# University of Huddersfield Repository

Gomes, Danilo

Dynamics of Early Project Collaboration

**Original Citation**

Gomes, Danilo (2019) Dynamics of Early Project Collaboration. Doctoral thesis, University of Huddersfield.

This version is available at http://eprints.hud.ac.uk/id/eprint/35135/

# DYNAMICS OF EARLY PROJECT COLLABORATION

**DANILO GOMES**

A thesis submitted to the University of Huddersfield in partial fulfilment of the requirements for the degree of Doctor of Philosophy

September 2019

University of
HUDDERSFIELD
Inspiring tomorrow's professionals

ART
DESIGN
ARCHITECTURE
HUDDERSFIELD

iɔl

# DYNAMICS OF EARLY PROJECT COLLABORATION

## DANILO FERNANDO DE OLIVEIRA GOMES

A Thesis submitted to the University of Huddersfield in partial fulfilment of the requirements for the degree of Doctor of Philosophy

The University of Huddersfield

September 2019

## Copyright statement

i. The author of this thesis (including any appendices and/or schedules to this thesis) owns any copyright in it (the "Copyright") and s/he has given The University of Huddersfield the right to use such copyright for any administrative, promotional, educational and/or teaching purposes.

ii. Copies of this thesis, either in full or in extracts, may be made only in accordance with the regulations of the University Library. Details of these regulations may be obtained from the Librarian. This page must form part of any such copies made.

iii. The ownership of any patents, designs, trademarks and any and all other intellectual property rights except for the Copyright (the "Intellectual Property Rights") and any reproductions of copyright works, for example graphs and tables ("Reproductions"), which may be described in this thesis, may not be owned by the author and may be owned by third parties. Such Intellectual Property Rights and Reproductions cannot and must not be made available for use without the prior written permission of the owner(s) of the relevant Intellectual Property Rights and/or Reproductions

# Abstract

Early project collaboration involves the resolution of misunderstandings among project participants. Misunderstandings can be considered a natural emergent feature in Early Project Collaboration, which only become problematic if they are not revealed and resolved, leading to wrong assumptions and false expectations among project participants.

At early project interactions, misunderstandings tend to involve individuals' different interpretations of what collaboration means. Diverse interpretations of collaboration become manifested within different artefacts that project participants design and select to use in the activity. When these diverse understandings are revealed and exposed in time, they can lead to opportunities to explore and expand different ways to perceive the situation, as well as to conceive different design alternatives.

However, little is known about the nature of collaborative interactions related to the resolution of misunderstandings at early project stage. Current interpretations of these collaborative interactions seem to be limited by a positivist and reductionist notion of knowledge, which have traditionally focused on individual models of cognition, separating mind and body.

A case study approach was adopted to address this gap in the literature and propose a new interpretation of early project collaboration. The findings from the case studies suggested that the resolution of misunderstandings requires that participants perceive and embrace the dialectical and situated nature of collaborative interaction towards mutual intelligibility, involving *breakdowns* and the use of *metaphors*.

The study also revealed that early project interactions involve the socio-construction of key constructs of collaboration objectivated in terms of *perceptions of interdependency and performance, and conceptions of resource and changing actions*. Thus, project participants need to work upon misunderstandings emerging from different interpretations of these key constructs of collaboration that become embodied into diverse artefacts, assembles, events and approaches in the activity.

As a result, this thesis proposes an alternative to current models of early project collaboration, based on a group-level framework that provides the means to interpret the dialectical and situated nature of early project collaboration. It is contended that the proposed theoretical framework provides a better interpretation of collaborative interactions because it allows the mapping of individuals' interactions to socially construct the project activity. It is suggested that this framework can potentially be used by project participants as a mapping tool, aligned with a pragmatic perspective, and supporting collective reflective interaction to socially construct collaboration.

# Table of Contents

# List of Figures

**Appendix 3**

## Appendix 4

# List of Tables

**Appendix 2**

# Dedications and Acknowledgements

# List of publications arising from the work

Gomes, D., & Tzortzopoulos, P. (2019). Metaphors of Collaboration in Construction. *Canadian Journal of Civil Engineering*. https://doi.org/10.1139/cjce-2018-0461

> Journal publication discussing existing definitions of collaboration and how they relate to three different perspectives on the nature of collaborative interactions. The disucssion suggest that these perspectives are usually manifested as organisational metaphors. The paper includes an expanded discussion from the contents presented on sections 2.2, 2.3 and 2.4, describing, respectively, the three metaphors of collaboration as: a *mechanism* (section 2.2.2); a *organisation* (section 2.2.3); and a *socio-construct* (section 2.2.4).

Gomes, D., & Tzortzopoulos, P. (2018). Building Shared Understanding in Early Design Collaboration. In: *Proc. 26th Annual Conference of the International. Group for Lean Construction (IGLC),* González, V.A. (ed.), Chennai, India. pp 473-483.

> Conference paper presenting a preliminary analysis of the Exploratory Case Study. The analysis aimed to capture misunderstanding among project participants and how individuals resolved such misunderstandings. The results of this study contributed in part with the further development of such analysis, presented in section 4.2.

Gomes, D., Koskela, L., Biotto, C., Talebi, S. & Pikas, E. (2017). Shared Understanding in Construction: A Conceptual Synthesis. In: *5th International Workshop: When Social Science meets Lean and BIM*, Aalborg, Denmark.

> This paper discusses the notion of "shared understanding" as a precodition to promote collaboration among project stakeholders. Through a literature review, the paper explores concepts and terms related to shared understanding. This conceptual synthesis is suggested as a new theoretical background supporting the exploration of collaboration system, methods and tools in construction. The author's contribution and exploration of the concept of shared understanding were partially used on section 2.4 of this thesis.

Gomes, D., Tzortzopoulos, P. & Kagioglou, M. (2017). Collaborative Concept Design as Socio-Construction. In: *5th International Workshop: When Social Science meets Lean and BIM*, Aalborg, Denmark.

> This paper focuses on the limited impact of implementing new contextual and media artefacts in supporting collaboration at early project stages. Through a literature review, the paper presents a model to study collaborative interactions, based on a socio-constructive perspective through Activity Theory. This contributed to the argument developed as parto f the theoretical framework, presented in section 2.4.

Gomes, D., Tzortzopoulos, P. & Kagioglou, M. (2017). Socio-Constructivist Account of Collaboration in Concept Design. In: *25th Annual Conference of the International Group for Lean Construction.* Heraklion, Greece, 9-12 Jul 2017. pp 301-308.

> This paper discusses a model to study early project collaboration. The proposed model suggests that collaboration is determined by the group's ability to perform collective reflective interactions. Such discussion influenced the conception of the theoretical framework presented in sections 2.4.2, 2.4.3 and 2.4.4.

Gomes, D., Tzortzopoulos, P., & Kagioglou, M. (2016). Collaboration through shared understanding in the early design stage. In: *24th Ann. Conf. of the Int'l. Group for Lean Construction.* Boston, MA, USA. pp. 63-72.

> This literature review paper presents an initial exploration of a socio-constructive perspective of collaboration. It concentrates in exploring the concept of shared understanding as iterative interactions involving mediated coupling and coordinated perception. The paper presents an initial investigation on how shared understanding can be articulated on existing lean approaches (e.g. Last Planner System, Set-Based Design and Choosing-By-Advantages). This initial discussion supported the futher development of the contents presented in section 2.2.6.

Koskela, L., Pikas, E., Gomes, D., Biotto, C., Talebi, S., Rahim, N. & Tzortzopoulos, P. (2016). Towards Shared Understanding on Common Ground, Boundary Objects and Other Related Concepts. In: *24th Annual Conference of the International Group for Lean Construction.* Boston, USA.

> Conference paper discussing preconditions for communication and collaboration in construction. The author contributed with the discussion around the definition of the concept of shared understanding. Such discussion contributed with the arguments presented in section 2.3.4.

# 1. Introduction

## 1.1. Introduction

This introductory chapter outlines the research presented in this thesis. It addresses the importance of collaboration in construction and how it has been seen as a key condition to overcome the poor performance at early project stages. In addition, it identifies the lack of consensus on what collaboration means in construction, and reveals that emergent misunderstandings between project stakeholders are some of the main reasons why collaboration is hampered at the early project stages of construction.

The research background is presented, discussing how previous studies have explored the ways in which project stakeholders resolve misunderstandings to support better collaboration. In this context, the current gap in the literature is identified, indicating the need to develop a better understanding of the dynamics of early project collaboration in construction.

In summary, this chapter presents the rationale for the inquiry, describing the research aim, objectives, the general methodological approach and expected contributions. The overall structure of the thesis is also presented.

## 1.2. Research Background

Construction, as any other human activity, whether we are aware of it or not, is collaborative and public by nature (Coyne and Snodgrass, 1993). Construction project delivery takes place in a social context, in which many people with varying, and often contradictory, interests and ideas are involved (Rittel, 1987). Hence, construction projects can be considered a collaborative act that relies on effective interaction between project stakeholders (Koskela, 2000; den Otter and Emmit, 2008). In this context, collaboration is assumed to enable project participants to build capacity, in a way that the group outcome is more than the sum of the individuals' outcomes (Bertelsen, 2003a; Shelbourn et al., 2007).

Overall, the term *collaboration* has been used widely and has carried a variety of meanings (D' Amour et al., 2005). There is also significant diversity in the way academics have conceptualised collaboration and its factors (D' Amour et al., 2005). In construction research, the concept of *collaboration* remains amorphous (Poirier et al., 2016). The majority of theoretical definitions of *collaboration* have been originally proposed in the fields of organisational theory and organisational sociology (D' Amour et al., 2005), which were then adapted to construction (Schottle et al., 2014; Poirier et al., 2016). Attempts at formalising the

concept of collaboration have resulted in normative definitions and checklists of antecedents and criteria for successful collaboration (D' Amour et al., 2005; Poirier et al., 2016). It has been recognised that such normative definitions fail to account for the evolutionary and dynamic nature of collaboration, because they tend to consider collaboration as an endpoint, something to be achieved rather than an evolving feature of the activity (Poirier et al., 2016). Consequently, it could be said that there is no consistent or fundamental understanding of what collaboration is (Gray, 1989).

In construction, the notion of collaboration seems to compete against self-interested growth and sub-optimisation strategies (Bertelsen, 2003a). Traditionally, poor performance in construction has been related to the lack of collaboration between different disciplines involved in various stages of a project (Latham, 1994; Egan, 1998; Anumba and Evboumawan, 1997; Anumba et al., 1997; Love et al., 1998; Faniran et al., 2001; Bertelsen, 2003a). Hence, the early engagement of stakeholders from all disciplines is contended to optimise project activity and reduce the need to compromise design later in the project (Macmillan et al., 2001). Multidisciplinary teams are usually assembled to maximise the influence of a variety of disciplines that will be engaged through the entire project activity (Dong et al., 2013a; Paranandi, 2014).

In the UK, the Royal Institute of British Architects (RIBA) Plan of Works (RIBA, 2013) refers to the Early Project as the *Strategic Definition* (Stage 0), *Preparation and Brief* (Stage 1), and *Concept Design* (Stage 2) (Figure 1). It suggests the multidisciplinary involvement of the construction project team in outlining proposals for building services, structural design, specifications and preliminary cost information along with relevant project strategies in accordance with the design programme.



**Figure 1: Fragment from RIBA Plan of Works (RIBA, 2013) - Early Project Stages**

In the USA, the American Institute of Architects (AIA) refer to Early Project as *Schematic Design*, and also suggest multidisciplinary engagement on designing the initial set of relationships and the scale of project components in conformance with the programme, including structural and MEP systems, performance criteria and estimated cost of the work (AIA, 1995).

Early Project in Construction can also be referred to the *Project Definition* phase in the Lean Project Delivery System (Figure 2), which consists of concept design generation based on the determination and translation of the project requirements into performance criteria for both product and process, supported by group decision-making (Ballard, 2008).
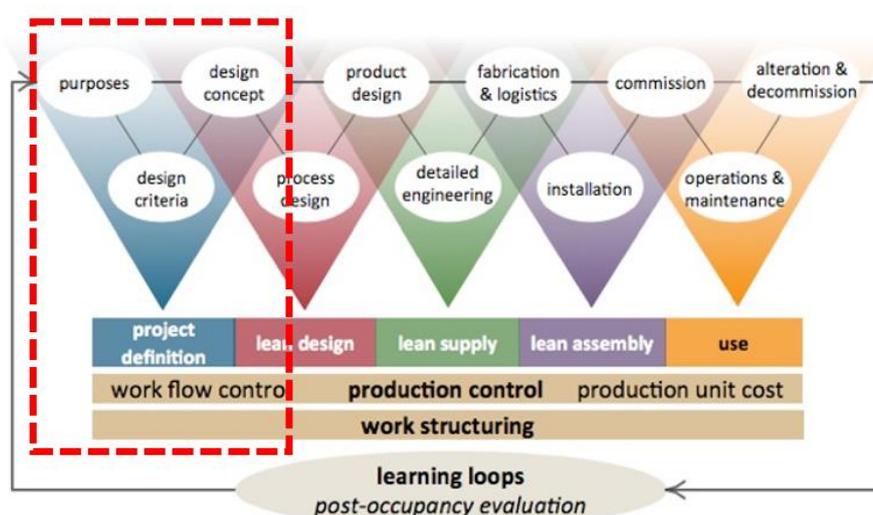


**Figure 2:** *Lean Project Delivery System* **(Ballard, 2008)**

Research in the field of New Product Development (NPD) refers to Early Project as the *Front-end* activities including outlining the business case, idea generation, product concept definition, market and technological assessment (Cooper, 1994; Kagioglou et al., 1998), in which the product strategy is defined as a set of information that represents the synthesis of preferences and requirements from all stakeholders (Tzortzopoulos et al., 2006).

Early project activities require the widest divergence in gathering information to support collective decision-making, involving business objectives, technologies, target markets, capabilities development and general product or service features (Hey et al., 2007). Early Project Stage deals with what is considered the *fuzzy knowledge* of design requirements and constraints, in which a high level of uncertainty and vague ideas are tolerated (Qin et al., 2000; Hsu and Liu, 2000). Thus, Early Project is seen as a deeper sense-making activity that is not

necessarily tied to any particular tool, and can be referred as a higher creative stage, also known as *Design ideation* (Jonson, 2005).

Due to its inherent interdisciplinary nature, the impact of early project decisions (see Figure 3) is substantial and it becomes extremely difficult, or even impossible, to alleviate or overcome the shortcomings of a poor design concept at later project stages (Wang et al., 2002).



**Figure 3: Change vs. Cost of Early Project Decisions adapted from Cambridge Institute for Sustainability Leadership (2015)**

Moreover, the rapid and dynamic rhythm of interactions can result in disorganised behaviour of project participants (Macmillan et al., 2001), and simply working together or discussing a similar topic does not indicate collaboration (Kvan, 2000). In addition, other factors have been indicated as consequences of lack of early project collaboration: late engagement of design participants; lacking or delayed input from participants in coupled tasks, in which the iteration needed has to be started with incomplete information; earlier decisions or intentions not taken into account in later tasks; change in design objectives or criteria; and unbalanced design resources (Koskela, 2000).

Project stakeholders are expected to engage in the social dynamics of collaboration to align their activities to achieve better outcomes (Valkenburg, 1998). However, the diversity of commercial interests and traditional practices usually leads to poor collaboration among project disciplines, affecting the process of decision-making and pushing problem solving downstream (Pikas et al., 2015; Adamu et al., 2015). Consequently, poor performance in the early stages of construction projects can result in negative environmental impacts, cost overruns and client dissatisfaction (Egan, 1998; Hsu and Liu, 2000; Qin et al., 2000; Macmillan et al., 2001; Bertelsen, 2003a; Zimina et al., 2012).

More specifically, the traditional configuration of construction around specialised functions of practices (i.e. professional disciplines) maintaining tight boundaries between business, design and construction activities, seems to lead to the emergence of conceptual barriers, leading to **conflicts of understanding** between project stakeholders (Forgues et al., 2009), as they construct fundamentally divergent interpretations about aspects of the project activity.

## 1.3. Research Problem

The research problem addressed in this thesis relates to conflicts of understandings among project participants at early project stages. In this case, participants' misunderstandings related to the project activity and about each other can hamper collaboration (Gray, 2004).

Individuals can decide to collaborate based on two reasons: one, when they perceive the opportunity to capitalise on a shared sense of purpose among potential partners; or two, when they attempt to resolve a perceived conflict of purposes (Gray, 1989). However, in practical configurations these motivations can easily become intertwined (Gray, 2004). For example, partnerships that start from a sense of shared purpose can evolve to a situation in which the stakeholders find themselves in conflict over the action to implement their agenda (Gray, 2004). Or, even if the starting point of the interaction is conflict, both parties need to reframe some of their original interpretations about the aspects of the circumstances (e.g. substantive issues, process, and the parties) in a shared way, in order to find an acceptable solution to the conflict (Gray, 2004).

Conflicts in construction projects emerge when different individuals, groups and organisations come to interact with different interests and multiple objectives (Green, 1996; Tzortzopoulos et al., 2006). Collaboration is hampered by conflicts usually emerging from the diversity of values and differences of power in the dynamic interaction of multiple organisations (Wild, 2002). In this case, different stakeholders with different objectives and targets are expected to interact in order to complete the project successfully (Bertelsen, 2003b), as Howell et al. (2004) described:

*"We come together on projects as strangers, each from a different background with different interests, each with our own history and carrying our own concerns. So each of us operates with a different background of obviousness – our way of functioning and seeing the world, the possible future, and how we should act as we move forward it. Moving from strangers to friends to partners does not happen by accident, nor is it likely to happen given*

*enough time. Creating a coherent team takes time, engagement, and reflection."* (Howell et al., 2004:7).

Project stakeholders engaged in collaborative interactions tend to reveal very early their different solution agendas and different ways of working (Brereton, 1996). Thus, early project collaboration can be negatively affected when participants coming from diverse disciplinary fields try to make sense of the situation based on a different background of experiences, values, and history of professional relationships (Gray, 2004).

Conflicts of understandings can happen due to different languages, diverse disciplinary standards and wrong assumptions between design disciplines (Parrish et al., 2008). They often emerge over assumptions about the consequences of certain "facts" in the evolving project situation (Lloyd and Busby, 2001). In this case, conflicts over resource allocation can be generated by divergences on strategic and operational issues interpenetrated with cultural differences and asymmetry of power between project parties (Wild, 2002). Overall, these can be considered conflicts of perception emerging as misalignments and misunderstandings between project stakeholders (Wild, 2002).

Moreover, the ad hoc, unplanned and intuitive nature of the project stakeholders' behaviour at early project stages adds to the nature of these misunderstandings, as activities need to be coordinated, and an opportunistic deviation initiated by one member is not necessarily perceived as relevant to other members (Cross and Cross, 1995; Cross, 2011). In this case, poor collaboration in the early project stage can be experienced as misunderstandings between team members around undocumented decisions and design representations, which are perceived as vague by other individuals (Maher et al., 1996). The challenge in this case is that these iterations are not easy to track, thus affecting the understanding of the reasoning behind decision-making of other project members (Cross and Cross, 1995).

Therefore, misunderstandings about the design object and about the task in the project team can emerge; and, if they happen during the early project stage, they can hamper project progress and negatively influence the activity (Valkenburg, 1998). Different ways of understanding and approaching the activity, along with diverse business purposes, lead to poor coordination in terms of structure and focus, resulting in frustration within design teams (Macmillan et al., 2001). In addition, conflicts emerging as diverse understandings of the project requirements held by different stakeholders can cause major unnecessary design rework (Tzortzopoulos et al., 2006). In particular, the conflicts between requirements sometimes can only be revealed

after their inclusion in the design, thus affecting the perception of performance (i.e. the quality of design can be perceived as poor) and, consequently, causing delays in the project delivery (Tzortzopoulos et al., 2006).

The important insight from the above is the notion of conflicts, and how they seem to have a key role in the dynamics of collaborative interaction. According to Gaski (1984), a conflict should be seen as a social interpretive phenomenon, which is defined in terms of how the parties involved perceive each other. From this point of view, neither the occurrence nor the outcome of the conflict can be completely and rigidly determined in any objective means (Vaaland, 2004). Thus, the way in which two parties perceive the fundamental aspects of the conflicts will be key to providing an understanding of that collaborative interaction (Vaaland, 2004).

In this case, it can be argued that misunderstandings are a natural and emergent aspect of collaborative initiatives in construction, and only become problematic when these conflicts are not addressed, and that the differences in approach and understanding can result in uncoordinated actions (Valkenburg and Dorst, 1998). Misunderstandings emerge as conceptual barriers and become problematic and evident when stakeholders do not differentiate and use the same term to refer to tasks that may vary in intent and degree of participation (Kvan, 2000). Thus, collaborative initiatives can fail when participants cannot find satisfactory approaches to understand each other's interpretation, or when they cannot find suitable ways to reinterpret and reshape the situation (Gray, 2004) and align their expectations to overcome any conflict of understanding.

## 1.4. Research Gap

Previous research tried to explain the dynamics of early project collaboration by focusing on understanding the interactions to resolve misunderstandings between project stakeholders (Cross and Cross, 1995; Engestrom, 1995; Valkenburg, 1998; Stumpf and McDonnel, 2002; Vaaland, 2004; Forgues et al., 2009; Groleau et al., 2012; van Amstel et al., 2016; Forgues et al., 2016; Paavola and Miettinen, 2018). However, it can be argued that some of these initiatives are limited due to epistemological perspectives, while others could only provide a partial understanding of these interactions. So, this research addressed this gap.

It is assumed that the ways in which participants interpret and shape issues and conflicts within the project situation can explain collaborative success or failure (Gray 2004). In this case, conflicts of understandings should not be approached as something to be removed, but rather as an inherent aspect of the social interaction, in which both parties perceive the situation

fundamentally differently (Engestrom, 1995; Vaaland, 2004). From this point of view, conflicts of understanding can have a contributory potential allowing a large number of ideas to be brought into discussion; and, if properly addressed, they can be considered a source of insight, supporting actions to achieve compromise (Vaaland, 2004).

The challenge for project participants is to form a clear picture of the perceptions of the parties, and to reveal their understanding of the other party's perceptions of the causes of tensions (i.e. conflicting events) (Engestrom, 1995; Vaaland, 2004). Thus, the evolution of the project content depends on the participants' negotiation strategies (Brereton, 1996) to resolve such conflicts of understanding.

Previous research suggested that, as at early project interactions, concepts need to be built up to turn the initial idea into something more robust, project members become involved in a persuasion process to convince the others of the value of certain concepts (Cross and Cross, 1995; Cross, 2011). In order to overcome misunderstandings, stakeholders need to interact over design semantics, which are justifications of design decisions and properties associated with performance and behaviour of design (Maher et al., 1996). Project participants tend to try to build a shared understanding about the early project situation using graphic tools and verbal communication (Schon, 1983; Cross and Cross, 1995; Oxman, 2006; Donn et al., 2012), aiming at building common ground[1] (Gu et al., 2015; Koskela, 2015).

In this context, the notion of Rhetoric has been traditionally used to explain the dynamics of collaborative interaction in terms of linguistic actions in project situations (Flores, 1982; Lloyd and Busby, 2001; Stumpf and McDonnel, 2002; Forgues and Koskela, 2009; Badke-Schaub et al., 2010; Dong et al., 2013b; Koskela, 2015; Koskela et al., 2018). From this point of view, collaborative interactions at early project stages can be explained by the methods of Rhetoric, in which the project activity is considered a persuasion process between arguer and an audience (Stumpf and McDonnel, 2002). More specifically, Rhetoric has been related to the idea that project stakeholders need to find a common language, which has been further related to the

---

[1] Koskela (2015) refers to *common ground* as a set of common values, mutually known facts, and commonly held presumptions, between the orator and the audience.

concept of *common knowledge* between individuals in terms of *shared mental models*[23] (Badke-Schaub et al., 2007; Forgues et al., 2009).

The main assumption of this interpretation is that project participants use argumentation to construct persuasive concepts, in which *knowledge* is considered guaranteed to be absolutely certain and reliable through the modes of formal logic (Stumpf and McDonnel, 2002). Hence, the Rhetoric perspective assumes an atomic idea of knowledge sharing, in which a *shared mental model* is ascribed to the entirety of the knowledge and belief structures associated with the project situation (Dong et al., 2013b). Consequently, successful collaboration is described in terms of the capacity of the teams to create these *shared mental models,* as a container of the group's knowledge, in which conceptual barriers, or conflicts of understanding are identified and resolved among participants' individual perceptions (Forgues et al., 2009).

However, the assumption that *shared mental models* encapsulate all the knowledge shared by a team is questionable (Dong et al., 2013b). The problem is that it assumes that project collaboration is dependent on individuals' enactment of their knowledge, which presumes that 'all knowledge' that is needed to solve a particular problem originates from the team members present at the situation (Dong et al., 2013b), and does not take into consideration the social and historical construction of the activity.

Alternatively, from a different epistemological perspective, early project collaboration has also been understood as a socially constructed phenomenon, in which project stakeholders interact with different frames of reference (Schon and Rein, 1994; Gray, 2004). From this perspective,

---

[2] **Mental models** are "*mechanism whereby humans generate descriptions of system purpose and form, explanations of system functioning and observed system states, and predictions of future system states*" (Rouse and Morris, 1986, p. 360 apud Cannon-Bowers et al., 1993, p. 226). From a purely cognitive standpoint, the mental model construct assumes that people organise knowledge into structured, meaningful patterns that are stored in memory (Johnson-Laird, 1983; Rouse & Morris, 1986 apud Cannon-Bowers et al., 1993, p. 226). The organisation of knowledge into structured patterns (i.e. mental models) enables people to process information in a rapid and flexible manner and underlies complex cognitive functioning (Rumelhart and Ortany, 1977 apud Cannon-Bowers et al., 1993, p. 226). The mental model construct has been invoked frequently by psychologists and engineers to explain human cognitive functioning and human system performance (Cannon-Bowers et al., 1993, p. 227).

[3] **Shared Mental Models**: Team members under high-workload conditions exercised mutual (or shared) mental models, allowing them to coordinate implicitly (i.e. without overt communication). In this case, Orasanu (1990 apud Cannon-Bowers et al., 1993, p. 229) used the term Shared Mental Model to refer to common models of the problem or situation. According to this view, team members must develop a shared understanding of the situation. These "shared situation" or "shared problem" models include a common understanding of the problem, goals, information cues, strategies, and member roles, all of which are grounded in the team's more general models of the task and team (Cannon-Bowers et al., 1993, p. 229).

project participants tend to present an ability to collectively inquire into the intentions and meanings of others involved in the conflict of understanding (Schon and Rein, 1994). The socio-constructive perspective suggested that, instead of describing early project collaboration in terms of Rhetoric, the resolution of misunderstandings can be better explained in terms of Dialectics (Bucciarelli, 1984).

In this case, an analysis of the social context of early project collaboration in construction should not neglect the artefact, rather it must explore the connections between context and artefact, process and product, the social and technical (Bucciarelli, 1984). Moreover, in order to capture the social dynamics of conflict resolution in project situations, there is a need to investigate poles of contradiction and the technologies used as instruments of socio-historical construction (Groleau et al., 2012).

The advantage of studying the socio-materiality of contradictions in project situations is that they can reveal the self-determinist nature of project interactions; in other words, the dialectical nature of project interactions, where a collection of individual determinations exists within multiple interpretations of a concept (van Amstel et al., 2016). However, while contradictions seem to be a fundamental concept to understand the heuristic (Dorst and Dijkjuis, 1995) and the dialectical (Goldschmidt, 1991) nature of early project collaboration, they are difficult to study empirically (van Amstel et al., 2016).

On this matter, previous research showed that the conception of artefact-mediated activity proposed by Activity Theory (see section 2.4.1) can be useful to understand the socio-construction and the emergence of contradictions in collaborative interactions in project activities (Engestrom, 1995; Aksenova et al., 2014; Forgues et al., 2016; Paavola and Miettinen, 2018). According to Engestrom (1995), Activity Theory provides a framework by which to study the dynamics of project collaboration, in which the meeting of the two or more perspectives and courses of actions cannot be reduced to immediately observable and recordable features of interaction (Engestrom, 1995). In this case, mediating artefacts have an epistemic role, in which the activity is, at the same time, directed and transformed by them (Forgues et a., 2016). Thus, project collaboration can be understood as a socio-historical

activity of object formation or object construction, in which design work, for example, serves as an objectivation[4] of the construction-in-making (Paavola and Miettinen, 2018).

In construction research, such approach was adopted to investigate the role of procurement methods (Forgues and Koskela, 2009), firm organisational structures (Groleau et al., 2012), architectural design (van Amstel et al., 2016), and the Building Information Modelling (BIM) process (Forgues et al., 2016; Paavola and Miettinen, 2018). The conclusion of these studies suggests that the development of new procurement methods, new digital systems and new applications can potentially allow better means to manage the resolution of misunderstandings around diverse perspectives of concrete objects of the project activity, especially building design representations (e.g. through BIM applications).

However, these studies do not provide a deeper understanding of the dynamics involved in the resolution of contradictions, emerging as misunderstandings among divergent objects of activity in construction projects. As suggested by Bucciarelli (1984), a deeper understanding of these interactions seems to be dependent on a broader approach to inquiry, which considers how the whole project activity emerges as a dialectical interaction involving the embodiment of participants' objectivations into artefacts. This leads to a research need for exploring a more comprehensive understanding of the dynamics of socio-construction of early project collaboration in construction, through a deeper understanding of the dynamics of the resolution of misunderstandings.

## 1.5. Focus and Scope

The research focus emerged from an extensive literature review on collaborative practices, and the identification of common problems faced at early project stages in construction.

Traditionally, research on collaboration in construction has focused on the development of organisational strategies and technological applications to support improvements in practice (see section 2.2.3 and 2.2.4). Embedded in such explorations is an underlying expectation to conceive, or use, a solution that can be applied and implemented in practice. Such a prescriptive approach seems to be the main stream of research and, while it seems to be appropriate in the study of activities with a certain level of predictability, previous research has identified that

[4] *Objectivation* is the conversion of a concept or abstraction into an object (Harvey, 2019). Understanding of reality is constructed through objectivations, which materialise individuals' interpretations and subjective intentions into objects (Berger and Luckmann, 1966).

those activities tend to have little impact on changing practices, especially at early project stages (Macmillan et al., 2001; Forgues and Koskela, 2009; Zimina et al., 2012; Leon and Laing, 2014; Boton and Forgues, 2017; Beckett, 2017).

While this research focuses on exploring a better understanding of the dynamics of early project collaboration, it also discusses which ways such a theoretical framework could be used as a self-reflective tool in practice, supporting practitioners' development to find ways to improve their own setting.

It assumes that a major feature of Early Project Collaboration is the forging of connections between diverse discourses (Dorst, 2006) through the collective construction of objects of activity, which may be hampered if there are differences in the way participants perceive and understand collaboration within the project activity.

Therefore, this research focuses on the socio-construction of the early project activity in real-world settings, considering how project participants (e.g. client, architects and contractors) interact in the task through a series of objectivations. It particularly investigates two construction project settings which adopted procurement strategies that enable the early engagement of the main stakeholders, one in the USA and another in the UK. A further description of these settings and how they were selected as cases to be studied is presented in the Research Method chapter (see section 3.3).

## 1.6. Research Aim

The aim of this research is to improve the understanding of early project collaboration in construction. It proposes recommendations to increase the effectiveness of future project initiatives, based on the study of early project interactions in real-world settings. The research describes the dynamics involved in the resolution of misunderstandings between project stakeholders, and provides guidance to improve the performance at early project stages.

## 1.7. Research Objectives

In order to achieve the research aim, a set of objectives was established with the respective research questions that addressed them:

**Objective (1):** *Identify and analyse how collaboration has been addressed in construction projects.*

Q1: *How has collaboration been addressed in construction projects?*

Q2: *What are the common problems related to Early Project Collaboration?*

**Objective (2): *Understand the emergence of misunderstandings at early project interactions and how they tend to be resolved.***

Q3: *How and why misunderstandings emerge at Early Project Stage?*

Q4: *How misunderstandings tend to be resolved?*

***Objective (3): Propose a better way to interpret collaborative interactions at early project stages.***

Q5: *How Early Project Collaboration is constructed?*

Q6: *How to better interpret Early Project Collaboration?*

# 1.8. Methodological Approach

The methodological approach was established based on the background, gap and focus presented earlier. This research adopts a socio-constructivist perspective of early project collaboration. In order to achieve the aim, this research investigates the ways people make sense of their world through the intersubjectivity of shared meanings, which aligns with an interpretivist perspective, as an epistemological approach. Thus, the Case Study was selected as the methodological approach, allowing for an in-depth empirical inquiry to capture participants' different perspectives on real-world contexts.

The decomposition of the research aim into research objectives guided the design of the Research Strategy (Figure 4).
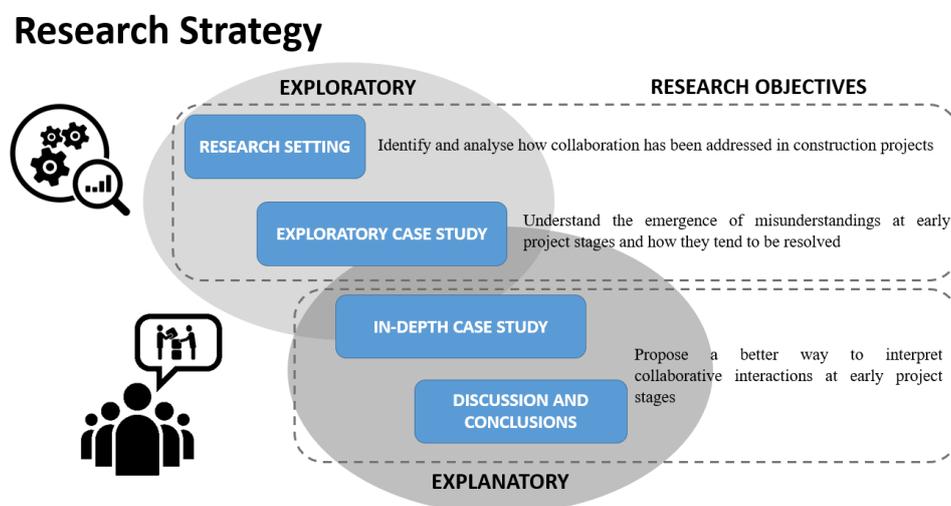


**Figure 4: Research Strategy**

This research was divided into two stages: The *Exploratory Activity* and *Explanatory Activity*.

In the Exploratory activity, the first two research objectives were addressed through a literature review and an exploratory case study. The literature review, initially, allowed the identification of how early project collaboration has been defined in construction research, and identified the common causes for poor collaboration at early project stage. The exploratory case study, developed in a Design Charrette activity at concept design stage, allowed the observation of this phenomenon in a real-life setting, focusing on gathering evidence of the emergence of misunderstandings between project participants, and also to get insights into what these individuals usually do to resolve misunderstandings. The results of this initial exploration allowed the further elaboration of a theoretical framework to support a better interpretation of early project collaboration, which led to the second stage of the research.

In the Explanatory activity, the third objective was addressed through an in-depth case study at the Early Stage of a Construction Project of a university building, in which the procurement method adopted was considered to enable improved collaboration among project participants. The decision to focus on one in-depth case study was made in order to provide for a large amount of rich information about participants' interactions for early project collaboration. In this case, participants were interviewed and, based on the proposed theoretical framework, an interpretation was elaborated to show how project stakeholders constructed a collaboration in that situation. Then, further interpretation and discussion over the nature, reasons and limitations of such interactions were addressed in comparison with other theoretical accounts of early project collaboration. Such discussion allowed for the suggestion of recommendations and guidance on the way project participants can improve their performance in these interactions.

Further description and justification of the method adopted is presented in Chapter 3.

## 1.9. Thesis Structure

The thesis comprises six chapters. The introductory chapter presents the background of the research, describing the research problem, gap, aim and objectives.

Chapter Two presents the literature review and synthesis leading to a theoretical framework based on a socio-constructive perspective of project collaboration. The chapter starts by describing the historical construction of diverse interpretations of project collaboration in theory and practice. It describes the context, origins and consequences of misunderstandings

in relation to project collaboration. Then, based on the ways misunderstandings tend to be resolved, and the framework proposed by Activity Theory, an alternative model to interpret the early project collaboration is presented.

The third chapter describes the research method, including the philosophical stand, approach and procedures adopted in this research. Such description explains and justifies the techniques applied in interpreting the phenomenon studied, as well the evaluation of the research results.

The fourth chapter presents the two case studies conducted on this research, in which the evidence collected was interpreted in terms of the proposed theoretical framework.

The fifth chapter discuss the overall findings of this research and what the main theoretical contributions are.

Finally, Chapter Six presents the research conclusions, discussing the findings of this research and what the main theoretical and practical contributions are (i.e. recommendations, lessons learnt, best practices). The conclusion chapter also presents suggestions for future research.

## 1.10.    Summary

This chapter introduced the research presented in this thesis. The background and research problem were discussed, and the research gap in the context of early project collaboration in construction was identified. The originality and importance of the research was explored. The methodological approach was outlined, indicating the main research activities and how they link to the research aim and objectives. Finally, the thesis structured was presented.

The following chapter presents the theoretical background of this research, constructed in terms of a review and synthesis of key literature on the topic.

# 2. Literature Review and Synthesis

## 2.1. Introduction

The previous chapter outlined the research problem and strategy. This chapter will focus on presenting the relevant literature on the topics addressed in this research, expanding on the research background and supporting the conception of a theoretical framework, aiming to address the research gap identified. The logic of such inquiry is summarised in the Literature Review and Synthesis Structure (Figure 5) presented below.

The first section (2.2) of this literature review presents the current understanding of collaboration. It addresses the fact that there is no consensus around the definitions of collaboration across different research fields (see section 2.2.1). Hence, considering that divergent interpretations of collaboration tend to lead to conflicts of understanding within early project activities, the following section (2.2.2) explores the notion of *Appreciative Systems* to explain why individuals interpret 'things' differently. In section 2.2.3, it is suggested that the socio-historical nature of the construction of these interpretations led to the emergence of paradigms of collaboration, which are usually related to three different metaphors of collaboration. These metaphors are further described and related to key definitions of collaboration found in the relevant literature to construction research (see sections 2.2.3, 2.2.4, 2.2.5). By understanding the differences among the three metaphors of collaboration, and how individuals tend to be embody them into different practices in construction, the author discusses the practical consequences of having diverse definitions of collaboration, in terms of emergent misunderstandings among these individuals (see section 2.2.6).

Thus, the second section (2.3) explores the nature of misunderstandings among project participants at early project interactions, discussing its context (2.3.1), origins (2.3.2) and consequences (2.3.3). In addition, *breakdown* interactions and the use of metaphors are explored as potential resolutions[5] of misunderstandings, leading project participants to build mutual intelligibility among them (2.3.4).

Finally, in the third section (2.4), a synthesis presents the construction of a theoretical framework to interpret the dynamics of early project collaboration. The proposed framework

---

[5] In this case, while the term solution refers to any general *"means of solving a problem or dealing with a difficult situation"*, the use of the term resolution specifically refers to *"the action of solving a problem or contentious matter"*, which better suits the type of phenomenon being investigated.

is based on *Activity Theory* (2.4.1) and the *Theory of Inquiry* from Dewey (1938), and suggests a way to map the dialectical and situated nature of project participants' interactions to resolve emergent misunderstandings and socially construct early project collaboration.
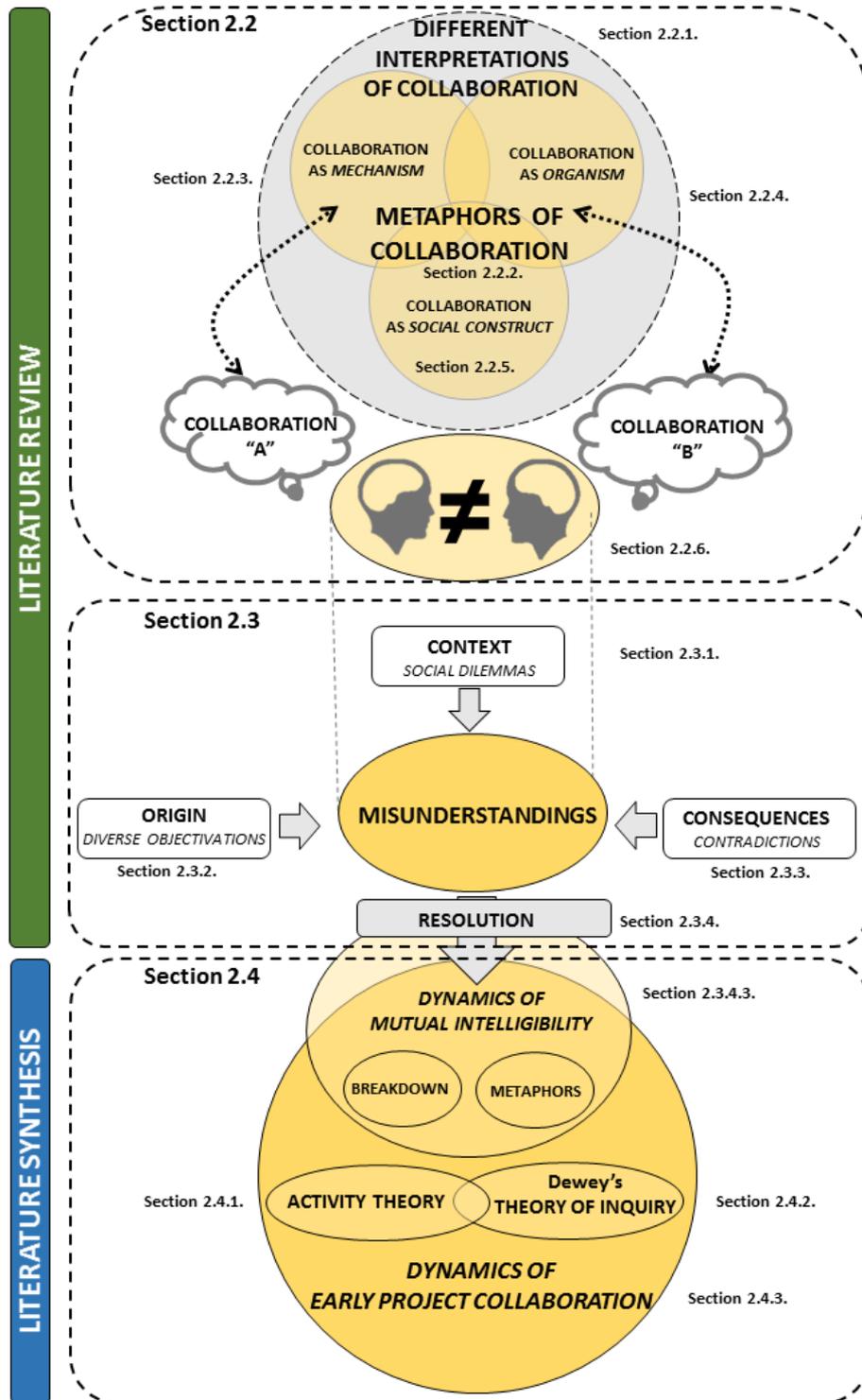


**Figure 5: Literature Review and Synthesis Structure**

## 2.2. Collaboration

Overall, the term *collaboration* has been used widely and has carried a variety of meanings to different people (Mattessich and Monsey, 1992; D' Amour et al., 2005). Consequently, it could be said that there is no consistent or fundamental understanding of what *collaboration* is (Gray, 1989; D' Amour et al., 2005).

In construction, the lack of consistency on what collaboration means has already been identified in previous research (Kvan, 2000; Schottle et al., 2014; Poirier et al., 2016). In this case, divergent interpretations of what constitute collaboration promote conceptual barriers, in which people are locked into 'patterns' of understanding that obscure other ways of conceiving and perceiving collaborative interactions (Coyne and Snodgrass, 1993; Schrage 1995; Leon and Laing, 2014).

As it was indicated in the introductory chapter (see section 1.3), this is a phenomenon that can emerge early on and negatively affect the project activity, when participants coming from diverse disciplinary background try to make sense of the situation based on different experiences, values, and history of professional relationships (Gray, 2004).

In this context, an important initial aspect of the inquiry towards improving the understanding of collaborative interactions in construction is to consider how and why different understandings exist in such circumstances (Thompson and Fine, 1999).

### 2.2.1. Appreciative Systems

The idea that individuals interpret situations differently has its origins in theories of social construction of reality,[6] since Weber (1930 apud 2007); Schutz (1932); Dewey (1938); Berger and Luckman (1966); and Silverman (1970), which assert that actions result from the meanings

---

[6] This thesis mainly addresses the phenomenon of collaboration from a socio-constructive point of view. Alternatively, Behavioural Psychology theories suggest that all human behaviours, like collaboration, are the result of experience (Moore, 2013; Cherry, 2019). Such theories argue that any individual, regardless of his or her background, can be trained to act in a particular way given the right condition (Moore, 2013; Cherry, 2019). This means that collaborative actions depend only on individuals' responses to environmental stimuli. Consequently, collaboration should be studied in a systematic and observable way regardless of internal mental states (e.g. cognition, emotions, moods, etc.) (Moore, 2013; Cherry, 2019). Therefore, as one of the main objectives of this thesis is to investigate how individuals in the same situation of "collaboration" can interpret it differently, the adoption of a behaviourist approach would be contradictory to the overall research approach. Definitions of collaboration originated in the context of Behavioural Psychology Sciences (e.g. Wood and Gray, 2001) are considered in section 2.2.4, for the purpose of analysing how they had affected the emergence of different interpretations of collaboration in construction.

that people attribute to their own and others' actions in society, in a constant and dynamic collective process of meaning attribution. According to Silverman (1970, p. 131), "*actions arise from meanings, meanings as social facts, meanings are socially sustained, meanings are socially changed.*" From this point of view, reality is not objectively given, but rather constructed through social interactions generating interpretations as collective meanings, that emerge from conversations among individuals in the social space (Gergen, 1985).

Max Weber (1930 apud 2007) was one of the first to propose that, in social interactions, individuals are influenced by their inherent models of behaviour that he named *ideal types*. According to him, these models are constructed based on actual historical events, that they will eventually deviate from, and they support representation and understanding of collective actions. Similarly, Bruner (1957) asserted that perception is constructed upon a certain range of inferences about properties and consequences of particular situation. In this context, individual actions of interpretation are influenced by what he called *'perception readiness'*, as an ability to easily identify common events, together with a need to carry habitual enterprises. Following this understanding, Dearborn and Simon (1958) proposed that individuals perceive in a situation what they are 'ready' to perceive. Through this *'selective perception'*, deliberation is affected by individuals' history of response and reinforcement leading them to selectively ignore what is irrelevant in the situation (Dearborn and Simon, 1958).

In the 1960s, Sir Geoffrey Vickers in his work *The Art of Judgments* (1965) provided one of the most comprehensive accounts on this socio-constructive nature of interpretive interactions involving individuals, groups of people, institutions and organisations in society. Vickers (1965) proposed the concept of *Appreciative Systems* as an epistemological model to make sense of what he called 'the social process'. The concept of *appreciative systems* contends that appreciation is enacted by individuals' ability to select and perceive (part of) reality to make judgements about it, contributing to the idea stream, and leading to actions that become part of the events stream (Checkland, 1994). In this case:

*"…both individually and in groups of various sizes, we gain experiences of the world (1). These experiences stem from both new events and ideas in the world and also from previous perceptions, interpretations, judgments and actions. They generate new interpretations of our perceived world (2) and the cycle continuous on and on… The real-world experiences, in our response to them, also help to generate our standards, norms and values (3), that is to say, the criteria of 'good/bad', 'acceptable/unacceptable' by which we make our judgements about the*

*world. (Vickers sees norms as the 'governing relations' we currently take as given – though they too will change over time with new experiences and new interpretations and judgements). Our interpretations and standards together enable us to make judgements (4) which are source of action (5) within the world."* (Checkland, 2005, p. 287-288).

Moreover, the notion of '*appreciation*' underlies that:

*"An action will both affect the current world and condition future experience in it, modifying over time our in-built readiness to see certain features of our perceived situation as significant and to neglect (or not see) other features. Equally the action, and judgements which lead to it, may help to modify the standards, norms and values which we have previously used."* (Checkland, 2005, p. 288)

Thus, human interactions invariably involve cycles of thought and action that are embedded in, and continuously reassert, the way individuals perceive the world and judge their actions within it (Checkland, 2005). The products of this process, as cultural manifestations, eventually condition the process itself (Checkland, 1994).

The main implication of the concept of *appreciative systems* is that, as each individual engaged in real-world situations invariably builds their model of the activity as a system of concepts, it can never be a single account of the activity in a collective situation (Checkland, 1994). Moreover, these models cannot be considered models of real-world action; rather, they are interpretive models indicating what each individual finds relevant to discourse and argument about the real-world action (Checkland, 1994). Consequently, as individuals interact in the project activity, these models become epistemic devices that support discourse and debate about different ways of understanding the situation.

Schön (1984) indicated the relevance of Vickers' concept of *appreciative system* to describe early project activity in construction. According to him, at this stage project stakeholders' (e.g. designers) actions depend on a normative framing of the situation, and only within the framework of an *appreciative system*, including their preferences, values, meanings and norms, that project stakeholders can achieve objectivity in their actions. In this case, each participant constructs its view of social reality through complementary processes of *framing* ('things' are selected for attention) and *naming* (these 'things' are named to fit the frame constructed for the situation) (Schön and Rein, 1994).

As project stakeholders' perspectives may vary over time in relation to the evolution of the project activity, it demands an account for the significance of values, norms and technical constraints in the form of artefacts shaping beliefs and conceptions in every participants' interaction (Bucciarelli, 1984).

In this case, Bucciarelli (1994) suggested that different participants work within different '*object worlds*' related to their technical experience, training, resources and responsibility. *Object worlds* affect the way individuals *frame* the situation by setting the basis for questioning, modelling, and identifying the resources within that world (Bucciarelli, 2003). Thus, *object worlds* are manifested through different instrumentalities, project strategies, production techniques and capacities, as well as varying scientific theories, concepts and principles (Bucciarelli, 2009).

Traditionally, the rational and instrumental thinking is the usual norm within these worlds, in which quantitative values prevail, fixing the magnitude of inputs and outputs, and true heuristics govern the way one understands the project situation (Bucciarelli, 2003). However, while *object world* work may be taken as instrumental (and potentially optimised) and rational in an analytical sense, the fact that no one at any stage can have a total understanding of the activity means that there is no corresponding analytical basis for reconciling participants' different perspectives, claims and proposals in the situation (Bucciarelli, 2003).

Therefore, the context of professional practice in construction projects emerges as a pluralistic world of objects with different and, sometimes, conflicting appreciative systems. *Appreciative systems* (Vickers, 1965), *Interpretive Schemes* (Dougherty, 1992), *Frames of Reference* (Schön and Rein, 1994) or *Object Worlds* (Bucciarelli, 2002) are different terms (Table 1) indicating the existence of distinct systems of meaning acting as underlying structures of belief, perception and evaluation, which render selectively filters in individuals' respective interpretation of similar information, consequently producing a qualitatively different understanding of a situation (Schön, 1983; Dougherty, 1992). An *appreciative system* provides shared assumptions about reality, influencing how people organise their thinking and action, identifying relevant issues and supporting the sense-making of those issues (Vickers, 1965; Dougherty, 1992; Schön and Rein, 1994).

**Table 1: *Appreciative Systems* and similar concepts**

| Concept | Author |
|---|---|
| *Ideal Types (models of behaviour)* | Weber (1904) |
| *Perception readiness* | Bruner (1957) |
| *Selective Perception* | Dearborn and Simon (1958) |
| ***Appreciative Systems*** | Vickers (1965); Checkland (2005) |
| *Frames of Reference* | Morgan (1980); Schön (1984) |
| *Object Worlds* | Bucciarelli (1984) |
| *Interpretive Schemes* | Dougherty (1992) |

## 2.2.2. Different *metaphors* of collaboration

*Appreciative systems* contain assumptions that are taken for granted in the situation (Morgan, 1980). Through social interactions, these assumptions are continually affirmed and reinforced; and, most of the time, they remained unquestioned and even beyond conscious awareness (Morgan, 1980).

Historically, this long-lasting and shared nature of some appreciative systems has been understood as a *paradigm* (Kuhn, 1962), which embodies different ways of seeing and approaching a shared reality or world views, through the language and concepts which filter and structure perceptions of a situation (Morgan, 1980).

In construction, previous research had explored how different paradigms have affected the way professionals understand construction activity. For example, paradigmatic views of construction activity have been aligned with foundations of traditions on epistemology and philosophy of science, initially proposed by Ancient Greek philosophers (Koskela and Kagioglou, 2005; Koskela and Kagioglou, 2006; Koskela, et al., 2017). According to these authors, the Platonic epistemology has dominated the notion of activities and knowledge in management and construction engineering, namely the rationalist approach, affording a trend of positivist and reductionist perspective to theory and practice (i.e. the *Thing* paradigm). On the other hand, the Aristotelean epistemology has emerged more recently in management and construction engineering research as an alternative and competing model, offering an empiricist approach, supporting a more holistic perspective (i.e. the *Process* paradigm) (Koskela et al., 2017). According to these authors, both paradigmatic approaches were trickled down to the context of construction through historical development manifested through, and embedded in, our professional and educational institutions and standard practices.

In this example, it is possible to notice that different paradigms, as specific *appreciative systems*, tend to be expressed through different metaphors of construction activity which symbolise the nature of the activity in completely different ways (e.g. as a *thing* or as a *process*).

In essence, a metaphor means that one thing is seen as another; consequently, the existing description of one thing is taken as a commonly believed re-description of the other thing (Schön, 1963; Schön and Rein, 1994). Such reinterpretation carries over to a new situation a set of familiar notions, as for example the evaluation implicit in the previous one, with the result that both the familiar and unfamiliar come to be seen in new ways (Schön and Rein, 1994). In this case, metaphors have been elaborated not only as linguistic objectifications conveying a shared understanding on the motive and purpose of activities, but they have allowed the historical evolution and persistence of whole *appreciative systems* on conceptualising activities.

Moreover, while *models* necessarily involve a reduction of the phenomenon to a simplified (and usually mathematical) analysable form, the use of *metaphor* is supposed to provide common ground for explanation (Rooke et al., 2008). Thus, a metaphor implies a socially shared way of perceiving a situation, as well as how it conveys the way in which it is possible to produce changes in the situation, unconsciously establishing a sense of performance (i.e. success or failure) in practice (Tomelleri et al., 2015).

These metaphors set a framework for analysis of organisations, in the same way that Vickers' *systems models* (i.e. *appreciative systems*) operate as epistemological devices in any social interaction. Consequently, organisational routines (i.e. institutional artefact – the project activity) reinforce this *thought world separation* by establishing the limits of interactions (Dougherty, 1992). This means that metaphors are invariably embedded in our shared artefacts existing as institutions, organisations, norms and rules (Tomelleri et al., 2015).

One of the first attempts to suggest the existence of such kind of shared representations was presented by the French sociologist Emile Durkheim in his work *Division of Labour in Society* (1893), in which he describes two metaphors of functional interactions in society: *The Mechanic Solidarity* and *Organic Solidarity*. It can be said that, historically, organisational theory has been dominated by these two metaphors: the *machine* and the *organism* metaphors (Morgan, 1980), which have been used to support the way people acquire information, knowledge and understanding about human interactions (Gharajedaghi and Ackoff, 1984).

The *Machine* metaphor conceptualises the world as something existing within a mechanism, as a machine made up of purposeless and passive parts that operate predictably, in which internal structure and causal laws of nature dictate its regularity towards a static equilibrium (Morgan, 1980; Gharajedaghi and Ackoff, 1984). Such structure is rationally devised by focusing on the expected performance to achieve pre-specified ends (Morgan, 1980). Thus, the *machine* metaphor implies that individuals should focus on the analysis and design of the formal structure of an organisation and its technology (i.e. standard operations/bureaucratic organisations) in the activity, as a means-ends relationship by which purposive rationality is established (Morgan, 1980). In terms of collaboration, under this perspective, there can emerge a widespread sense of resignation in the face of power of the technical-administrative machine, bringing negative impacts on the quality of interaction between participants (Tomelleri et al., 2015). What happens is that these normalising actions may lead to a reduced sense of responsibility and motivation (Tomelleri et al., 2015), in which the standard procedures work as the manifestation of power structures that are in place. It seems that most people tend to adopt this metaphor to conceptualise collaboration because it puts the responsibility of performance control in something inanimate, as in the case of information systems.

The *Organismic* metaphor conceptualises collaboration in terms of organisations acting as organisms with a purpose of their own, which is survival (Morgan, 1980; Gharajedaghi and Ackoff, 1984). In this case, the functioning of the system is dependent on its ability to learn and adapt to a changing environment from which it gets essential inputs, as resources (Morgan, 1980; Gharajedaghi and Ackoff, 1984). Consequently, an organismic system seeks a dynamic equilibrium instead of a static one, adjusting the behaviour of their parts homeostatically, as a way to maintain the properties of the whole within acceptable limits (Morgan, 1980; Gharajedaghi and Ackoff, 1984). In this organismic metaphor, survival is the ultimate objective, where profit is the means, growth is the end, and planning represents predictions of environmental changes and the preparations set for them (Morgan, 1980; Gharajedaghi and Ackoff, 1984). An important assumption of the *organismic* metaphor is that it accepts that systems can be influenced by other systems, and eventually controlled by them by the application of force when it is supposed to act against their will. This type of external control of an organisation is subject to matters of choice and will generate less conflict when there exist submission or consent (Gharajedaghi and Ackoff, 1984). Moreover, the purpose of these organismic systems is to make the best of a future that the system believes to be largely out of

its control, but it is predictable. Consequently, in order to cope with this situation, the system depends on its ability to bring its future under its own control.

In addition to these, a third metaphor has been used as a counter argument to the machine and organismic metaphor to explain human systems. The *Social Systems* metaphor conceptualises collaborative organisations as systems with a high level of interdependence between their parts (i.e. individuals, professional groups and organisational units) (Gharajedahi and Ackoff, 1984; Tomelleri et al., 2015). In this case, the performance of the system does not result from the sum of the independent performance of its parts, but rather from the product of their interactions in both coded and informal ways. Therefore, effective management of a social system will require management of the interactions between its parts and its environment (Gharajedaghi and Ackoff, 1984). In order to collectively coordinate their interactions, participants will avoid the idea of "controlling structures", as it is a fundamental condition in the previous metaphors and will arrange themselves on the basis of *situated actions*, requiring various actors to find ways to align their behaviour according to the specific situation in hand (Suchman, 1987; Tomelleri et al., 2015).
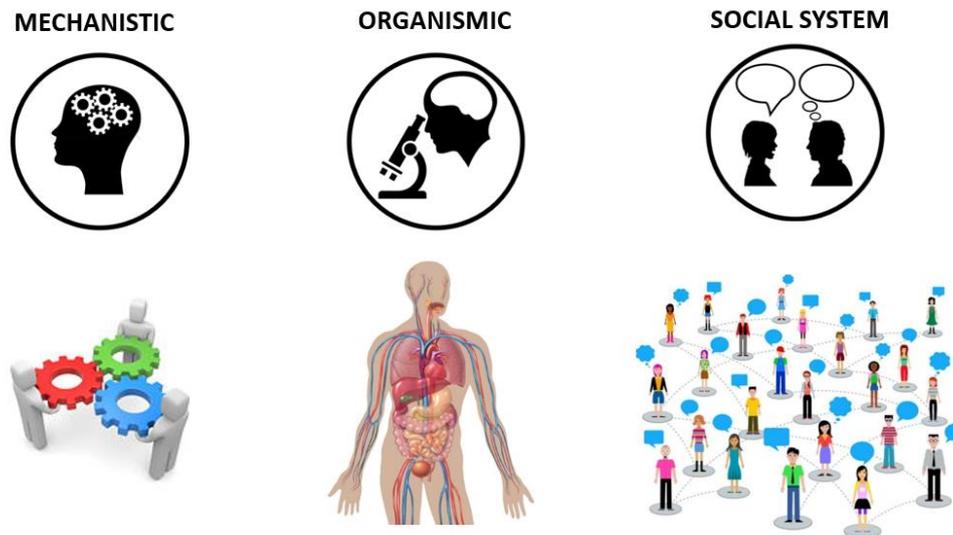


**Figure 6: Metaphors of Collaboration**

In this context, the next section explores how theoretical definitions of collaboration in construction and other relevant research fields (e.g. Design, Management and Operations Research, Social Sciences, Behavioural Sciences, Psychology, Human Relation Research, Production Planning Control, Philosophy, Sociology) can be aligned with these three metaphors of collaboration (Figure 6), representing different *appreciative systems*. Such

inquiry is focused on the embedded assumptions and practical applications of the proposed concepts of collaboration, and it is expected to help answer the following research question (Q1): *How has collaboration been addressed in construction?*

## 2.2.3. Collaboration as a *Mechanism*

A great part of research on collaboration has been based on the fundamental idea that project activities, including Design, are *problem-solving* activities (Simon, 1969). In this case, advancements on Computer-Aided Design (CAD) technology have been focused on the interrogation of how these "tools" (i.e. information systems) could potentially support collective problem-solving. Such investigations have been assuming that collaboration can be enabled by artefacts acting as a media supporting information processing systems, combining cognitive capacities of human beings with computer systems.

One of the first and more extensive works on how these collaborative systems can support design activity in construction was developed by Peng (1994; 2001) (Table 2). In Peng's (1994) definition, the words "communicate" and "coordinate" seem to indicate a way to determine the actions related to collaboration, which consequently could be directly correlated with the capability of information systems (i.e. to what computers can do). This assumption about the role of information systems, as the basis for most CAD systems, is also present in Edmonds et al.'s (1994) definition (Table 2). Edmonds et al.'s (1994) argument, that collaboration is a "complex activity", seems to fit reasonably with the idea that information systems should be employed to support higher information processing capacity, which could not be achieved by sole human cognition.

This perspective on the potential role of "information systems" in supporting collaboration in design and construction activities is advanced by research led by Mary Lou Maher. For example, the definition proposed by Saad and Maher (1996) (Table 2) also assumes that Design is a problem-solving activity. More importantly, Saad and Maher (1996) seem to consider information systems as an "environment", which is expected to behave as a continuum of space and time, defining where and when interactions between designers are supposed to happen. This implies a quite deterministic idea of how these "environments" come into existence in the first place as an object of prior design. According to Saad and Maher (1996), the development of such information systems would support collaborative design, because it would allow shared understanding to emerge and be maintained through standard computer representations.

**Table 2: Defining Collaboration as *Mechanism***

| | |
|---|---|
| Peng (1994, p. 21) | "…when participants of different technical specializations communicate and co-ordinate with each other to achieve, or, to cope with, design unity in final products. …Cooperative architectural modelling, a clearer picture of communication in collaborative design can be gained." |
| Edmonds et al. (1994, p. 41) | "...is a complex activity involving participants with heterogeneous skills… and support agents are viable for design tasks." |
| Saad and Maher (1996, p 183) | "...an activity in which teams of designers work together toward a final solution. The activity of designing through the interaction of designers and the environment is what we refer to as collaborative design." |
| Kvan (2000, p. 413) | "Collaborative design consists of parallel expert actions, each of short duration, bracketed by joint activity of negotiation and evaluation. Thus, the design activity itself is discrete, individual and parallel, not intimately linked. The participants act as individual experts addressing design issues from their perspectives." |
| Simoff and Maher (2000, p. 139) | "Collaborative design denotes activity itself when more than one person works on a single design problem, having a common goal or intent. Collaboration is possible when the collaborators share activities and information to achieve common goals. Effective collaboration occurs when the collaborators share design tasks, communication, representation a documentation." |
| Haymaker et al. (2000, p. 206) | "Traditional collaborative design relies on verbal communication and artefacts representing aspects of the design to share and negotiate this knowledge. However, the forces of expansion, specialization and distribution of knowledge often make traditional modes of collaboration difficult." |
| Anumba et al. (2002, p. 91) | "There are essentially four modes of collaboration depending on the nature separation and pattern of communication, between project participants." |
| Li et al. (2005, p. 931) | "In a collaborative design system, designers and engineers can share their work with globally distributed colleagues via internet/intranet." |
| Kleinsmann (2006 apud Kleinsmann and Valkenburg, 2008, p. 370) | "…the process in which actors from different disciplines share their knowledge about the design process and the design content. They do that in order to create shared understanding on both aspects, to be able to integrate and explore their knowledge and to achieve the larger common objective: the new product to be designed." |
| BSI (2016) Collaborative production of architectural, engineering and construction information – code of practice (p. 1) | "A major constituent of these collaborative environments is the ability to communicate, re-use and share data efficiently without loss, contradiction and misinterpretation… the use of this standard is particularly applicable where technology enable processes are used to support projects." |

Following such conceptualisation, it seems that it became a common place in CAD research to use the term "collaborative system" to refer to these information systems (i.e. computer systems), as predetermined structures to exchange information that support distributed communication between designers (Kvan 2000).

Kvan's (2000) conception of collaboration (Table 2) seems to have informed subsequent research on the topic of collaborative design, most of which is not questioning the assumptions embedded in the proposed perspective of collaboration. In this case, Kvan's (2000) proposed breakdown of the design activity seems to be influenced by Simon's original conception of design reasoning, and becomes relevant by serving the purpose of understanding and explaining diverse types of reasoning involved in design by reducing them to "smaller tasks". Consequently, such reduction would allow the development of artificial mechanisms to support and eventually reproduce these tasks within a "collaborative system", as suggested by Simoff and Maher's (2000) definition (Table 2).

Such perspective seems to reinforce the historical construction of an idea that collaboration could be reduced to the act of sharing two distinct instances of the same activity: one related to the action in itself, and the other related to information as a separate entity. A key aspect of such reductionist perspective of collaboration is in the conceptualisation of communication as a means – and, more importantly – as the objectivation of the collaborative interaction, as presented by Haymaker et al. (2000), for example (Table 2). From this perspective, possibilities and constraints of collaborative interactions are assumed to be communicated through verbalisations and representations of the project (Haymaker et al., 2000), putting most of the responsibility on the design of the structure of these communicative artefacts. Such deterministic approach to the nature of communication in collaboration is also present in Anumba et al.'s (2002) definition (Table 2), which conceptualises four modes of collaboration according to the nature of separation and patterns of communication between project participants.

Such understanding of collaboration influenced research initiatives focused on further developing what was thought to be the communicative capabilities of information systems in Construction. For example, a lot effort was devoted in conceiving the computational capabilities and ontological structures of what would become the core of BIM systems (e.g. Kiviniemi, 2005; Eastman et al., 2011; Singh et al., 2011).

Research has also tried to expand the capabilities of such collaborative systems for distributed arrangements of design activities. For example, according to Li et al.'s (2004) definition (Table 1), a collaborative CAD system needs two kinds of capabilities and facilities: *distribution* and *collaboration*. Li et al. (2004) emphasise that these two aspects can be described as two different requirements of a system: the first takes into consideration the geographical distribution supporting remote design activities, while the second regards coordination between individual systems focusing on the way in which pieces of information are structured.

Moreover, the idea of a collaborative system presupposes an embedded structure previously designed, as a framework, in which project activities are supposed to fit into the system, as distributed and shared tasks, as well as computational capabilities and facilities to process and coordinate information. This kind of conceptualisation supported further development of strategies and approaches for collective design activities, in which "collaboration" is essentially defined as "knowledge transfers" (Kleinsmann 2006; Kleinsmann and Valkenburg 2008) (Table 2). From this perspective, *knowledge* is conceptualised as a "thing" capable of being exchanged (i.e. objectivated) as a piece of data or information, and the whole purpose of collaboration is to promote these *knowledge* exchanges and coordination. This conceptualisation of collaboration also affords an idea that the *process* and *content* of early project activity can be dissociated and perceived as two distinct dimensions of the same phenomenon. Consequently, within this perspective, in a quite broad and shallow way, *collaboration* has been assumed to be the activity of sharing knowledge through a structured environment supporting communication (BSI 2016) (Table 2) (Cardoso et al., 2016; D'souza et al., 2016).

## 2.2.4. Collaboration as an *Organisation*

However, *collaboration* has also been conceptualised as an organisational structure (i.e. organisation) designed to engage a collection of individuals in what is usually supposed to be *problem-solving activities*. Most of the research that followed such perspective was originally conducted in the field of Management and Operations Research, with some influence from Social and Behavioural Sciences, as well as from studies on Psychology.

For example, in the context of Behavioural Science, Appley and Winder (1977) defined collaboration as a *relational system*. According to them, collaboration is achieved when a group holding common objectives can balance between awareness of interdependences and reciprocity of actions. From this point of view, the relational system is seen as the

objectification of collaboration that should be designed previously, and therefore, exist prior to individuals' participation on it. Thus, it implies a sense of "control" and predefined responsibilities regarding the way actors operate and with whom they should interact. Moreover, there is an underlying assumption that these structures are something (i.e. process) designed and controlled by high-level stakeholders (i.e. "managers") in the organisation, and not actually by the individuals that operate in the activity.

Such idea is present in Shea and Guzzo's (1987) definition of collaboration (Table 3), which suggests that, within such *structure*, important outcomes become equally distributed among the participants, while those participants aim for high task interdependence. Such definition seems to imply that the role of an organisation is to establish and control its members' interactions. Previously, Deutsch (1949) apud Tjosvold and Tsao (1989) had proposed a similar idea on his theoretical model of cooperation (Table 3), suggesting that collaboration should be conceived as a model of interdependence determining what affects interactions in organisations.

In this sense, these conceptualisations seem to suggest that one of the main consequences of seeing collaboration as *the organisation system* is that they can be defined as the locus, as the manifestation, of collaboration. Consequently, such *systems* of relationships inherently can be seen as an object of design (i.e. *institutional artefact*), which eventually is instantiated through other representational artefacts that help instruct and support people in complying with the organisation's purposes. In this case, the notion of *process* seems to have a fundamental role in representing instantiations of these organisations as a designed system of relationships. For instance, in Wood and Gray's (1991) definition, collaboration is seen as an *interactive process* (Table 3), in which functions of *control* and *responsibilities* are instantiated in terms of *shared rules, norms and structures*. Moreover, this conception of collaboration as a process seems to imply that it can be predetermined, as a set of relationships and actions, in advance of the situation. This idea relies on the notion that the process is an objectivation of collaboration, as can be noticed in Mattesschi and Monsey's (1992) definition (Table 3), which conceptualises collaboration as *well-defined relationship*.

According to Mattesschi and Monsey (1992), collaboration involves commitment to the definition of these mutual relationships and their goals, requiring mutual authority and accountability in a joint effort to develop a structure in which responsibility, resources and rewards are shared (Mattesschi and Monsey 1992). Such orientation towards the predesign of

relational structures (i.e. organisation) as the objectification of collaboration can also be observed in other contexts. For example, Huxham and Vangen's (2000) definition in the context of Human Relations research is framed by the notion of "membership" (Table 3). Their idea of "membership" implies the existence of *a priori structure*, that will be interpreted differently by each member. Similarly, in the context of Production Planning and Control, Camarinha-Matos and Abreu (2007) (Table 3) suggest that collaboration is "a process understood as a set of tasks performed by the collaborative network of members".

**Table 3: Defining Collaboration as *Organism***

| | |
|---|---|
| Shea and Guzzo (1987, p. 26) | Collaboration exist when someone "structures the jobs of group members so that they have to interact frequently with each other in order to get their jobs done." Consequently, "important outcomes are distributed equally among group members and the members will aim for high task interdependence." |
| Deutsch (1949) apud Tjosvold and Tsao (1989, p. 189) | "a model of interdependence that stipulates how values, tasks, and rewards affect interaction in organizations. Specifically, shared vision, supportive culture, group tasks, and common rewards are hypothesized to induce cooperative interdependence and interaction. In cooperation, people believe their goals are positively linked; one's goal attainment helps other reach their goals." |
| Wood and Gray (1991, p. 146) | "when a group of stakeholders of a problem domain engage in an interactive process, using shared rules, norms, and structure, to act or decide on issues related to that domain." |
| Vreede and Briggs (2005 apud Briggs et al. 2006, p. 122) | "collaboration is in fact joint effort towards a group goal". The authors propose that a collaborative engineering process can be designed and deployed for those which are effectively engaged in the task. |
| Schottle et al. (2014, p. 1275) | "Collaboration is an interorganizational relationship with a common vision to create a common project organization with a commonly defined structure and a new and jointly developed project culture, based on trust and transparency; with the goal to jointly maximize the value for the customer by solving problems mutually through interactive processes, which are planned together, and by sharing responsibilities, risk, and rewards among the key participants." |
| Poirier et al. (2016, p. 785) | "Collaboration is conceptualised as a system comprised of four interacting core entities; structure, process, agents and artefacts that are conditioned by a fifth: context." "The core entities and their interactions possess powers that prompt and conditions events and their empirical manifestations." |

In alignment with such conception of collaboration, some researchers in Construction Management and Design have tried to define *sets of management practices* or *general strategies* that are assumed to generate collaboration through a determined process. For example, focusing on promoting early project collaboration, Whelton et al. (2004) suggested a

set of management practices that can engage multiple stakeholders in resolving the purpose of projects. These authors proposed that this would be able, through the implementation of a process that seeks early and frequent feedback, to establish up-to-date information about needs and values between the stakeholders. In this case, the *workplace planner* is the individual responsible for designing the process and producing this set of information from focused dialogues with the stakeholder groups (Whelton et al., 2004). It can be said that embedded in this argument is the assumption that the existence of a process is sufficient to produce *collaborative outcomes*.In another example, Briggs et al. (2006) propose similar ideas in their concept of *Collaborative Engineering*, which is conceived as an approach to design collaborative work practices for high-value recurring tasks (Table 3). Similarly, the concept of *Integrated Design* is proposed as a processual approach that assembles, integrates and harnesses all the collective skills and capabilities of clients and stakeholders engaged in a supply chain (Forgues and Koskela, 2009). Likewise, the terms *Co-design* and *Participatory Design* have been used to refer to a processual approach that puts together the expertise from designers and the people that will be affected by the changes produced by design (Sanders and Stappers, 2008).

More importantly, this understanding of *collaboration* as something that can be objectivated in a specific form of organisational arrangement has led Construction Management research to focus on structuring project teams according to specific situations, allowing project participants to trust the success of collaboration on the 'quality' of these pre-existing structures. For example, Howell (2013, p. 28) suggested that: *"common sense tells us that the best solutions to complicated complex problems arise when teams are structured for the situation at hand"*. It could be said that Howell's (2013) argument seems also to imply that teams are structured by some 'superior force' or conditions existing outside the team, as the role of managers to design these processes.

From this point of view, therefore, collaboration lies in the nature of relationships between organisations and their members. Such perspective is focused on how individuals can establish collaborative interactions, by redesigning their context of organisational structures, mostly in terms of processes (Arup, 1970; Ballard, 2000; Parrish et al., 2008; Mossman et al., 2011; Poirier et al., 2016). Consequently, individuals who see collaboration as these specific organisations expect that the relationship established between organisations will determine how the participants interact to perform in a project (Schottle et al., 2014).

## 2.2.5. Collaboration as a *Social Construct*

Alternatively, *collaboration* has also been conceptualised as a social construct. In this case, human collaborative interactions involve the collective construction of the idea of *collaboration*, assuming that there is no predefined idea of what is supposed to be collaboration. The sociologist Max Weber in his *Objectivity in Social Science* (1949) suggested that collective actions in society should be understood as an historical event where individual actors seek social construction of shared meanings in a situation of functional interdependence. Thus, in Sociology, there emerged the idea that shared understanding is a fundamental basis for social interaction. Louis Wirth (1948) argued that the "*mark of any society is the capacity of its members to understand one another and to act in concert toward common objectives and under common norms*" (Wirth 1948, p.2). Moreover, Wirth (1940) suggested that shared understanding among members of a society and their ability to act collectively towards common goals it is what distinguishes humans from other animals' organisations. In this case, human society can be defined as "*a set of common understandings, a system of reciprocally acknowledged claims and expectations expressed in action…*" (Wirth 1940, p. 473). From this point of view, agreement cannot be imposed by coercion or fixed by custom, in a way that it is no longer a subject of discussion (Wirth 1948). It is always underdevelopment and has continuously to be won, resulting from the interpretation of views based upon feelings, thinking together and mutual consent (Wirth 1948). Wirth (1948) named this as the "art of compromise", suggesting that this is one of the foundations of democracy. According to him, shared understanding in mass democracies is not the matter of agreement of all issues, but rather, as Dewey (1938) had suggested before, the established habit of discussion, debate, negotiation and compromise over issues that involve the society itself (Wirth 1948).

These fundamental works on Philosophy and Sociology seem to suggest a dialectic and socio-constructive nature of *collaboration*. Later, similar ideas emerged in the context of Operations Research and Systems Thinking. Russell L. Ackoff and Fred E. Emery, in their book *On Purposeful Systems: An interdisciplinary Analysis of Individual and Social Behaviour as a Systems of Purposeful Events* (1972), proposed a comprehensive interpretation of collective interactions in social groups, seen as purposeful social systems. In this case, a *social group* is a type of purposeful system where its members are intentionally co-producers of a common objective. As the *common objective* is an outcome intended by each member of the social group, the intention – or, in other words, the purpose – to co-produce common objectives is what generates the interactions among the social group (Ackoff and Emery 1972). This

suggests that individuals and, consequently, organisations can change their goals in constant environmental conditions, in a way that they display will to choose their goals as well as the means by which they will pursue them (Ackoff and Emery 1972).

**Table 4: Defining Collaboration as a *Social Construct***

| | |
|---|---|
| Emery and Ackoff (1972, p. 197) | "...if someone's presence increases the expected value of another's state, then there is cooperation (collaboration). However, if someone's presence reduces this expected value, then this one conflicts with the other. If, one has no effect on the other's expected relative value, then one is independent of the other." |
| Engeström (1987 apud Bardram 1998, p. 7) | "Human activity is always embedded within a socio-cultural context of other humans and work activities thus always take place within some community of practice. Collaborative activity as one that has a unique objective distributed onto several actors, each performing one or more actions in order to achieve the shared objective, thus a division of work is established and regulated by different set of rules and norms." |
| Coyne and Snodgrass (1993, p. 163) | "Human activity, including design, is "collaborative" and "public", whether we are aware of it or not, involving a 'collective' that is much more extensive than the individual or even a particular group. Designing involves bringing collective or shared experience to bear in making judgements." |
| Schrage (1995, p. 32) | "Collaboration is the process of shared creation: two or more individuals with complementary skills interacting to create shared understanding that none had previously possessed or could have come to on their own. Collaboration creates a shared meaning about a process, a product, or an event." "Collaboration is a state of grace we switch into and out as the moment and the task demand." |
| Valkenburg (1998, p. 119 and 120) | "Creating a design in a team requires constructing a shared understanding within the team. This shared understanding is the desired result of the team members turning into each other, connecting the essential topics within the design task and making the necessary decisions. Shared understanding is a mutual knowledge of all team members on what they are doing, why, and how they are doing it." |
| Macmillan et al. (2001, p. 170) | "Shared understanding is the key to successful collaboration... and can be achieved if all of the team members can agree on a shared design strategy, i.e. clarify and agree on the methods and processes of design to follow." |
| Stempfle and Badke-Schaub (2002, p. 477) | "Design teams are expected to learn through experience and self-reflection how to assess the conditions of the given situation considering an overall range of requirements, in order to flexibly adjust their collective path of actions." |
| Fischer (2004, p. 159) | "Collaborative design demands a balance between collective capability to establish connections and interdependence, as well as individual capacity to develop autonomous actions and to trust in their potential performance." |
| Thomson et al. (2007, p. 3) | "Collaboration exist when autonomous or semi-autonomous actors interact through formal and informal negotiation, jointly creating rules and structures governing their relationships and ways to act or decide on the issues that brought them together; it is a process involving shared norms and mutually beneficial interactions." |
| Hill et al. (2014, p. 5) | "when diverse people collaborate to generate a wide-ranging portfolio of ideas… collaboration should involve passionate disagreement. Yet the friction of clashing ideas may be hard to bear… that only stifles the free flow of ideas and rich discussion that innovation needs." |

These social systems will presuppose that relevant choices to system functions are distributed and interdependent, making individual parts differently responsible for different parameters of choice. This is particularly relevant because individuals will become responsible for making choices related to not only their own purposes, but also the purposes of others (Ackoff and Emery 1972). Consequently, if someone's presence increases the expected value of another's state in the situation, then this person perceives this situation as *collaboration* (Ackoff and Emery 1972) (Table 4). If someone's presence reduces this expected value, then this person perceives the situation as *conflictual* with the other. Then, if one believes it has no effect on the other's expected relative value, then this person perceives themselves as *independent* of the other. In this case, Ackoff and Emery's (1972) reference to "expected value" can be correlated with an idea that collaboration is dependent on individuals' social construction of their collective perceptions of the state of the situation.

This perspective of collaboration assumes that public welfare is the result of project activities deriving from the compromise of individualistic choices, and influenced by diverse value systems – or, in other words, *appreciative systems* (Rittel and Weber 1973). In this case, a project activity has the objective to distribute advantages and disadvantages in the commitment of resources among social individuals (Rittel 1987). Consequently, those plans will never be beneficial to the whole group, and the designed course of actions will represent compromises resulting from negotiation and the application of power (Rittel 1987).

In this case, unlike the traditional assumption that a project activity is a problem-solving activity developed through pure analytical thinking upon problems that exist as a determined 'thing' in the world, Rittel and Weber (1973) and Rittel (1984) argued that designing is argumentative and dialectical. Hence, when different points of view are brought together, individuals usually experience *breakdowns* in terms of misunderstandings about the consequences of their assumptions (Rittel 1984). According to Schön (1983) and Rittel (1984), reflection and awareness of those conflicts of appreciation may lead designers to understand the intractability of their dilemmas and to suggest an alternative design decision. Such activity seems to depend on questioning behaviours within dialogues among these individuals, in a way that a dialectical interaction is conducted by increasing individuals' shared understanding of how to best construct the activity and proceed in the task (Coyne and Snodgraas 1993; Schrage 1995; Engeström et al., 1997; Bardram, 1998; Valkenburg and Dorst, 1998; Macmillan et al., 2001; Stempfle and Backe-Schaub, 2002; Thomson et al., 2007; Hill et al., 2014) (Table 4).

From this point of view, the participants' ability to collectively construct the activity and establish a balance between individual and collective perceptions of the situation is fundamental for collaboration. According to Fischer (2004), *collaborative design* demands a balance between the collective capability to establish connections and interdependences, as well as the individuals' capacity to develop autonomous actions and to trust in their collective potential performance (Table 4). In this sense, Badke-Schaub et al. (2010) also suggested that *collaborative design* will relate to the existence of two dimensions of collective interactions: one called *assertiveness*, when individuals attempt to satisfy their own concern, and another called *co-operativeness*, when individuals aim to satisfy another's concerns. Similarly, Stompff et al. (2016) suggested a collaborative design ability, existing as two iterative dimensions in the *reframing* action in social context. One dimension is the *sensemaking,* involving reconstruction of prior operating frames of understanding; the other is the *future framing,* which is the designing of frames for future activities. Such idea of prior operating frames seems to be related to the concept of *appreciative system*, that is constructed from the team's perception of the situation; the second type of *framing* is one that guides the future interactions between individuals (Stompff et al., 2016). Moreover, these last three definitions of collaboration seem to be particularly related to an idea that collaboration is socially constructed as a collective perception of the situation, in combination with the collective conception of a course of actions to change that specific situation.

## 2.2.6. Discussion: consequences of diverse definitions of collaboration in construction

Once *collaboration* is considered to exist in terms of a media framework enabling enhanced communication and coordination between stakeholders in construction (Maher et al., 1996; Kvan, 2000; Wang et al., 2002; Anumba et al., 2002; Eastman et al., 2011; Singh et al., 2011), efforts have been concentrated on developing integration through the redesign of these means of interaction (i.e. software tools). Working on the interactions between human and computer systems to support collective design activity, researchers following this approach have been developing communicative and coordinative capabilities of information systems based on standardisation strategies. Consequently, approaches have traditionally been focused on sharing information among design teams, including the establishment of data exchange standards and integrated set of tools (Wang et al., 2002).

However, because of the highly distributed nature of design teams and the diversity of design tools they usually employ, these approaches are becoming insufficient to support early project

collaboration (Wang et al., 2002). Mostly, because the majority of these tools do not support a rapid and reliable evaluation of several design options with the necessary input from people with a multidisciplinary background (Wang et al., 2002). In this case, activities related to conflict resolution and the generation of new solutions are still left to the human expertise (Wang et al., 2002). For example, Edmonds et al. (1994) identified a contradiction in the essential proposition of these information systems, suggesting that it should explore the problem of supporting emergence within these systems. According to Edmonds et al. (1994), this is a key feature of the creative design process; and, in order to support such emergence, these information systems could not simply be based on the manipulation of predefined objects. They should allow the deconstruction and reconstruction of such objects.

Thus, while the majority of traditional CAD systems may be adequate to develop individual design activity, they had continuously failed to directly support the collaborative nature of design interactions (Saad and Maher 1996). In this case, advances in Computer-Integrated Design systems have been made based on the need to share data between several design software (Saad and Maher 1996). However, new models of representation are not enough, and the complexity of design artefacts requires different methods of interaction (e.g. the manipulation of graphic models) (Maher et al., 1996). In this case, the pattern of interactions in collaborative design situations shows that designers tend to document less information in a collaborative session because they can describe their intentions verbally (Maher et al., 1996). In these situations, semantic descriptions used to define the purpose and performance of design artefacts may be represented differently considering the various disciplines involved (Saad and Maher, 1996).

Consequently, the challenge for these computer systems is to integrate the various perspectives emerging from different reasoning processes articulated by team members in this interaction (Arias et al., 2000). Ideally, these approaches would allow designers to work on the combination of shared visual and semantic representations of design artefacts, in a way that could communicate their understanding using different media (Saad and Maher, 1996). In addition, to improve such communication between participants in design, researchers have been suggesting the use of intelligent agent systems and shared ontology to address the diverse nature of data in terms of information and knowledge in construction projects (Anumba et al., 2002; Eastman et al., 2011). In order to solve the problem posed by the use of heterogeneous software tools, those authors suggested the development of intelligent agent systems, which consist of self-contained knowledge-based systems with the capability of handling the

specialist problems and providing a collaborative framework for interactions (Anumba et al., 2002). However, these authors reinforced that *collaboration* still requires participants' social abilities to coordinate their interactions with other agents (Anumba et al., 2002), which can be related to actions of *negotiation* and *evaluation* according to Kvan (2000).

In this case, recent research identified key limitations of current computer (i.e. information) systems to support these *social abilities* in Construction Projects (Adamu et al., 2015; Forgues et al., 2016). According to these authors, BIM systems work as common platforms to share data, which require changes in the way team members produce and exchange project data to support information processing in these platforms. However, the traditional linear and diverse nature of conceptualising construction projects hampers the initiative to understand and represent how information should be created and processed among those individuals (Forgues et al., 2016). As a consequence, the interdependencies between tasks and information exchanges in a process are not sufficiently comprehended by the group members, creating hindrances to a successful collaboration process (Kiviniemi, 2011).

This situation also generates a paradox (i.e. contradiction) in that, while a computer system can provide a collaborative structure to support the coordination of design information to be exchanged, it does not necessarily support the nature of collaborative actions, requiring a change in the collective mindset (Forgues et al., 2016). Recent studies on computer systems to support collaboration in the context of BIM systems indicate the need to advance in the social aspects of collaborative interactions (e.g. negotiation and collective evaluation) involving discussions around abilities for social construction of meaning – as *shared understanding*[7] and *situational awareness*[8] (Adamu et al., 2015; Forgues et al., 2016) and the nature of mediating artefacts (Forgues et al., 2009).

On the other hand, further initiatives to improve collaboration in construction have been focused on changing organisational structures by adopting *new procurement routes* (i.e. Integrated Project Delivery) along with *new project management strategies* (i.e. Target Value Design) (Mossman et al., 2011; Zimina et al., 2012). These initiatives assume that a central problem for collaboration in construction is the fragmented nature of construction defined by transactional procurement routes (Egan, 1998; Koskela et al., 2003; Bertelsen, 2003a; Forgues

---

[7] *Shared Understanding* is further described at section 2.3.4.1.
[8] *Situational Awareness* is further described at section 5.4.

and Koskela, 2009; Zimina et al., 2012). According to these researchers, they should be abandoned and new forms of relational contracts should be developed.

In this context, new forms of procurement, like the Integrated Project Delivery (IPD), are expected to enable the early involvement of the different stakeholders and support the alignment of commercial terms for project-level teams, in which profits and risks are shared among stakeholders to create a unified project culture (Parrish et al., 2008; Mossman et al., 2011). However, results from studies on the influence of new procurement forms in the collaborative performance of integrated teams showed that the adoption of a relational contract was not sufficient to mitigate socio-cognitive barriers between the players (Forgues and Koskela, 2009; Zimina et al., 2012). According to Forgues and Koskela (2009), while new procurement routes can provide a better context for collaboration, it was possible to recognize fundamental limitations regarding project managers' and designers' ability to perform in the new situation. One of the problems seems to be that such organisational changes will incur in changing traditional systems of work (i.e. practices and understandings), and changing roles and responsibilities between participants. In this case, while the implementation of new *organisational systems,* acting as structural artefacts objectivating collaboration, can play an important role, they seem to be not enough to provoke the necessary changes in attitude and behaviour (Zimina et al., 2012).

In this case, collaboration can be disrupted when participants experience conflicts between traditional and alternative conceptualisations of what constitute project management (Johnston and Brennan, 1996) in construction (Koskela and Kagioglou, 2006; Koskela et al., 2017). Hence, traditional project management models in construction are criticised, because they fail to create the necessary situations of conversation necessary to develop shared perspectives and common concerns (Howell et al., 2004). This may happen because, under this perspective of collaboration, things like *group goal* – in other words, the individuals' purposes in the activity – have already been predetermined by a central *brain* of the organisation (i.e. the high-level management).

Another critical consequence of conceiving and predetermining the means of collaboration within the design of an organisational system is that conversations about trust in the realm of a command and control management model, focused on hierarchical control, tend to generate resignation and cynicism from the participants (Howell et al., 2004).

Contrary to the two previous ways of conceptualising *collaboration*, the socio-constructive perspective acknowledges that human activity is inherently indeterminate and, consequently, is subject to dialectical interactions in which different concepts of collaboration held by different participants 'coexist' in the situation. In this case, *collaboration* exists when the collection of individuals in the situation interact to resolve emergent misunderstandings within multiple interpretations of what makes collaboration in the situation (van Amstel et al., 2016).

Thus, it is possible to say that people tend to create social institutions (e.g. organisations), that objectivate their conception of collaboration, making whatever they believe to be collaboration possible (Boaz, 2015). Such idea is a keystone for the socio-constructivist view of collaboration in society. According to Weber (1930 apud 2007), the social construction of these shared institutions is manifested through the concept of *ideal types*. For example, the *iron cage* metaphor is used to describe the context of social interactions in modern society (Weber, 1930 apud 2007). Weber (1930 apud 2007) argued that modern society is marked by the *rationalization of existence*, in which the main forces of modern life, like science, capitalism, and bureaucratic organizations, are considered as triumphs of rationality and, therefore, there is no reason to question them (Weber, 1930 apud 2007). In this way, people tend to believe that *rational order* is embedded:

> *"…into legal codes and administrative organisations that promise order, predictable decisions, regularity of procedures, and responsible, objective, and qualified officials; into economies that operate according to principles of calculated advantage, efficiency, and means-ends strategies; and into technologies that promote standardization, mechanical behaviour, and uniform tastes. The advantages of rationalization in terms of power and material satisfaction are so overwhelming that the historical process which has brought that system is irreversible"* (Weber 2007, originally presented at "The Protestant Ethic and the Spirit of Capitalism", from 1930, online source).

Weber's argument for the *rationalization of existence* may help to explain why collaboration has been so vastly conceptualized in different ways (e.g**.** as a *mechanism* or a *relationship*). Arguably, this implies that these specific forms of conceptualizing – and, in fact, objectivating collaboration (e.g. as communication mechanisms or as organisational systems) – are ways to assure the maintenance of existing power structures, allowing control and avoiding changes by means of institutionalizations (Berger and Luckmann, 1966). In this case, in analysing the definitions of collaboration as *mechanisms* and *organisations*, it can be noticed there is a

tradition to approach collaboration deterministically, in which objectivations of collaboration are expected to be *well-defined* as institutions. However, the idea that any human activity can reach a definitive *well-defined* status can be questioned. According to a socio-constructive perspective, those activities will always be underdevelopment.

In this sense, Ostrom (1998) questioned the inefficiency of collaborative approaches influenced by the over-reliance on rationalistic models of behaviour. According to Ostrom (1998), approaches based on a rational perspective of collaboration, on the behalf of allowing the determination of mechanisms and systems of control over the tasks, tend to fail to account for the autonomy and free will of project participants. Moreover, considerations about *social* abilities to conduct collaborative dialogues and how shared meanings emerge in relation to these activities simply do not exist in this models of collaboration.

From a socio-constructivist perspective, *collaboration* is not one thing, but it will have different configurations in different situations for different players (Bardram 1998). In this case, Engeström et al. (1997) and Bardram (1998) proposed that collaborative interactions in human activity occur in terms of dynamic transitions between three different "levels", namely: *co-ordination, co-operation* and *co-construction* (Figure 7).
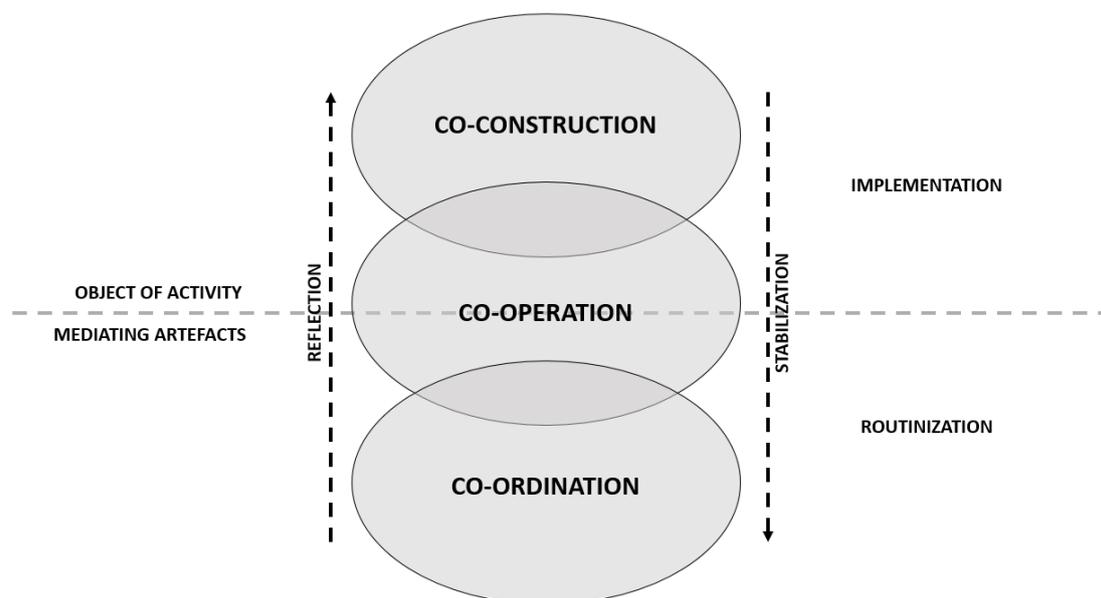


**Figure 7: Dynamics Levels of Collaboration adapted from Bardram (1998, p.11)**

The first refers to *co-ordination*, where actors are considered as passive participants in the activity (Bardram 1998). This will involve routine interactions, in which the diverse actors will interact upon a common (i.e. well-known) object, but their individual actions are only

externally related to each other. The participants know that, in order to accomplish these tasks, they have to follow scripted roles, achieving success in their individual actions (Engeström 1997). These scripts usually become tacitly assumed traditions and norms, coded in written rules, standards, plans and schedules (Bardram 1998). The second refers to *co-operation*, and it suggests that participants share an object of activity, which enables them to relate to each other in a distributed way and make corrective adjustments to their own and the others' actions in order to achieve the overall objective (Bardram 1998). In this case, the object is stable and generally agreed upon; however, the means, in other words, the artefacts and actions, by which the activity will be developed, may not be present or known. Consequently, cooperation requires that these means are established in a way that each actor has to balance his own actions with the actions of the other players, which might involve persuasion (Engestrom 1997). The third refers to *co-construction*, in which interactions will emerge when the object of work is not stable – or, more frequently, when it is not existent (Bardram 1998). These interactions require the collective construction of the activity, in which the actors will focus on the re-conceptualisation of their own organisation, redefining the purpose of their interaction and their relations with their shared objects (Engeström 1997).

Overall, this dynamic model suggests that collaboration in human activities (e.g. construction projects) will not only exist on one *level* (Bardram 1998). In fact, these three *structural levels* represent different *analytical perspectives* that may coexist in the same collaborative activity (Engeström 1997). Consequently, different players may develop different perceptions over what constitutes collaboration in the same task. Moreover, the natural evolution of the activity towards development will involve the management of the dynamic transition between these *levels* (Bardram 1998), in terms of *implementation* and *routinisation* of activities and actions.

Thus, it could be argued that the key aspect of the dynamics of (early project) collaboration is that these different *levels* do not exist objectively, but they are embedded within different ways in which individuals interpret and conceptualise collaboration in the overall construction project activity.

The notion of collaboration metaphors, as ideal types shared by social groups, is an indication of how academics and practitioners have historically contributed to the continuous construction of diverse concepts of collaboration, which can be seen to have evolved as socially constructed *appreciative systems* (i.e. shared analytical perspectives)*,* framing the way participants tend to perceive, as well as conceive, their interactions and artefacts on collaborative interactions.

As these conceptualisations of collaboration differ fundamentally in ontological terms, in that the challenge participants face in construction project situations involve overcoming conceptual barriers, as emergent misunderstandings, in which actions and artefacts from one stakeholder can be interpreted by others as incoherent, even contradictory, as regards their idea of collaboration. This also means that participants' perception of collaborative performance is based on their ability to question and reflect on their concepts of collaboration and how they have been perceived and constructed (i.e. objectivated) in the situation, potentially revealing conflicts of understanding.

# 2.3. Misunderstandings

This section explores how the socio-constructivist perspective can offer a framework to explain the dynamic involved in the emergence and resolution of misunderstandings at early project collaboration (Figure 8).
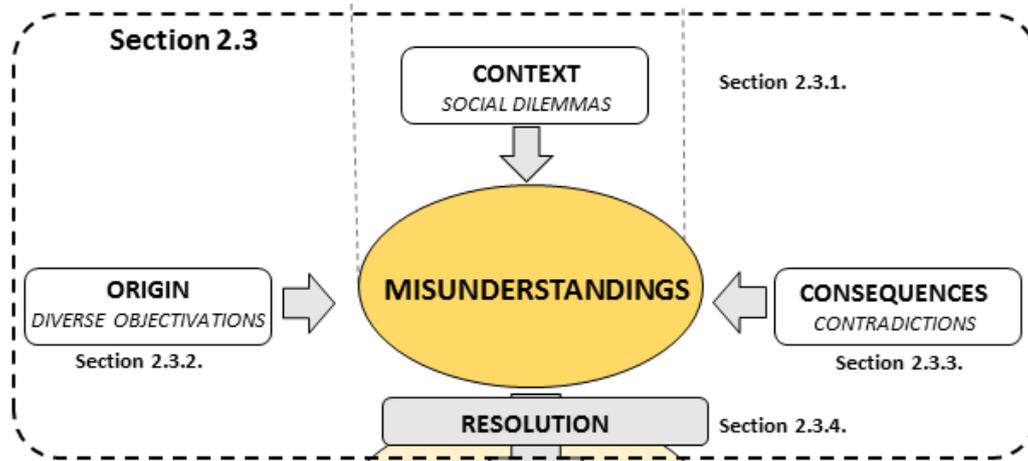


**Figure 8: Dynamics of emergence and resolution of misunderstandings**

## 2.3.1. Context: *Social Dilemmas*

If project activities always exist in the realm of a socio-historical context (Rittel and Weber, 1973), then the context of conflicts of understanding can be related to the concept of *social dilemmas* proposed by Dawes (1980) and Ostrom (1998) in the field of Economics.

According to Ostrom (1998), *a social dilemma* emerges whenever someone is faced with trusting others to collaborate with him or her on long-term joint endeavours. *Social dilemmas* are situations in which individuals can produce independent choices to contribute or not to joint benefit, and the consequences of these choices are interdependent (Dawes 1980; Ostrom 1998).

These situations are dilemmas because at least one outcome exists that yields greater advantage for all these participants, and therefore a conflict exists between the individual and group rationality (Ostrom 1998). In this case, if all the participants choose the maximization of their short-term self-interest, they will not prevail.

The concept of *social dilemmas* suggests that a collective perception of interdependency needs to be constructed in the task, while it still allows *free will* from the participants (Dawes, 1980; Ostrom, 1998). In these situations, the group requires the contribution of all participants to find ways to align their actions in order to avoid independent behaviour (Ostrom, 1998).

However, participants in a project activity will find resistance to resolve these dilemmas, because their individuals' frames determine what counts as a fact and what arguments are taken to be relevant and compelling in the situation (Schön and Rein, 1994). Moreover, its resolution is hampered by the fact that these *frames* are usually exempt from conscious attention and reasoning, as suggested by the notion of *appreciative systems*, in which they exist as underlying structures of belief, perception and evaluation (Schön and Rein, 1994).

According to Ostrom (1998), humans have evolved specialized cognitive capacities that increased their long-term returns within social interactions. Hence, social endeavours are highly dependent on our capacity to learn and use *reciprocity norms* and *social rules* (Ostrom 1998). Specifically, these cognitive capabilities are particularly related to how one makes sense of the world and infer grammatical rules embedded in language (Ostrom 1998). The following sections on this chapter explore a socio-constructivist perspective to sense-making and its relevance for early project collaboration.

## 2.3.2. Origins: Diverse Objectivations

One of the main arguments of the socio-constructionist perspective is that the practice by which individuals render the world and their lives intelligible cannot be made exhaustively explicit (Winograd and Flores, 1987). According to Heidegger (1962), existence is interpretation, thus the interpreted and the interpreter cannot exist independently.

### 2.3.2.1. Knowledge vs. Understanding

In essence, such an idea fundamentally challenges the traditional concept of *knowledge*, objectively existing as mental representations (Gergen, 1985; Suchman, 1987; Winograd and Flores, 1987; Thompson and Fine, 1999). Traditional conceptions of *knowledge* have tried to categorize the world into compartmentalised domains of knowledge, in which facts can be enumerated as well as causal relationships between them (Suchman, 1987). Moreover, this traditional conception of knowledge suggests that the relation between observable behaviour and the *processes* that make the same behaviour meaningful are not available to direct observation (Suchman, 1987).

Under this perspective, one of the most influential works on the nature of knowledge was elaborated by Polanyi (1958), suggesting a dualistic nature to knowledge, in which it is constituted by two inseparable states: *tacit* and *explicit*. Such conceptualization allowed further suggestion that knowledge is dynamically created through movements between the tacit and explicit states (Nonaka, 1994). Following this conceptualisation, knowledge management

strategies have been conceived based on the notion that all (tacit) knowledge could be disembodied (explicit) from its possessors and become an organisational asset (Snowden, 2002).

Within this conception, the notion of *shared knowledge* would signify a potentially enumerable body of implicit assumptions that support actions or utterances, allowing participants in an activity to understand each other's action (Suchman, 1987). Such idea also implies that communication between speaker and listener (e.g. project participants) is made possible because of the existence of a *common stock of background knowledge*, in a way that what is said always requires reference to facts, as objective measures, shared by certain individuals (Suchman, 1987). Consequently, this notion of background assumptions implies that *knowledge* should be considered as a collection of things that are there in the mind of the speaker motivating particular actions or linguistic expression, as well as the interpretation of those by the listener (Suchman, 1987).

However, since an individual's account for an action can only be articulated when the premises of the action are called into question, as the moment when these background assumptions are generated, there is no reason to believe that such background assumptions, as well as this notion of *knowledge*, are part of the actor's mental state (as stable mental representations) prior to action (Suchman, 1987).

In fact, it could be argued that the *taken for granted* aspect of assumptions would not be a manifestation of an individual's mental state, but rather something constructed outside of its head (Suchman, 1987), socially and historically. In this case, assumptions should be seen as inherent conditions embedded in individuals' background of interpretation (i.e. *Appreciative Systems*), and not as something leading to false interpretation of the world (Winograd and Flores, 1987). Moreover, since individuals always operate within the framework of such background of interpretation, there is no neutral viewpoint from which individuals can see their beliefs as things objectively existing in the world (Winograd and Flores, 1987).

The reason for this is that *meaning* is fundamentally social and cannot be reduced to the meaning-giving activity of individual subjects (Winograd and Flores, 1987). Therefore, as an alternative to the idea of *knowledge* as mental representations, an inquiry into collaboration, and how a collection of people make sense in an activity, should focus on the power of collective representations as analytic tools for understanding social interactions (Thompson and Fine, 1999).

Therefore, it is necessary to abandon the traditional notion of *knowledge* and steer the discussion around the situated aspect of *understanding*. According to Pritchard (2014), unlike knowledge, understanding is a specific kind of achievement, in which successes are accountable to ability. Hence, success should be creditable to the agent's exercise of the relevant ability (Pritchard, 2014). More specifically, the author refers to a cognitive achievement in which success in understanding is creditable to the agent's cognitive ability.

In this case, knowing can be seen as less demanding than understanding, considering that, to gain knowledge of causes, it does not necessarily require the agent to be able to carry the relevant cognitive load by itself (e.g. knowledge can be acquired by trusting the word of an expert) (Pritchard, 2014). On the other hand, understanding is more than a general conception of the relation of cause and effect. Rather, it requires a grip on how a cause generated an effect, a grip that could be given as an explanation of why the event happened (Pritchard, 2014), and it can never be disembodied from the actor and the situation.

Such argument draws attention to account for the nature of understanding and how it is socially constructed, especially considering its role in early project collaboration. Thus, instead of referring to a stock of background assumptions, as a collection of things inside the mind, Winograd and Flores (1987) suggest that individuals' experience of the world is grounded in pre-understandings, as the result of previous experience within a tradition, that without which understanding itself would not be possible. Under this perspective, knowledge could be claimed as the result of interpretation, which depends on the entire previous experience of the interpreter and its situatedness in tradition (Winograd and Flores, 1987). Thus, everything that is said in any human activity is said within the context of individuals' pre-understandings of that experience within tradition, and only makes sense with respect to it (Winograd and Flores, 1987). Consequently, even if *knowledge* can be considered the result of individuals' interpretation, it cannot be stated as totally *subjective* (particular to an individual) nor totally *objective* (independent of the individual) (Winograd and Flores, 1987).

Notwithstanding, how could the continuous reference to knowledge existing as 'something' objective be explained?

### 2.3.2.2. *Objectivations* as humans' interpretive interactions

For Berger and Luckman (1966), the authors of *The Social Construction of Reality*, the answer is the fact that human society, as social construction, has a dual character in terms of *objective facticity* and *subjective meaning* (Berger and Luckman, 1966). According to Berger and

Luckmann (1966), the key question in this matter is, *How is it possible that subjective meanings become objective facticities*? In other words, *How is it possible that human activity should produce a world of things?*

Berger and Luckmann (1966) argued that human activity, or what we assume to be 'reality', is filled with *objectivations* and these activities are only possible because of such objectivations. In this context, individuals are constantly surrounded by objects that proclaim the subjective intentions of someone else (Berger and Luckmann, 1996). Thus, reality and, consequently, understanding of reality is constructed through objectivations, which materialize individuals' interpretations and subjective intentions into objects (Berger and Luckmann, 1966). In this case, reality can only be known partially and provisionally, through interpretative actions that individuals make while constructing situational definitions of it (Thompson and Fine, 1999).

One special case of objectivation is *signification*, or the human production of signs to serve as an index of subjective meanings (Berger and Luckmann, 1966). The need to externalize ourselves in activity can be explained in anthropological terms, by an imperative to provide a stable environment for our inherent instable human organism (Berger and Luckmann, 1966). One's signalling action makes its subjective meaning objectively available in the common reality of our social world. Signs and sign systems (as a clusters of signs) are special kinds of objectivation, because their inherent level of detachability allows subjective intentions to be expressed beyond the immediate presence of the body ('here and now') (Berger and Luckmann, 1966).

In this case, language is action that creates situations and not only describes them (Winograd and Flores, 1987). For example, the act of mentioning (or arguing for) certain issues and properties of a situation is an interpretative act into the collective discourse of the activity, in which *objects* are created becoming subject to others' interpretation (Winograd and Flores, 1987), as objectivations of meanings.

Such objects and properties are not inherent in the world, and only become present-at-hand in the event of breakdowns (Heidegger, 1962). Thus, from this point of view, *knowledge* lies in the being that situates us in the world, not in a reflective representation of such world (Winograd and Flores, 1987).

The objective quality of language leads us to encounter language as a facticity external to ourselves, forcing us into its patterns (Berger and Luckmann, 1966). Patterns of language historically constructed provide us with ready-made possibilities for ongoing and emergent

objectifications of our unfolding experience (Berger and Luckmann, 1966). This understanding supports the *Sapir-Whorf hypothesis*, which contends that natural languages influence the way we think. Such hypothesis suggests the notion of linguistic relativity, and the influence of language on our metaphysical assumptions (Whorf, 1956).

This perspective about the social construction of reality draws attention to the *institutional formulation of social problems*, examining the dynamic and historical processes affecting collective meaning (Thompson and Fine, 1999). Berger and Luckmann (1966) suggest that all human activity can be subject to *habitualisation*. In this case, repeated actions become cast into a pattern, which can be reproduced with an economy of effort (Berger and Luckmann, 1966). *Habitualisation* precedes *institutionalisation*, which occurs whenever there are reciprocal typification of habitualised actions between actors (Berger and Luckmann, 1966). Such shared typification of habitualised actions constitute what are called *institutions*.

*Institutions* are available to all members of a particular activity (i.e. the social actors) and, by the very fact of their existence, they imply control (Berger and Luckmann, 1966) as an object to control human conduct by setting predefined patterns of conduct in relation to that activity. They also imply historicity, in a way that its stabilisation or crystallisation through time led it to be experienced as existing over and beyond individuals, who embody them occasionally (Berger and Luckmann, 1966).

These conditions lead institutions to be experienced as possessing an objective reality of their own (Berger and Luckmann, 1966). For example, history itself, as the tradition of the existing institutions, has the character of objectivity (Berger and Luckmann, 1966). This means that human organizations are considered symbolic entities, and even the past is an object of construction, in which the meaning attributed to time and history derives from situational appropriateness and moral entrepreneurs (Thompson and Fine, 1999).

These aspects of social construction of reality can be observed in early works in sociology and economy, that suggested that collective meanings in social activities, as the case of the metaphors of collaboration presented earlier (Section 2.2.2 Different *metaphors* of collaboration), are explanatory devices referring to a general class of ideas. These ideas are constructed and usually operate outside of individuals' consciousness and free will (Durkheim, 1893), thus serving to coordinate social action and providing for a common reality (Smith, 1776).

Thus, collective meanings can be seen as *appreciative systems* objectivated on these metaphors, functioning as *community ethos*, and influencing the actions, thoughts and emotions of social actors towards system equilibrium (Thompson and Fine, 1999). Moreover, such objectivations create both reality and common sense (Moscovici, 1984).

In this sense, socially shared representations, as metaphors of collaboration, can also be seen as dynamic structures operating on an assemblage of relationships and actions that appear and disappear through time (Moscovici, 1984). The dynamic aspect of these objectivations means that human interactions continuously need to reconstitute common sense, in the form of understandings that support the creation of images and meanings, without which no collectivity could operate (Thompson and Fine, 1999).

## 2.3.2.3. Early Project *Objectivations*

Collective meanings at the early project stage in construction are articulated in terms of ideas that are elaborated through concepts usually described in words and drawings (Lawson, 2005). In this case, drawings and words are used by project participants (i.e. designers and clients) as *objectivations* to reveal and express what is problematic and unsatisfactory in the situation, as well as to help them to see a way forward and describe it as a complex set of characteristics (Lawson, 2005).

In fact, project participants tend to use several types of objectivation, for example: *vocal signs* (aligned with the 'traditional' idea of language)*; sketches* (as a type of graphical language)*; gestures* (as type of physical language); *material entities* (e.g. props and physical models) (Tversky and Kessel, 2014) to support the interpretative acts of perceiving (the situation) and conceiving (projecting change in the situation). These types of objectivation tend to be complementary, in a way that the combination of gestures, diagrams and words can facilitate the clarification and resolution of ambiguities in social activity (Tversky and Kessel, 2014).

As interpretive acts are inherently individual ones, in a way that one cannot dictate or control what others interpret in a situation, these *objectivations* tend to shape and predispose the kind of activity project participants do in the situation (Radcliffe, 1996). In this case, project participants assuming a deterministic perspective tend to approach the speculative nature of project activity, in a way that they usually reconfigure the activity into rational forms by articulating pre-conceived *objects* (Beckett, 2017), for instance recollecting habitualised actions and/or institutional forms of the activity (Berger and Luckmann, 1966).

Moreover, this initiative to operate in the activity through the recollection of previous experiences, based on "patterns of actions", can be seen as taken for granted *objects*, by which they can rely on understanding (i.e. perceive) and acting (i.e. conceive) in the situation (Tversky and Kessel, 2014).

For example, the concepts of *problem* and *solution* can be considered a very particular kind of institutionalised *objectivation* in early project situations, which has been traditionally taken for granted within the deterministic perspective of Design activity. Thus, early project activity, also known as *Design Ideation* (Jonson, 2005) or *concept generation*, usually is believed to be a situation to be decomposed into 'sub-problems', which are described in terms of design features of possible alternatives and list of materials, giving the impression of a systematic method of design (Radcliffe, 1996). In adopting such approach, project participants seem to believe in an objective existence of 'problems' and 'solutions', as entities detached from the process that objectivated them.

However, it can be argued that the emergence of these concepts (e.g. 'problems' and 'solution' alternatives) is arbitrary and uncertain, hence they cannot be constrained to a particular place or sequence in a systematic method of design (Radcliffe, 1996). In a certain way, such decomposition and listing of concepts is not sufficient to describe project participants' interactions (Radcliffe, 1996).

Concept generation cannot be constrained to happen only during the prescribed time in a project activity, as dictated by notions of due process and proper sequence of phases in design (Radcliffe, 1996).

In this sense, previous research suggested that *problem* and *solution* actually co-evolve at early project stages (Maher et al., 1996; Dorst and Cross, 2001). This means that the *problem* as such never truly exists in any objective sense (Beckett, 2017).

Alternatively, *problem* and *solution* should be considered as aspects of a single concept (Beckett, 2017), which is the object of the project activity. In this case, *problem* and *solution* should be seen as moments of a concept undergoing its dialectical interactions (Beckett, 2017), supporting the socio-construction of the activity, through participants' iterations to perceive the situation and conceive its change.

This Dialectical 'determination' of the design problem occurs when project participants act by reducing the situation to a simpler 'thinkable form', as a concept (i.e. an objectivation), to

which he or she adds features or qualities to distinguish it. Such action establishes the *problem* as an object of thought (Beckett, 2017). The subjectivity of such action relies on the fact that such 'determination' of the problem is only a determination of the concept of the problem, and it is entirely cognitive and situational; hence, it only emerges as the result of project participants' interpretive actions through and towards what they see as problematic in the situation (Beckett, 2017).

Moreover, a dialectical and socio-constructive perspective to early project objectivations suggests that these interactions (e.g. between designers and client) can only be judged appropriate and successful to the extent that they provide the means for individual expressions, while they enable both participants to understand each other's intentions (Eckert et al., 2010), in what can be referred as *mutual intelligibility*.

Mutual intelligibility depends on interpretative conventions enabling participants to engage in dialogue with each other (Eckert et al., 2010). In this case, it is possible to say that, for example, the emergence of *guiding principles* as a usual practice at an early project activity in construction do not belong to an individual, but rather to the history of the practice, as a collective expertise that is developed progressively through a series of projects (Lawson and Dorst, 2009). Such collective expertise enables the team to act as a whole in developing an appreciation of what these guiding principles (as a set of agreed understandings and rituals) mean in the history of practice (Lawson and Dorst, 2009).

A dialectical perspective to these objectivations allows us to abandon the implied teleological understanding of early project activity, in which problems are expected to precede its solution, as cause and effect (Beckett, 2017). It also highlights, and increases awareness about, participants' subjective intervention into the project situations (Beckett, 2017), particularly their social construction of the activity through such objectivations**.**

For example, at early project interactions, the *Brief* and other documents are a kind of objectivation that dominates the attention of project participants (Radcliffe, 1996). Another kind of objectivation related to early project interactions can be seen in the initiative of designers to conceive and present the *stages of the design process* and *signing-off* actions, as the means by which the committee of client representatives would recognize and acknowledge their preferences and commitment to project decisions (Eckert et al., 2010). Even the use of a *whiteboard* can be seen as an objectivation in early project interactions, which, in the context

of a meeting, is usually used as summarizing tool, where 'things' recorded on it become physically available to all the group (Radcliffe, 1996).

### 2.3.2.4. Linguistic *Objectivations* at Early Project interactions

Early project activity derives the meaning of its effectiveness from the resources of languages (Trousse and Christiaans, 1996). In such interactions, especially when designers negotiate with clients, the solution-oriented nature of drawings can be considered problematic or even difficult to interpret (Lawson, 2005). In contrast, verbal descriptions (i.e. linguistic objectivations) may allow the open interpretation of range of meanings (Lawson, 2005).

When the material object (i.e. a sketch or a prop) is not yet existent, or it cannot propagate itself across space and time, language as vocal signs is the main artefact (linguistic objectification) (Fleming, 1998). Moreover, it functions as a *verbal plan* to produce future artefacts (Fleming, 1998) and the initial ground for further objectivations. According to Fleming (1998), even when such material objects (i.e. graphic and physical signs) are at hand (on a table, for example), linguistic objectivations are still needed to give the objects status as accessible and stable 'things'.

At early project stage, the use of linguistic objectivations can lead to a stability necessary to survive in the context of the situation, as well as certain fluidity appropriate to its social construction (diverse perspectives) (Rittel, 1987; Fleming, 1998).

During these interactions, words can be very powerful when allowing slightly different ways of perceiving a situation (Lawson, 2005). For example, a situation of *transparency* can be reinterpreted into the conception of a *panorama* (Lawson, 2005). Thus, such *discursive objects* in many ways become objective references for the situation in hand (Lloyd and Busby, 2001).

Ultimately, this means that both forms of objectivation must be addressed in conjunction (Cross and Cross, 1995), in a way that words help design participants to express their ideas by being sufficiently evocative without being too prescriptive (Lawson, 2005).

This suggests that designing is built on a linguistic base, in which understanding of design concepts and precedents is dependent on a shared cultural experience (Eckert and Stacey, 2000; Lawson, 2005). From this point of view, early project interactions resemble a dialectical conversation, to the extent that participants reminisce and recall social occasions from their past as way to continuously reinforce the notion of a shared experience (Lawson, 2005). Especially involving long-lived project teams, *shared concepts*, as popular words representing

sophisticated sets of architectural ideas (e.g. *belvedere*), seem to be key to support the progress of early project activity (Lawson, 2005).

Moreover, these conversations seem to involve an ability that is primarily perceptual, allowing project participants to articulate through *unlikely analogies* that describe and explain the situation to other people in different ways (Lawson, 2005), until they reach some alignment (i.e. mutual intelligibility) between what is desired and what can be realised. Particularly at early project stages, where design ideas tend to evolve very fast and intensively, the ability to interact using simple words or phrases to represent complex sets of ideas is fundamental (Lawson, 2005). Otherwise, it would not be efficient if participants had to explain all major concepts raised throughout the conversation (Lawson, 2005).

Early project conversations ideally should help to solidify plans and ideas of the participants as they work to move the project forward (Fleming, 1998). According to Fleming (1998), linguistic objectivations are elaborated within two extremes of a continuum, indicating a relationship of dominance in designers' discourse. Within this continuum, Fleming (1998) suggests three sections: *indexing, constituting* and *elaborating* (Figure 9).
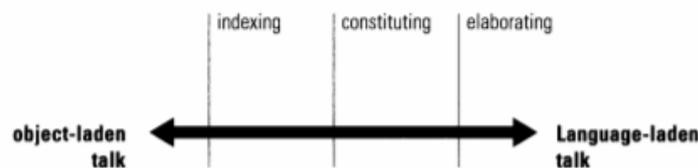


**Figure 9: Continuum of design talk (Flemming, 1998, p. 46)**

The left side of this continuum refers to discursive actions, in which the object leads and language follows (linguistic objectivations). In such discourse language, *indexing* is highly restricted and dependent on a perceptually shared material object (Fleming, 1998). On the right-hand side of the continuum, utterances can be related to *elaborating*, in which language leads and objects follow, in a way that language is relatively independent of the material world and function to express value systems, temporal references and social relations through narrative and argumentation (Fleming, 1998).

According to Fleming (1998), this is an indication of the rhetorical stability of the object and its detachment from immediate occasions, addressing its historical configuration (i.e.

*institutions*). This contributes in certain objects' capacity to be 'taken for granted' (Fleming, 1998).

In the middle of these spectrums there is what Fleming (1998) calls *constitutions*, which establish objects as novel interventions in the physical world, tying the immediate material present to its rhetorical construction (Fleming, 1998). It fundamentally imbues objects with personal, modal and topical force – in other words, agency, action and form, respectively (Fleming, 1998).

*"That is, such utterances establish the authorship of the object, indicate the manner and force of its production, and situate it in a meaningful terminological field."* (Fleming, 1998, p. 50).

Therefore, through such linguistic objectifications, designers articulate their material commitments in the task (Fleming, 1998). The construction of such *constitutions* articulating the three entities, namely agency, action and form, can be seen as the manifestation of the socio-constructivist aspect of the activity, in which such entities correspond to what Activity Theory calls*: subject, object* and *mediating artefact*. These aspects are further discussed in the section 2.4.1.

## 2.3.2.5. Graphical and Physical Objectivations at Early Project Stage

In parallel to abstract conceptions of needs and wishes through Linguistic objectivations (i.e. vocal signs), project participants usually use drawings and other physical props (e.g. models) to conceive primary images of the materiality of what might be the outcome of the project activity (Lawson, 2005). Specifically, through drawings (and other types of virtual models) such materiality is not constrained by physical aspects of the real world (Lawson, 2005). Moreover, drawings and models (virtual or not) can potentially become *perceptual interfaces*, seen as points of external reference by which participants develop conversations to negotiate between what is desired and what can be realised (Lawson, 2005; Eckert et al., 2010).

According to Goldschmidt (1991), the constructive role of sketches and models in supporting the 'dialogue' between project participants' reflective appreciation of the situation and their reinterpretation or conception of ideas through analogies is an indication of the dialectic nature of early project activity.

One advantage of using gestures, sketches and arrangement of props is that they can represent concepts more directly than words (i.e. vocal signs) (Tversky and Kessel, 2014). They are

forms of visual signalling, and they work differently from vocal signs in a way that they allow the representation of objects in terms of spatial properties and relationships, which vocal signs do not (Tversky and Kessel, 2014).

Concepts objectified in words usually need to respect a linear order in which words can be comprehended. Sketches and gestures do not need to follow such order. Such linear order is a weak form of structure that is not sufficient to represent tri-dimensional properties and relations (Tversky and Kessel, 2014). Gestures and sketching differ in such a way that one is a transient action, and the other is static and stable. In this case, sketching, as marks on a page, and the arrangement of props can be seen to have a similar nature (Tversky and Kessel, 2014).

Overall, visual signs tend to be more efficient in a way that they objectivate individuals' interpretation of the situation, in terms of what they find problematic, including only the details that these individuals find relevant to signalling (e.g. to draw on a paper) and to resolve (i.e. to change) in the situation (Tversky and Kessel, 2014). Moreover, project participants' produce visual signs to create visual displays, as a way to induce images (i.e. their own objectification) of the entity that is being designed (Goldschmidt, 1991).

Visual signs function as medium in order for project participants to see the evolution of their work in the activity (Schön, 1992b). Drawings, for example, are tangible visual percept (i.e. object of perception), which are elaborated in relation to the argument designers are constructing (Arnheim, 1993). Drawings, also function as *perceptual referent*, tying conceptual themes (i.e. ideas) to concrete images (Arnheim, 1993). As visual signs, they also function as screenshots of a designer's momentary perception in the activity (Arnheim, 1993). Therefore, visual signalling can also be seen as argumentative actions, which bring about gradual dialectical transformations of these 'images', as individuals' interpretations on the situation interact (Goldschmidt, 1991; Arnheim, 1993).

The situatedness of early project activity suggests that the function and nature of sketches are inseparable from that of the design they serve (Arnheim, 1993). In this case, since the entity to be designed, as the object of activity, does not exist yet, and therefore was never perceived, project participants may make use of precedents derived from *metaphors* (further discussed in section 2.3.4.4), analogous cases, or entities belonging to a similar type to give origin to "new" entities (i.e. objects in a situation) (Goldschmidt, 1991). Consequently, retrospective examination of those visual signs implies historicity to such objects, which eventually can lead to a condition of institutional object, taken for granted in the task. In this case, sketches can

help one to explore an array of displays (different constructs) of shapes and relationships among shapes (Goldschmidt, 1991), objectifying such "entities" as images.

This linguistic and dialectical nature of early project objectifications can be noticed as, in what Goldschmidt (1991) calls, *interactive imagery,* in which project participants look for sufficient relevance and coherence in their visual signs (e.g. sketches) allowing the maturation of a plausible, and potentially effective, representation of the designed entity (i.e. object of activity), or an aspect of it. This corresponds to the way project participants can simultaneously produce a display and generate an image of the interpretation that it triggers (Goldschmidt, 1991). Moreover, the iteration involved in reasoning in *interactive imagery* while sketching can be related to the notions of *seeing as* and *seeing that* (Goldschmidt, 1991) – in other words, project participants' abilities to conceive and perceive in the project situation. In this case, *seeing as* indicates participants' figural argumentation constructing its perception of the situation, and *seeing that* indicates participants' non-figural argumentation constructing its conception of the object that is being designed (Goldschmidt, 1991).

According to Goldschmidt (1991), the dialectics of early project interactions then emerge as cyclic movements, in which, for the most part, *as* arguments are going to be preceded and followed by *that* arguments. Usually, *as* arguments are made related to visual signs (i.e. sketches, gestures, props) (Goldschmidt, 1991). Such inherent and situated movement gives origin to a structure (coherent or not) that can be seen as the participants' own theory of the activity, or codex of design rules, asserting "objectivity" to the activity. Goldschmidt (1991) reinforces that these "rules" are applied to the task at hand in a unique way, by using or creating visual displays (as well as other signs, e.g. vocal signs) to construct the object of activity, which was non-existent before.

Inquiry into early project interactions should take these acts towards changing the situation (i.e. design moves) as acts of reasoning, which present a coherent proposition inherently linked to an object that is being constructed (Goldschmidt, 1991). In this context, participants' arguments should be taken as the rational utterance made by them towards these objectivations or any particular aspect of them (Goldschmidt, 1991). Consequently, inquiry into how interactions are composed by a set of arguments can show how early project activity is gradually constructed as a set of collective objectivations.

## 2.3.3. Consequences: Contradictions

Section 2.2.6, described how, in construction, the way individuals understand and conceptualize collaboration at early project interactions is limited by the metaphor upon which they are realised, as underlying *appreciative systems*. In this case, at early project interactions, the issue seems to be not that there are completely different ideas of collaboration, but that, for most of the time, people are not aware of their own orientation towards these conceptualisations, as they operate subconsciously by relating to the historical-cultural development of their practices.

Consequently, project participants come to interact at early project stages with pre-existing patterns of work activities, specialised work languages, different organisational constraints and priorities, and different expectations and perceptions of quality and success (Sonnewald, 1996) about collaboration. Differences in these aspects may cause them to challenge or contest other participants' contributions (Sonnewald, 1996), as well as the whole collaborative performance. Moreover, when individuals and organisations become committed to a particular metaphor, within a tradition of practice, they often see alternative perspectives as misguided, or as presenting threats to the nature of their activities (Morgan, 1980; Sonnewald, 1996; Green, 1996).

In this case, it could be argued that objectifications of collaboration (i.e. concepts, systems, strategies, methods, techniques and data) in construction projects, enacted by individuals according to and within one of these perspective (i.e. metaphors of collaboration), are often interpreted and evaluated in inappropriate ways, with great loss of significant meaning by other project participants who might conceive collaboration differently. It can be said that individuals in these situations will experience misunderstandings, hostility, or calculated indifference, hampering or making impossible an open and constructive debate (Morgan 1980).

### 2.3.3.1. Examples of Misunderstandings in Construction

Green (1996) explored how implicitly different metaphors of client organization, as different conceptual understandings, held by practitioners in construction projects, often affect how client briefing activity is approached. According to him, construction professionals exhibit difficulties in what he called a *pigeonholing* approach to diagnosing client's problems, in which the default paradigm implies that the client is seen as a 'unity' and not as a 'pluralistic' situation. In this case, the underlying metaphor, which sees organisations as *machines* (see section 2.2.3), leads construction professionals to take for granted that the client's objectives

translated in the brief are clear, pre-determined and remain static over time (Green 1996). However, such approach becomes incompatible – or, in other words, contradictory – when the client organization is interpreted as multi-faceted, with no broad agreement on the project objectives (Green, 1996). Following this second perspective, the brief needs to be socially constructed through debate amongst client members and other stakeholders over a period of time (Green 1996).

Divergent and sometimes conflicting perspectives on what constitutes *design management* within construction organizations can create difficulties in establishing a company-wide strategy (Tzortzopoulos and Cooper, 2007). According to Tzortzopoulos and Cooper (2007), the lack of a clear theoretical foundation for design management, as well as the lack of agreement on the potential benefits of managing design from the contractor's perspective, led to a poor definition of the company's and its members' role in the design management activity.

In another example, Macmillan et al. (2001) identified that architects and engineers, when asked to elaborate models representing the *concept design phase*, presented quite distinct ideas of the activity. The engineers tend to represent concept design prescriptively, in terms of multi-phase procedures, while the architects, conversely, tend to portray only few broadly defined stages (Macmillan et al., 2001). Similarly, while studying participants' interactions when developing a BIM strategy in a construction project, Forgues et al. (2016) identified that misunderstandings can emerge when stakeholders, that usually have been organising their activity in a highly linear and fragmented way, have difficulties in understanding and representing how their collaborative interactions operate in the project. This was aggravated by the fact that participants have difficulties in knowing the activities of the other members, and how precisely to represent how they are made interdependent in the project (Forgues et al., 2016).

Such *conceptual gaps* were identified when participants' process maps of design activities were compared in a BIM context (Forgues et al., 2016). In this case, conceptual barriers (i.e. contradictions) emerged when different maps, as different artefacts constructed by different project stakeholders, showed large *semantic ambiguities* related to participants' objectivations of the design activities (e.g. actions, mechanisms or data). This was evidenced when participants used different taxonomy (i.e. language systems) to refer to the same data, task or phase (e.g. each participant defined the distribution of the work in a different set of phases) (Forgues et al., 2016).

The examples observed in these researches can be seen as evidence of how the 'default' *appreciative systems* of construction activity have been traditionally biased towards individualistic and deterministic epistemological systems, which fundamentally seem to be based on a common and general conception of construction as a *self-fragmented* industry (Wild, 2002).

However, the description of construction activity as an *industry* is limited, and it has affected the way we analyse, manage, and operate in construction activities (Groak, 1994). The *industry* model has led to confusion, especially regarding inherent aspects of construction processes which are seen as problems (Groak, 1994). In addition to that, it also defined the parameters of change and improvement for both products and practices (Groak, 1994).

The underlying concepts of the *industry* metaphor can be considered inappropriate to understand certain aspects of construction, in which issues of quality and efficiency are seen as matters to be dealt with by management, information and feedback, and conflicts are perceived as problems arising from poor communication (Groak, 1994).

For example, the industry model implies that a unified organisation that is regularly coordinated is preferable to one that is specifically assembled for a project (Groak, 1994). Consequently, the division of labour in construction is seen as a particular problem (i.e. *fragmentation*), rather an inherent characteristic (Groak, 1994).

In the same way, the concept of *feedback* in the industry model assumes that activities in construction can be described as a transformation process, with an identifiable set of inputs and a set of criteria by which the output can be measured. This led individuals in construction to expect these activities to be regular and with a defined route for improvement, which is not always the case (Groak, 1994). These inadequacies indicate how the traditional appropriation of the *industry* metaphor tends to lead to analytical difficulties and misleading conceptualisations (Groak, 1994).

Diverse interpretations of what design activity consists of (Alexander, 1964; Simon, 1969; Schön, 1983) tend to influence the emergence of different approaches and artefacts embedded in practices (Dorst, 1997; Dorst, 2006). Moreover, over specialisation and scientific development of independent domains of design practice and theory have led to consistently different understandings about the nature of design activity (Bucciarelli, 2003). In this case, the flexibility and openness of design as a discipline, that had allowed different ontological

interpretations about its practice, can also be seen as source of misunderstandings and contradictions in the context of collective practice (Buchanan, 1995).

For example, traditionally, design as an activity has been usually implied as a problem-solving activity (Simon, 1969). In this case, it is common practice to consider *design problems* as the set of a written project brief that should drive designers' activity (Bridges, 2007). According to this perspective, designers should engage in solving ill-structured problems "*before they receive all the relevant information necessary to solve it*" (Smith, 2005). The inherent contradiction of such concept of design activity is that the problem exceeds the designer's current *knowledge base* (Smith, 2005). In this case, the relevance of the word *problem* is key, because what designers experience is a "situation", requiring their active engagement to construct "a problem" for them. Moreover, in a context of social practice, the inherent interaction among practitioners from different socio-historical backgrounds may reveal that a general idea of the 'problem to be solved' as the object of design activity cannot be totally shared among them. Such conception may lead designers to not recognise that other participants may judge what is problematic in the situation differently. As a consequence, practitioners will face confusion and misinterpretation around strategies and actions that were set based on different expectations of what is the object of activity.

Therefore, describing Design as a "problem-solving" activity is very problematic, or even meaningless, if we cannot define or crystalise a design problem in empirical descriptions (Dorst, 2006). The rationalistic tradition tends to grant problems some kind of objective existence, without accounting for the subjective construction inherent in the way problems are formulated (Winograd and Flores, 1987). According to Winograd and Flores (1987), a 'problem' is always constructed by human beings in situations of practice, which means that it arises in relation to a specific socio-historical context. From this point of view, project participants face divergence of *normative, existential* and *phenomenological roles*, rendering expectations relevant to a particular project situation (Wild, 2002).

Alternatively, Design can be interpreted as an activity in which participants invariably interact to socially construct their situated idea of design, as the object of activity (Schön, 1984). An example of such perspective can be depicted in Schön's (1984) description of a student and tutor interaction at early project stage:

> *"She (the student) wants him to appreciate her design; he doesn't think she is designing at all. The two of them miscommunicate both about the nature of designing and about the*

*nature of their own interaction. Here, the predicament of learning to design has become a learning bind." "In order to dissolve such a bind, Northover (the tutor) would have to get interested in what she meant by what she said and did, and she would need to explore a new set of meanings for his words. But in the behavioural world they have constructed for one another, such mutual exploration is highly unlikely." "...unless Northover (the tutor) begins to behave in such a way as to help convert this situation (win/lose game) into a process of reciprocal translation. But such a change... would signal that he had begun to reflect-in-action on his own practice as a studio master. Indeed, I believe that good design teachers do sometimes become reflective practitioners of studio education, learning how to negotiate a "ladder of reflection" that can include as one of its objects even the behavioural worlds of student/teacher interaction."* (Schön, 1984, p. 9)

The above shows that divergence and lack of consistency among project participants about their understanding of the nature of design may hamper the activity.

## 2.3.3.2. Misunderstandings as Dialectical Interactions

Misunderstandings between project stakeholders may occur when their interrelated tasks have different priority measures and/or conflicting constraints (Sonnewald, 1996). They can be revealed in terms of disagreements, when a speaker explicitly, whether via tone and/or words, disagrees with something someone says in the interaction (Paletz et al., 2017).

Disagreements emerge not simply as stating a potentially controversial viewpoint, but rather as constraints are revealed limiting the search for a course of action (Paletz et al., 2017). In this case, some of these disagreements may be too fundamental for project teams to overcome, in a way that they might increase uncertainty by revealing more underlying differences than the project team is capable of handling (Paletz et al., 2017). These types of misunderstandings can be seen as systemic contradictions, in which different stakeholders conceptualise the activity in fundamentally different ways (Engestrom, 1995).

Contradictions are not the same as problems and conflicts (Engestrom, 2008). Contradictions are historically accumulated structural tensions within and between activity systems, and can be considered the source of change and development in practices (Engestrom, 1995; Engestrom, 2008; Forgues et al., 2009). According to Putnam (1986), contradictions can be seen as diametrically opposed and mutually exclusive choices. Contradictions incorporate dualism, in which opposites are seen as interdependent and mutually defining rather than

discrete (Putnam et al., 2016). Hence, they emerge within inherent conflicts of interest and in the ongoing struggle of unity and division in social interaction (Putnam et al., 2016).

Contradictions emerge when, in everyday practices, different constructions of objects of activity (or, in other words, different socio-historical constructs) are actualized confronting each other (Groleau et al., 2012). According to Engestrom (2008), a primary contradiction emerges from diverse perceptions of value within and between activity systems. A secondary contradiction then emerges when new and old elements collide within the activity system. Such contradictions can be usually embodied within traditional professional partnerships in terms of bureaucracies, statuses and roles (Groleau et al., 2012).

Attention should be draw to situations of coexistence of artefacts from different socio-historical traditions (Groleau et al., 2012). In this case, contradictions can be examined through the links in various levels in which different interpretations of the objects of activity confront each other, causing tension in the activity (Groleau et al., 2012). To understand the difficulty of practitioners to act in certain ways, it is necessary to depict and analyse the inner contradictions of the entire activity system in which he or she is working (Engeström, 1995). Such contradictions, whether stemming from the existing rules, division of labour, or from the object itself, can contribute to discoordination and failure, as well as contribute to trigger re-mediation or transformation of participants' actions (Engeström, 1995).

At the early project stage in construction, contradictions over the project activity are also reproduced in the project proposal (e.g. concept design), becoming contradictions of design space, and manifesting in terms of constraints, problems, paradoxes, conflict, controversy, incongruity or uneasiness (van Amstel et al., 2016). Moreover, in a construction project activity, the imperative economic, political and cultural conditions can become sources of contradictions (van Amstel et al., 2016). In this case, contradictions become evident when project participants become bothered by something they could not understand and translate into clear project constraints (van Amstel et al., 2016).

The advantage of recognising the socio-materiality of contradictions in a project activity is that multiple interpretations within the same concept can be taken into account, including the ways participants find to overcome these conflicts of interpretations (van Amstel et al., 2016). Moreover, the notion of contradiction underscores the dialectical nature of early project activities, as a social pragmatic activity aimed at changing material conditions (van Amstel et al., 2016).

In this case, the notion of Dialectics seems to offer a more accurate account for the nature of misunderstandings at early project interactions in construction, in which:

*"Interdependent opposites aligned with forces that push-pull on each other like a rubber band and exist in an ongoing dynamic interplay as the poles implicate each other. Focuses on the unity of opposites and the forces or processes that connect them. This interplay is dynamic in that tensions emerge and evolve, dissolve or reproduce themselves in the context of ongoing social interaction within and among social systems"* (Langley and Sloan, 2011, p. 262 apud Putnam et al., 2016, p. 11)

Dialectics also refers to the ongoing struggles that emerge in conflict situations; however, as a construct, it differs from the notion of contradiction by emphasising the constant push and pull between contradictory aspects (Putnam et al., 2016). Instead of looking at the dualism of binaries, it focuses on unity and the ways that opposites mutually define each other rather than develop separately (Putnam et al., 2016). Therefore, dialectics provide a way of incorporating process dynamics into the study of misunderstandings (Putnam et al., 2016).

### 2.3.3.3. Construction seen as a Socio-Constructed Project Activity

The dialectical nature of conflicts of understanding within construction project activities can be seen as a social interpretive phenomenon (Gaski, 1984), which is defined in terms of how the parties involved in a project perceive each other. From this point of view, neither the occurrence nor the outcome of the conflict of understanding can be completely and rigidly determined by any objective means (Vaaland, 2004). Thus, the way in which two parties perceive the fundamental aspects of the conflicts will be key to providing an understanding of that interaction (Vaaland, 2004) in terms of collaboration.

In this context, a more useful and appropriate notion for construction activities is the concept of *Projects* (Groak, 1994; Bertelsen and Koskela, 2005). Any project activity aims to initiate change in the world (Luras, 2016). Thus, project activities always take place in a social context, in which plan-making aims at the distribution of advantages and disadvantages among a certain group of individuals with often contradictory interest and ideas (Rittel, 1987).

Construction projects can be seen as the production of a unique kind of product or service (Bertelsen and Emmitt, 2005). The situated nature of projects (Suchmann, 1987) suits the inherent provisional characteristics of construction, which is determined significantly by location, site and performance. In this case, the traditional notion of supply chain from the

*industry* model does not fit to the notion of projects and their own demand chain. In a project, the provision of a service or a product relies on the organisation of resources (e.g. services, finances, information and products) as a specific configuration of those generally available (Groak, 1994).

Thus, construction activity, as projects, can be seen as "*temporary coalitions in a turbulent environment requiring unpredictable configurations of supply industries and technical skills*" (Groak, 1994). In this case, the project can be seen as an invention of the project participants, in which emergent problems are not something to be eliminated from work or anomalies to be excluded from our theoretical models, but rather are inherent characteristics to be recognised as necessary components of our analytical tools (Groak, 1994).

The notion of projects re-interprets construction as comprising a set of shifting figures on a shifting social ground (Wild, 20020). It entails interactions of power and resource differences under conditions of uncertainty at boundaries of organisations, transactional task systems and their environments (Wild, 2002). In this context, even the notion of what configures uncertainties can be seen differently, since different organisations have different stakes in and different commitments into the project (Wild, 2002).

Stakeholders in a project activity must develop a deep understanding of the situation they face, involving all aspects that directly or indirectly influence the project activity (Luras, 2016). Thus, project interactions rely on how people make sense of their experience in the world, in a continuous attempt to gain insight into situations (Luras, 2016).

In this case, sense-making is key in the project activity, because participants need to make sense of the situation to be able to appreciate what is possible and desirable in terms of change (Luras, 2016). A 'situation' is, in fact, a part of reality that can be seen as a contextual whole, and sense-making in project activity is an ongoing dialectical process that is always relying on existing understanding that is used to make sense of the experience, and consequently is updated based on the new experience (Luras, 2016). From this point of view, the project activity, as a system, is not something given in nature, but something defined by intelligence (Luras, 2016). In other words, it is socially constructed by its participants.

Schon (1983) called this the *reflective conversation with the situation*, in which participants' perceptions are dynamic, in a way that the understanding of what should be accomplished and how it could be accomplished is continuously shifting (Rittel, 1987). In these interactions, each participant can be seen as an independent cognitive and social agent, whose actions are

intertwined through the need to produce a common product. Thus, project participants work upon a set of agreed understandings and rituals that frame their collective work, forming what Radcliffe (1996) called an *intellectual federation*. Hence, as in any confederation, these understandings are not static, and they are constantly negotiated, restated and reinterpreted by its participants (Radcliffe, 1996), supporting the continuous dialectics of the project activity.

Therefore, early project activity requires engagement in negotiations towards shared perspectives of the situation, that allow project stakeholders to meaningfully interact and, consequently, have a better understanding of each other's positions, in which could be called a state of *Mutual Intelligibility*. Such negotiation emerges when two or more parties holding disparate positions about some common object of activity are willing to try to reach some form of agreement despite their different views and objectives (Lawson, 2005). In the next section, the notion of mutual intelligibility in the context of early project interactions is further explored as a key aspect of the resolution of misunderstandings.

## 2.3.4. Resolution: Breakdowns, Metaphors and Mutual Intelligibility

From a social constructionism perspective, objectivations are moments in the continuing dialectical process between individuals and their social world (Berger and Luckmann, 1966). This means that human activity is essentially social and collaboratively constructed through a world of artefacts and actions, the significance of which is inherently conveyed with respect to specific situations (Suchman, 1987).

The fact that human activity always occurs within the context of a situation renders an awareness of this situation with difficulty (Winograd and Flores, 1987). The whole concept of a situation states that one is not standing outside it, therefore it is impossible to acquire any kind of objective knowledge of it (Winograd and Flores, 1987). Thus, humans are always within situations, and to inquire on that situation is a task that can never be entirely completed (Winograd and Flores, 1987).

Suchman (1987) was particularly concerned with the 'situational' aspect of human activity. The rationalist tradition assumed plans, as objective models of action, that could be improved and transformed into axiomatic theories of action (Suchman, 1987). According to her, this perspective should be abandoned and inquiry into human activity should take plans as artefacts, functioning as resources for individuals' practical deliberations about actions towards a state of mutual intelligibility (Suchman, 1987).

Thus, instead of abstracting actions away from its situation, inquiry into human activity should focus on studying how people use their circumstances to achieve intelligent action. This means that objectivity on human actions is achieved rather than given. One of the biggest examples of this is how language stands as a resource in a generally indexical relationship to the situation that it presupposes, produces, and describes, allowing mutual intelligibility to be achieved in the activity (Suchman, 1987). In this case, plans and accounts can also be seen as artefacts in a way that, in order to represent their actions, individuals must construct objects of them (Suchman, 1987).

Moreover, since the significance of linguistic expressions is always dependent upon the circumstances of their use, the attention to indexicality is fundamental to distinguish classes of expressions, the meaning of which is conditional on the situation of their use. In this case, a measure of the indexicality of an instruction can only be achieved by the reference to its use in the situation from the instruction follower, and it is not inherent within the instruction itself (Suchman, 1987).

Such condition highlights that mutual intelligibility on a situation is related in great measure to the efficiency of language (Schultz, 1962). Also, stability in the social world is not the consequence of a stable body of shared meaning, but of individuals' collective interactions to find coherence in situations through interpretive actions (Suchman, 1987). According to Suchman (1987), this involves a process called 'documentary method of interpretation', in which individuals search for uniformities that underlie unique appearances, in a way that actions are taken as evidence, or documents of underlying plans or intent. This ability to ascribe intent on the basis of evidence, as well as the interpretation of evidence on the basis of ascribed intent, is what supports mutual intelligibility (Suchman, 1987), in the same way that Berger and Luckman (1966) suggested that habilitualised actions tend to generate institutionalisations as long-lasting objects of activity.

As individuals are constantly interacting through objectivated intentions, the stability of the social world comes not from some sort of eternal structure, but instead from a continuum of situated actions that create and recreate *shared understanding* on specific occasions of interactions (Suchman, 1987), allowing mutual intelligibility to emerge in shared activities.

## 2.3.4.1. Shared Understanding

In this case, creating shared understanding faces the challenge of integrating various perspectives emerging from different descriptions of the world and, it depends on reasoning around conflicting arguments and goals among design participants (Arias et al., 2000).

Previous research on collaboration design, suggested the idea of shared understanding as a mutual view amongst the team members on a relevant design topic and design activity. Thus, shared understanding would involve similarities in the individual perceptions of actors about either how the design topic is conceptualised, as the content of the situation, or how their *transactive memory* system works, as the process to conceive a solution (Kleinsmann, 2006). Such proposition assumes *Transactive memory*, as a "*set of individual memory systems, which combines the knowledge processed by particular actors with a shared awareness about who knows what*" (Wegner, 1987 apud Valkenburg and Kleinsmann, 2008, p. 371).

However, this perspective is limited by a determinist notion of knowledge, seen it as an objective entity (see section 2.3.2.1). Alternatively, Smart (2011) proposed that shared understanding implies similarity of understanding in relation to a particular phenomenon (i.e. goals, task, situation), involving the emergence of the abilities to form expectations and predictions regarding future states, actions and events. Smart's (2011) suggestion that shared understanding is an ability, is coherent with the situated nature of design activity, and acknowledge the difference between *knowledge* and *understanding* in supporting the conception of expectations and predictions to change a problematic situation.

Therefore, shared understanding could be related to a collective and dynamic ability to conceive and coordinate actions towards common goals or objectives of multiple agents within a group, based on diverse backgrounds of experiences, beliefs and assumptions on the task, through the use of tools (Bittner and Leimeister, 2013). It can also be seen as the expression of how agents' roles, responsibilities and capabilities (Smart, 2011) are socially constructed in relation to the conception of shared goals and their perception of the aspects of the current situation. In this case, shared understanding is a construct that is both a challenge and an important condition for mutual intelligibility – and, consequently, collaboration (Bittner and Leimeister, 2013).

## 2.3.4.2. Breakdowns

The situational aspect of human activity can also reveal the limits of individuals' construction of mutual intelligibility. Individuals in the world are always engaged in acting within a

situation, without the opportunity to fully disengage themselves and act as detached observers, in what Heidegger (1962) called *thrownness*.

Since every intention is an interpretation (Winograd and Flores, 1987), different individuals in the same situation can produce different interpretations (Winograd and Flores, 1987). As the situation untangles, individuals' intentions are articulated through objects and properties, which potentially emerge as contradictory instruments and fragments of interpretation in the search of utility (Winograd and Flores, 1987).

In this case, individuals' *thrownness* may obscure the social dimension of understanding (Winograd and Flores, 1987), in which institutions (i.e. institutionalised objects of activity) are taken for granted and emergent contradictions are not resolved.

This is because, most of the time, people may find it difficult to understand what a particular object is 'proclaiming', especially when the interaction involves people who do not previously know each other (Berger and Luckmann, 1966).

In the context of early project collaboration, project participants usually interact with different appreciative systems, thus producing diverse judgements over their interactions (Schön, 1983). In these interactions, different points of view are brought together and the individuals usually experience breakdowns, in terms of revealing different understandings about the consequences of their assumptions (Rittel, 1984). Thus, it is only when a breakdown happens that individuals become aware of the fact that *things* in the world (i.e. objectivations in the situation) exist, not as a result of individual acts of cognition, but through their active participation in a domain of discourse and mutual concern (Winograd and Flores, 1987). These moments can be related to Heidegger's (1962) notion of *breakdowns*, which are any interrupted moment of habitual, standard, comfortable *being-in-the-world*.

Participants on project collaboration should be able to reflect about this breakdown (Rittel, 1984). According to Schön (1983), reflection and awareness of those conflicts of appreciation may lead project participants to understand the intractability of their dilemmas and to suggest alternative project decisions. From the cognitive point of view, the breakdowns reveal the nature of individuals' practice, making them 'present-to-hand' (Winograd and Flores, 1987). Change, as the expected project output, can only emerge in the recurrent structure of breakdown, in which the project constitutes interpretative actions upon the breakdown and committed attempt to anticipate forthcoming breakdowns (Winograd and Flores, 1987).

### 2.3.4.3. Mutual Intelligibility

In this case, while *language* has the role of creating our world, *breakdowns* create the space of what can be said, forming a continuum in which language and cognition are merged (Winograd and Flores, 1987) and cannot be dissociated from its social construction.

> *"Knowledge and understanding (in both the cognitive and linguistic senses) do not result from formal operations on mental representations of an objectively existing world. Rather, they arise from the individuals' committed participation in mutually oriented patterns of behaviour that are embedded in a socially shared background of concerns, actions, and beliefs. This shift from an individual to a social perspective – from mental representation to patterned interaction – permits language and cognition to merge."* (Winograd and Flores, 1987, p. 78)

Language in a broader sense, including physical and graphical signs, should be seen not as merely a reflective, but rather a constitutive medium, in which we design ourselves and the social artefacts in which our lives find meaning (Winograd and Flores, 1987).

As it was mentioned before, at early project situations each participant interacts with their own set of assumption guiding their interpretations and actions (Hey et al., 2007) – in other words, their *appreciative systems*. These are underlying structures of belief, perception and appreciation, comprised of implicit understandings about what issues are relevant, what values and goals are important, and what criteria can be used to evaluate success (Vickers, 1965; Schön, 1984). Appreciative systems influence the implicit pairing between the individuals' perception of what is problematic in the situation and their conception of a desired end state of goal (Schön, 1983; Hey et al., 2007), that changes the situation.

Thus, divergent appreciative systems result in contradicting sets of goals, assumptions and attentional foci in a design set (Hey et al., 2007). At the early stages of a construction project, contradictions often emerge over the consequences of certain 'facts' in the evolving situation (Lloyd and Busby, 2001). A designer may start constructing a 'verbal model' (as an abstract concept) of a change in the situation. Then, another participant may dispute this conception in terms of different formulations about the potential consequences of that change, taking into consideration whether that change meets certain performance criteria (Lloyd and Busby, 2001), according to its own appreciative system.

In the emergence of such contradictions, project participants usually put their technical skills on second and display a certain set of skills to make a convincing interpretation of the situation (Lloyd and Busby, 2001). In this case, designers in particular tend to show a set of skills in order to construct an effective argument to get their version of the consequences of the proposed change on the situation accepted by other participants (Lloyd and Busby, 2001). By using language mechanisms, as of engagement, exaggeration and imagery, designers try to create situations of implied objectivity regarding a common agreement and/or past experiences (Lloyd and Busby, 2001). Thus, conversation is developed based on the existence of a *common ground*, as a set of common values, mutually known facts, and commonly held assumptions between agents from different backgrounds (Koskela, 2015).

The use of language mechanisms by project participants at early project interactions allows early project conversations to take place over a bedrock of common assumptions and experiences, thus allowing participants to interact without extensive explanations (Lloyd and Busby, 2001; Koskela, 2015). Common assumptions usually refer to technical properties of a design solution, and common experiences relate to past events or facts that serve as ways of contextualizing the current situation (Lloyd and Busby, 2001). Both can be seen as individuals' objectivations, operating as discursive artefacts and serving as objective reference for interpretation on the situation when there is a 'meeting'.

A 'meeting', in this sense, is an event marked by an encounter in an inherently, but not necessarily formal, social activity. Every time someone meets another one (e.g. another project participant) and its objectivations in the activity, a meeting phenomenon takes place. It is in the context of 'meetings' that project participants can engage in a *breakdown*, and start to observe and apprehend 'things' in the situation as: past experiences; individuals' preferences; institutions; organisational history; subjective qualitative appreciation; and emergent misunderstandings (Lloyd and Busby, 2001).

It is important to highlight that these interactions are interpretative ones, in which interpretive aspects of the situation become at hand, objectivated by and for a specific set of project participants. Therefore, it could be said that early contradictions between individual appreciative systems may not prevent, but rather enable, the negotiation of shared appreciative systems, as long as the contradictions are made explicit (Hey et al., 2007) and the participants are keen to reflect on them.

One problem is that individuals may not be aware of their own implicit assumptions until they are met with contradicting perspectives (Hey et al., 2007). According to Hey et al. (2007), several activities can make individual frames explicit and, consequently, reveal contradictions among them, for example collectively building a group vocabulary and defining terms, concepts and categories. When contradictions between participants' individual appreciative systems are made visible, common frames can start to be negotiated (Hey et al., 2007).

When individuals' appreciative systems are externalised, they expand the project team object of activity, allowing other participants to expand their engagement in what Schön (1983) calls "conversation with the materials of the situation" (Arias et al., 2000). At early project stage, such expressions, interpretations and responses occur through objectivations, which are most of the time linguistic (i.e. vocal signs) at first (Lloyd and Busby, 2001).

The construction of such a 'verbal model' of the proposed change in the situation is only possible because participants are familiarised with previous designs and the relevant technological principles applied (Lloyd and Busby, 2001), allowing them to achieve mutual intelligibility. Thus, objectivations resulting from such early project interactions (e.g. concepts and sketches) can be seen as a common or shared object (Lloyd and Busby, 2001) in the situation.

In order to overcome emergent contradictions, as different perspectives on the dialectical objectivation of the project situation, project participants seem to need to draw upon common experiences to construct objects of activity that appear to be familiar to others (Lloyd and Busby, 2001). In this case, linguistic objectivations seem to play a key role as *conversational objects* that function as media to explore decisions that have to be made (Lloyd and Busby, 2001).

## 2.3.4.4. Metaphors

In this case, *metaphors* play a key role in project conversations because they embody symbolic representations that imply socially shared ways of perceiving a situation, as well as conceiving changes in it (Tomelleri et al., 2015).

In essence, a *metaphor* means that one thing is seen as another; consequently, the existing description of one thing is taken as a commonly believed redescription of the other thing (Schön, 1963; Schön and Rein, 1994). In a metaphor, the old concept is not simply applied to a new situation, but it is taken as a symbol for a new situation, in which this new

conceptualization grows through making, elaboration and adaptation (Schön, 1963). Hence, metaphors entails *seeing-as* and can lead to new developments in the situation (Goldschmidt, 1991).

Such reinterpretation carries over to a new situation a set of familiar notions (e.g. the evaluation implicit in the previous interpretation) and, as a result, both the familiar and unfamiliar come to be seen in new ways (Schön and Rein, 1994). Thus, considering their dynamic nature, 'metaphors' can be seen as the traces left by the *displacement of concepts* (Schön, 1963). A 'concept' is someone's notion about a thing, which can be objectivated in language, behaviour, images, logical terms, or judgement (Schön, 1963). Following the arguments from Dewey (1938) and Wittgenstein (1967), such concepts can be seen as tools we construct for coping with the world (Schön, 1963) – as the key aspect of objectivations in socio-construction.

In our everyday interactions with the world, we learn what to expect about certain situations. Through such gradual learning, individuals become able to relate these situations to many other familiar concepts, which consequently provide them with many other expectations (Schön, 1963). Therefore, our concept about something is our learning about it, which is inherent, dynamic and indeterminate (Schön, 1963). Language is one way to objectify this body of expectations in a situation (Schön, 1963). When someone says 'this is an X' to someone else or itself, it awakens such expectations, allowing them to deal with that 'object' in the situation (Schön, 1963). Thus, linguistic objectivations of a concept can be seen as shorthand for our learning about certain areas of our experience, which necessarily happen in the social context of our 'commerce with the world' (Dewey, 1938; Schön, 1963).

In this sense, metaphors can be seen as objectivations that build social relationships, generating consistency between an individual's inner world and their social environment, by unconsciously establishing a sense of performance, in terms of success and failure for the collective practice (Tomelleri et al., 2015).

Metaphors are selected based on their utility to interpret and explain these troubling situations (i.e. to objectivate individuals' perception) or to allow the situation to be changed (i.e. to objectivate individuals' conception) (Schön, 1963). According to Schön and Rein (1994), *framing* and *naming*, which can be seen, respectively, as objectivating perceptions and objectivating conceptions, proceed through generative metaphors. Perception (usually referred to as problem formulations) and conception (usually referred to as solution generations or problem-solving) are grounded in different 'problem-setting stories' rooted in different

appreciative systems, that may be objectivated, in turn, by different generative metaphors (Schön and Rein, 1994).

In a metaphor, such transposition and new interpretation does not occur with perfect freedom, and pre-existing conceptual structures on the situation tend to resist it (Schön, 1963). In this case, cultural context embodied in language tends to provide individuals with common 'metaphors', existing as *institutions* in the situation, which impose themselves over the efforts to interpret new situations, and individuals cannot think without being influenced by them (Schön, 1963). *Institutions* are taken for granted, and operate as underlying *appreciative systems*, as indicated in section 2.2.2. Thus, metaphors that individuals choose invariably come from the interaction of what is imposed by the culture, as common language objects from the 'culture's store', and what individuals can reconceptualise in the situation (Schön, 1963).

The normative force of generative metaphors is derived from its embedded purposes, values and images that have long been powerful within a particular culture (Schön and Rein, 1994). Thus, it is possible to say that generative metaphors and their underlying *appreciative systems* tend to be relatively constant over long periods of time (Schön and Rein, 1994), generating institutionalised objectivations, as in the case of the *industry* metaphor in the context of construction activities.

The emergence of such metaphors shows that appreciative systems are not *free-floating* but are grounded in the *institutions* that sponsor them (Schön and Rein, 1994). The embedded assumptions and common expectations, in terms of a sense of obviousness of what is wrong and what needs fixing, that come from the match between these metaphors and situations can be considered a key aspect to the emergence of contradictions implicit at early project activities (Schön and Rein, 1994), where the project activity is still under-determined. In this case, micro-conflicts tend to increase the likelihood of analogies, helping to reduce uncertainty (Paletz et al., 2013).

In conclusion, an important aspect of the use of metaphors as a socio-constructive linguistic mechanism is that such displacement of concept is carried over as a projective model in a new situation (Schön, 1963). This means that, in a project activity, associations are not restricted, and they are built around the stimulus projected upon, thus allowing different ways of looking at something and focusing on conceiving the conditions propitious for changing the situation (Schön, 1963). Since cultural contexts involve a set of 'theory-resources' with overlapping priorities given and imposed by language, the projective nature of metaphors is key to

explaining how intelligent learning proceeds and, consequently, how it allows mutual intelligibility to be achieved (Schön, 1963).

## 2.4. Synthesis of the Literature

The previous sections suggested that early project collaboration is hampered by emergent misunderstandings between project participants, due to the inherent interaction between objectivations originated from divergent appreciative systems. Thus, in order to reveal and assess the dynamics of such conflict resolution towards mutual intelligibility at early project interactions, it is proposed in this thesis the use of a Dialectical Model of Project Collaboration. This section presents the argument and rationale behind the construction of such theoretical framework based on Activity Theory model (Figure 10).
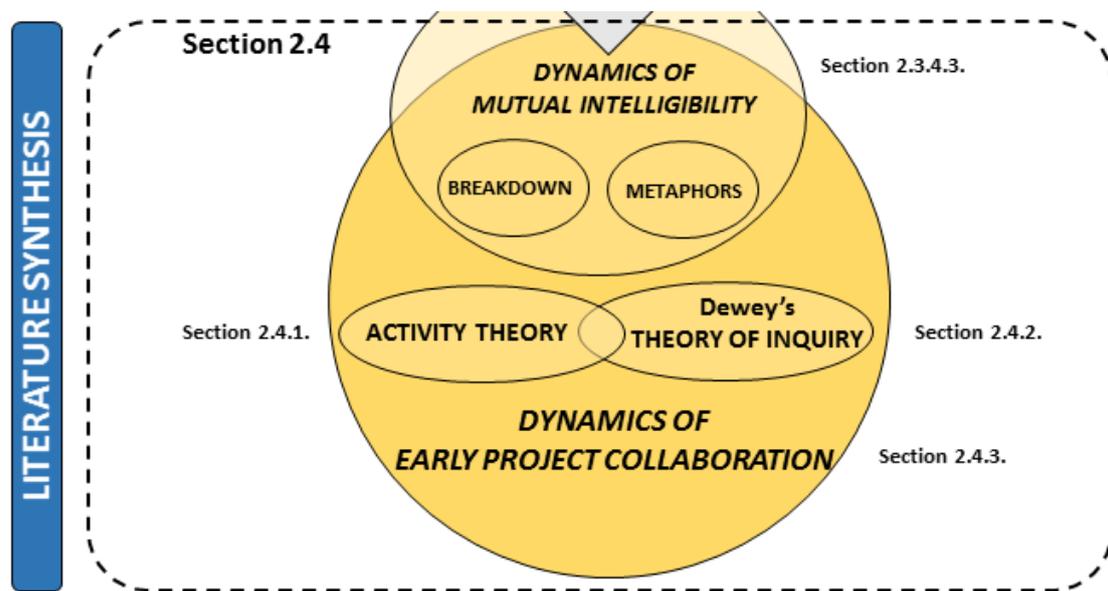


**Figure 10: Structure of the Synthesis of the Literature**

## 2.4.1. Activity Theory: a socio-constructive framework to study Project Collaboration

During the early 1980s, an important theoretical approach started to emerge supporting the inquiry into the socio-constructive and dialectical nature of human interactions towards development, namely the Activity Theory. Mostly influenced by the ideas proposed by Lev Vygotsky (1978) around human development, and further explored in the work of Yrjö Engeström (1987), Activity Theory states that human activity is always embedded within a socio-cultural context of other individuals and, thus, work activities always take place within some community of practice. According to Vygostsky (1978), every human action should be understood as an Activity System, which involves a triad of *subject*, *object* and *mediating artefacts*, leading to a cultural mediation of actions (Figure 11).
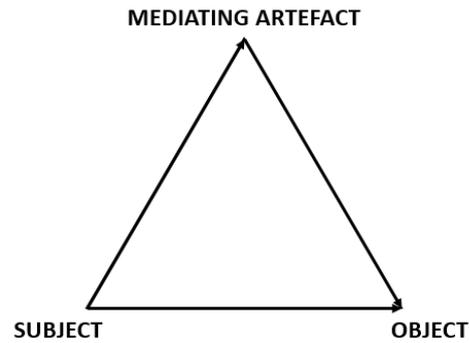
**Figure 11: 1st generation Activity Theory Model (Vygostky, 1978)**

The concept of activity is consistent with the understanding that meaning is enacted and acquired through social interaction. It is negotiated and manifested through practice, in which human activities are embedded not only in forms of discourse, but also in the material action shaped in technology, rules and social structures (Blackler, 1993). In Activity Theory, human actors work within a broadly objective, but socially and culturally defined, reality (Nardi, 1996). More importantly, their activities are themselves mediated by tools, seen as mediating artefacts, that are culturally biased and which are, consequently, developed and transformed during the activities (Nardi, 1996; Engeström, 2001).

The concept of *activity* can be related to concepts as *frames*, *social world* (Blackler, 1993) and to the idea of *appreciative systems*, presented in section 2.2.1. Such understanding led Engeström (1987) to propose an expanded version of the model of activity initially conceived by Vygotsky (Figure 11), to consider the collective and contextual aspect of an activity. The uppermost sub-triangle represents individual or group actions, while the lower indicates how these actions are embedded in a collective activity system through: *rules, community* and *division of labour* (Figure 12).

In this case, *Rules* can be considered historically constituted codes of conduct, which may be explicit or not, and that are sustained by patterns of interaction; *Community* represents the other individuals sharing interest in and influencing the evolving activity; *Division of Labour* is manifested by roles (e.g. job descriptions), methods, routines (e.g. organised processes) by which diverse participants act towards the object of activity (Groleau et al., 2012).

The concept of *activity* highlights the relationship between motives and context of action, supporting inquiry into the ways social individuals enact activities through negotiation of concepts and actions (Blackler, 1993). The Activity Theory model suggests that object-oriented actions are always, explicitly or implicitly, characterized by ambiguity, surprise, interpretation,

sense-making, and potential for change (Engeström, 2001). It is then assumed that the settings for different activities are not determined by objective, physical features, but rather are constructed by the subjects engaged in them. In this case, concepts of activities like 'work', 'play' or 'study' can be interpreted differently depending on the participants' socio-cultural situation (Blackler, 1993).
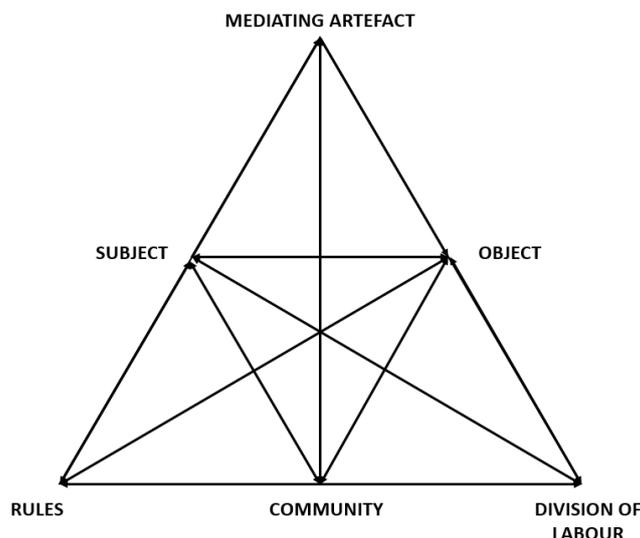


**Figure 12: 2$^{nd}$ generation Activity Theory Model (Engeström, 1987)**

Thus, a third generation of activity theory was then developed towards understanding the interactions to form new meanings that go beyond two or more activity systems (Engeström, 2001), as happens in situations of project collaboration. Engeström (2001) suggested that, in this situation (Figure 13), interactions involve a dynamic evolution from the initial state of the object (1) as unreflected, moving to a following state of collectively meaningful object (2) constructed by the activity system in the situation, and then to achieve a potentially shared or jointly constructed object (3) in collaboration with other activity systems.
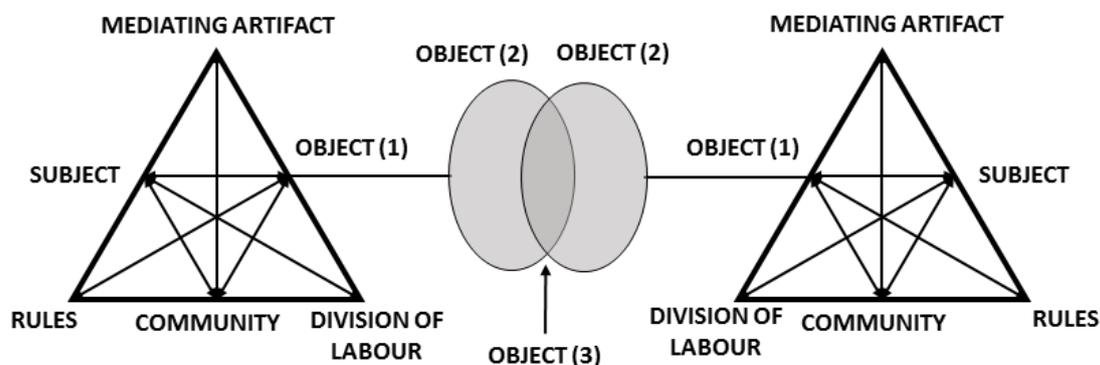


**Figure 13: 3$^{rd}$ generation of Activity Systems Theory model (Engeström, 2001)**

An understanding of the differing interpretations of object of activities demands consideration of a range of factors affecting them (e.g. economic, historical, social, scientific, philosophical and cognitive) (Blackler, 1993). Moreover, diversity of interpretations over the objects of activities indicates that human experience is inherently identified with uncertainty, incoherency and dilemma, in which awareness of them is usually obscured by the pragmatism of prevailing social routines (Blackler, 1993), or what Heidegger referred to as *thrownness*. In this case, it is crucial to investigate the interpretational role of language in channelling perceptions and debates, when participants are faced with ambiguities and conflicts around concepts of activities (Blackler, 1993).

The primary unity of analysis in Activity Theory is the *artefact-mediated activity*, in which five key constructs should be taken into consideration (Kaptelinin and Nardi, 2006; Engeström, 2008):

- *Objectivations*
- *Mediating Artefacts*
- *Historicity and Institutionalisations*
- *Contradictions*
- *Collaboration*

### 2.4.1.1. Activity Theory and Objectivations

Activity theory assumes that human cognition is object-oriented and, therefore, there is no objectless activity (Leont'ev, 1921, p. 52; apud Engeström, 1995). If activity is a subject-object interaction, then an object has the status of a *motive or intention*, in which a motive is an object meeting specific needs of the subject (Kaptelinin and Nardi, 2006). Kaptelinin and Nardi (2006) suggested that objects of activity can be interpreted as *objectives that give meaning to what people do*. However, objects of activity are different from motives because they are tentative and collective by nature, in a way that they can be renegotiated as the active unfolds (Groleau et al., 2012).

In this sense, the ultimate cause behind human activities is *needs*, which, in the specific situation of the activity, is transformed into an object (Kaptelinin and Nardi, 2006); in other words, it is objectivated. An activity then emerges from the coupling between needs and objects. Objects of activities are *prospective outcomes* directing and motivating actions. Activity objects can be both physical things or ideal objects, as an abstract concept (Kaptelinin and Nardi, 2006). According to Engeström (2008), activity objects start as an idea or concept,

which is initially produced in the form of an abstract explanatory relationship; then, it is transformed into a complex object, leading to a concrete (new) form of practice.

Coordination happens around such objects, which become crystallised when the activity is over (Kaptelinin and Nardi, 2006). Therefore, objects have a historical dynamic trajectory apart from the subjects (Engeström, 2008). Objects and goals have different meanings. While goals can be considered relatively short lived and finite aims of individuals' actions, objects should be understood as a constantly reproduced purpose of a collective activity system that continuously produces motives and defines the horizon of possible goals and actions (Engeström, 1995).

This distinction is fundamental to understand that, while organisations may emerge through conversation, they do not do that for the sake of conversation (Engeström, 1999). From an Activity Theory perspective, organisations will emerge and continue to exist for the purpose of producing goods, services, or an ever 'less-clearly-definable' outcome for costumers or users (Engeström, 1999). Thus, the idea of an object should not be reducible to resources or a specific product, but rather objects should be realised simultaneously as projective-transitory horizons and embodiment to reproblematise every single situation (Engeström, 1999).

### 2.4.1.2. Activity Theory and Mediating Artefacts

The concept of objectivation in the Activity Theory framework is built upon a non-deterministic and dialectical perspective to explain how participants (i.e. subjects) in an activity system construct their objects using *mediating artefacts*. An artefact is anything created by human beings with reference to the use of cognition to serve their purpose (Ostrom, 1980).

According to Activity Theory, mediating artefacts function as the embodiment of individuals' appreciative systems, as a need-related capacity, by which the object gains a motivating force that shapes and directs the activity (Engeström, 1995). Moreover, artefacts shape the way humans interact with reality (Kaptelinin and Nardi, 2006). For example, within an organisation the enactment of practices happens through artefacts that can be technological instruments, as well as more abstract entities such as signs, languages, or codes (Groleau et al., 2012). In such a way, both tools and signs can be considered mediating artefacts (Engeström, 2008).

There is nothing inherently fixed in a mediating artefact, which allows collaborative and dialogical interaction of different appreciative systems in the construction of objects of activity (Engeström, 2008). Thus, mediating artefacts allow further elaboration of the object of activity

linking activity systems, involving both the capacity to apprehend the conditions of the activity and the possibility to change these conditions through practice (Engeström, 2008).

## 2.4.1.3. Activity Theory and Historicity and Institutionalisations

As mediating artefacts are created and transformed during the activity itself, they can carry within its structural properties accumulated experience of the ones who previously engaged in similar situations, and, consequently, mediating artefacts can carry with them the historical evidence of development in the activity (Kaptelinin and Nardi, 2006). Thus, activity systems can usually be seen as historical systemic formations of relatively durable actions usually taking shape as an institution (Engeström, 1995).

*Actions* and *goals* are interdependently connected in a way that they are, at the same time, shaped by and used to structure the entire activity system (Engeström, 1995). *Actions* are conscious goal-directed behaviour undertaken with the motive to fulfil the object of activity (Kaptelinin and Nardi, 2006). Different actions may result in the achievement of the same goal. Thus, different individuals may hierarchically decompose and organise their goals and actions into an arbitrary number of sublevels, leading to, in its lower levels, the enactment of automatic actions, or what is usually referred to as *operations* (Kaptelinin and Nardi, 2006). These operations are characterised by routine and unconscious practices, which do not have their own goals (Kaptelinin and Nardi, 2006).

Activity systems based on an extensive division of labour and operationalisation that gain durability can become institutionalised. Thus, practitioners may find it difficult to construct a connection between the goals of their ongoing actions and the more durable object of the institutionalised activity system.

In this context, objects of activity (either abstracts and concrete) may appear to be vague, confusing, fragmented or even contested (Engeström, 2008). According to Blackler (1993), tensions will emerge within and between activity systems, due to the coexistence of contrasting conceptions of the object activity. For example, doctors working in the same medical practice may be unknowingly enacting different concepts of *healthcare* (Blackler, 1993). In the same way, in healthcare activities, the abstract concept of *illness* (seen as an object of activity) is difficult to define, but it is quite a fundamental one (Engeström, 2008). This means that an activity system is in constant imbalance and development, in which involves the emergence and resolution of internal contradictions (Engeström, 1995).

In this case, individuals tend to try to *stabilise* the activity system by temporarily closing these objects and motives, through what can be called *tertiary* (Wartofsky, 1979 apud Engeström, 1999), *auxiliary* (Engeström, 2008), or *intermediary* (Paavola and Miettinen, 2018) artefacts (e.g. standard tools, processes and vocabulary). Thus, individuals make use of language mechanisms (e.g. metaphors), as well as visual and physical representations to construct and use such artefacts (Engeström, 2008).

## 2.4.1.4. Activity Theory and Contradictions

In order to understand how collaboration develops, it is necessary to depict and analyse the inner contradictions of the entire activity system (Engeström, 1995). Such contradictions, whether stemming from the existing rules, division of labour or from the object itself, can both contribute to discoordination and failure, as well as contribute to trigger remediation or transformation of participants' actions (Engeström, 1995).

Such contradictions can be usually embodied within traditional professional partnerships in terms of bureaucracies, statuses and roles (Groleau et al., 2012). Attention should be draw to situations of coexistence of artefacts from different socio-historical traditions (Groleau et al., 2012). Therefore, contradictions need to be examined through the links in various levels in which different views of the objects of activity confront each other causing tension in the activity (Groleau et al., 2012).

## 2.4.1.5. Activity Theory and Collaboration

Collaboration is an inherent aspect of Activity Theory. According to Engeström (1995), collaboration is articulated in the meeting between two activity systems over perspectives and courses of actions. In collaboration, the objects, mediating artefacts, and communities of the two or more participants tend to be quite different (Engeström, 1995). The practical consequences of such activity depend on whether the two parties are able to generate a shared object (i.e. object 3 in Figure 13) as a joint horizon of meaning (Engeström, 1995).

In collaboration, participants examine and establish their actions in relation to qualitatively different conceptions of activity object, which demands examining the cultural-historical construction and content of such objects of activity (Engeström, 1995). This means that, within a collaboration context, actions should be examined in relation to qualitatively different conceptions of the object of activity (Engeström, 1995), for example considering different conceptions of what constitute project collaboration in the activity.

Usually, such differences are reduced to differences between domains of professional specialization. However, fundamentally different conceptions of the activity object can also be observed within the same domain of specialization (Engestöm, 1995). Moreover, in large activity systems (e.g. large organisations) with an extensive division of labour, alienation and tension can rise, and participants may find it difficult to build a connection between their individual objects of activity and the overall object of the activity system (Engeström, 1999).

According to Activity Theory, there is an intricate non-determinist interconnection between the type of the object encountered (e.g. the participants' generalised conception of the object of activity) and the participants' actions observed (Engeström, 1995). Thus, the situational aspects of participants' mediational dynamics and systemic contradictions need to be analysed in the same way, including the analysis of the equivalence between different participants' conceptions of respective object of activity (e.g. "*the patient's generalised conception of himself… and the physician's conception of the object of his work"*) (Engeström, 1995). In construction projects, this would refer to an analysis of the equivalence between the client concept of himself with his needs, and the project team conception of the project activity.

The next section of this synthesis of the literature presents a reflective dialectical framework to support inquiry into early project collaboration in construction. The proposed framework is based on Activity Theory model, and suggests how a *Project*, which can be seen as a shared object between activity systems in the context of construction, is socially constructed through collaboration. The proposed framework is expected to help in providing an understanding of why participants conceive project collaboration as objects of activity in certain ways, and why they may find it difficult to resolve emergent contradictions among their conceptions of objects of activity.

## 2.4.2. Dewey's *Theory of Inquiry* as a base for a Dialectical Model of Project Activity

One of the main intakes on the dialectical nature of Project activities was conceived by John Dewey (1938) in his *Logic: Theory of Inquiry*. Dewey conceived *inquiry* as a transactional, open-ended and inherently social activity, in which individual inquirers are members of communities of inquiry (Schön, 1992). According to Dewey, every inquiry consists of actions involving concrete or abstract objects (Kaufmann, 1959). Thus, Dewey's idea of *Inquiry* can be interpreted as an equivalent for a *Project* activity, in which the aim is to bring people together in a way that they can jointly promote change to a specific situation (Steen, 2013).

In a Project activity, collaboration happens when mutual intelligibility across different worlds is established as an incipient movement towards sharing of appreciations and towards the formation of collective object worlds shaping the community of practice (Schön, 1992; Bucciarelli, 2003). In this case, while individual reflection-in-action involves critically questioning one's own strategies and assumptions that underlie their individual choices, in collaboration a dialogue needs to be established to overcome misunderstandings across divergent object worlds (Schön, 1992; Bucciarelli, 2003).

The dialectical nature of these dialogues was addressed by Dewey (1938) in terms of the 'inherent ethical qualities' of project activities. According to him, moral concerns exist throughout the whole of human experiences, while people are constantly making deliberations and choices of actions, in which they need to take into consideration the consequences of those for others (Fesmire, 2003; Hildebrand, 2008 apud Steen, 2013). In a Project activity, this 'moral inquiry' emerges through dialogue revealing incompatibilities and frustrations among participants (Steen, 2013), leading to systemic contradictions in the activity.

Such dialogue is dependent on participants' ability to express and share their experiences, as well as their ability to empathise with others (e.g. by engaging in storytelling) (Lloyd, 2000; Steen, 2013). In this case, as a transformative activity, a *Project* involves two complementary abilities: *perception* and *conception* (Dewey, 1938). *Perception* is one's capacity to sense what is in the situation, and *conception* is one's capacity to envision what could become the situation (Dewey, 1938). In this case, participants' abilities to construct their *perception* and *conception* are key in the observation of facts, the interpretation of meanings and the conception of ideas emerging from their collective interaction in a project activity (Dewey, 1938, p. 109, *Logic: The Theory of Inquiry*; apud Steen, 2013).

Schön (1992b) addressed the constructive interplay between *perception* and *conception* through the notion of different 'kinds of seeing' involved in participants' interactions in project activity.

## 2.4.2.1. Perception

Dewey's (1938) notion of *perception* can be related to what Schön (1992b) called *seeing that*, as individuals' ability to visually apprehend what is there to see, as recognising and judging features of quality on a configuration and/or as detecting the consequence of an action (Schon, 1992b). *Seeing that* means becoming aware of something regardless of individuals' ability to state the criteria by which they do so (Schon, 1992b).

In a project interaction, participants not only visually register aspects of the situation, but also construct its meaning through the identification of patterns and by giving them meanings beyond themselves. Thus, the way participants perceive their moves, as actions to change the situation, involves a judgement of quality, which is embodied in acts of seeing (Schön, 1992b), leading to particular determination in the situation.

Hence, in perception, designers can both visually apprehend a specific configuration and judge its scalar quality (Schön, 1992b). These appreciations are dependent on the participants' ability to make such 'normative judgement of quality', in which the participants need to recognize if the action changes the situation for better or for worse (Schön, 1992b). Appreciative judgements are particular, as individual subjective judgements, and, to this extent, others may not agree with them (Schön, 1992b).

The participants' appreciative system is what enables them to perceive the qualities and consequences of their actions. Appreciative systems are dynamic, varying from individual to individual and over time. In order to be effective in a project interaction and not be hampered by its subjectivity, project participants' judgements need to be at least internally consistent (Schön, 1992b) within a kind of "logical" construction inherent to their own appreciative system. Such internal consistency grants "objectivity" to project participants' experimentation, in a sense that it can make mistakes and become aware of them (Schön, 1992b). It is the participants' ability to perceive and make subjective judgements that renders this kind of objectivity possible (Schön, 1992b). Thus, in order to make such judgement, project participants need to be able to perceive the results of their actions and discover if that experiment worked (Schön, 1992b).

### 2.4.2.2. Conception

In parallel to that, Dewey's (1938) notion of *conception* can be related to what Schön (1992b) termed *seeing-as*, as individuals' ability to conceive representations that correspond to specific domains in the situation (Schön, 1992b). Such domains are constructs that project participants create and use to account for evidence of their behaviour, and by which they imply objectivity to their actions (e.g. design topics). They seem to function as formal features in which project participants conceive their actions and find qualities within these domains (Schön, 1992b). As project actions produce consequences in more than one domain, appreciations are also drawn from these domains (Schön, 1992b).

Schön (1992b) suggested that a grasp on the construction of such domain-categories can be based on participants' use of language – in other words, on their linguistic objectifications, which may involve metaphorical descriptions of 'figures'. According to Schön (1992b), such figures are not often explicitly invoked, but designers seem to lock into them and then work from them, explicitly referring to problems constructed based on the domains as 'things' they have perceived.

Thus, the conversational structure of Project activity seems to harness this explorative nature of these interactions, in which participants can perceive in their actions more than they can anticipate (Schön, 1992b). According to Dewey (1938), the iteration between perception and conception in the context of project collaboration involves *dramatic rehearsal* (e.g. modelling and simulating actions), in which the collection of individuals deliberates to the point that the course of actions appears to harmonise pressing interests, needs and other factors of the situation (Fesmire, 2003 apud Steen, 2013), in what can be seen as a dialectical continuum.

In this sense, it could be said that project activities are driven by the interplay between *perception* and *conception* (Suwa and Tversky, 2003). Coordination between the two abilities, so that each amplifies the other, is one important feature related to expertise in project collaboration (Suwa and Tversky, 2003). The coordination between perceptual discoveries and conceptual generations in a situation is what Suwa and Tversky (2003) called *constructive perception*, and entails awareness of the ways perception grounds interpretations, as well as the ways conception leads to new interpretations (Suwa and Tversky, 2003). An awareness of these allow participants to constantly reposition their perception in a deliberate and constructive way, while it also supports their conception of new ideas and new forms of interpretation (Suwa and Tversky, 2003).

Consequently, a dialectical continuum is established by the potentially endless self-corrective procedures of a project activity, in which each specific action is treated by the participants as a self-contained unit towards defining and changing the situation (Kaufmann, 1959). Such task is subject to appraisal in terms of beliefs and actions by all participants, and it usually involves the recognition of common objects (Kaufmann, 1959). Clarification of these objects promotes mutual intelligibility and collaboration among participants (Kaufmann, 1959).

## 2.4.3. Theoretical framework: A Dialectical and Situated Model of Project Collaboration

In order to inquire into the dynamics of early project collaboration in construction, a theoretical framework is proposed based on the third generation of Activity Theory model (Figure 13). The proposed model suggests a dialectical interaction between project participants, seen as activity systems, which engage in the socio-construction of the object of activity (i.e. the Project), through the enactment and negotiation of mediating artefacts towards mutual intelligibility on the object of activity (2.3.4).
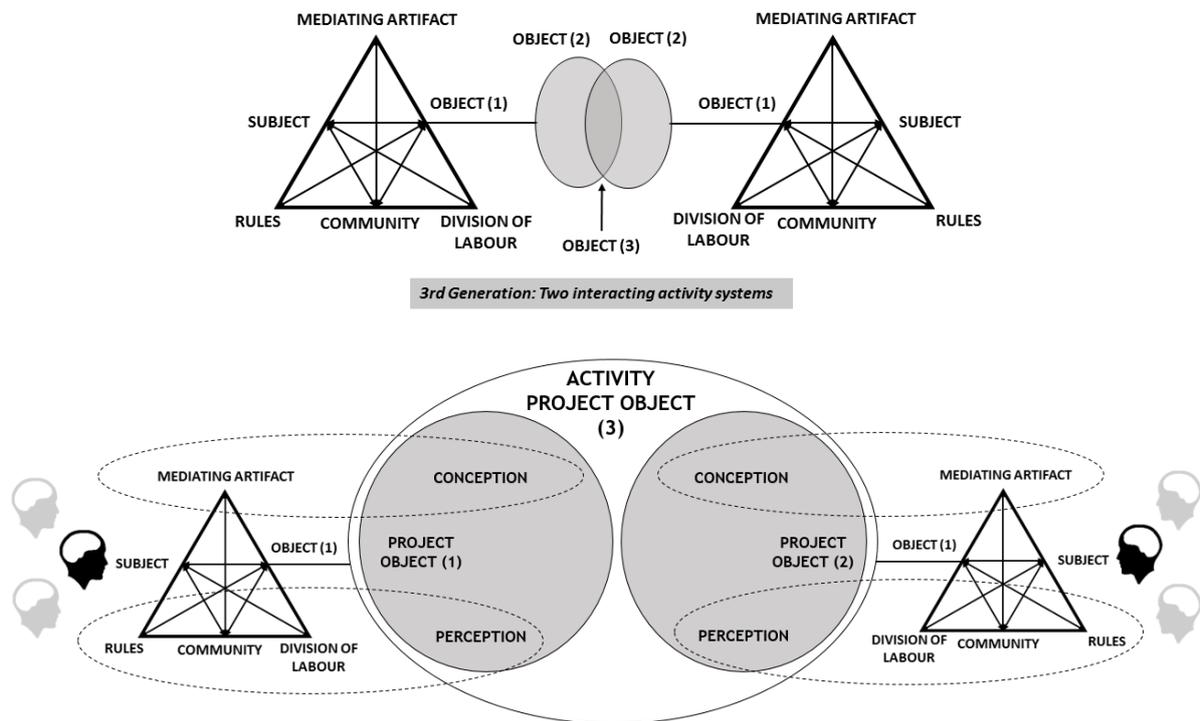


**Figure 14: Theoretical Framework based on the Activity Theory model**

The proposed model contends that collaboration is a social construct, and emerges as a set of shared objects constructed in the context of a project activity. In this case, the model suggests that, throughout the activity, the *Project* object tends to be broken down into a set of auxiliary objects (Engestrom, 2008), supporting the overall construction of the activity, and embodying the inherent aspects of these activity systems (e.g. division of labour, rules, community). In this case, following Dewey's (1938) and Schon's (1992) understanding of a Project activity, this model suggests that a *Project* object can be seen as composed of two auxiliary objects: *perception* and *conception* (Figure 14).
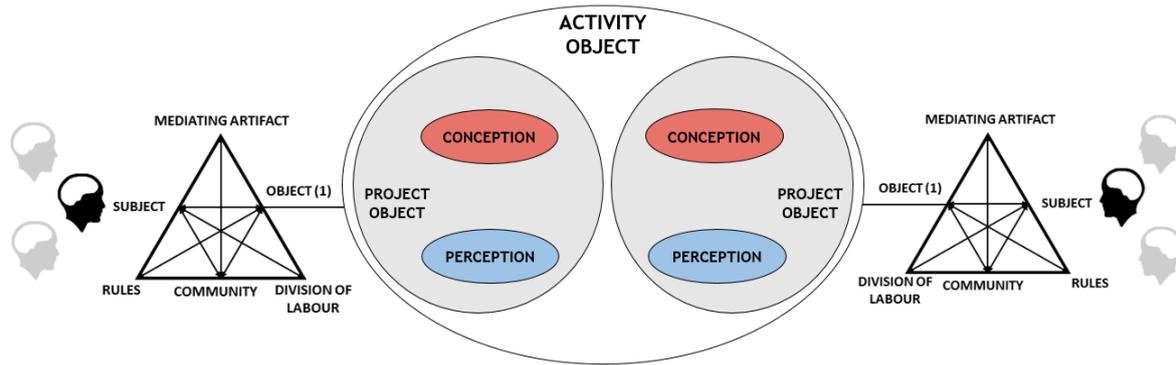
**Figure 15:** *Perception* **and** *Conception* **as two complementary instances of the Project Object**

The model assumes that, as a *Project* activity has the purpose to change a situation, it inherently involves individuals' initiative to sense and interpret what the situation is (i.e. *perception*), as well as their initiative to conceive what the situation could or should become (i.e. *conception*). These two complementary instances of a project represent a secondary level of objectivation in the project activity model (Figure 15). As each individual in the interaction construct their own idea of the project, by which they objectivate their existence, the resulting activity comes from a dialectical interaction of these auxiliary objects.

In the same way, initiatives to articulate and construct *perception* and *conception* in the situation seem to involve a third level of objectivation, which embodies the ways in which each individual, as an activity system, realises *collaboration* in a project activity, according to their own *appreciative system*.

In this case, despite the ontological differences between the three main ways of conceptualising collaboration in construction (i.e. metaphors of collaboration) identified in section 2.2.2, there are key constructs of collaboration that have been commonly described throughout a diverse range of research fields and background of experience.

These key constructs are *interdependency, performance, resources* and *changing action*. They can be seen as key constructs of project collaboration, emerging as a third level of auxiliary objects of activity supporting the dynamic and collective construction of participants' perception of the situation, as well as their conception of actions to change the situation. It could be said that each of these aspects of collaboration have been historically constructed as key objects of project collaboration within community of practices, and can be assumed to be institutionalised in some sense in project activity.
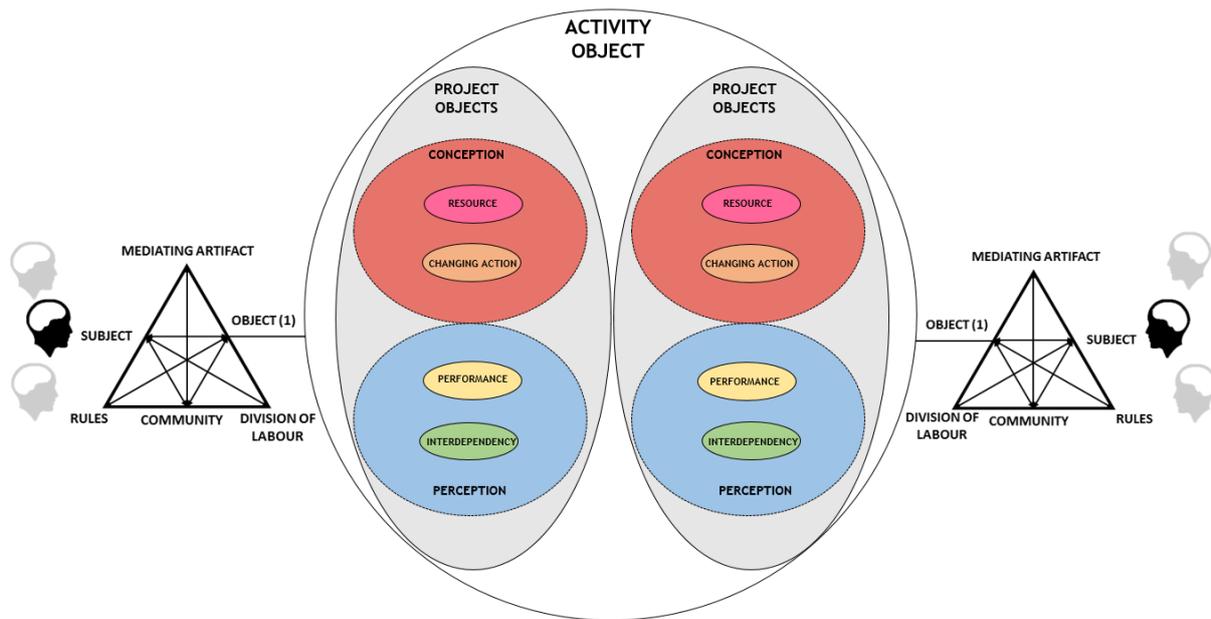
**Figure 16: Key constructs of project collaboration**

According to the proposed model, these commonly referred constructs of collaboration could be then interpreted as recurrent institutions in the project activity, objectivating collaboration for certain individuals. This means that, independent of the individuals' ontological orientation towards one or another metaphor of collaboration (leading them to appreciate and approach collaboration in different ways), project participants tend to objectivate collaboration through these common objects (Figure 16).

Thus, the following synthesis of the literature attempts to provide an explanation of how these key aspects of collaboration can be seen as a third level of objectivation supporting the dynamic construction of perceptions and conceptions in a project activity.

## 2.4.3.1. Dynamic Construction of Perceptions of the Situation

### 2.4.3.1.1. Perception of Interdependency

*Functional Interdependency*

As was mentioned earlier (section 2.3.1), in every situation of project collaboration a conflict is posed between individual and group rationality, which can be called *social dilemma* (Ostrom, 1998). In these situations, individuals' choice to collaborate seems to depend on the emergence of a collective perception of a purposeful functional interdependency in the situation.

Ackoff and Emery (1972) suggested that, if someone's presence in the situation increases the expected value of another's state, then there is cooperation. However, if someone's presence

in the situation reduces this expected value, then this one conflicts with the other. If one has no effect on the other's expected value, then one is independent of the other. In this case, it could be argued that individuals' perception of collaboration in a project will be decreased if he/she doesn't want to know or doesn't care how his/her actions are affected or dependent on others in the task, which can be called *indifference*. In the same way, if a participant acknowledges, in terms of assuming or supposing that the situation doesn't affect him/her, this will lead to an *independent* behaviour, which is commonly referred to as *Free riders*. It is possible to argue that the construction of a collective perception of interdependency will be based on the participants' perception of their increased efficiency of the activity by being interdependent, in comparison to the perception of the potential benefits of independent actions.

In this case, participants decide to engage in the activity because they expect to *increase their long-term results* from interactions in social dilemmas (Ostrom, 1998). Embedded in this notion of development is the idea that the collection of individuals is able to perceive, as suggested by Ackoff and Emery (1972), that their interaction in the task increased the expected value of both in the situation. So, participants in collaboration tend to perceive that they can jointly maximise what they value (Schottle et al., 2014), in a mutually beneficial interaction (Mattesschi and Monsey, 1992; Thomson et al., 2007).

Thus, functional interdependency, as a key aspect of collaboration, can be seen as individuals' initiative (i.e. choice) to perceive the group as interdependent in a situation that aims to achieve a certain purpose. This initiative, then, is usually objectivated somehow in the activity. For example, such perception can be correlated to the socio-historical construction of a notion of *division of labour* as a key aspect of collaboration, which was originally proposed by Adam Smith (1776) in his argument that "*man is an animal that makes bargain*" and has a "*propensity to truck, barter and exchange one thing for another*".

*Complementary Purposes*

The socio-construction of a perception of interdependency in an activity seems also to be fundamentally linked to the idea of establishing a shared purpose in the activity. Overall, it has been claimed that collaboration involves an ability to establish *common objectives* (Ackoff and Emery, 1972) or a *common goal*, as a desired state of outcome (Locke and Latham, 1990 apud Briggs et al., 2006; Camarinha-Matos & Abreu, 2007), which necessarily starts with the perception that there is something in "common" among the participants.

In this sense, previous researches have suggested that collaboration involves ensuring a *shared sense of purpose* (Kvan, 2000; Whelton, 2004; Hill et al., 2014). In this case, Appley and Winder (1972) suggested that one of the key initiatives at early project collaboration is related to individuals' choice to make commitment to justice, while they are aware of their competing value systems. This means that the socio-construction of a perception of interdependency depends on the group initiative to establish complementary purposes that are fair and aim to bring benefits to everybody. Moreover, this also indicates that participants' choice to see them as interdependent individuals in a project situation depends on them actively constructing what Engeström (1987) called *shared objects*.

### 2.4.3.1.2. Perception of Performance

*Collection of Skills (Assembling the Project Team)*

In parallel with and supporting the socio-construction of their perception of interdependency in the situation, participants in a project need to construct a collective perception (i.e. belief) that the collection of individuals involved can be effective in performing the activity (Shea and Guzzo, 1987). Such constructive of perception is what Shea and Guzzo (1987) called *Potency*. According to them, this perception depends on group members' sense that they have what they need to succeed, which may involve certain: skills, training, talent, money, time, access to key organisation members. Further in this section, these aspects are related with a conception of *resources* (*section 2.4.3.2.1*).

Initiatives towards constructing this perception do not necessarily represent an overreliance in the collective factor of what the team can do. Instead, as suggested by Fischer (2004), collaboration involves individuality, autonomy and trust in one's strength, in the same way that Adam Smith (1776) believed that the collective naturally benefits from individual selfish actions.

Overall, the socio-construction of the perception of performance can be related to initiatives towards *team definition,* which Kvan (2000) argues is a key initial aspect of collaboration. This only make sense if it is assumed that the participants are purposefully engaged and aware of the potential performance of each other. Without a grasp on how each of the participants would perform and potentially contribute in the collective interaction for the common purpose, there is no coherent perception of a *Team*.

Therefore, the collective and dynamic construction of the perception of team performance is dependent on what is usually considered a key aspect of social interactions: *Trust* (Ostrom,

1998). In this case, *Trust* can be seen as a firm belief in the reliability, truth, or ability of someone or something (*Oxford English Dictionary*) to perform in the task. Such perception is constructed based on the group's potential performance, which is still to happen in the activity. Thus, it takes into account the history of the participants in the activity and within the community of practice (i.e. their previous experiences). Camarinha-Matos and Abreu (2007) suggested that collaboration depends on a kind of collective expectation, in which the group perceives the *potential benefit* of collaboration, based on its survival capacity, in combination with its performance capacity, to accomplish the task in a better way. So, if the group has received positive feedback about performance to date, it tends to believe it can be effective henceforth (Shea and Guzzo, 1987).

*Activity Value Systems*

As it was argued earlier (Section 2.2.1), collaboration involves the emergence of diverse and sometimes conflicting *appreciative systems* (Vickers, 1965), or what could be called *value systems*, held by the participants (Rittel and Weber, 1973). These value systems exist embodied in a collection of individual or collective objectivations within the context of multiple interpretations of what is the situation and how to conceive its change (van Amstel et al., 2016). Thus, in project collaboration, participants engage in making judgements on how to perceive the situation and how to conceive the proposed actions, based on a set of previously shared experiences. This can be related to the idea of a "culture of expertise" (Coyne and Snodgrass, 1993), that is manifested through traditional ways of thinking and common assumptions that exist embedded in professional practices (Lloyd and Busby, 2001; Thomson et al., 2007).

In this case, individuals are used to rely on standards and norms to frame the way they perceive and interpret this reality (Checkland, 1994). Therefore, these *values*, as individual or collective judgements over the experience, can be recognised as common norms or rules within historical evolution of social groups (Wirth, 1940, 1948; Wood and Gray, 1991; Ostrom, 1998) and communities of practice (Engeström, 1987; Bardram, 1998).

However, these diversity of values, as different frames of appreciation, can ultimately configure epistemic barriers among participants' individual perceptions (Forgues et al., 2016). Thus, project participants have to construct a *shared sense of values* in a way that they all have to agree on what is important for them (Hill et al., 2014) in the situation – in other words, what is *truth* for them in that specific situation. Only then can they collectively construct a perception of their performance in task.

**Table 5: Set of key constructs of *Perception* on project collaboration**

**Perception: collective capacity/actions to sense what is the situation (Dewey, 1938)**

| | | |
|---|---|---|
| **Interdependency** | Individual's choice to perceive themselves as interdependent in a situation | |
| | Functional Interdependency | *Division of labour* (Smith, 1776)<br><br>Collective *presence* and *expected value* (Ackoff and Emery, 1972)<br><br>*Social dilemmas* (Ostrom, 1998) |
| | Complementary Purposes | *commitment to justice* (Appley and Winder, 1972)<br><br>*common objectives* (Ackoff and Emery, 1972)<br><br>*Shared objects* (Engeström, 1987)<br><br>*common goals* (Locke and Latham, 1990; Camarinha-Matos and Abreu, 2007)<br><br>*shared sense of purpose* (Kvan, 2000; Whelton, 2004; Hill et al., 2014). |
| **Performance** | a collective perception that the the collection of individuals can be effective in the activity | |
| | Collection of Skills | *Potency* (Shea and Guzzo, 1987)<br><br>*Performance capacity* (Camarinha-Matos and Abreu, 2007)<br><br>*Team definition* (Kvan, 2000)<br><br>*Trust* (Smith, 1776; Ostrom, 1998; Fischer, 2004) |
| | Activity Value System | *shared sense of values* (Hill et al., 2014)<br><br>*culture of expertise* (Coyne and Snodgrass, 1992)<br><br>*Common assumptions* (Lloyd and Busby, 2001; Thomson et al., 2007)<br><br>*common norms or rules* (Wirth, 1940; 1948; Wood and Gray, 1991; Ostrom, 1998)<br><br>*communities of practice* (Engeström, 1987; Bardram, 1998)<br><br>*value systems* (Rittel and Weber, 1973; Amstel et al., 2016)<br><br>*Frames* of reference (Schön, 1983; Gray, 2004; Forgues et al., 2016)<br><br>*Appreciative Systems* (Vickers, 1965; Checkland, 1994)<br><br>*Synthesise different perspectives* (Fischer, 2004) |
| | Development | *increase their abilities and desires to satisfy their own needs* (Gharajedaghi and Ackoff, 1984)<br><br>*increase their long-term results* (Ostrom, 1998)<br><br>*Public Welfare* (Rittel and Weber, 1973)<br><br>*Mutually beneficial interaction* (Mattesschi and Monsey, 1992; Thomson et al., 2007)<br><br>*Maximize value* (Schottle et al., 2014) |

Therefore, individuals aiming to collaborate need to synthesise different perspectives (Fischer, 2004) in a way that they can jointly create or recreate those rules and structures (Thomson et al., 2007). Steen (2013) suggested that it requires an ability to empathise with others in a way that the group becomes more aware of its underlying perceptions.

The initiative of participants in collaboration to share a sense of rules of engagement will keep them focused on what is imperative and discourage unproductive behaviour (Ostrom, 1998; Hill et al., 2014), yet it requires their interaction to construct or set the rules for that activity. In each new project situation, individuals tend to reconstruct prior operating frames (Stompff et al., 2016). These can be seen as previous objectivations of *value systems* that become institutionalised. When these rules are in place, this tends to lead to a collective sense of fairness, in which *free riders* are identified and punished (Howell, 2013). In this sense, an important aspect of project collaboration is individuals' capacity to learn reciprocity norms and social rules, which enhances their opportunities to benefit from coping with social dilemmas (Ostrom, 1998).

The perceptions of *interdependency* and *performance* are linked (Shea and Guzzo, 1987) in a socio-constructive manner. It could be argued that objectivations related to both perceptions support the construction of the perception of the situation, which is constantly transformed as the project activity evolves in terms of its resolution towards changing a situation.

In this case, Shea and Guzzo (1987) argued that changes in the group's perception of performance affect how group members organise their task interdependence. It seems obvious to think that the more the participants believe that the other members are able to perform in the task, the more they will be willing to collaborate and become interdependent. However, the converse also holds (Shea and Guzzo, 1987) in that their perception of a lower performance from other members in the group will affect how they organise their task interdependence and, ultimately, their willingness to collaborate, which may create unbalance in the group.

## 2.4.3.2. Dynamic Construction of Conceptions of Course of Actions

### 2.4.3.2.1. Conception of Resources

*Resource Commitment*

Resources are created by what humans do with what nature provides (Gharajedaghi and Ackoff, 1984). Hence, it could be argued that what is to be considered a resource in the situation of project collaboration, is subject to particular interpretations within the particularity of individuals' *value systems*. In this case, considering that the expected change a project will produce in a situation is to promote *development*, as an increase in individuals' abilities and desires to satisfy their own needs and legitimate desires, as well as those of others, the more developed an individual or organisation is, the more resources they can find or develop (Gharajedaghi and Ackoff, 1984).

According to Rittel (1987), project activities involve the distribution of advantages and disadvantages in commit resources within a social context. In this case, one key aspect of collaboration is the initiative to establish an organisational resource dependence, which is achieved by gaining control over crucial resource supplies, leading to a reduction in uncertainty (Wood and Gray, 1991). Thus, an important aspect of the conception of course of actions that needs to be socially constructed in the situation is what the project participants conceive as resources and how they make them interdependent in the task.

In order to construct their conception of resources, individuals in collaboration need also to conceive what are their potential outcomes (Kvan, 2000) and, more importantly, individuals need to be conscious of their moves toward the others (Appley and Winder, 1977). Thus, generally there will be an effort to equally distribute these outcomes among group members (Shea and Guzzo, 1987), leading to an interdependency of consequences (Ostrom, 1998) among individuals' activities.

Therefore, the conception of resources in project collaboration requires an effort towards building shared understanding on what they are using to perform the activity (Valkenburg and Dorst, 1998). Usually, the objectivation of the conception of resources can be noticed by initiatives to *sharing things* like work, information, responsibilities, and processes in the context of collaboration (Li et al., 2004; D' Amour et al., 2005; Kleinsmann, 2006; Schottle et al, 2014; Poirier et al., 2016).

### 2.4.3.2.2. Conception of Changing Actions

*Course of Actions to Change the Situation*

Another key aspect of a project activity, as a purposeful social interaction, is the conception of a course of actions by which common objectives are pursued (Ackoff and Emery, 1972; Rittel and Weber, 1973; Schottle et al., 2014) and change is produced. In this case, individuals and organisations act towards compromise on collective claims and expectations for the social system, resulting in *concerted actions* (Wirth, 1940; 1948) that change the situation (Simon, 1969; Schön, 1983; Sanders and Stappers, 2008; Steen, 2013). Thus, usually the outcome of collaboration is a set of coordinated actions of individuals to produce a new object (Anumba et al., 2002; Amstel et al., 2016) that eventually promote the expected change in the situation.

In this sense, participants in collaboration engage in constructing or modifying their collective environment, working rules and interactions (Astley and Van de Vem, 1983, 251 apud Thomson and Perry, 2006), in order to produce changes in what they have perceived as the

situation (Gharajedaghi and Ackoff, 1984). It has been argued that, to act or decide collectively on the situation (Thomson et al., 2007), participants need to agree on a *shared design strategy* (Macmillan et al., 2001), or to construct or reconstruct *shared mental models* of the whole activity (Forgues et al., 2016), in such a way that individuals could flexibly adjust their collective path of actions (Stempfle and Badke-Schaub, 2002).

From the socio-constructivist perspective, this involves participants' initiative to reconceptualise their own interaction and organisation in relation to *shared objects of activity* (Engeström, 1987).

Such conception is dynamically constructed when participants debate about these conceptions of changing actions by building models of future states of activity systems (e.g. architectural models of a building) (Checkland, 1994; Peng, 1994; 2001). As was mentioned before (see section 2.3.2.3), according to Schon (1992), these conceptions of changing actions are objectivated through representations that become shared objects of activity. In project collaboration, the conception of these objects involves bringing the collective or shared experience to bear in making judgements (Coyne and Snodgrass, 1993). Thus, through actions of representation, project participants express their commitment to their conceptions, and they attempt to persuade others (Cross and Cross, 1995).

In this case, individuals' conceptions of changing actions are objectivated and shared among the group, not only through graphical and physical representations (i.e. drawings, images and models), but also through discourse (i.e. conceptualisations and metaphors) (Schön, 1963; Peng, 2001). More specifically, objects of activity, embodied in these representation actions, objectivate *individuals' or collective appreciative systems* and their expectations over the *future of activity system* (Stompff et al., 2016), which is the *Project* in this case.

Hence, the interaction with these representations allows participants who see different aspects of a situation as problematic to objectively and constructively explore their differences and search for alternative course of actions that go beyond their own limited vision of what is possible (Thomson et al., 2007). In this sense, a great part of the collaborative interaction involves resolving or avoiding conflicts (Cross and Cross, 1995) over contradictory conceptions of course of actions. This requires reconciling and harmonising claims, requirements and proposals (Bucciarelli, 2003), which were objectivated in those representation actions.

**Table 6: Set of key constructs of *Conception* on project collaboration**

**Conception: collective capacity/actions to envision what could be the situation (Dewey, 1938)**

| | | |
|---|---|---|
| | participants conceive what they are contributing and using to perform the activity | |
| **Resources** | Commitment / Sharing | *commit resources within a social context* (Rittel, 1987) |
| | | *organisational resource dependence* (Wood and Gray, 1991) |
| | | *identify individuals outcomes* (Kvan, 2000) *and their actions towards the others* (Appley and Winder, 1977) |
| | | *distribute the outcomes* (Shea and Guzzo, 1987) |
| | | *interdependence of consequences* (Ostrom, 1998) |
| | | *Sharing* (Li et al., 2004; D' Amour et al., 2005; Kleinsmann, 2006; Schottle et al., 2014; Poirier et al., 2016 |
| **Changing Action** | participants conceive a collective course of actions to change the situation towards development | |
| | Course of Actions | *establishment of a course of actions* (Ackoff and Emery, 1972; Rittel andWeber, 1973; Thomson et al., 2007) |
| | | *Collective Planning* (Rittel and Weber, 1973; Schottle et al., 2014) |
| | | *Set of coordinated actions to produce a new object* (Amstel et al., 2016) |
| | | *construct or modify their collective environment, working rules and options* (Thomson et al., 2005) |
| | | *reconceptualize their own interaction and organisation* (Engeström, 1987) |
| | | *creating shared meaning about a process, product or event* (Schrage, 1995) |
| | | *building models* (Checkland, 1994; Peng, 2001) |
| | | *frames of future activities* (Stompff et al., 2016) |
| | | *avoiding and/or resolving conflicts/contradictions* (Cross and Cross, 1995) |
| | | *Shared strategy* (Macmillan et al., 2001) |
| | | *Collective path of actions* (Stempfle and Badke-Schaub, 2002) |
| | | *Coordinated actions* (Anumba et al., 2002) |
| | | *construct shared mental models* (Forgues et al., 2016) |
| | Anticipation of the effects of actions | *Dramatic Rehearsal* (Dewey, 1938) |
| | | *Anticipate the behaviour and predict effects of actions* (Smart et al., 2009) |
| | | *reveal the concesequences of individual assumptions* (Rittel, 1984) |

Consequently, it is possible to say that collaboration involves the conception of shared meanings about the collection of objects of activity (i.e. process, products or events) (Schrage, 1995), which relies on their effort towards building *mutual intelligibility*. Ultimately, as these interactions happen in terms of interpretive and representational expressions of individuals' perceptions of what needs to change in the situation, as well as their conceptions of how to change the situation, it can be said that the emergence and resolution of contradictory

perspectives in the project are an indication of the dialectical and socio-constructive nature of collaboration.

*Anticipation of the effects of actions*

In order to constantly assess whether the conception of changing action is resulting in the expected development in the situation, project participants need to be able to conceive an anticipation of the effects of their coordinated actions. In this case, it has been argued that only when participants are able to anticipate the behaviour of other elements in the situation and predict the effects of others' actions on the environment are they able to coordinate their collective actions (Smart et al., 2009).

This can be related to what Dewey (1938) refers to as *Dramatic Rehearsal*, which is a key ability in the social construction of a project activity. In this case, since the representations of the proposed course of actions can be expected to reveal the consequences of individuals' assumptions in the activity (Rittel, 1984), the collection of individuals can benefit from artefacts that allow the representation of multiple points of view, supporting mutual intelligibility between individuals' conceptions, leading to a sense of coherence among the participants (Haymaker et al., 2000).

## 2.4.4. Summary: A framework to interpret Early Project Collaboration

This synthesis of the literature suggested that *interdependency, performance, resources* and *changing action* can be seen as key constructs of project collaboration functioning as *auxiliary objects of activity*. In this case, individuals' interactions to objectivate these constructs would support the dynamic and collective construction of the *perception* of the situation and the *conception* of the actions to change the situation in a project activity (Figure 17).

This synthesis of the literature also indicated that each of these key constructs of project collaboration have been historically constructed within community of practices, in which they have been objectivated as a series of different terms, as presented in Table 5 and Table 6. Hence, some of these constructs can be seen as key aspects of collaboration, in some sense *institutionalised* in project practices. Following the Activity Theory framework, these key constructs of project collaboration can be seen as *auxiliary objects*, which might also be broken down and further objectivated in a specific project activity. These interactions involve the embodiment of these key constructs of collaboration through mediating artefacts in the situation. This lower level of objectivation can be referred as *situational objects* (Figure 17),

110

and it indicates how the same auxiliary object (e.g. the perception of performance) can be objectivated differently at different instances of the same project activity, by different individuals.
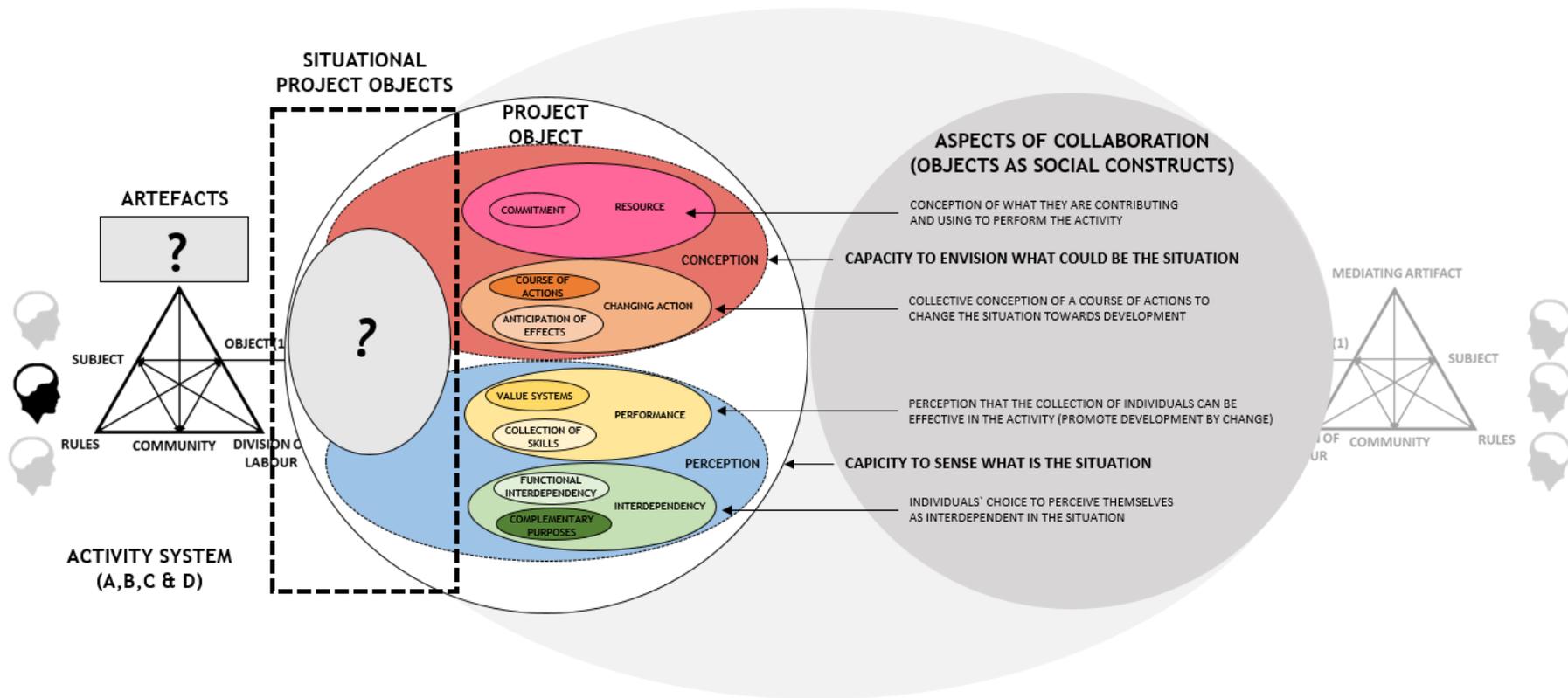
**Figure 17: A framework to inquiry into the Situational Objects and Artefacts**

In this case, the dialectical nature of project collaboration indicates that individuals and organisations, seen as activity systems, will construct *situational objects* in pairs, from each side of the activity (Figure 16). This means that these situational objects can be seen as 'shared' in a sense of being correspondent and complementary to each other. Then, project participants tend to interact towards a 'shared objectivation' of the situation and compromise on the proposed course of action (i.e. concerted actions). In order to do that, they need to build mutual intelligibility among them (see section 2.3.4).

However, as individuals tend to hold different *metaphors* (i.e. *appreciative systems*) of collaboration (see section 2.2.2), these *situational objects* are likely to be interpreted and approached differently, even if they are termed similarly. Thus, it is assumed that, if the dynamics of collaboration are linked to the stability of the objects of activity and mediating artefacts, as suggested by Bardram (1998) (see section 2.2.6), an understanding of the social construction of project collaboration involves considering the evolution of these objects, and the interactions towards the resolution of misunderstandings around *situational objects* in the project activity.

This synthesis of the literature suggested that the resolution of misunderstandings in project activity tends to involve interactions towards *mutual intelligibility* (see section 2.3.4). In this case, as collaborative project interactions start as a *dyad[9] of objectivations* (see section 2.3.2) around the key constructs of collaboration, which eventually lead to emergent *misunderstandings* (see section 2.3.3), the dynamics of mutual intelligibility in these situations seem to involve *breakdowns* (2.3.4.2) and *metaphors* (2.3.4.4).
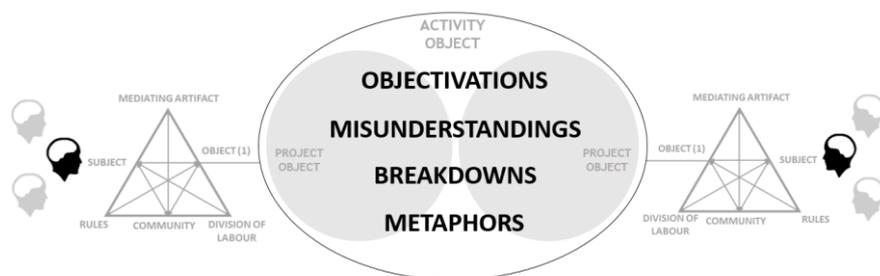


**Figure 18: Key interactions towards Mutual Intelligibility**

[9] According to the dictionary, a *dyad* is something that consists of two elements or parts. In sociology, a *dyad* is a group of people, the smallest possible social group. As an adjective, "dyadic" describes their interaction. In practice, this relationship refers to dialogic relations or face-to-face verbal communication between two people involving their mutual ideas, queries and answers. A *dyad communication* brings the two people into a sphere where each person influences the other (Macionis and Gerber, 2011).

More specifically, the dynamics of mutual intelligibility seem to involve reflections on the means and object of work (i.e. artefacts and situational objects), stimulated by a *breakdown* or by deliberate shift of focus within the collaborative interactions (Bardram, 1998). The resolution of misunderstandings seems to lead to the re-embodiment of means and objects of work through implementation and routinisation of instance of activities (Bardram, 1998), into other *situational objects*, which can be embodied in language and/or graphical artefacts (see section 2.3.2.4 and 2.3.2.5). In this case, an inquiry into how individuals objectivate key constructs of collaboration in the situation may reveal a spectrum of stability, in which different aspects of collaboration could have been institutionalised, as *situational objects*, according to individuals' and organisations' appreciative systems.

*Breakdowns* can be seen as collective reflective interactions in the activity related to the dynamics of mutual intelligibility, potentially leading to an expansion of individuals' current interpretation of the key constructs of collaboration. These interactions seem to depend on the individuals' ability to find new objectivations that merge different perspectives and support richer discussion around the key constructs of collaboration. As indicated in section 2.3.4.4, this ability can be related to the projective nature of actions to construct *Metaphors*, as *shared situational objects*.

The enactment of these key interactions towards mutual intelligibility by project participants could be considered as a way to overcome misunderstandings, and allow the social construction of collaboration in a project activity.

In this case, the main part of the proposed framework (Figure 17) could be used to map potential misunderstandings emerging from the different ways that individuals objectivate collaboration in a project activity – and, consequently, provide a grasp on the dialectics and situated nature of the construction of collaboration. The dynamics of mutual intelligibility (Figure 18) can be seen on another level of this framework, which describes the resolution of misunderstandings around divergent objectivations of collaboration.

In the fourth chapter of this thesis (see section 4), both components of these theoretical frameworks are tested through Case Studies. First, the Exploratory Case Study investigated how project participants, engaged in early project activity, resolve emergent misunderstandings in the task. Then, the In-depth Case Study inquired into how project participants socially constructed collaboration by enacting key constructs of collaboration through situational and institutionalised objectivations.

# 3. Method

## 3.1. Introduction

The previous chapter set out the researcher's interpretation of the background of inquiry, as well as stating what is believed to be problematic in this context. The current chapter presents a description of the research method adopted. Such description represents the logical development of the research activity (Kerlinger, 1979), presenting the procedural framework within which the inquiry was conducted (Remenyin et al., 1998). The choice of method took into consideration the purpose of the inquiry, the research aim and objectives, and the resources available to conduct the research (Robson, 2002). The description presented in this chapter should demonstrate that there is a coherent connection between research philosophy, approach, techniques and procedures (Kagioglou et al., 1998; Sexton, 2000).

## 3.2. Research Philosophy

The research philosophical orientation can be mostly determined by its epistemological approach. Epistemology is the branch of philosophy concerned with the theory of knowledge; in other words, it is the study of the nature of knowledge (Buckingham, 2011). In a research activity, epistemology refers to the researcher's presentation and justification of its assumptions on the ways in which knowledge about reality can be obtained (Easterby-Smith et al., 2002). Over time, the epistemological debate has produced divergent paradigms of inquiry: the *rationalist;* the *empiricist;* and the *dialectical or socio-constructionist tradition*. In essence, each of these paradigms can be associated with a set of epistemological assumptions and methodological implications, giving origin to a myriad of research methods (Easterby-Smith et al., 1994; Saunders et al., 2009).

Epistemological orientations, ontological assumptions and axiological purposes about the nature of the world support the definition of research philosophy and research approach (Pathirage et al., 2005). Thus, an understanding of the philosophical positions underlying different research methods can help to clarify the research design, in terms of what kind of evidence is gathered from where, and how such evidence is interpreted in order to provide answers to research question (i.e. methods of data collection and analysis). Furthermore, it can help to indicate the limitations of particular research approaches.

Each approach captures different ontological, epistemological, and axiological assumptions and approaches (Lu and Sexton, 2004). One way to represent and inquire into the relationships

between research philosophy, approaches and methods is proposed by Sexton (2003) (Figure 19).
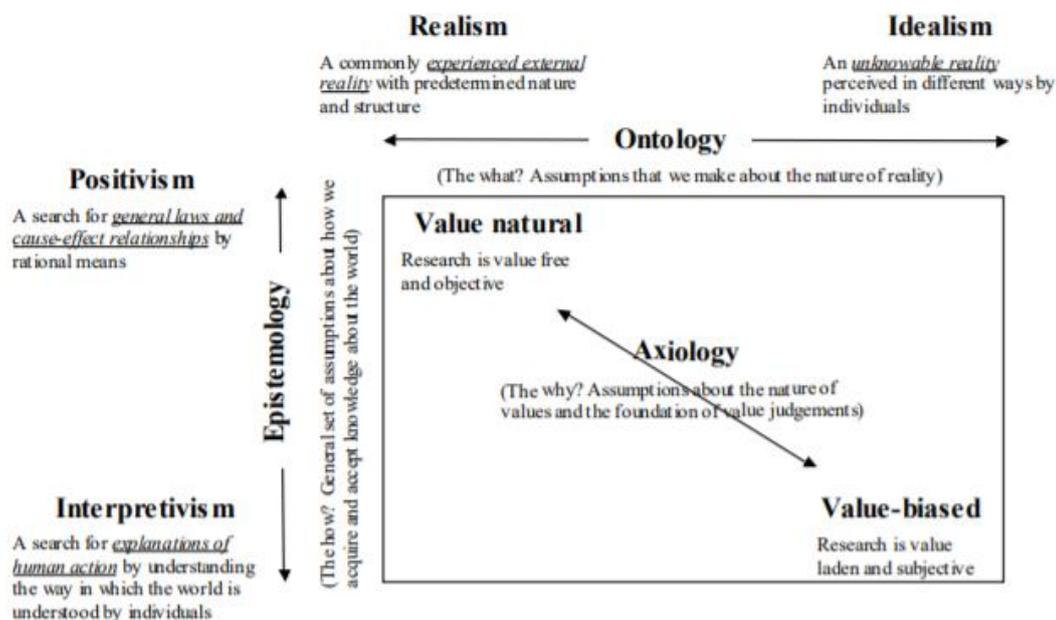


**Figure 19: Dimension of Research Philosophy (Sexton, 2003)**

In this case, following the definition of the research problem, aim and objectives (as stated in the Chapter 1), this research aligns with an interpretivist approach to research. It also assumes that reality – in other words, *knowledge* about reality – is multiple, socially constructed and is in constant change. From this perspective, subjective meanings are forces motivating actions and social phenomena (Mertens, 2005; Saunders et al., 2009). Such philosophical orientation assumes that we are all biased by our own background of experience and beliefs in the way we see and create things in the world. Consequently, research activity is seen as value bounded and the researcher should be seen as part of what is being researched (Mertens, 2005; Saunders et al., 2009).

An interpretivist inquiry starts with the premise that it is necessary to explore the subjective meaning that is motivating the actions of social actors in order for the researcher to be able to understand these interactions (Saunders et al., 2009; Creswell, 2013). Thus, an interpretative research approach tends to involve methods that support in-depth investigation describing qualitatively contextual and historical factors (Mertens, 2005; Saunders et al., 2009).

In this sense, the goal of the researcher is to rely as much as possible on the participants' views of the situation being studied (Creswell, 2013). Following this recommendation, the orientation

of research procedures should be broad enough and general (e.g. interview question: *What is Collaboration?)* so that the participants can express the meaning that they construct about a situation, which is typically forged in discussions or interactions with other persons. Therefore, an interpretive research approach seems suitable to investigate the social dynamics involved in the resolution of misunderstandings at the early stages of construction projects.

Moreover, a socio-constructive perspective about reality suggests that collective meanings (i.e. schemata and theories) generated through such social interactions will emerge from conversations among individuals in the social space (Gergen, 1985), in which individuals develop subjective meanings of their experiences directed toward certain objects or things (Berger and Luckmann, 1966). According to Weber (2007), scientific understanding about social phenomena can only be achieved through the study of models of behaviour of purposeful individuals. From this perspective, Weber (2007) suggests that social action must be understood through interpretative means, taking into consideration how individuals subjectively relate to one another. This kind of interpretation should consider the subjective meaning and purpose that individuals attach to their actions (Weber, 2007).

In this case, the research activity can be seen as the "*the controlled or directed transformation of an indeterminate situation into a unified whole*" (Dewey, 1938). Hence, from a socio-constructionism perspective, the aim of an inquiry is not the sole development of general knowledge that represents some external reality, but rather a meaningful construction that allows people to come together in a joint exploration that, eventually, can bring about change in a desired direction (Steen, 2013). In this case, both observable facts and subjective meanings abstracted from the situation can be seen as acceptable evidence of "knowledge" in use (Saunders et al., 2009).

In terms of research practices, Saunders et al. (2009) argued that *social constructionism* is an ontological approach on its own, based on *Subjectivism* and not related to *Pragmatism*. However, it could be argued that a pragmatic approach does not exclude, and actually should consider, the socio-constructive nature of reality. In this sense, it is possible to say that the socio-constructivist view of inquiry aligns with the pragmatic maxims that the search for truth is irrelevant, and we should explore what is useful, in terms of what individuals find that enable them to effectively act in problematic situations (Mertens, 2005; Saunders et al., 2009).

Thus, one of the outcomes of an interpretative and socio-constructive research should be the identification of practical applications in which different perspectives are integrated in trying

to improve (i.e. change) the situation (Saunders et al., 2009). Moreover, from this point of view, inquiry into a problematic situation would allow researchers to reflect on the many ways in which the situation and activities can be conceptualised and materialised by practitioners and other researchers (Dewey, 1938).

In this case, Kelly (1955), in his *Personal Construct Theory*, argued that individuals engaged in changing problematic situations of practice or science will simultaneously and continuously make and test hypotheses and revise their concepts accordingly. According to Kelly (1955), both research and practitioners organise their results into what he called schemata, that feed and originate broader systems of meaning, which he called *theories* – in other words, *systems of inquiry* (or *appreciative systems)*. It is through the interaction of these schemata and theories that humans make sense of the world (Kelly, 1955).

In this case, researchers should also be able to reflect about the socio-construction of their inquiry, in which they recognise that their own background of experience and the context of the situation shape their interpretation (Creswell, 2013). Consequently, researchers need to position themselves in the history of research to acknowledge how their own interpretation flows from their personal, cultural and historical experiences, while they follow the basic principle of the "primacy of practice", which states that meaning of our conceptualisations of the world (i.e. ideas, theories, assumptions) should be evaluated on the basis of their consequences and implications in practice (Dalsgaard, 2014).

A particular reflection in terms of appropriate research approaches and procedures can also be seen as another level of inquiry, in which the design of a specific research method involves the meaningful construction of a plan of actions to achieve the desired aim of supporting joint exploration in research field (Crotty, 1998), which would allow further action towards change in social context.

Consequently, the output of such inquiry (as the thesis here presented) can be seen as an argument adding to the ongoing history of inquiry over a specific topic (e.g. early project collaboration), which is usually framed as a particular branch of 'science', and is also subject to judgement on its own logic and utility (Kaufmann, 1959; Schon, 1992). It can be argued that this contributes to the overall Dialectics of Inquiry, in which reality is constantly socially constructed by reflective practices (Kaufmann, 1959; Schon, 1992). In such a way, this chapter can also be seen as evidence of such reflective practice of the author of this thesis.

## 3.3. Research Approach: Case Studies

The research approach can be seen as the 'blueprint' of the inquiry, which was designed taking into consideration a set of aspects: the nature of inquiry; the type of question being made; what is considered relevant sources of evidence; how to collect such evidence; and how to interpret the answers for the research questions in a satisfactory manner (Easterby-Smith et al., 2002; Yin, 2013). Thus, the main purpose in defining the research approach is to deal with the logical construction of the inquiry, aiming to avoid the situation in which the evidence obtained does not address the research aim and objectives (Yin, 2013).

As this research adopts an interpretivist point of view, in which inquiry should be focused on the ways people make sense of the world through the intersubjectivity of shared meanings (Walsham, 2006), one approach that allows researchers to capture the perspective of different participants in a real-world situation is Case Study (Eisenhardt, 1989; Yin, 2013).

A Case Study approach consists of in-depth empirical inquiry in a contemporary phenomenon (i.e. situation) in a real-world context, in which the different meanings that different participants hold in a situation can be seen as the unit of analysis (Yin, 2013). In this sense, a Case study approach is appropriate for "how" and "why" research questions, and it implies that inquiry relies on multiple sources of evidence (Yin, 2013).

In Case Studies, the establishment of the *unit of analysis* comes from defining and bounding the "case", in which a relationship between the specific research questions and the specific case is elaborated. As a result, the inquiry stays within feasible limits (Yin, 2013).

In this research, for example, following Yin's (2013) argument, the concept of "collaboration" does not alone produce the grounds for a case study. Rather, it involves the specific selection of a real-life situation in which "collaboration" is manifested, and questions and propositions can be made about that specific case in relation to the concept of collaboration.

Moreover, giving the purpose of the study, bounding the case in terms of the individuals involved (i.e. social groups), as well as temporally and spatially, can help to determine the scope of evidence to be collected (Yin, 2013).

In the Case Study approach, the research benefits from prior development of theoretical positions to guide the search and analysis of evidence towards what the researcher believes should be examined within the scope of the study (Yin, 2013). Such exploration towards

previous theoretical positions on the research topic is presented in the literature review chapter (see section 2).

The development of preliminary theories or theoretical propositions related to the topic of study, prior to the conduct of any data collection, is one point of difference between Case Study research and other related qualitative methods such as *Ethnography* (Lincoln & Guba, 1994; Van Maanen, 1995) and *Grounded Theory* (Strauss and Corbin, 1994). However, when the existing *knowledge base* about the unit of analysis (case) is poor or questionable, any empirical study is likely to assume the characteristic of an Exploratory Case Study (Yin, 2013).

## 3.3.1. Research Strategy

The overall aim of this research was to improve the understanding of early project collaboration in construction. Thus, in order to achieve such aim, the research objectives presented in Chapter 1 (see section 1.7) were translated into a set of research questions (Figure 20).



**Figure 20: Research Strategy**

The overall research activity was divided into two stages: *Exploratory* and *Explanatory*. The four initial questions (Q1-Q4) guided the exploratory stage of the research activity, supporting the development of an explanatory principle, as a theoretical framework. Such theoretical framework was then further investigated empirically in the In-depth Case Study at the explanatory stage, where questions Q5 to Q6 were addressed.

**EXPLORATORY STAGE**

**RESEARCH SETTING**

QUESTIONS

How collaboration has been addressed in construction projects?

What are the common problems related to Early Project Collaboration?

SOURCE OF EVIDENCE

Previous Research

TECHNIQUE

Literature Review and Synthesis

THEORETICAL REFERENCES
Co-Design
Organisational Collaboration
Collaborative Systems

ANSWERS

Diverse definitions of collaboration in construction

Misunderstandings as source of poor collaboration at early project stage

CONSTRUCT

*Appreciative Systems*

*Objectivations*

CONTINUOUS REVISION OF THE RESEARCH SETTING WITH FURTHER LITERATURE REVIEW AND REFLECTION

**EMPIRICAL STUDIES**

**EXPLORATORY CASE SUDY**

QUESTIONS

How and why misunderstandings emerge at early project stage in construction?

How misunderstandings tend to be resolved?

TECHNIQUE

Direct Observation, Doc. Evidence, Protocol Analysis

CASE

Design Charrette event (1 hour long) for Concept Design (Building Envelope)

ANSWER

Misunderstandings emerge as contradictions based on different interpretations of objects of activity.

Breakdowns and Metaphors help individuals to reach Mutual Intelligibility

CONSTRUCT

*Contradictions*
*Breakdown*
*Metaphors*
*Mutual Intelligibility*

**IN-DEPTH CASE SUDY**

QUESTION

How Early Project Collaboration is socially-constructed?

TECHNIQUE

Semi-structured interviews, Doc. Evidence and Conversation Analysis

CASE

Early Stages of a School Building Project (Competitive Dialogue Process)

ASSUMPTION

Collaboration is constructed by the dynamics of Mutual Intelligibility, in which misunderstandings are resolved and Shared Objects of Activity are generated.

ANSWERS

Map of stakeholders interactions to resolve misunderstandings and construct collaboration at early project activity

**DISCUSSION AND CONCLUSION**

THEORETICAL REFERENCES
Socio-constructivism
Activity Theory
Reflective Practitioner

QUESTION

How to better interpret Early Project Collaboration?

TECHNIQUE

Communication Analysis and Cognitive Mapping

ANSWERS

Contribute to a better understanding of Early Project Collaboration in Construction.

Recommendations and Best Practices

Proposed Theoretical Framework as a Collective Reflective Tool

**EXPLANATORY STAGES**

**Figure 21: Research Process**

As is shown in the figure above (Figure 21), the exploratory stage of the research activity started with an investigation to define the research setting. This activity focused on answering the first two questions (Q1 and Q2), addressing previous research in the topic through a literature review, and aiming to understand how collaboration has been defined, and what causes for poor collaboration at Early Project interactions have been identified. Answers drawn from a particular, and arguably relevant, set of theoretical references (e.g. *Co-Design,*

*Organisational Collaboration, Collaborative Systems*), led to the establishment of the type and sources of evidence, as well as an explanation of how they would be gathered.

In combination with the literature review, an exploratory case study was conducted to empirically investigate what can hamper early project collaboration in practice. In this case, the study focused on common problems identified in the literature, which are emergent misunderstandings between project stakeholders. In this sense, the exploratory case study aimed to answer the questions Q3 and Q4 by gathering empirical evidence on the emergence of misunderstandings at early project stage, as well as getting insights into how project stakeholders resolve these misunderstandings. A further description of this exploratory case study is presented in the next session (3.5.1.1).

The answers obtained in the exploratory stage of the activity supported the setting of the main constructs that formed the basis for the conception of the theoretical framework (Figure 18, section 2.4.4), which is suggested as an explanatory principle of the phenomenon studied. In this case, these *constructs* can be considered conceptualizations used to describe a field of study (March and Smith, 1995). Thus, such theoretical framework afforded further assumptions in addressing questions Q5 and Q6, in the explanatory stage of the research activity. Based on Activity Theory and the Reflective Practitioner concepts elaborated by Schon (1983), the proposed theoretical framework can be seen as an explanatory artefact, objectivating the theoretical proposition elaborated and, at the same time, indicating the type of evidence that is to be gathered in the empirical study. In this case, the use of constructs identified in the literature review, and further elaborated in the synthesis of the literature, provided justification and relevance for the adopted approach.

In transitioning to the explanatory stage of the research activity, the main empirical investigation was formulated as an In-depth Case Study to address Q5, and to investigate participants' interactions to construct collaboration at Early Stages of a Construction Project. In this study, the researcher applied a set of techniques (e.g. direct observations, semi-structured interviews and document analysis) to gain access to evidence of participants' interactions for the social construction of the objects of activity. This inquiry started with the assumption that early project collaboration involves the dynamics of emergence and resolution of misunderstandings in these situations. The main sources of evidence were semi-structured interviews conducted with project participants, in which the research asked them about their previous interactions in the project. The interview questions were based on the proposed

theoretical framework (Figure 17, section 2.4.4). A further description of who was interviewed and how they were structured and conducted is presented in the following section (3.4.4).
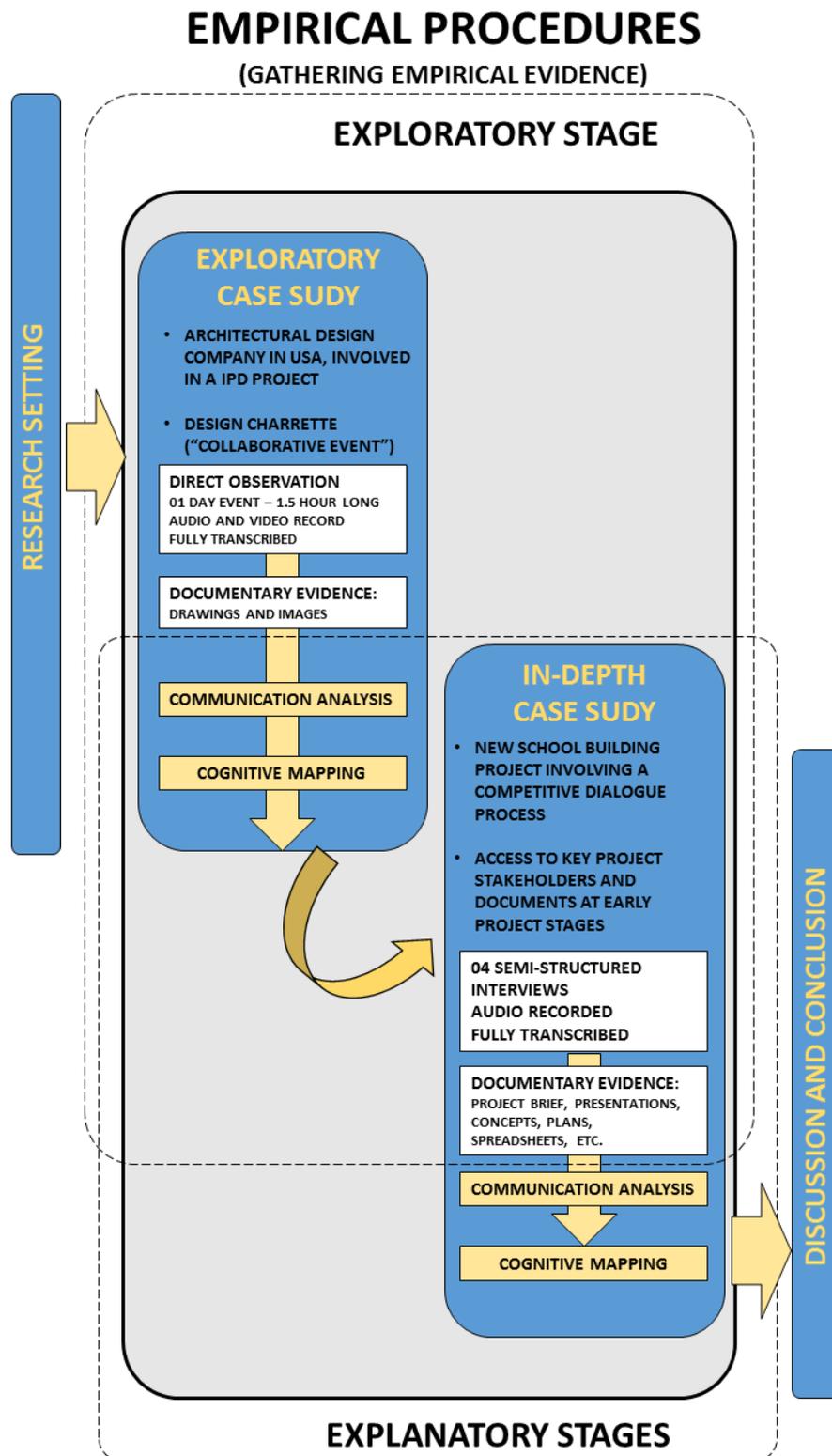


**Figure 22: Empirical Procedures**

The interpretation of the content of the interview conversations was elaborated based on a Communication Analysis (see section 3.5.1), to indicate how early project collaboration was socially constructed in the case study. Following that, a cognitive map of the objects of activity was produced based on the interpretation of the dynamics of early project collaboration identified in the case study, in which limitations and best practices were also highlighted.

Such analysis allowed the suggestion of ways to improve participants' collaborative performance, as well as to elaborate on the proposition of collective reflective tool based on the conceived theoretical framework (see section 6.3.2). Thus, at the end of this inquiry, the researcher was able to draw a set of recommendations based on best practices identified in the literature and in the Case Studies. Moreover, the discussion (see section 5) can be seen as an answer for the main research question.

It can be argued that the description of research activities, and the interdependency between different instances and context of the research process, allow the evaluation of the research internal coherence and value (as presented in section 3.6). Moreover, such description can also indicate how the adopted research approach can be evaluated as a *pattern of inquiry* fitting into existing *systems of inquiry* (i.e. interpretative research approaches), allowing comparisons towards validity and reliability of the research to be made.

## 3.3.2. Selection of the cases

### 3.3.2.1. The Exploratory Case Study

The advantage of conducting an exploratory case study is that it is flexible and adaptable to change, which can be particularly useful to expand our understanding of a phenomenon (i.e. situation) (Saunders et al., 2009). Thus, in this type of case study, it is essential that the researcher gains access to an organisation that has actually experienced the situation in a substantial way (Walsham, 2006).

The case study began from the assumption that Early Project Collaboration can be considered the activity of designing together, and it was designed to address the following research questions:

> *Q3: How and why do misunderstandings emerge at early project stage in construction?*

> *Q4: How do these misunderstandings tend to be resolved?*

The case selected for this exploratory study was a Design Team activity, a Design Charrette event, in which participants had to work on the Schematic Design (i.e. Concept Design) of a Medical Office Building (MOB) in Alaska, USA. This event took place in March 2017.

All the participants in this event were members of the same organisation: An Architectural Design Company, based in San Francisco, USA. This case was selected due to the fact that it involved a set of experienced project stakeholders (Architects and Graphical Designers) working together and co-located to propose ideas for the Building Envelope of the MOB. An important factor in the selection of this case was the fact that this Architectural Design Company had extensive experience in working very closely with other disciplines ('collaboratively') at Early Project Stages, within relational procurement methods (e.g. IPD, see section 2.2.4 and 2.2.6).

The Design Charrette was a one-day event, taking place at the company's office in San Francisco, USA. The event observed by the researcher was the third Design Charrette activity on that project. According to the Project Design Leaders (Architect Leader 1, AL1; Architect Leader 2, AL2), the first two Design Charrettes included other project stakeholders (e.g. the client, structural and systems engineers, and the contractor) and resulted in the initial scheme presented at this third Charrette in terms of a *brief* document, *footprint* plan and overall volumetric shape of the building.

The participants engaged on this third Design Charrette included five Architects of the San Francisco branch: AL1, AL2, A3, A4, A5, and one Graphic Designer: GD. The Graphic Designer came from a different branch of the same company to participate on this one occasion. During the Charrette, the participants were all expected to interact and contribute while exploring alternative design ideas for the building envelope of the MOB.

The researcher observed and video recorded the participants' interaction throughout the whole duration of the activity, which took about 1 hour and 20 minutes. Before starting the session, the researcher and AL1 agreed that the researcher would not participate in the design activity and would just observe the team's interactions. As a result, the researcher was able to circulate through the office to produce notes about the activity. Thus, in order to free the researcher to make these observations and notes, the activity was registered using audio (tablet) and video (camera) recorder devices. The data collected with these equipment was used to produce the transcriptions of participants' interactions, which then supported the *protocol analysis* (see section 3.5.1.1).

Interestingly, the office had a layout arrangement which favoured this kind of activity. As can be seen in Figure 23, there is a large pin-up wall in the centre of the office, and two high tables that were used by the participants when they worked in two separate groups. This "studio space" setting closely resembled the regular working stations of the participants, which seemed to have made them feel more comfortable when engaging in this activity. If they felt that they needed any drawing tool or computer, they had easy access to their own desk.



**Figure 23: Exploratory Case Study setting: Architecture Office, San Francisco, USA**

As can be seen in Figure 23, the camera was set to the left of one the tables, in such a way that it could record the whole of the physical interactions between the participants within the studio space during the whole session. The camera was positioned high enough (approximately 2 metres high) in order to get an overview of the drawings and gestures on this table (Group A, AL1) (Figure 23).

Overall, the session took about 1 hour and 20 min, approximately. In the last ten minutes, when the participants had already concluded their activity, AL1 gave the opportunity for the researcher to question the participants about their perceptions and reflections on the activity.

Then, after the session, considering how the session was conducted, the overall output and the level of interactions of both groups, the researcher decided that it would only be necessary to transcribe and analyse the interactions developed within Group A, in addition to the initial briefing and conclusion remarks that involved the whole group.

In terms of qualitative analysis, it was noted that, during the whole time of the activity, project participants interacted using gestures, verbal and graphical representations to explore different design ideas, which provided rich evidence of emergent misunderstandings and initiatives taken to resolve them, in the context of this early project activity.

Thus, following the synthesis of the literature, the qualitative analysis aimed at identifying the main constructs related to the emergence and resolution of misunderstandings, according to the preliminary framework (section 2.3.4 and 2.4.4), as four types of interactions in the activity:

- *Objectivations* – Individuals' different interpretations in the Project Activity
- *Contradictions* – Emergent Misunderstanding
- *Breakdowns* – Explanatory interactions and questioning understandings and embedded assumptions
- *Metaphors* – Conceptual Bridges of Understanding

In terms of analysis, these constructs were used to describe different modes of interactions in the Design Charrette activity. The analysis took into consideration the fact that all the individuals' actions can only make sense when considered within the context of social interaction. Therefore, the unit of analysis was established as distinct events involving the interactions between one or more individuals. In this sense, each of the four types of interactions can be seen as distinct forms of interaction involving the dynamic construction of mutual intelligibility. A further description of how the analysis was conducted in the exploratory case study is presented in section 4.2.

## 3.3.2.2. In-depth Case Study

The In-depth case study involved the early project stage for a new school building of a University in the UK. The new building comprised approximately 7,300 sq m. The project began in mid-2016 and it is due to be delivered by mid-2019.

One of the main reasons for the selection of this case is because this project involved a particular type of relational procurement method, namely *Competitive Dialogue*. The *Competitive Dialogue* procedure allows a public entity that knows what outcome it wants to achieve in awarding a public contract, but does not know how best to achieve it to discuss, in confidence, potential solutions in the dialogue phase of the tender process with short-listed bidders before calling for final bids (Burnett, 2009).

Elaborated as part of the European Union (EU) Public Procurement Directives, it is:

"*…a procedure in which any economic operator may request to participate and whereby the Contracting Authority conducts a dialogue with the candidates admitted to that procedure, with the aim of developing one or more suitable alternatives capable of meeting its requirements, and on the basis of which the candidates chosen are invited to tender.*" (Art. 1(11) (c), Directive 2004/18 from EP and CEU, 2004)

The *Competitive Dialogue* procurement method presupposes a more intensive and concurrent interaction between Design and Construction activities, in a way that Early Project Proposals that are put forward to the client should contemplate the concept design requirements in alignment with the building cost and building schedule commitments. Thus, it was assumed that such context would provide a rich opportunity for the researcher to examine a case of Early Project collaboration.

The researcher also decided that, in order to provide a more comprehensive understanding of collaboration in construction, it was necessary to take a broad perspective in what the construction project activity entails and where it starts. This research assumes that the main purpose of a project activity is to produce change in a specific situation. In this case, the dynamic and evolving nature of the project activity means that the objects of interactions throughout the activity assume distinct instances as project stakeholders advance towards realising this change (Figure 24).

In this study, in order to describe these different changes that occur to the project activity, the researcher objectivated them in three different instances, namely: *Business Case*, *Setting Project Template, Building Project Design,* and *Building Project Realisation.* This differentiation of "instances" of the project activity involves different purposeful activities linked to the chain of the main purposeful activity, namely the building project. They were considered in this inquiry regardless of their duration in time, since the time frame can potentially vary from one project to another.
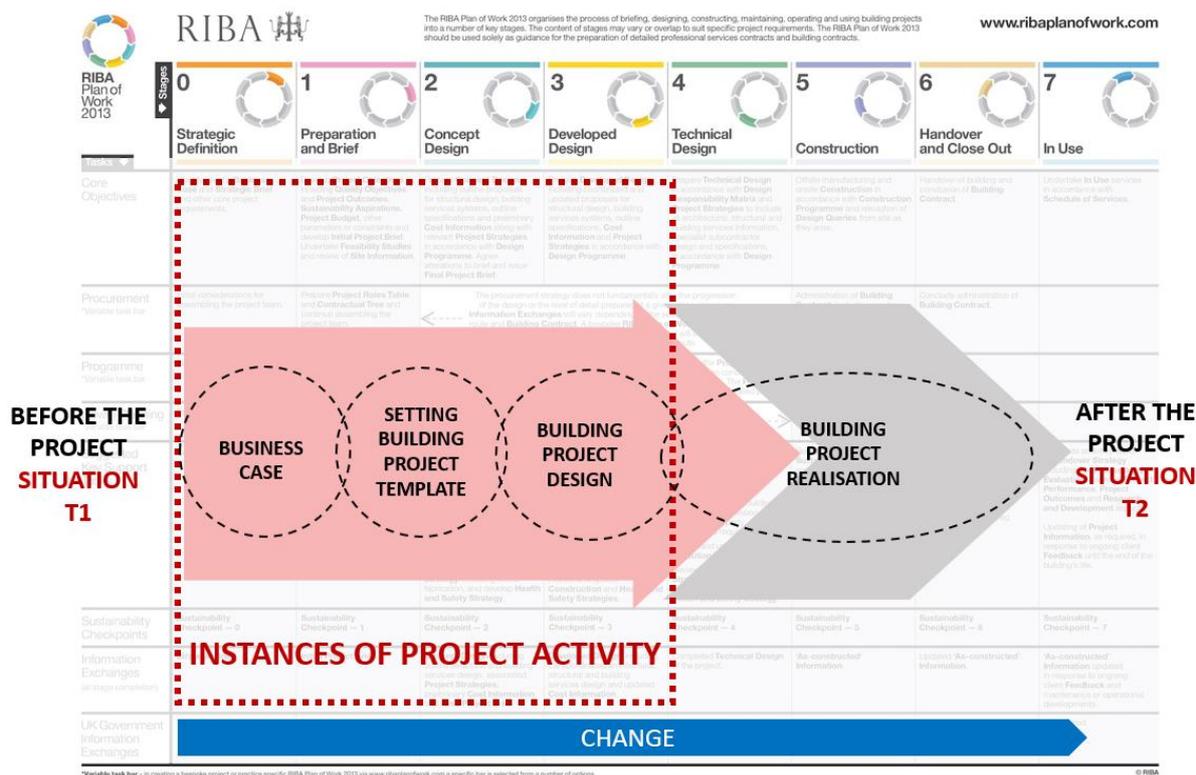
**Figure 24: Instances of the Project Activity in relation to Stages in RIBA Plan of Works**

Therefore, this inquiry considered the main project stakeholders' interactions since the start of the inception of the Building Project Case within the University institutional operations (i.e. Business Case Stage), and followed these stakeholders' interactions and perceptions until the end of Stage 2, according to the Project Template elaborated by the University (as a client). By this stage, a set of Consultancy Teams have participated in the development of initial project proposals. At this stage, the Building Project Design (which is equivalent to RIBA Stage 2 - Concept Design) was approved by the Dean of the School as well as the States Department Director. The plans were approved and contracts signed off, starting the activities for *Planning Approval* and Pre-Construction (Stage 3 in the Project Template), which can be considered activities related to the Building Project Realisation, and not Early Project Stage, therefore they were excluded from the scope of this study.

As the project involved a set of five *Bid Teams*, as participants in the competition stage, the researcher engagement with the stakeholders from outside the University organisation (identified in the analysis as the *Consultancy Team*) could only start after there was only one competitor left in the process. That took place by the end of Stage 1+, when three of the original five competitors had already left the process, and one of the last two contenders dropped out of the competition. After the first stage (Stage 2 RIBA), one of the bidders was chosen to

continue developing their project proposal further. At this Stage (1+), the only "competitor" still remaining in the process had a few more weeks (between 3 to 4 weeks) to present the final proposal for the Building Project Design (Concept Design – Stage 2 RIBA). During this period of 3 to 4 weeks, the researcher had the opportunity to observe and record the main stakeholders' interactions at one "engagement meeting", in which the Consultancy Team and the University's Operational Panel discussed the details of the current state of the project proposal and the potential feedbacks from members of the school's staff.

In order to inquire on how collaboration was constructed from the *Business Case* until the *Building Project Design* stage, the study concentrated on retrospective inferences from key project stakeholders about their own activities and their interactions with others throughout these early project stages. Thus, a series of semi-structured interviews were conducted with the key project stakeholders, when they were close to the end of the Building Design Project Stage. These series of interviews took place during an interval of four months between June 2017 and March 2018. From the University side, most of the time acting as the client, the stakeholders interviewed were: The *Dean of the School* and a high-level *Staff member*. From the Consultancy Team side, acting as the service providers: The *Design Manager* from the Contractor Company, and one of the *Lead Architects.*

The structure of the interview protocol was previously conceived considering the "key constructs" of the proposed theoretical framework (Figure 17). From a methodological point of view, the main Unity of Analysis of this case study was the collective construction of the early project activity.

Following the analysis and conclusions from the Exploratory Case Study (see section 4.2.3.3), the proposed theoretical framework suggests that the social construction of the early project activity could be evidenced through interactions for *objectivations, contradictions, breakdowns and metaphors*, involved in the dynamics of mutual intelligibility in project situations. In addition to that, following the argument presented in the synthesis of literature (see section 2.4.4), this study aligns with the Activity Theory framework in order to propose a way to map project stakeholders' interactions towards constructing their collaboration. Therefore, the interviews' questions were elaborated to identify impressions from the participants on how they interact to resolve misunderstandings and construct mutual intelligibility in each of the key objects of activity.

Therefore, this study was concentrated on these three initial instances of the project, considered as the early project stage, in order to analyse how these objects were socially constructed by the stakeholders' interactions, in terms of further objectivations and articulations of mediating artefacts in the activity (Figure 17).

The semi-structure interviews were based on a set of 13 open-ended questions that took around one hour to be answered. The Interview Protocol containing these questions is presented in Appendix 1. The order of the questions in each occasion followed the researcher's interpretation of what was more relevant in the conversation with the stakeholders. A further description of the interview strategy is presented in section 3.4.4.

The audio from these interviews was recorded and used as a basis to produce full transcripts of these conversations. The detailed *communication analysis* based on the transcripts of the interviews can be found in Appendix 4. In addition to the data gathered from the interviews, the researcher complemented the analysis of the stakeholders' interactions with important data from the documentary evidence: *project brief, PowerPoint presentations, drawings (sketches and construction drawings), protocols, management tools (e.g. spreadsheets)*. In this case, in both case studies, multiple sources of evidence were articulated to allow triangulation of data. Such evidence was gathered through different research techniques and procedures, which are described in the following section.

## 3.4. Research Techniques and Procedures

### 3.4.1. Literature Review

A literature review is an explicit way of selecting, evaluating and interpreting the existing body of recorded documents on a topic, to fulfil a specific aim or express a certain view (Hart, 1998; Fink, 1998). It usually aims at identifying patterns and themes that summarise existing research in the field, as well as contributing to theory development by identifying conceptual contents (Seuring and Müller, 2008). The review of prior and relevant literature is a fundamental feature of academic research (Webster and Watson, 2002), and it helps the researcher to discover and construct the justification and demonstrate the relevance of the research, based on previous experience in the topic (Hart, 1998; Gill and Johnson, 2002). The review outlines the main lines and limitations of existing research in the field (Seuring and Müller, 2008).

Overall, literature review as a research method supports the description and critical analysis of the current state and historical construction of knowledge in a specific subject of study

(Jankowicz, 2000). In this case, a critical literature review can reveal the interchangeable use of certain constructs and the lack of consistency in operationalising it (Garcia and Calantone, 2002). A literature review can increase the understanding of certain phenomena as it can help to reveal how individuals conceptualize these phenomena using certain constructs (Garcia and Calantone, 2002).

In this research, the literature review was conducted across different subject areas (e.g. Construction Management Research, Co-Design Research, Operations Research, Management Research, Computer Systems for Collaborative Working Research, Socio-Constructive Research and Activity Theory), focusing on a conceptual analysis of different definitions of *collaboration* and identification of common problems related to early project collaboration.

The search for relevant publications on the topic of collaboration in construction started in major databases (e.g. *Design Studies, Construction Management and Economics, Design Issues, Automation in Construction* and others), using a structured keyword search for the term *collaboration*. This initial search took into consideration the overall number of citations of these publications and led to the identification of key publications on this topic in other research fields that had an influence on Construction Research (see

Table 11, Table 12 and Table 13 in Appendix 2). Thereafter, a content check was conducted by reading the abstracts of those papers to verify whether the articles presented a clear statement towards presenting a definition of *collaboration*. Subsequently, the content of the selected articles was assessed in terms of a descriptive analysis about the concept of collaboration presented in the paper, which then was clustered into three main forms of conceptualising *collaboration* in construction projects (see

Table 11, Table 12 and Table 13 in Appendix 2). The complete literature review is presented in Chapter 2 of this thesis.

## 3.4.2. Direct Observation

Direct observation is a research technique used to access evidence of relevant behaviour and context-specific environmental conditions (i.e. company culture) in a case study (Remenyi et al., 1998; Yin, 2013).

In this research, direct observation as a source of evidence was concentrated in the Exploratory Case Study, as it was focused on identifying how and why misunderstandings emerge at early project stage in construction, as well as how these misunderstandings tend to be resolved. In

the exploratory case study, direct observation took place during the researcher's attendance at the Design Charrette event, considered by the participants as a *collaborative design meeting*. During this event, the researcher had total access to the participants' interactions and outputs (e.g. drawings and notes). At the end of the Design Charrette event, the researcher also had the opportunity to ask the participants questions about their impressions about the activity.

During the In-depth Case Study (Explanatory Activity), the researcher was allowed to engage in direct observations on two occasions: at the 4th Engagement Meeting, and at a "Feedback Panel" Meeting. The aim of conducting such observations in those meetings was to gather evidence of participants' interactions to construct their conception of collaboration in the project activity.

However, because the scope and duration of this case was much broader and long, respectively, the evidence produced by direct observation was identified as less relevant for the overall analysis of the project activity. This decision was further corroborated by the evidence collected through the semi-structured interviews (i.e. retrospective reflection on the phenomenon), which provided a much broader and deep interpretation of the stakeholders' interactions and their underlying intentions. A further description of the interview procedures can be found in section 3.4.4.

## 3.4.3. Documentary evidence

In case studies, documentary information can be considered an important source of evidence. It can also be helpful in augmenting evidence from other sources, providing further insights (Yin, 2013). Its unobtrusive nature means that documentary information can provide a broad coverage of events, time span and settings (Yin, 2013). Documents can be considered a stable type of evidence, which can be reviewed repeatedly (Yin, 2013). Following Activity Theory framework, it could be said that the same applies for any mediating artefact.

Different types of documents have been accessed and analysed, including project briefs, sketches, drawings, presentations, spreadsheets and others (see Table 7). In both case studies, the documents made available for the researcher were artefacts used in Early Project Interactions among project stakeholders, and they were considered evidence of their constructive interactions for collaboration in the situation. The specific documentation analysed within each case is described in Chapter 4 (and presented in Appendix 3 and 4).

**Table 7: Documentary Evidence obtained for In-depth Case Study**

| DOCUMENTARY EVIDENCE |
| --- |
| In-Depth Case Study |

**Client (The University)**

    Project Brief
    Schedule of Accomodation

**Consultancy Team**

Architects

    Presentations from Engagement meetings including:
        Project Team Assemble
        Site Analysis
        University Precedents
        Design Strategies
        Concept Design (04 Design options)
        Picture of Design Team Review (20.10.2016)
        Design Evolution (Floor Plans)
        Façade Treatments & Materiality
        Review of Adjancies
        Daylight Factor Simulations
        Ventilation Strategy
        Interior Material Pallet
        Acoustics Strategy
        Perspective Images
    Sketches produced during the interview

Contractor

    Architectural Schedule of Services
    Responsibility Matrix
    Schedule of Information
    Sample: Construc. Arch. IRS (Design - Information Requirement Schedule)
    Sample: Precon. Arch. IRS (Preconstruction Architectural - Information Requirement Schedule) - RIBA Stage 3 & 4
    Design Programme (RIBA Stage 4)

# 3.4.4. Semi-structured interviews

Interviewing is a fundamental qualitative research technique that can provide a rich account of individuals' experiences, impressions (i.e. perceptions) and ideas (i.e. conceptions) about the case (Easterby-Smith et al., 2002; Alvesson, 2003). Thus, based on personal experiences from the interviewees, the researcher can explore new dimensions of the situation and discover new clues (Burgess, 1982).

From a socio-constructivist perspective, interview situations can be seen as a subjectively, linguistically and socially rich situation (Alvesson, 2003). Thus, reflection about the interview procedure can reveal a certain bias in the construction of the questions, as well as in the interpretation of the responses, related to inaccuracies and lack of reflexivity (in which the interviewee gives the interviewer what they want to hear) (Yin, 2013). In this case, all the audio evidence from the interviews was recorded and transcribed, in order to help reduce the effects of these weaknesses. Thus, recording the audio of the interviews avoided the issue of poor

recalling evidence and supported the development of the *Communication analysis*. Fragments of the interview transcripts are shown in Appendix 3 and 4 as evidence of the constructs from the theoretical framework.

There is a set of interview types, which can vary depending on the questions being asked, ranging from structured questions to totally open-ended ones (Easterby-Smith et al., 2002; Yin, 2013). Within this range, semi-structured interviews are based on a set of predetermined questions; however, the order of the questions can be changed according to the interviewer's interpretation of what is more relevant (Robson, 2002). Thus, a semi-structured interview can be sufficiently flexible to allow the exploration of emergent issues, while it maintains its general purpose and focus. Therefore, as the interviews conducted in this research were to support both an exploratory and explanatory aspect of the inquiry activity, with different purposes and stages, the semi-structured approach was the one considered more appropriate.

**Table 8: List of interviews conducted in the In-depth Case Study**

| LIST OF INTERVIEWS | | | |
|---|---|---|---|
| **Client and User (i.e. University):** | | | |
| 01 Interview with Dean of the School | | 45 min | 30.06.2017 |
| 01 Interview with Staff Member (from Senior Management Team) | | 36 min | 03.08.2017 |
| **Service Provider (i.e. Consultancy Team):** | | | |
| 01 Interview with the Project Design Manager from the Contractor Company | | 1h05min | 08.09.2017 |
| 02 Interviews with one of the Lead Architects | 1st | 1h06min | 13.09.2017 |
| | 2nd | 1h34min | 15.03.2018 |

In the In-depth Case Study, the semi-structured interviews followed a protocol containing a set of questions to be asked to the project stakeholders (see list of stakeholders above – Table 8).

The protocol was conceived based on the theoretical framework elaborated at the end of the synthesis of the literature, and aimed to identify how project stakeholders perceived that early project collaboration was socially constructed in the situation. The logic behind the protocol is explained in Figure 17, p. 112.

The detailed interview protocol document used in the in-depth case study, and the full interview transcriptions, are included in Appendix 1 and 3.

# 3.5. Qualitative Data Analysis

*Data* can be considered the facts and statistics collected together for reference or analysis (Simpson and Weiner, 1989). Qualitative Data refers to actions (e.g. linguistic actions) which carry with them intentions and meanings leading to specific consequences (Miles et al., 2014). Such type of data is not usually immediately accessible for analysis, but requires some sort of processing (Miles et al., 2014). In this case, the researcher should focus on producing *evidence*, as the available body of facts or information indicating whether a belief or proposition is true or valid (Simpson and Weiner, 1989).

An interpretative approach to the analysis of qualitative data inherently involves the researcher continuously making the decisions on what to leave in, what to highlight, what to report first or last, what to interconnect, and what the main ideas are (Miles et al., 2014). Moreover, it tends to look at qualitative data thematically in order to extract essences of participants' meanings (Miles et al., 2014). Such approaches usually use descriptive techniques, in which analysis reaches across multiple sources of evidence in order to condense them in a coherent argument (Miles et al., 2014), to present evidence that test research propositions. In this case, the role of the researcher is to gain a holistic overview of the specific case in terms of social arrangement, ways of working and its underlying rules (Miles et al., 2014).

Thus, techniques focused on *Communication Analysis* can be used to highlight the nuances and meanings embedded in each word in a data corpus (i.e. transcripts from interview and meetings) (Miles et al., 2014). Through such analysis, the researcher intends to capture evidence on participants' perceptions (i.e. meanings) from the inside the case. This requires from the researcher deep attentiveness, empathetic understanding and a certain suspension of preconceptions about the situation (Miles et al., 2014). This also means that such techniques are relatively little standardised in terms of instrumentation, thus any mechanism of analyses is very much situated in the context of the case.

Moreover, the researcher's analysis is also constructed with words (Miles et al., 2014). These words can be assembled, sub-clustered or broken into segments to allow the researcher to compare, contrast and construct themes and patterns out of them (Miles et al., 2014). Rigour on the interpretation of such material (as the logical construction of an argument describing the ways in which people in the case come to understand, account for, or take action in the situation) is what grants the research credibility and trustworthiness (Miles et al., 2014).

In this research, the technique used for qualitative data analysis included *Communication Analysis*, *Storytelling* and *Cognitive Mapping*, which are presented in the following sections**.**

## 3.5.1. Communication Analysis

Early project interaction, especially design, can be considered a discursive activity and it requires a semio-linguistic and action-based analysis (Trousse and Christiaans, 1996). In this case, argumentative interactions at early project activities derive their meaning from being effective in producing a determined effect, using the resources of language (Trousse and Christiaans, 1996). Thus, communicative interactions can be seen as sources of meaning production in the social context of the construction project.

The activity of producing meaning collectively is systemic (Cooke and Gorman, 2006). Participants in a team actively interact with their local environment, making their personal direct perceptions available to other team members in their local environments through the use of mediational means (i.e. lexical devices/representations) (Cooke and Gorman, 2006). Such context of interaction presents specific and varied roles, with interdependences between its participants.

In these situations, transcripts from the project teams' interactions can be used to study how they negotiated before setting upon a shared idea (Stumpf, 2001). Similarly, from a pragmatic point of view, Cannon-Bowers et al. (1993) suggested that what should account as evidence of these negotiations is the performance that manifests understanding, and not the mechanisms that made such performance possible. In this case, the content of communication is taken as the basis of inference (Holsti, 1969). Such technique assumes that it is possible to analyse the symbolic meanings embedded within messages (Krippendorff, 1980).

Such analysis would not only provide a better understanding of the early project activity, but it could also reveal how different project stakeholders hold different points of view during the activity (e.g. *different types of problem-solving rationales*) (Trousse and Christiaans, 1996). Thus, since the focus of analysis is the project stakeholders' interactions to socially construct collaboration, as a set of shared meanings, it is suggested that *Communication Analysis* is a suitable technique to gather evidence of the content and flow of these interactions, providing an insight into the collective construction of meanings in the situation (Cooke and Gorman, 2006).

Communication Analysis techniques allow the researcher to match the key constructs elaborated from theoretical references with key codes (i.e. themes) emerging from the qualitative data gathered (Miles and Huberman, 1994; Easterby-Smith et al., 2002), providing the evidences of the "phenomenon". Codes are labels that researchers use to assign meaning to a set of data (e.g. phrases, sentences and paragraphs) (Miles and Huberman, 1994). In order to allow transparency, while conducting such analysis, the researcher should clearly state the objectives of the analysis, as well as the content of the data and the analytical constructs used to make inferences, right at the beginning of the activity (Holsti, 1969; Krippendorff, 1980) (see Table 9).

**Table 9: Coding Scheme for both Case Studies**

| | | |
|---|---|---|
| *Events* : a set of purposeful interactions related to emergence and resolution of misunderstandings | | |
| **Exploratory Case Study** | *Objectivations:* | Individuals interpretive interactions |
| | *Misunderstandings:* | Individuals recognising and revealing diverse interpretations |
| | *Breakdowns:* | Individuals initiative to question, justify and expand their interpretations |
| | *Metaphors:* | Individuals initiative to reinterpret a situation by displacing concepts (i.e. transposition/association) |
| Interactions related to dialectics and situated construction of the key constructs of project collaboration, at different instances of the Building Project activity | | |
| **In-Depth Case Study** | *Perception of Interdependency:* | Individuals initiative to objectivate their perception of interdependency on the task, and and embody them into artefacts, assembles, events or approaches |
| | *Perception of Performance:* | Individuals initiative to objectivate their perception of performance on the task, and and embody them into artefacts, assembles, events or approaches |
| | *Conception of Resource:* | Individuals initiative to objectivate their conception of resource on the task, and and embody them into artefacts, assembles, events or approaches |
| | *Conception of Changing Actions:* | Individuals initiative to objectivate their conception of changing actions on the task, and and embody them into artefacts, assembles, events or approaches |

In this sense, *Communication Analysis* finds similarities with *Template Analysis* technique, in which the researcher produces a list of codes, as a *template*, representing a specific *theme* in the discourse data (King, 1998). It is important to mention that the elaboration of this list of codes usually is dynamic and involves an initial formulation based on prior evidence from literature and personal experiences, which is then continuously revised for insertions and deletions of codes until it reaches a final instance at the end of the study (King, 1998).

## 3.5.1.1. Exploratory Case Study: Protocol Analysis

There are many techniques which fit into the notion of *Communication Analysis* (e.g. Content Analysis, Template Analysis, Protocol Analysis, etc.). In this context, it has been argued that, in analysing early project interactions (e.g. design), besides the content of communication interactions, the video evidence can provide context about gestures, deixis references and interactions partners (Stumpf, 2001). Thus, as opposed to traditional *Content Analysis* technique (Holsti, 1969; Krippendorff, 1980), which focuses exclusively on the verbal (i.e. words) account of research subjects (e.g. participants and interviewees), the *Protocol Analysis* technique (Ericsson and Simon, 1993) considers that the iteration between verbal and graphical interactions (i.e. Sketches, Models and Images) us accounted as qualitative data.

*Protocol Analysis* was originally used as a technique to study the cognitive aspect of design thinking (Ericsson and Simon, 1993). Since then, protocol studies have been widely developed to investigate designers' actions in the design process (Ericsson and Simon, 1993; Lloyd et al., 1995; Cross et al., 1996; Tang et al., 2011; Cardoso et al., 2016; Kokotovich and Dorst, 2016).

In this case, Ericsson and Simon (1993) proposed two types of protocols: *concurrent* and *retrospective*. In this case, process-oriented design research usually used concurrent protocols, registering participants' verbalization during the design activity, and researches that are content-oriented generally used retrospective protocols, registering participants' perceptions and impressions after the activity is finished (Dorst and Dijkhuis, 1995). While there seems to be a certain incompatibility with current paradigms of individual design reasoning (Lloyd et al., 1995), concurrent protocols seem to be adequate in the context of collective design teams since they naturally have to communicate verbally to conduct the design task (Tang et al., 2011). Thus, the protocol in these situations will be the collection of the communicative and argumentative interactions between team members (Tang et al., 2011).

A protocol analysis involves a series of procedures (Ericsson and Simon, 1993, Tang et al., 2011). According to these authors, the first step is to establish the paradigm of observation, including research ontology and epistemology, and to define what the situation is to be observed including the participants and the delimitation of the context. As a technique that fits into the notion of *communication analysis* presented in the previous section, Protocol Analysis also requires the design of a coding scheme (Ericsson and Simon, 1993; Tang et al., 2011). In order to improve the qualitative features and retrospective analysis, Suwa et al. (1998) suggested the use of video recording to register participants' interactions during project

activities, which was done in the Exploratory Case Study of this research, providing further insight into the meanings and intentions of the stakeholders' interactions.

Previous research suggested that representative models of the situation to be studied can be utilised as ontology (i.e. conceptual framework), helping to understand the process to design and feed the coding scheme (Tang et al., 2011). However, a socio-constructive perspective on early project interactions means that the ontology that would give rise to a coding scheme cannot be fully prescribed. In fact, a socio-constructive account of project activity provides a framework to help the discussion upon reflective models to emerge within the situation, in which both researcher and team could potentially reflect upon their actions in transiting between frames (i.e. *appreciative systems*) and supporting shared experiences (Valkenburg and Dorst, 1998). Further discussion on these implications is presented in Chapter 5.

Therefore, considering the setting of the Exploratory Case Study, the communication analysis technique selected was *Protocol Analysis*, in which project stakeholders' communicative interactions during the Design Charrette Event, including verbal and graphical means, were audio and video recorded for further analysis. Such analysis took into consideration previous research discussing the resolution of misunderstandings at early project situation, as a conceptual framework (see section 2.3.4), but the coding scheme for this specific analysis emerged from the detailed consideration of the dynamics of meanings (i.e. design topics and intentions – see section 4.2 and Appendix 3) articulated in the event. The coding activity involved the examination of each segment of the communication protocol to determine whether it contained an explicit reference to these aspects related to the construction of early project collaboration. Thus, the analysis of the transcripts of these conversations also helped to refine the coding scheme and terminology in the construction of conceptual framework (theoretical proposition – explanatory principle). Further detail of this analysis and construction of the coding scheme are presented in section 4.2.

### 3.5.1.2. In-Depth Case Study: Conversation Analysis

In the In-Depth Case Study, the *Communication Analysis* technique adopted was closer related to what is called *Conversation Analysis* (Stumpf, 2001), which aims at analysing and describing the specific procedures that underlie interactions for sense-making among a collection of participants (Stumpf, 2001). In this situation, verbal, physical (e.g. gestures) and graphical interactions among the participants are assumed to be highly organised and a deliberate achievement (Stumpf, 2001). Hence, observations in action and access to internal documents

(i.e. brief, images, design representations) can support an in-depth understanding of people's interactions for the construction of shared meanings.

In the In-depth Case Study, the researcher analysed the communicative interactions (e.g. storytelling, expressions and drawings) of the project stakeholders during the interviews, which focused on the retrospective protocol of the participants' impressions on their interactions at Early Project activities.

The data obtained from the semi-structured interviews was audio recorded and then digitally transcribed to a Word file. This then became subject to *Communication Analysis*, based on the coding scheme, discerning key themes and the respective types of discourse depicting evidences of the social construction of collaboration.

Therefore, before starting the in-depth case study, the researcher conceived a preliminary template, as a set of codes linked to the constructs (see Table 9) established by the synthesis of literature in the shape of a theoretical framework, and also based on previous experiences (for example, the coding scheme of the in-depth case study was also based on the results of the exploratory study). These codes can also be related to the specific research questions at each instance of the research activity (as is presented in the initial part of sections 4.2. and 4.3). The stakeholders' impressions, identified in the interview transcripts, were then matched to the relevant codes from the theoretical framework, or led to the creation of new codes, representing the set of constructs related to the social construction of collaboration in the early project stages in construction.

It is important to state that, since it would be impossible for the researcher to predict how participants would objectivate the main constructs in the different instances of the project situation, the choice was made to produce the matching between raw data (i.e. interview transcripts) and the coding schemes manually, instead of automated options, using software (e.g. Nvivo). In this case, phrases, paragraphs, drawings and gestures were considered units to be coded. The analysis was not straightforward, and it involved cycles of interpretation and reinterpretation of the content in order to guarantee a coherent match. This allowed the researcher to produce a more comprehensive and detailed identification of the embedded meanings in the stakeholders' retrospective account of their interactions. As the researcher conducted both the interviews and qualitative data analysis of the transcripts, it allowed the researcher to more precisely recollect the subjective semantics of the data.

Further description of these constructs and codes is presented at the beginning of section 4.3.

### 3.5.1.3. Storytelling

In each case study, participants' dialogues in the project activity, as well as their responses to the interview questions, were used to construct a narrative answering the research questions, mainly describing how collaboration was constructed in each situation. By referring to individuals' discourse (e.g. produced verbally and graphically) and their recollection about their interactions in the situation, the researcher was able to construct a 'story' about each case (Eisenhardt, 1991).

In the exploratory case study, the story focused on describing the events (as emergent events), in which misunderstandings and contradictions occurred. Then, especially in the in-depth case study, the story described all the events mentioned by the interviewees as an account of their interactions on the activity, as well as the events registered in the documentation made available to the researcher (which indicate more than one source of evidence).

This particular story indicated how the key aspects of collaboration, seen as social constructs, indicated in the theoretical framework (see Appendix 4) as *Objects of Activity* (*Interdependency; Performance; Resources; Changing Actions*), were constructed throughout the case (the project activity), leading to the social "construction" of collaboration at Early Project Stage.

Tables and Models have been used to describe the themes (i.e. constructs) of collaboration and their dynamic interactions evolving through time, and how they relate with the evidence found in the literature. As these 'stories' give situation-specific accounts for the research questions, validation on how this evidence can be used to test the research propositions is achieved and justified by the *Unique Adequacy requirement of Methods* (described in section 3.6.1).

### 3.5.1.4. Cognitive mapping: *Mapping the Social Construction of Collaboration*

According to Miles and Huberman (1994), cognitive mapping can be used to construct descriptions of concepts held by individuals in a particular set. A cognitive map can be drawn from the set of evidences, obtained from *communication analysis*, to describe the links between individuals' conceptualisations in the situation (Miles and Huberman, 1994). In this case, the sources of evidence to build these maps are the transcripts (i.e. the text) and the documents accessed, and not the subject directly. These maps allow an additional form of interpretation, meaning the researchers' own story and discourse on the case. Hence, they allow the

representation of spatial and temporal features of such conceptualisations, which can be difficult to express in written format (Miles and Huberman, 1994).

In the in-depth case study, cognitive mapping was used to represent how the *social constructs* (i.e. object of activity) of Project Collaboration emerged and were "systemically organised" in each main instance of the project activity (see section 4.3.3), leading to the construction of collaboration in the case. This technique was used to represent the relationship and interdependences between the mediating artefacts and "objects of activity", according to participants' perceptions, obtained from the interviews. Hence, these cognitive maps helped to analyse how the interactions affected the construction of the objects of Activity dynamically, in terms of:

- How they evolved through time (in the Project Activity Stages – formally established);
- How the constructs were objectivated creating interdependency between objects and artefacts;
- How they became "shared" objects among different project participants.

Therefore, the cognitive mapping helped the researcher to show the dynamics involved in participants' interactions to construct collaboration in the project situation.

## 3.6. Evaluation

A sufficiently rigorous research approach can grant the study reliability (Robson, 2002). In an interpretivist research approach, evidence is mostly regarded as based on subjective interpretations of the researcher, thus case studies can be criticised for being inherently biased and, consequently, suffering from lack of rigour (Robson, 2002).

Rigor in an interpretative research should be approached in terms of consistency and integrity (Remenvi et al., 1998), and the adoption of *Unique Adequacy Requirements of Methods* (Rooke and Kagioglou (2007) provided the means to assess the products of this research.

Generalisability is also particularly important in case studies, because it is concerned with the applicability of theories developed in a specific setting to other situations (Robson, 2002). Section 3.6.2 presents how generalisability is addressed on this research.

### 3.6.1. Unique Adequacy Requirement of Methods

The evaluation of the results of this research followed the Unique Adequacy (UA) requirement of methods as suggested by Rooke and Kagioglou (2007). The UA is derived from sociological disciplines, and addresses the problem of evaluating products of research, without considering

positivist standards (i.e. objectivity) (Rooke and Kagioglou, 2007). Schutz (1962) originally proposed to address this problem through three postulates: *logical consistency, subjective interpretation* and *adequacy*.

*Logical consistency* involves clarity of definition and compatibility with the rules of formal logic, giving the model its objective validity (Rooke and Kagioglou, 2007). In this case, objectivity is achieved in practice by reconciling the subjective perceptions of different participants, in what Schutz (1962) calls *inter-subjectivity* (Rooke and Kagioglou, 2007).

*Subjective interpretation* focuses on the models that individual minds construct and the typical contents that can be attributed to it in order to explain the evidence as the result of such conscious activity (Schutz, 1962).

*Adequacy* means that any act referred to in a theoretical model has to be understandable by the actor, and by those observing the act, in the same way (Rooke and Kagioglou, 2007). In this case, description of activities (i.e. objects of study) can be seen, simultaneously, as inter-subjective and objective constructs produced by common-sense understanding (Rooke and Kagioglou, 2007).

The UA requirement of methods is based on the *adequacy* postulate, and it indirectly helps to address the evaluation of *logical consistency* and *subjective interpretation*. It consists of two related criteria: the *weak* and *strong* form (Rooke and Kagioglou, 2007).

The *Weak* form requires that adequacy is achieved by the fact that the researcher knows (or is at least aware of) what any research subject would ordinarily do in that situation (Rooke and Kagioglou, 2007). It is a matter of own judgement, and the researcher's competence in performing relevant activities within the situation of inquiry (Rooke and Kagioglou, 2007). The *weak* form of UA was achieved by the researcher's previous experience as an Architect working on early project situations. This experience (i.e. activity under study) was used to guide the design of the interview questions, as well as the analysis of the team conversation and project documents (e.g. concept design, project brief, etc.).

In its *Strong* form, UA requirements concern the reporting technique applied in the research (Rooke and Kagioglou, 2007). The UA requires that the methods of analysis used to report on a situation (e.g. themes and codes used in the *communication analysis*) are derived from that situation (Rooke and Kagioglou, 2007). Thus, descriptions (e.g. models) of a specific situation

should be a matter of seeing how participants in the situation construct meanings in the situation (e.g. the project activity) (Rooke and Kagioglou, 2007).

In the case studies, the *Strong* form of UA is addressed by the use of illustrative quotations from project participants, referring to their particular interpretative activities towards mutual intelligibility, as evidence. This is presented in Chapter 4, as well as Appendices 3 and 4, and is addressed through the storytelling approach, using participants' conversations fragments to corroborate the researcher's interpretations.

By allowing research subjects to speak for themselves in the context of their practice, researchers are able to capture not just the level of commitment of the participants in the task, but also the reasons behind their actions and the practical outcomes of the task (Rooke and Kagioglou, 2007). In the end, what is captured is not just an indicator, but an insight within the activity in which project members understand and construct the setting in which they work (Rooke and Kagioglou, 2007).

## 3.6.2. Generalisability

There is criticism in terms of generalisability of case studies, in which the focus on a single or a small number of cases can be an indication that generalisation is not possible or justified (Meyer, 1977). However, generalisation in case studies should be achieved by means of the potential utility of the proposed (new) understanding as an analytical tool, functioning as the basis on which similar situations can be understood by similar social settings (Remenyi et al., 1998).

By focusing on understanding the dynamics presented within single settings, a case study can be used to provide a description of the phenomenon that can support the test and generation of better theories (Eisenhardt, 1989; Silverman, 1998). Hence, an important criterion for interpreting the research findings of a case study is the identification and addressment of rival explanations for these findings (Yin, 2014).

In order to allow such comparison, the case study and unit of analysis should be similar to those previously studied by others, or it should innovate in clear and operationally defined ways (Yin, 2014). Theoretical formulations support analytic generalisation, as a way of generalising the results from empirical studies, by eventually corroborating, modifying, rejecting or advancing existing theoretical concepts, or by generating new concepts (Yin, 2014).

Analytical generalisation was addressed by comparing the proposed theoretical framework with existing models describing early project collaboration (see section 5). Such analysis starts by discussing the limitations of existing models of collaboration (see section 5.2), and develops towards a better way of interpreting early project collaboration as a dialectical and situated interaction (see sections 5.3, 5.4, 5.5). The analysis is concluded with a proposition of how this theoretical framework could be potentially used as a collective reflective tool in practice (see section 5.6).

## 3.7. Ethical Issues and Data Protection

The research presented in this thesis was approved by the Research Ethics Committee of the School of Art, Design and Architecture of the University of Huddersfield.

The confidentiality of the companies and the individual participants was respected. The interviewees and participants of the design meeting are referred in the report by codenames to preserve their identity. In both case studies, in order to anonymise the participants and the companies studied, their real names were substituted by their professional role and a respective number when necessary. Moreover, all information presented as output of this research is used anonymously.

It is important to state that all the content recorded from the interviews and design meeting events, as well as any graphical artefact and other documents analysed, will only be used for the purpose of this research. All data will remain safely stored in the University Repository.

## 3.8. Summary

In this chapter, the method adopted in this research was presented, including the description and justification for the research approach, as well as its alignment with the interpretivist research philosophy. The logic of inquiry presented described the construction of the research activity linking the set of research questions with the respective research techniques and procedures to gather evidence from theoretical and empirical sources. The activities involved in analysing such evidence were thoroughly described in the last part of this chapter, as well as the procedures to evaluate the validity, reliability and generalisability of the research output.

# 4. Case Studies

## 4.1. Introduction

This chapter presents the two case studies conducted in this research. The exploratory and in-depth case studies are presented as narratives describing the *situation*, *events* and *interactions* linked to the type of evidence (i.e. social constructs, see Table 9) being gathered. Overall, such narratives describe the researcher's interpretation in analysing the qualitative data obtained from direct observations, documentary evidence and semi-structured interviews.

## 4.2. Exploratory Case Study

As part of the exploratory stage of this research, the Exploratory Case Study started from the assumption that Early Project Collaboration can be considered the activity of designing together, and it was designed to address the following research questions:

> *Q3: How and why do misunderstandings emerge at early project stage in construction?*

> *Q4: How do these misunderstandings tend to be resolved?*

The case selected for this exploratory study was a Design Team activity, a Design Charrette event, in which participants had to work on the Schematic Design (i.e. Concept Design) of a MOB in Alaska, USA. A further description of this case study was presented at section 3.3.2.1.

### 4.2.1. Situation: The Design Charrette

A Design Charrette activity is assumed to be an organisational context at the Early Stage of a Construction Project that enables collaboration to emerge (Dougherty, 1992). As a specific project activity, this Design Charrette was conceived to allow participants to meet in a face-to-face interaction and present, discuss and negotiate their potential contribution in the design of the building envelope of the MOB project.

The participants engaged in this Design Charrette included five architects: AL1, AL2, A3, A4, A5, and one Graphic Designer: GD. In this case, throughout the transcriptions of the session, 'AL' stands for Architect Leader, 'A' for Architect, and 'GD' for Graphic Designer.

In analytical terms, this Design Charrette activity can be divided into three different modes of interactions: *briefing, exploration* and *presentation*. In each of these modes, certain events were identified describing participants' interactions towards mutual intelligibility, while considering the emergence and resolution of misunderstandings among them. Thus, each of these events

were then interpreted in terms of the four key constructs of mutual intelligibility (section 2.4.4 and section 3.5.1, Table 9, p. 138):

- *Objectivations*
- *Misunderstandings*
- *Breakdowns*
- *Metaphors*

### 4.2.1.1. The *Briefing*

The initial part of the activity was focused on presenting the project situation, naming the *briefing mode*. This *briefing* started with AL1 presenting the current state of design development based on the result from previous charrettes. AL1 then described the conversations that she and AL2 had with the client and other stakeholders in the previous Design Charrette, as well as how these individuals supported the work they (AL1 and AL2) did in developing the site analysis and initial design decisions (Figure 25). This part of the activity can be seen as a distinct 'mode' of interaction; this is because it involved a unilateral verbal and graphic presentation, in which objectivations elaborated by AL1 and AL2 regarding the project were put forward to the group, but almost no questions emerged at the time. In this case, it is possible to suggest that these objectivations, as the presentation of previously addressed topics, became assumed as 'known facts' about the project activity – in other words, they became *institutionalised objects*.



**Figure 25: Briefing**

### 4.2.1.2. The *Exploration*

After this initial *briefing* and during the major part of the Design Charrette activity, which took about 35 minutes, the focus of the participants was to work on individual design alternatives for the building envelope. In this *exploration mode*, the participants were split into two groups

(Group A and B) to explore possible design ideas about a set of suggested *design topics* (Figure 26) presented during the *briefing*. Thus, throughout this period, participants' conversations tended to be around these design topics. In this case, the proposed design topics could be seen as objectivations of aspects of the building project, which the participants perceived and used to frame their interpretive interactions in the activity.

The storytelling and protocol analysis (see Appendix 3) present only the transcription and analysis of Group A interactions. The decision to focus on the description of the interactions involving only Group A during the *exploration mode* was based on the fact that this was the group in which AL1, as the main lead architect, was involved, and because this group had experienced situations of misunderstanding throughout this mode of interaction.



**Figure 26: Exploration – Group A**

### 4.2.1.3. The *Presentation*

Towards the end of the Design Charrette activity, the participants were engaged in exposing and discussing the alternatives explored by each participant. At this *presentation mode*, each participant presented verbally to the whole group their conceptions related to the overall building envelope using the sketches they had produced, which they had pinned on the wall (Figure 27).



**Figure 27: Presentation**

## 4.2.2. Storytelling + Communication Analysis

The storytelling and communication analysis of the participants' interactions in the activity related to events towards the constructs of mutual intelligibility, with reference to transcriptions and images of the Exploratory Case, as presented in Appendix 3 (pp. 235-272).

## 4.2.3. Discussion

### 4.2.3.1. Summary of the Design Charrette Activity

The complete *storytelling* and *conversation analysis* (presented in Appendix 3) provided an interpretation of the project participants' interactions in the Design Charrette activity. Following the initial coding scheme (Table 9), participants' interactions were identified and analysed according to the proposed constructs of mutual intelligibility established in the synthesis of the literature, which are: *objectivation, misunderstandings, breakdowns,* and *metaphors.* Each of these interactions were interpreted and framed as distinct events, in which project participants were engaged to achieve mutual intelligibility around objects that were brought and/or emerged into this Design Charrette activity.

The *diagram* below (Figure 28) works as a Cognitive Map, showing how each of these events were mapped according to the proposed key constructs of mutual intelligibility. The numbers show the sequence of events, and the colour scheme is used to relate the events to the design topics addressed, as part of the overall object of the Design Charrette activity (i.e. Team's Design Object).
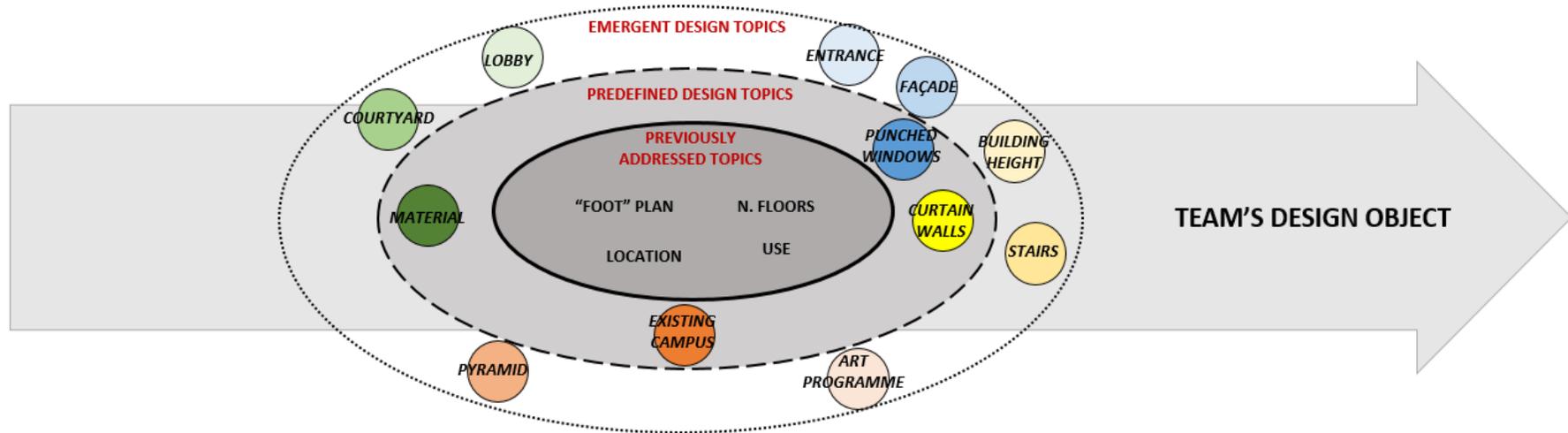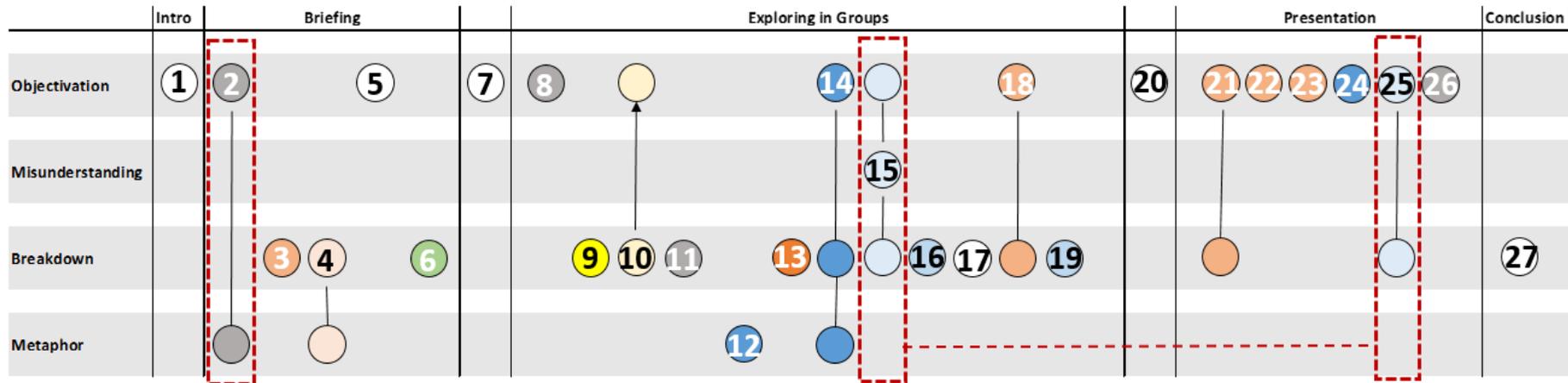
**Figure 28: Cognitive Map of events towards Mutual Intelligibility at Design Charrette**

This cognitive map highlights three main events, namely 2, 15 and 25, which indicate how a misunderstanding emerged between AL1's and A4's divergent interpretations about the *Building Entrance*, and how they resolved the situation.

In the event n. 2, AL1 kick-started the design charrette activity by presenting the *Brief*, as a document, showing and referencing the current "Foot Plan" as a design representation of the current state of the building project activity. She also commented on the selected *Design Topics*, which were summarised in four keywords: *Existing Campus, Punched Window, Curtain Wall + Glazing* and *Materials* (Figure 26). At the time, no one questioned the selection and the nature of those objectivations and how they were embodied into the artefacts (e.g. design representation and design concepts). Therefore, it can be argued that mutual intelligibility around the current state of the design task was initially assumed based on the result of this interaction. More specifically, AL1 and AL2 seem to have assumed that everyone had a shared understanding of what the design representations and images meant for the group. Such assumption was also made about the meaning of the words used to describe the selected *Design Topics*. Hence, as the *Brief* presented to the group was conceived by AL1 and AL2, after their involvement in the previous design charrette activity, it is possible to argue that their *appreciative systems* gave origin to certain assumptions on how and what the other participants should interpret about the current state of the project situation.

However, later on, during the exploration mode, there was a moment (i.e. Event 15, see Appendix 3, p. 246) when A4 indicated that she had a different interpretation about those initial design representations (e.g. Foot Plan + Perspective). This was then revealed to be a conflict of understanding between her interpretation and AL1's interpretation of the *building entrance*.

This sequence of events showed that the initial assumption, that everybody was interpreting the representations similarly, was proved wrong. In this case, the misunderstanding may have been caused by A4's lack of understanding of the representation or her inattention to some aspects of the representation. However, after this revelation, A4 and AL1 continued working on their individual conceptions of the Emergent Design Topic: *Building Entrance*. Later on in the task, during the presentation mode, this misunderstanding was exposed again, but in more depth and involving the whole group (Event 25, see Appendix 3, p. 259). This interaction supported the breakdown of the individuals' assumptions about the *building entrance*. At this event, the participants engaged in a set of questioning and explanatory interactions to

collectively understand the reasons behind these diverse interpretations, and the nature of the assumptions embedded in their individual perspectives.

Similarly, referring to how participants interacted in the two previous design charrettes, AL2 suggested that interactions between different disciplines usually involved such a breakdown of individuals' assumptions (AL2's answer to the researcher's questions at the end of the activity):

> *"We actually had a contractor and the mechanical subcontractor… so we had the actual people who is gonna build it… and then someone would say 'well this what I would like' and then somebody else would say 'well, have you thought about this?' So there was a lot of different takes between all the people that is designing and building it... and all the systems and exteriors… and the owner, who is gonna pay for it."*

In another moment (Event 18), during the *exploration* mode of activity, AL1, A4 and GD started a playful conversation about the idea of a "pyramid", which was suggested by the client as a reference to the pyramids in the existing buildings in the campus. In this interaction, they expressed how, in their view, it would not fit to the current concept of the proposed building envelope design. Through this breakdown, GD suggested the idea of putting a pyramid as a sculpture in the courtyard. However, up until that moment, the idea of a pyramid was still a loose concept in the project and the discussion of individuals' views of the purpose of the pyramid had not been explored. Thus, GD tried to achieve mutual intelligibility about this Emergent Design Topic (i.e. the *Pyramid*) by questioning and then discussing her conception of a *Sculptural Element* with AL1. The conversation was developed and led to the collective evaluation of GD's conception of how a *Sculpture* as the proposed objectification of the Emergent Design Topic *Pyramid* could be implemented. Interestingly, in this case, in addition to the use of graphical representations, GD also uses gestures to describe her conception and to support mutual intelligibility (Figure 57 and Figure 58, in Appendix 3).

The use of a metaphors to bridge an understanding and achieve mutual intelligibility on design topics was noticed a few times during the Design Charrette Activity (Events 2, 12 and 14, in Appendix 3). The most significant 'metaphor' event took place at the end of the *briefing* (Event 2), when AL1 tried to explain her perspective about how they should approach the main objective of the session: to design the exterior of the MOB. In her concluding argument, she used the combination of two metaphors within a comparison: the *cousin* vs. the *twin* building. This would make it clear that the new MOB should fit into the context of campus, but at the same time it should not look exactly the same as the existing buildings. By using these

metaphors, AL1 expected to summarise the whole argument presented earlier as the Brief for the Design Charrette activity.

## 4.2.3.2. Key issues regarding the organisation of Design Charrette Activity

The individuals invited by AL1 and AL2 to participate in this Design Charrette activity were not involved in the conception of the structure of the activity. The Architect Leaders established the way in which the activity should be conducted, and controlled the session in a way that supported this plan. This seemed to have influenced the behaviour of the other participants who, on some occasions, relied on AL1 and AL2's impressions (i.e. interpretations) of the situation. Interestingly, most of the *breakdowns* interactions seem to emerge in relation to these previously defined aspects of the design proposal. Consequently, design decisions made in the previous Design Charrettes (1 and 2) were not under revision and became a 'known fact' in the project, even if they became incompatible and in contradiction with new propositions.

Another issue identified in this case was that, by the end of the Design Charrette activity, the participants didn't take the opportunity to discuss within the context of the group the potential performance of the alternatives presented. Basically, each participant presented their own idea, as an alternative for the building envelope (or even just the façade scheme) to the group, and explained the rationale behind that idea. However, there was little discussion across the whole set of the ideas presented. One could say that the interactions during the presentation of these ideas were superficial, in a sense that there was little reflection on the overall performance of each idea, for example checking for interdependency with other systems and the performance of the expected situation, or even doing a comparison between them. It could be said that this would be crucial, considering that these interactions would improve the support regarding decisions being made and allowing the Architect Leaders to keep moving and evolving the project.

One possible reason for the lack of collective reflection on the interdependency and combination of design proposals may be due to the fact that participants who were invited to contribute to this activity by the Architect leaders would not necessarily be engaged in future stages of the project. Consequently, it seems that they were not concerned with potential interdependencies and consequences of their proposition in relation to the other disciplines in the project. In other words, it was not part of their brief to consider how their proposed actions would affect the actions (proposals) of other participants (i.e. engineers and contractor) in the task.

In addition, the observed behaviour at the end of the task suggested that one of the Architect Leaders (AL2) would become responsible for "synthesising" a proposal, based on his (maybe supported by AL1, but this was not clear) interpretation of the ideas presented. As was mentioned in the comments post session, a similar procedure was adopted after the first and second Design Charrette Activity. Such synthesis become subject to AL2's own appreciative system, which might "filter" aspects of the collective reflection engaged in the activity.

## 4.2.3.3. Key Findings and Proposition: *The Dynamics of Mutual Intelligibility*

This study showed that misunderstandings can be considered a natural emergent feature of early project collaboration. In this case, the emergence of diverse understandings in a project activity is not what hampers collaboration, but rather it becomes problematic when they are not perceived, revealed and resolved, which can lead to a situation where project participants hold wrong assumptions and expectations among their interactions.

Misunderstandings seem to happen when participants hold wrong assumptions emerging from their perceptual interactions with the other players. These misunderstandings eventually become exposed through dialogue and also from their interactions with the artefacts in the situation. Diverse understandings in a project activity emerge and are manifested through the artefacts that participants create and choose to embody their objectivations (i.e. interpretations) in the task.

In most of these occasions, participants seem to objectivate the situation based on assumptions about a topic or the way that others historically interpreted that topic in the situation. When these diverse understandings are revealed and exposed in time, it can lead to opportunities to explore and expand different ways to perceive the situation, as well as ways to conceive different design alternatives, benefiting the collection of participants in the task.

In order to resolve these conflicts of understanding and try to reach mutual intelligibility, the project participants, who perceived the conflicts as contradictions, engage in interactions to review and reposition their interpretation. The case study showed that this involved breakdown interactions, with explanatory and causal reasoning linked to questioning behaviours among them. Since individuals' interpretive interactions leading to diverse understandings are affected by the way they frame the situation, according to their *appreciative systems*, to expose different perceptions in the project activity requires participants to engage in collective explanatory interactions (e.g. asking and describing). Such collective reflective practice can help them

break down assumptions (that might be proven to be wrong), especially about other participants' work contributions.

Moreover, the study showed that the dynamics of mutual intelligibility involved in the resolution of misunderstandings in early project activity require the breaking down of assumptions, and need to bridge understandings across different individuals, with different appreciative systems. One way of doing this is through the use of metaphors. In this case, project participants use metaphors as explanatory interactions, constructing new "explanatory artefacts" that help them bridge different frames of understanding (i.e. *appreciative systems*), and collectively establish predictions about future states, in order to collaborate in the project activity.

In this exploratory case study, individuals' interactions seem to have involved **dynamic iterations of (1) *objectivations* (2) *misunderstandings* (3) *breakdown* (4) *metaphors*** to build mutual intelligibility among the participants (Figure 29). In such iteration, project participants use verbal, written and graphical artefacts to explore, break down and expand their collective understanding about the object of activity (e.g. the Building Project), supporting collaboration in the task.
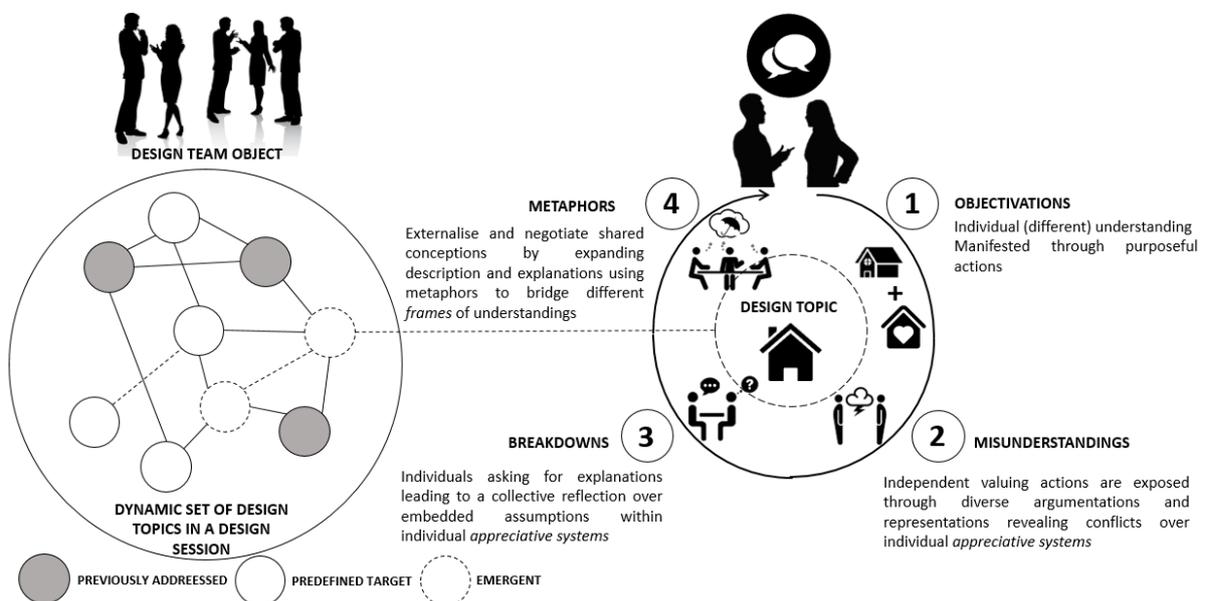


**Figure 29: Dynamics of Mutual Intelligibility at Early Project interactions**

Therefore, early project collaboration seems to require that participants perceive and embrace the dialectical nature of mutual intelligibility, and to work upon misunderstandings emerging from different perceptions founded on individual appreciative systems. The study showed that

misunderstandings become manifested through diverse artefacts of interaction (i.e. verbal argument, graphical representations, organisational processes), and the dialectical nature of interactions to reach mutual intelligibility in the early project collaboration can potentially review, reposition and re-construct their collective interpretations, and the overall activity.

In this case, the proposed model of dynamics of mutual intelligibility (Figure 29) could be used as a framework to investigate how early project collaboration is constructed in a broader sense. In this case, this framework could be used to identify how project teams map and reflect on their interactions at the early project stage. By focusing on mapping the dynamic set of objects of activity, it would be possible to expose diverse interpretations over these objects, and identify how collaboration is socially constructed, especially at the early stages of a construction project activity. Such inquiry is presented in the following section, as the In-depth Case Study.

# 4.3. In-depth Case Study

As part of the explanatory stage of this research, and following the answers obtained in the exploratory case study, the In-depth Case Study was designed to address the main research question:

> *Q5: How is Early Project Collaboration constructed?*

This study started from the assumption that Early Project Collaboration can be interpreted as a socially constructed and dialectical activity. Thus, the inquiry concentrated on identifying how the key constructs of collaboration (Table 9), named in this thesis as *auxiliary objects* in the project activity (section 2.4.4 and Figure 17, p. 112), were socially constructed by the stakeholders' interactions, in terms of further objectivations, as *situational objects*, at different instances of the project activity. This inquiry also considered the embodiment of these objects into *mediating artefacts, events, assembles and approaches* in the activity.

## 4.3.1. Situation: instances of The Building Project Activity

The early stages of this construction project activity were differentiated in terms of different *instances* of the Building Project activity. This differentiation regards different purposeful activities within the chain of the main activity. It can be explained by the fact that, as the main purpose of any project activity is to produce change in a specific situation, the objects of interactions throughout the activity can assume distinct instances, as stakeholders advance towards realising that change (Figure 30).

Thus, in this study, the project activity was initially objectivated as the *business case*. It was then instantiated towards *setting the building project template*, which involved the procurement and team assembling tasks. Following that, the project activity was instantiated as the *design* and *realisation* of a building.

These instances were considered in this In-depth Case Study regardless of their duration in time, since the time frame of them can potentially vary from one project to another. A complete description of the instances of this building project activity are presented in the next section.
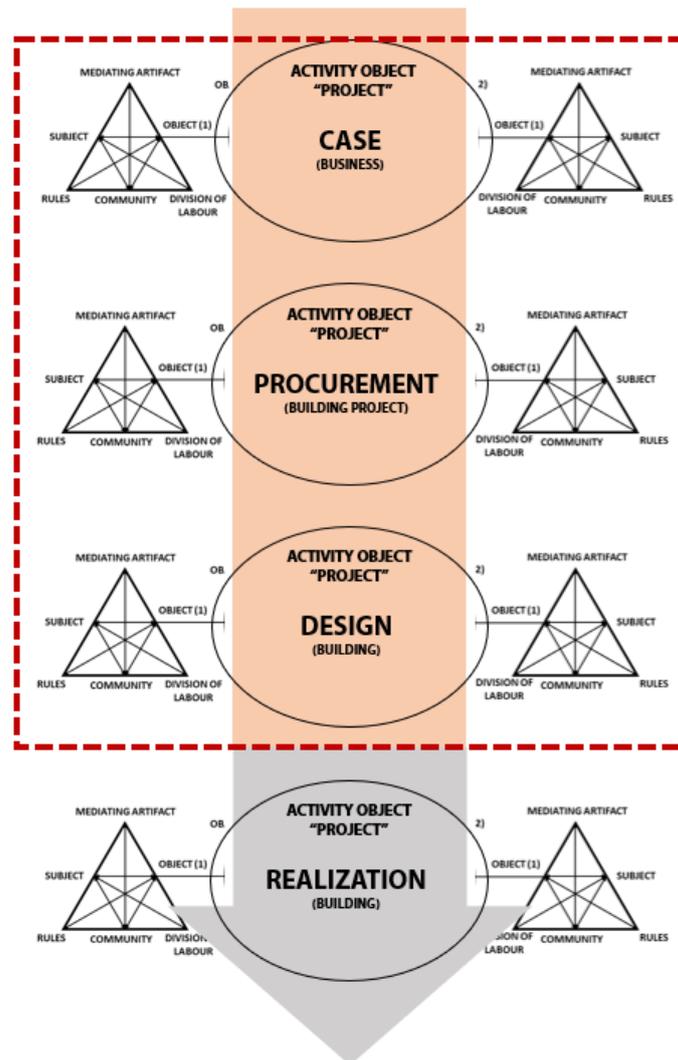
**Figure 30: Different instances of the Building Project Activity**

### 4.3.1.1. Business Case

The first instance can be interpreted as the setting out of the Building Project Activity. At this point, it was important to understand how the Building Project Activity emerged within the University institutional activity. In this case, *the University* can be considered as an *institution* of professional education. An *institution* means that a university is a large and important organisation, as well as being a long-lasting and habitualised objectivation of a practice, seen as a custom or tradition, existing for a long time and accepted as an important part of a particular society (see section 2.4.1.3). Thus, in order to accomplish the purpose of providing professional education, a collection of individuals institutionalised their purposeful interactions throughout the socially and historical construction of the University, as an organisation.

These interactions were then conceptually objectivated in a set of operational projects that have been designed and redesigned by certain individuals playing specific roles within the institutionalised activity of the University. These roles can be seen as way to embody the institutional object, which relates to the objectivation of a set of specific skills (related to some expected performance) and purposes within the larger institutional system. The set of operational projects are then related to different branches existing within the institutional structure of the University in terms of *schools and departments*. One of these branches is the **School of X,Y and Z,**[10] the educational purpose of which is specifically related to supporting professional education in **X, Y and Z.**

The main purpose of a *School Operational Project* is to steer a set of educational activities. Efficiency and development in accomplishing the overall purpose of these activities (i.e. professional education) is dependent on the capacity of individual stakeholders (e.g. management team, supportive staff, academics and students) to design and perform their interactions interdependently, making use of and sharing what it is conceived to be resource in the situations (e.g. time and space). Thus, the *School Operational Project* establishes the professional educational activity as a set of course of actions conducted by individuals seen as interdependent agents in the application of resources.

The *School Operational Project* is under constant reflection and revision. However, not everyone in the organisation is necessarily supposed to engage in such reflection and revision. There are in place many levels of reflection, in which all the individual stakeholders, who are engaged in the institutional activity, can give feedback and purposefully contribute to the construction and reconstruction of the *School Operational project*.

More importantly, the overall University institution is conceived in a way that such reflection and reconfiguration is the responsibility of a few key stakeholders. Thus, individuals holding key institutional roles within the University organisation, with the ability to design course of actions and having the power to apply resources in these actions, must work upon such *School Operation Projects* to align the collection of individuals' purposes within the overall institutional activity. In order to support the construction of this alignment, the institutional activity (i.e. the University) contends that these project activities should involve *assemblies* (i.e. people gather together for a common purpose) that are commonly conceptualised as *teams*

---

[10] The real names of the University, School and project participants (including individuals and companies) were excluded to anonymise their identity (see section 3.7).

or *panels*. Thus, these *assemblies* work as emergent objectivations supporting the perception of interdependency and performance in the *School Operational Projects*. Moreover, these *assemblies* are also responsible for setting the course of actions to achieve the overall purpose of education for the schools.

Within this institutional context, the *Building Project activity* under investigation emerges from one of the *School Operational Project* activities, when one of these assemblies, namely the Senior Management Team (SMT) of the school of X, Y and Z, identified the need to change their operational project. This need for a change triggered the Building Project activity in its *Business Case* instance, in which the SMT started to work upon a case to convince the University's Directive Board of the need and relevance of such change through the construction of a new building.

So, during the *Business Case* instance of the project activity, the changes suggested in the *School Operational Project* were initially conceived, presented and evaluated within the University's institutional activity. However, at this instance, interactions can be interpreted as occurring between two polarities of a dialectical process (Figure 31). On the one hand, the SMT can be seen as a *Conception panel* arguing for the change in the *School Operational Project*, while, on the other, the University's Directors Board can be seen as an *Evaluation Panel*, with the power of decision and application of resource (e.g. money).
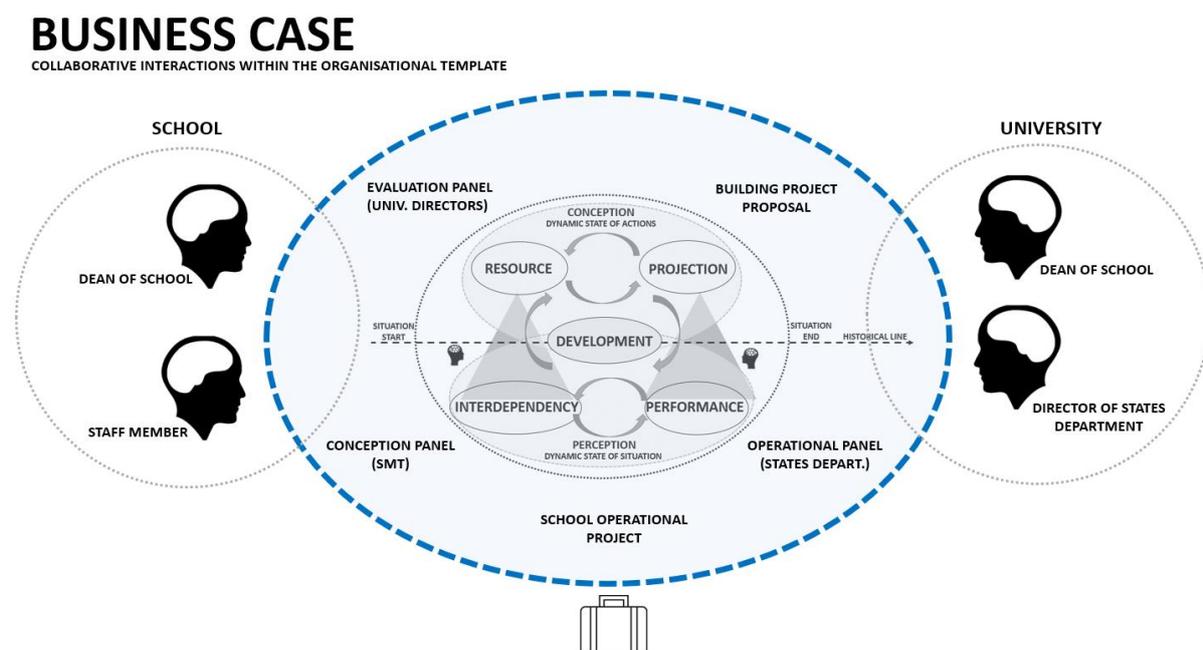


**Figure 31: Business Case instance of the Building Project Activity**

At this point, as the major aspect of the proposed changes in the *School Operational Project* was the construction of a *New School Building*, when there was an approval for that in the *Business Case*, the University put in place a *standard procedure*, as an institutional artefact. This was to designate an *Operational Panel*, led by the Estates Department, to procure the *Building Project*, leading to the next instance of the building project activity.

## 4.3.1.2. Setting the Project Template

This instance of the overall Building Project Activity relates to the assemble of the *Operational Panel,* and the following interactions to set a template for the Building Project activity, including the planning for the following instances: *Building Project Design* and *Building Project Realisation*. Thus, since the University does not have, as one of its institutional activities, the capacity to develop building projects by its own means (i.e. with its own members and their institutional roles), it established an *Operational Panel*, which is in charge of setting a template for building project activity, defining how the University, as *the Client*, can procure this capacity from other individuals and organisations available in the market.

It then became the responsibility of the *Operational Panel* to design the terms and procedures by which the University was going to procure these services externally. More specifically, this instance of the building project activity focused on specifying not only what are the tasks to be executed in the activity, but also the measures by which the University, as the Client, is evaluating the performance of the participants in those tasks.
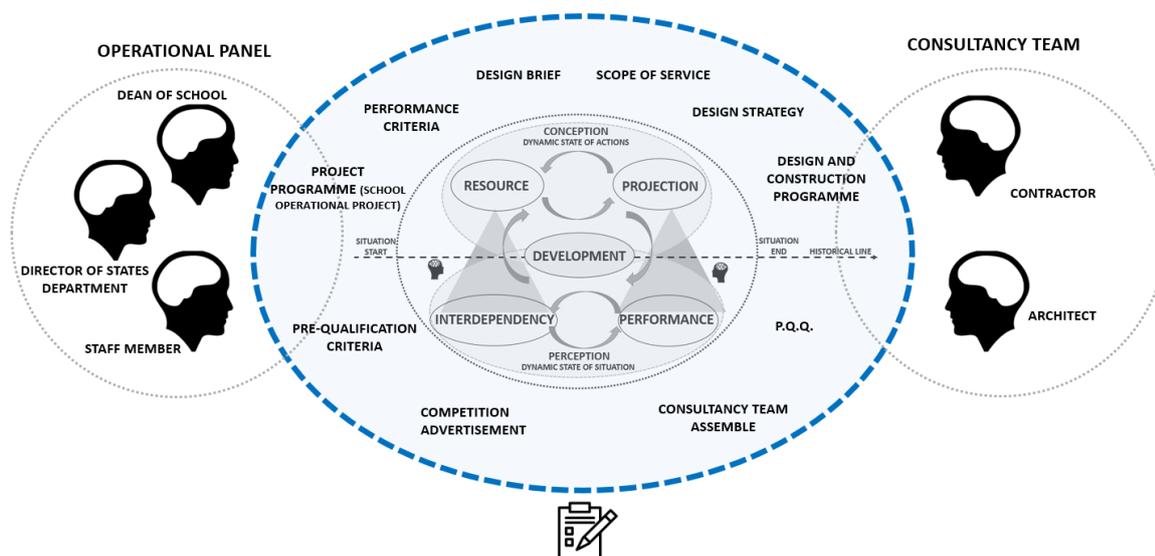


**Figure 32: Setting the Project Template instance of the Building Project Activity**

In parallel to that, individuals and organisations external to the University started to assess their potential participation in the Building Project Activity. In this case, as it was observed in the first instance, project activities can be interpreted as a dialectical process, in which two polar entities interact towards mutual intelligibility (Figure 32).

On one side was the *Operational Panel*, establishing from the perspective of the Client how they would objectivate what they want and expect from the *Building Project Activity,* in what can be called the *Project Template*. On the other side was a set of individuals and organisations that, having had access to these objectivations, as formal requirements to participate in the building project activity, evaluated their ability and capacity to accomplish the task as a *Team* (i.e. the Consultancy Teams), while taking into consideration the potential benefits of getting involved in the activity.

### 4.3.1.3. Building Project Design

After setting the project template, the purpose of the activity then moves to the *Design of the Building Project*. At this point, the Project Template was already set as a *Competitive Dialogue* process (see section 3.3.2.2), the *Competition Advertisement* had finished and some of the Consultancy Teams, seen as *competitors*, that applied were selected to participate in the Building Project Activity.

The *Building Project Design* instance actually involved two stages of the *Project Programme*, within the Project Template designed and controlled by the Operational Panel.

In the first stage (Stage 1), there were initially five competitors (i.e. Consultancy Teams) that were expected to present *Initial Design* proposals for the Evaluation Panel. At the end of this stage, the Evaluation Panel should have selected the three better proposals to move forward to Stage 2, at which the proposals should reach a further level of development (i.e. Design Development Stage 3 RIBA). At this point, the Consultancy Teams presented their Building Design proposals, including their commitment to building cost and construction schedule.

However, at the end of Stage 1, the Client wasn't happy with the current state of the proposals, which led the Operational Panel to review the Project Programme and extend this stage (Stage 1+). During this extension, it was only when two of the competitors dropped out of the competition, and only when one "competitor" remained to conclude this instance of the Building Project activity, that the participants of the Consultancy Team felt more confident in

investing more effort and resources to reach a sufficient level of acceptance by the Client's team.
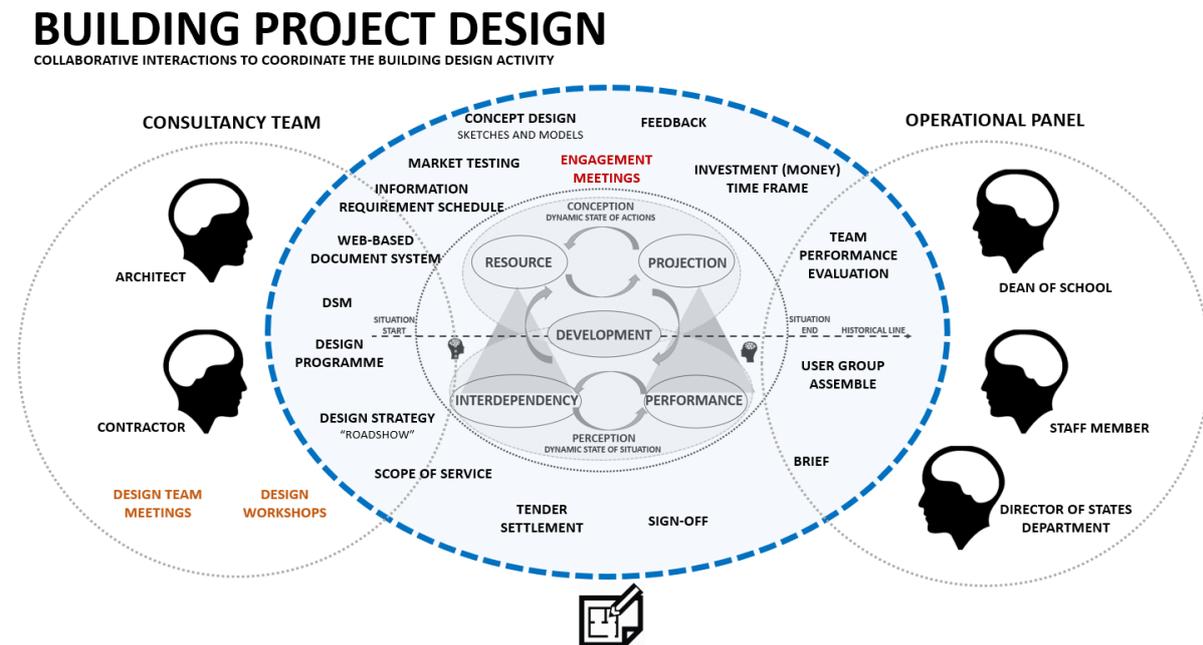


**Figure 33: Building Project Design instance of the Building Project Activity**

After that, the researcher was allowed to start his investigation of the participants' interactions in the Building Project activity. Therefore, the following analysis focuses on the participants' retrospective reflections, when there was only one 'competitor' on the run to win and be selected to participate on the *Building Project Realisation*.

Therefore, the two initial stages of the established Project Programme were the one considered as the early project stage under analysis in this In-Depth Case Study. At this point, the Building Design proposal was still fresh in the project participants' memory, and a few project decisions were still under consideration. A major step towards the conclusion of this instance was referred as the "signing off" of the Building Design by the *Dean of the School*.

## 4.3.1.4. Building Project Realisation

Following the Building Project Design instance, the Project activity moves to what can be defined as *Building Project Realisation*, where the majority of the building features have already been conceived, in a way that they were seen as 'frozen', and should not be subject to changes. At this instance of the Building Project activity, the Consultancy Team and the Client Team needed to work towards getting *Planning Permission* for the Building Project, as well as to work on the conception of the construction activities to realise the Building Project on time

and on budget. This does not mean that the construction activities were not considered by the time the Consultancy Team was conceiving the Building Project Design, but rather that some decisions and detailing of construction activities were not required (contractually) to be made at that point.

## 4.3.2. Storytelling + Communication Analysis

The *Storytelling + Communication Analysis* of this In-Depth Case Study is presented in Appendix 4 (pp. 273-395). It follows the structure identified in terms of different instances of the Building Project activity just presented (4.3.1). The analysis is based on the transcripts of the interviews and the data gathered treated as documentary evidence: *presentations, drawings (e.g. sketches and construction drawings), protocols, management tools (e.g. spreadsheets)*.

## 4.3.3. Discussion

### 4.3.3.1. Summary of the Building Project activity

By concentrating on the three initial instances of a Building Project activity, the Storytelling and Communication Analysis (see Appendix 4) presented how different aspects (i.e. socio constructs) of collaboration, that can be interpreted as *auxiliary objects* in the project activity, were objectivated by different participants in different ways, becoming *Situational Objects*. Moreover, this inquiry tried to reveal how project participants created and/or used specific *mediating artefacts, events, assembles and approaches* to embody these *auxiliary objects* into *situated objects* of collaboration, supporting their interactions in the Building Project activity.

The study revealed that interactions between the Client and Consultancy Team in the Building Project activity seem to configure a dyad (i.e. dialectics), in which individuals' objectivations seem to build correspondence across both sides of the project activity. Thus, interactions tend to aim at establishing mutual intelligibility between Client and Consultancy Team towards a set of concerted actions (i.e. shared objects of activity) to deliver the Building Project.

This analysis is summarised into three cognitive maps (Figure 34, Figure 35 and Figure 36) corresponding to the three instances of the Building Project activity studied. These cognitive maps are based on the proposed theoretical framework (Figure 17), and they show the links between the *auxiliary objects*, *situational objects*, and their embodiment (e.g. artefacts, events, assembles and approaches), from each side of the dyad of the Building Project activity.

## 4.3.3.2. Business Case

The study demonstrated that, at the *Business Case* instance of the Building Project activity, certain individuals within the institutional operational frame of the University began to engage towards changing the *School Operational Project.* At this instance, a dyadic[11] interaction emerged between **the School** and **the University**, in a way that members of the School engaged with the University's Board of Directors to agree on the proposed changes (Figure 34).

At this point, it was noticed that the key constructs of project collaboration (i.e. *auxiliary objects*) were objectivated as a set of *Projects* and *Assembles* within the University's institutional operation template. From the fragments of the interviews, it is possible to say that these objectivations allowed participants to embody their perceptions and conceptions of what the situation is, what needed to be changed in the situation and how they agreed to do that.

Before the proposition of a Building Project Activity, which was the main focus of this inquiry, there was an activity already in place, known as the *School Operational Project*. The main purpose of the *School Operational Project* was to continuously design and redesign (i.e. steering) the School's educational activities. So, within these cycles of redesign there emerged the need for a "New School building".

It was possible to notice that, in the context of these *School Operational Projects*, the University's Organisational Template operates in terms of what it calls *Panels*, which are assemblies of members with diverse functions in the organisation that become collectively responsible for the project conception, delivery and evaluation. It seems that, embedded in the idea of *Panels,* there was an assumption that these assembles were purposefully engaged in the School Operational Project activity.

In this case study, the steering of the *School Operational Project* as an activity was done by a specific assemble, the SMT, which included key members of the staff from the School. Thus, the expectation was that the activity purposes and means should be objectivated collectively by this team. An important feature of this group of individuals was that the Dean of the School seemed to be the one who assembled the team, deciding who should be involved. Therefore, the socio-construction of a *Perception of Interdependency* among the *SMT members* seemed to be influenced by his decision, and not so much by a voluntary engagement in the situation,

---

[11] Consisting of two parts; relating to the interaction between two people (in Social Science) (Cambridge Dictionary online).

which could hamper how much the members of the panel felt to be interdependent in the activity.

Once the argument for a New School Building was conceived and developed within the realm of the School Operational Project by the SMT (including the Dean), it was then presented to those who have power of decision in the University's Organisation Template – in other words, the University's Board of Directors, which, on this occasion, was objectivated as the *Evaluation Panel* in the Building Project activity. They were seen by the SMT as the potential "*sponsors*" of the New Building Project as, within the University's Organisational Template, the power of decision seems to be directed linked to those who have "control" over the monetary resources of the organisation.

Once the Building Project activity had received approval by the *Evaluation Panel*, the University's Organisational Template put in place the *Operational Panel* that became responsible for setting a *Building Project Template*. The Operational Panel was another assemble led by members of the Estates Department and with the involvement of the Dean of the School. The formation of the Operational Panel can be seen as one of the main outputs of this instance of the Building Project activity. In this case, it could be said that, without the interactions to conceive and approve the case for a New Building Project, there would not be any purpose (i.e. function) to be fulfilled and no need for an Operational Panel to be assembled.

So, considering the interactions described by the key project participants (see Appendix 4), it is possible to say that, at this instance of the Building Project activity, on one side the School's **conceptions of resource** and **changing actions** were embodied into the *School Operational Project*, and their **perceptions of performance** and **interdependency** were embodied by the involvement of the SMT.

In this case, the School Operational Project included interactions to describe and negotiate the School conception of resource, in terms of *Money, Time* and *Space*, which were further objectivated at this point, as *Budget, Programme* and a *New Building Project*, respectively. Hence, the conception of a *New Building Project* was also envisioned as the way project participants' at this stage objectivated their changing action (i.e. the main purpose of the Building Project activity), which was in accordance with their conception of changes to the Educational Project of the School.
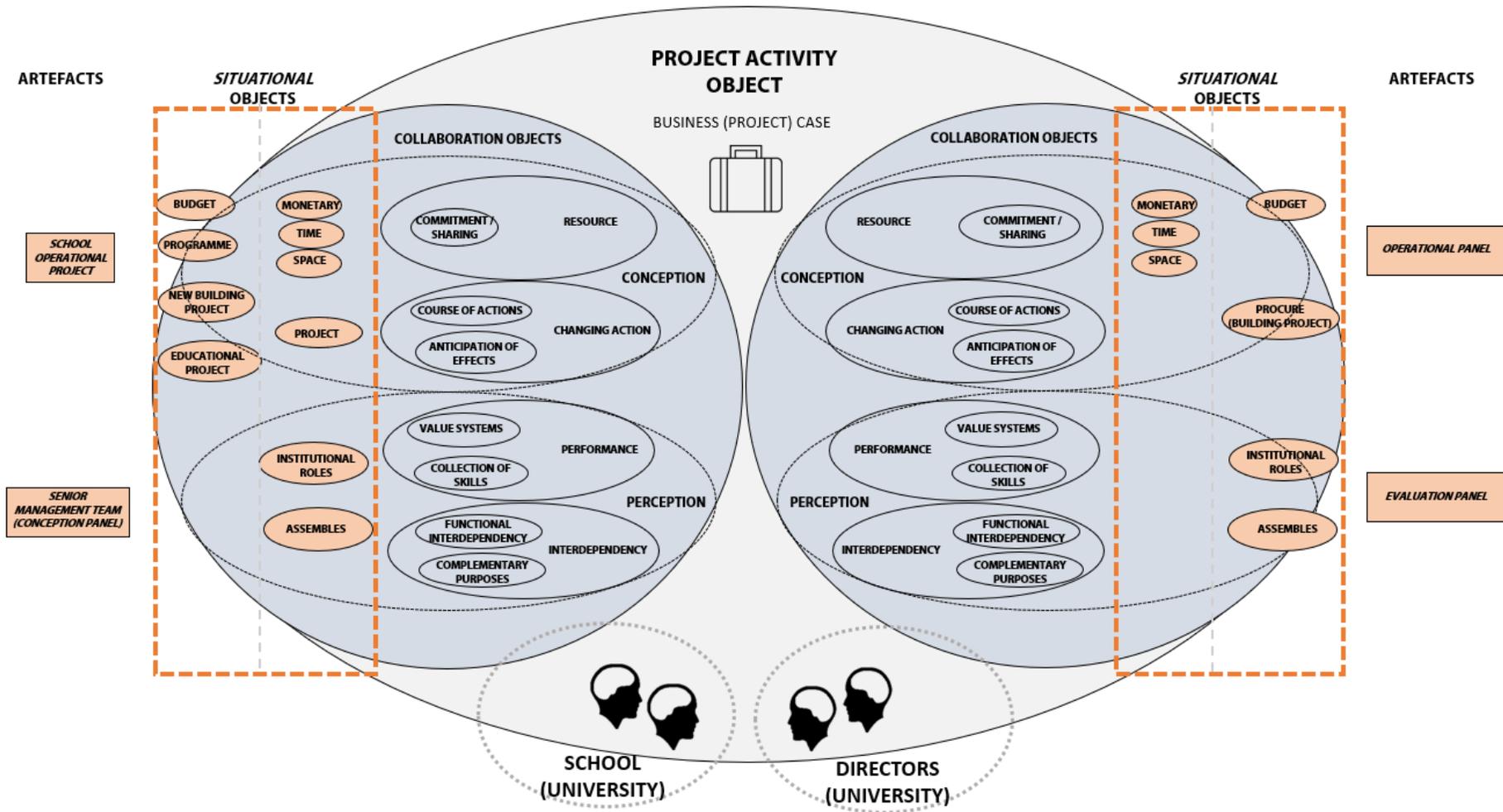
**Figure 34: Cognitive Map 1 – Socio-construction of Business Case**

The presence of SMT, as part of the existing establishment within the University's Organisational Template, supported the construction of the School's **perception of performance and interdependency**, objectivated in this situation, in terms of *institutional roles* and *assembles*, respectively (Figure 34).

On the one hand, the *Evaluation Panel* assembled for this activity involving the Board of Directors was seen as way to embody the perception of performance and interdependency, from the University's side. In this case, the *Evaluation Panel* was also seen to objectivate the **perception of performance** in terms of *institutional roles*, and the **perception of interdependency**, by its nature, a purposeful *assemble* of individuals in the situation. The *Evaluation Panel* also interacted with the SMT to objectivate their conception of resource, in terms of *Money, Time* and *Space* (Figure 34). For example, from the interviews it was possible notice the role of the *Evaluation Panel*, seen as the 'sponsors' of the project, in setting the *Budget*, as a way to objectivate Money as a resource in the Building Project activity.

Moreover, as the 'sponsor' of the Building, and as the 'rulers' of the University's Institutional Operation, the *Evaluation Panel* objectivated their **conception of changing action** as a *Procurement Task*. Thus, it entailed the assemble of another panel, according to the University's Organisational Template, involving members of the Estates Department, which would lead the following instances of the activity as *The Operational Panel*.

These kinds of interactions can be seen as evidence of the dialectical nature of project activities, in which an assemble (i.e. The SMT, as a Conception Panel) became responsible for conceiving the supposed necessary change in the situation, while another assemble (i.e. the *Evaluation Panel*) was responsible for operationalising the change in the situation. In this case, both panels contributed in a mutual 'determination' (i.e. socio-construction) of the change activity.

This seems to be related to the fact that both assembles, operating as activity systems, were able to reach mutual intelligibility in a shared object of activity (i.e. the Building Project as a change) at this point. This means that they were able to socially construct a shared purpose, which was to make the *School Operational Project* more efficient (i.e. developed) by the means of realising (i.e. procuring) a New *Building Project* through the engagement of an emergent *Operational Panel* (which was believed to be able to properly perform the task). Therefore, they were able to agree to move to the next instance of the Building Project activity, which was: *Setting the Building Project Template*.

This investigation into the *Business Case* instance of the Building Project activity was crucial in order to understand the further development of the overall activity. An example of this is the way that certain aspects of the conception of changing action, which were part of the University's Organisational Template (e.g. Operational Panel led by the Estates Department), and seemed to have led to specific contradictions within the Client Team in regards to different ways of interpreting and objectivating the Project Brief in the next instance of the Building Project activity.

#### 4.3.3.2.1.  Dynamics of Mutual Intelligibility

Apparently, no contradictions emerged in the project participants' interactions at this instance, as most of individuals' objectivations came from the University's Organisational Template, as an *Institutional Activity* (2.4.1.3). Thus, these individuals were supposedly familiarised with these type of objects of activity, and misunderstandings were not reported by the stakeholders interviewed.

On one occasion, the Staff Member referred to an extended description on how *space* was a key resource lacking in the current state of the School Operational Project. Such explanation could be seen as a **breakdown interaction**, which led both sides (School and University) to reposition their conception of resource in the activity, and potentially reach mutual intelligibility on that objectivation.

### 4.3.3.3.  Setting the Building Project Template

At this instance of the *Building Project* activity, the dyadic interactions involved on one side the University seen as an activity system (most of the time represented by Operational Panel), while, on the other side, there was a set of different individuals and organisations that could potentially provide the entailed services (i.e. Building Project), which eventually would become the Consultancy Team, as another activity system (Figure 35).

Each of these activity systems were engaged in a dialectical interaction to construct different objects of activity, that seemed to mirror each other and were complementary in the overall Building Project activity. On one side was the University with a *Project Procuring activity*, and, on the other side, the consultants with a *Team Assembling activity*. At this point, it was noticed that even if the key constructs of collaboration (i.e. *auxiliary objects*) were objectivated differently on each side of the overall Building Project activity, they were correspondent and influenced an overall notion of collaboration among the individuals interviewed. In this case,

it was key for individuals on both sides to find mutual intelligibility among their *situational objectivations* (Figure 35).
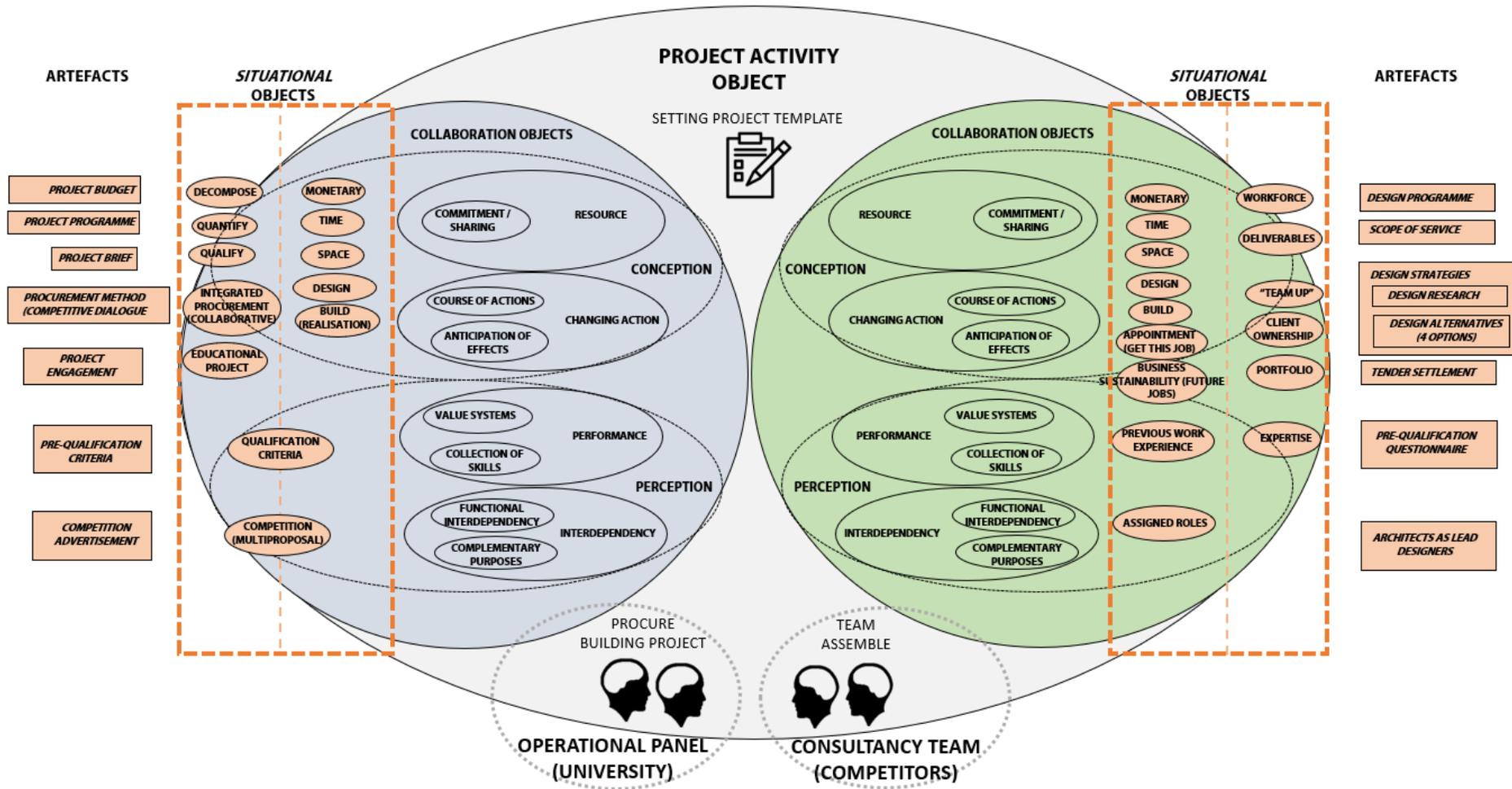
**Figure 35: Cognitive Map 2 – Socio-construction of Setting Building Project Template**

At this instance, the Client's **conception of changing action** was objectivated by the *Operational Panel* in terms of *procuring the design and realisation* (i.e. construction) of a New School Building. In this case, as the Client is a public-funded institution, it wanted to avoid traditional situations where design and realisation of a building differ around cost estimation, usually leading to cost overrun. So, it further objectivated this conception by devising an *integrated procurement method*, in which design and realisation are bounded contractually. Based on their previous experience, the Operational Panel decided to embody this conception into a specific procurement method: *The Competitive Dialogue* (see description in section 3.3.2.2).

The decision of the *Operational Panel* to establish the procurement of design and realisation of the New School Building as a competition seemed to have driven the way that the other key constructs of collaboration (i.e. *resource, performance and interdependency*) were objectivated at this instance on both sides of the Building Project Activity.

For example, the Operational Panel objectivated their **perception of interdependency** in terms of an *engagement template*, which was further objectivated into a *competition scheme* embodied into the Competition Advertisement document, thus setting the template for the interactions (i.e. interdependency) between Client and Consultancy 'Teams'. On the other hand, the Contractor, Architects and other stakeholders also interacted to interpret and reply to this engagement template, and construct their **perception of interdependency** through the *assemble of a team* capable of joining the competition. In order to form a Team, these individuals had to objectivate the interdependency among them, in terms of assigned roles and responsibilities (e.g. Architects as Lead Designers).

In the same way, the Operational Panel objectivated their **perception of performance** in terms of the *qualification criteria*, which was embodied into a Pre-Qualification Criteria document that was attached to the Competition Advertisement. On the other hand, the Contractor, Architects and other stakeholders interacted to interpret and reply to this document, via a Pre-Qualification Questionnaire (PQQ), which objectivated their **perception of performance** in terms of describing their *previous work experience* and providing proof of their *expertise*.

On the Client side, the **conception of resource** started from objectivations made at the Business Case instance (e.g. *Money, Time* and *Space*), which was further objectivated and embodied into the *Project Budget, Project Programme* and *Project Brief*, respectively. At this point, because of the procurement method and template of competition, the objectivations made via the

Business Case had to be transformed into more objective descriptions. Thus, *Money, Time* and *Space* underwent interactions to *decompose, quantify* and *qualify* them into a set of formalised/standardised information to be put forward to the Consultants. These transformations involved interactions within the Client team, which ultimately were determined by the Operational Panel (led by the Estates Department).

Once the Consultants had attended to the competition requirements, as a *pre-qualified team of experts*, they were granted access to interpret the Client's conception of resource through the Project Documents (*Budget, Programme and Brief*). Therefore, this interpretation allowed them to objectivate their own **conception of resource** in correspondence with the Client's, in terms of *workforce* available and their *deliverables* in providing the service. In this case, in order to support the *assemble of the team*, the Contractor, following its own Organisational Template (i.e. institutionalised procedures), embodied these objectivations into a *Design Programme* and *the Scope of Service*.

Therefore, while, on the one hand, the Client was setting out and putting forward a template for them to procure the Building Project activity, on the other hand, the Consultants were reading and interpreting this as an opportunity to *get a job* and achieve *business sustainability*. Following the Project Template set by the Client, the group of individuals and organisations were engaged in setting up a Team capable of delivering an integrated *design* and *realisation* (i.e. construction) of a Building. Thus, for the Consultants, the **conception of changing action** was objectivated in terms of these capabilities to *team up* and, potentially, *being appointed*.

In order to *build the team* and to cope with the formalised engagement template, by which Client's conception of changing action and resource were made available, the Consultants engaged in a series of interactions described as *Design Strategies* (see Appendix 4), which could be seen to embody their **conception of changing actions** at this instance of the Building Project activity.

### 4.3.3.3.1. Dynamics of Mutual Intelligibility

Once the *Operational Panel* was putting in place and took the lead in conducting the Building Project activity, a systemic contradiction began to emerge within the Client Team between the *Operational Panel* and the School's main purposes and expectations in the activity. It seemed that, while the *Operational Panel*, led by the Estates Department, was seen the activity as just a building project to be procured, the School had a broader vision of what that project activity meant, in terms of changing their school operational project. In theory, these purposes do not

exclude each other, but the ways in which they became objectivated in the activity led to emergent misunderstandings across both teams.

In this case, it could be noticed that the Estates Department led this instance of the Building Project activity, meaning that the majority of key constructs of project collaboration (i.e. auxiliary objects) were objectivated according to their own perspective (i.e. appreciative system), especially considering how to conduct a project *competition*. This seemed to have entailed a general strategy to embody the Client's **conception of changing actions** as much objective as possible, including the formalisation of the Engagement Template.

For example, the **conception of changing action and resource** was partially objectivated by the notion of space, which was then further quantified and qualified in order to achieve an objective measure, finally embodied into the Project Brief. In this case, the enactment of two different types of Project Brief seemed to indicate the different purposes and perspectives between the Estates Department with *Project Brief 1 – Performance Criteria*, and the School with *Project Brief 2 – Spatial Requirements*.

The overall interactions at this instance seemed to have emerged from the Estates Department's operational procedures within the University's Institution. As a result, there was found some resistance from the members of the School, which later felt that, because of the way these things were objectivated and embodied in the activity, collaboration with the Consultancy Team was limited (see Appendix 4).

At this instance of the Building Project activity, **breakdown interactions** were noticed when the initial objectivations made during the Business Case had to be reframed into more objective descriptions of the Client's **conceptions of resource and changing action**, as well as their **perception of performance**. As some of the objectivations were embodied into standard formats of documentation, procedures and processes, these breakdowns seemed to have helped both sides (i.e. Operational Panel and Consultancy Teams) to achieve mutual intelligibility in certain aspects of the Building Project activity.

At this point, the Dean made use of a **Metaphor** (e.g. *discipline agnostic area* (see full transcript at Appendix 4)) as a way to build mutual intelligibility into the translation of the School's **conception of changing action** embodied into the Project Brief 2 – Spatial Requirements. With that, the Dean expected that the Consultancy Team would better understand what the School's expectations from the Building Project activity would be, as a spatial change for the School Operational Project.

### 4.3.3.4. Building Project Design

At this instance of the Building Project activity, the dyadic interactions moved on, but they assumed an inverted dynamic. At this point, the Consultancy Team took the left side on proposing the **conception of changing action**, which was, ultimately, embodied into the *Tender Settlement*, and the Client assumed the right side, which entailed assessing the proposed conception of changing action, which potentially led them to *Sign-off the Contracts*. As opposed to the previous instance, both sides interacted upon an emergent shared object, namely the *Building Project Design* proposal. However, in order to socially construct this instance, as a *shared object* across both sides of the activity, project participants had to interact to overcome misunderstandings, emerging as systemic contradictions, and achieve mutual intelligibility around the way both sides had objectivated the key constructs of collaboration (Figure 36).

Initially, the Building Project Design instance involved interactions within the Consultancy Team to objectivate their **conception of changing action** as the *Building Design proposal*. Thus, interactions within the Consultancy Team were aimed at the further objectivation of this Building Design proposal, to make it fit into the Building Project Template set by the Operational Panel, in the previous instance. For example, the Consultancy Team's **perception of interdependency** was objectivated in terms of an *Engagement Strategy,* including how both types of interactions, within the Team and with the Client, should be in accordance with the *Engagement Template* established by the Operational Panel. In this case, the Consultancy Team further objectivated the engagement strategy into the enactment of *tools, document exchange standards, shared virtual space* and *events*, which were then embodied into a set of events (e.g. *Design Team Meetings* and *Design Workshops*) and tools (e.g. *Scope of Services, Design Structure Matrix* and *Information Requirement Specifications*).

Most of these events and tools were put in place by the Contractor Organisation, acting as Team Leader, and they were seen by them as standard procedures at this instance of the Building Project activity. The adoption of these events and tools also supported the Consultancy Team construction of their **perception of performance**, which was objectivated in terms of *roles* and *responsibilities*, that could be *measured* and *controlled* within the team. For example, as described by the Design Manager (Contractor) (see Appendix 4) the use of tools like the *Scope of Service* and *Design Structure Matrix* helped the Consultancy Team to establish and control the roles and responsibilities in accordance with their **conception of changing actions and resources** (e.g. project deliverables).
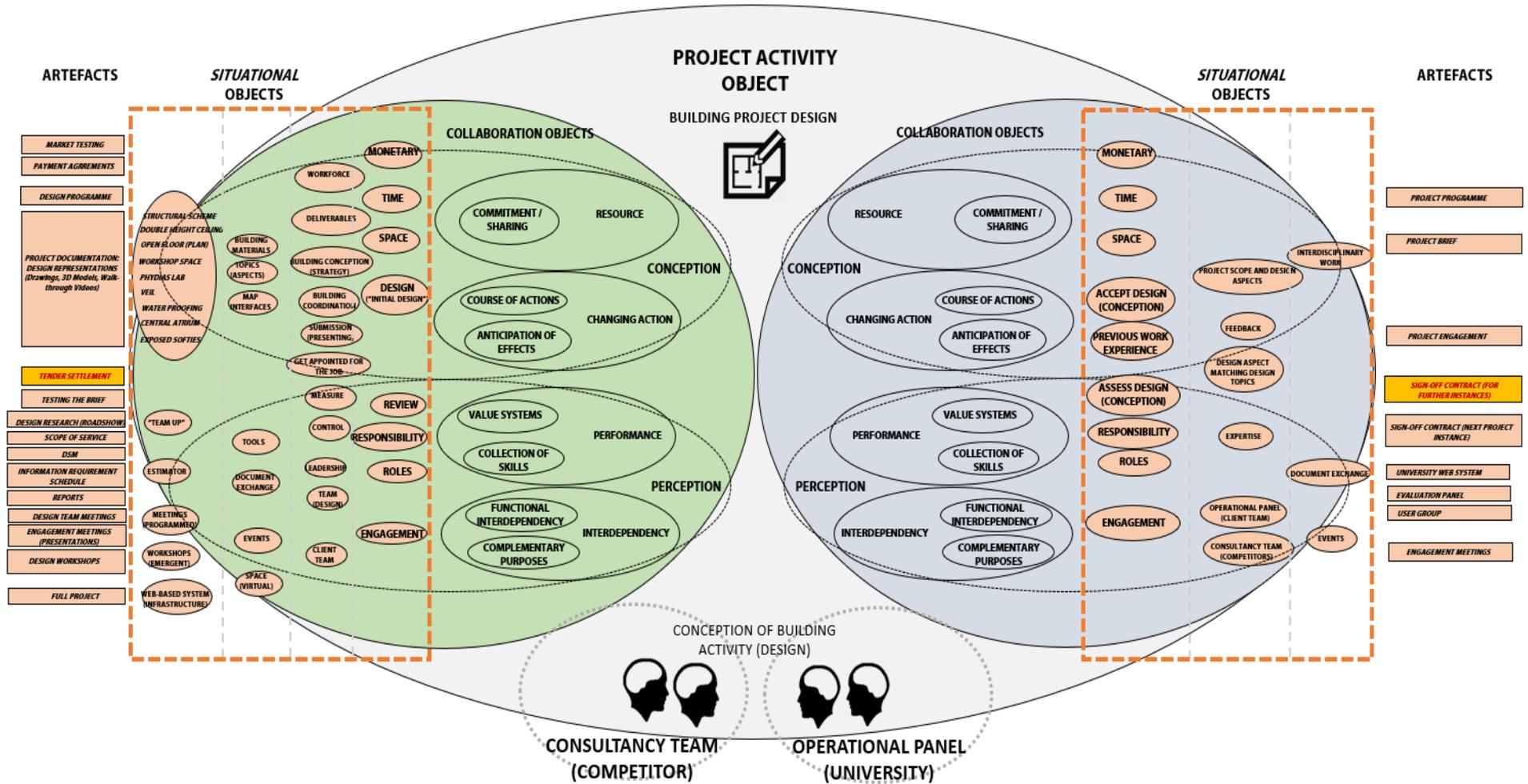
**Figure 36: Cognitive Map 3 – Socio-construction of Building Project Design**

At this point, the Consultancy Team's objectivations of the **conception of changing action** became merged with their **conception of resource**. In this case, a set of artefacts known as *Design Representations and Programme* (drawings, 3D model, spreadsheets) embodied aspects of both conceptions objectivating the *Building Design* proposal, as a key situational object at this instance.

In principle, the *Building Design proposal* objectivated the Consultancy Team **conception of changing action**, which was to design a new School Building, along with the objectivation of their **conception of resource,** in terms of *Money* (How much it cost?)*, Time* (How long it takes to build?), and *Space* (How big it is? How the space works?). Moreover, the *design representations and programme* also allowed further objectivations of the **conception of changing action**, such as the *building coordination* and *project submission* to be embodied through the interactions to produce these artefacts. In addition, *Design representations and programme* were also used to articulate further objectivations of the **conception of resource**, when they became subject to interactions involved in the *Market Testing*.

Overall, the Consultancy Team constructed its own conceptions based on its interpretation of the Client's conceptions embodied in the Project Brief, at the start of the competition. Thus, at this instance of the activity, the *Building Design proposal* embodied into these *Design Representations* and *Programme* became an important (shared) artefact, which was also subject to the Client Team's **conception of changing action** objectivated through its assessment interactions.

In order to support the Client's **conception of changing action** objectivated at this instance into *Assessment* interactions, their **perception of interdependency** seemed to have been objectivated into the *Project Engagement Template*, setting the format for *document exchange* and the *engagement events* with the Consultancy Team. In addition, the Client's **perception of performance** was further objectivated into the value systems embedded into the aspects previously described in the *Project Brief* and *Project Programme*. Thus, the Client Team seemed to objectivate their **perception of performance** by assessing the Building Design proposal, as a potential shared objectivation of all participants' conception of **changing action and resources**, against their own conception of changing action and resources, previously objectivated into the Project Brief and Project Programme. This assessment was further objectivated into *feedback* interactions, which originally followed the Operational Panel's pre-established procedures of the Engagement Template.

An important aspect of this instance of the Building Project activity was that, at a certain point (which was supposed to be the programmed end to this instance), the Client identified a **misalignment** between the proposals developed by the Consultancy Teams, and the expectations of the Client. This triggered a series of **breakdown interactions** to review and reposition the key constructs of collaboration across both teams. At this point, the Consultancy Team and Client interacted towards a compromise on the *Building Design proposal*. When both parties compromised on the **shared objectivations** of the key constructs of collaboration, the Consultancy Team felt it was ready to present a *Tender Settlement.* At this point, the Client believed that it was ready to *Sign off the Contracts* and move to *Building Project Realisation*.

### 4.3.3.4.1. Dynamics of Mutual Intelligibility

At this instance of the Building Project activity, systemic contradictions emerged around the ways in which the key constructs of collaboration were objectivated into the *Procurement* and *Engagement Template.* In this case, emergent **misunderstandings** around individuals' conceptions of resource and changing action, as well as their perception of performance and interdependency, seemed to have triggered interactions towards the **dynamics of mutual intelligibility**, as a way to socially construct compromise on shared objects in the activity.

For example, the Design Manager (Contractor) and the Architect reported that, initially, there was **an imbalance between the conception of changing action** (i.e. Design activity) **and the conception of resource** (i.e. Money and Time: Workforce), within the Consultancy Team because of the way the *Procurement* was established as a *Competition*. At this point, Team members' commitment in the task was challenged by the risk of not being appointed to the job. Thus, the Consultancy Team put in place a set of *tools* (e.g. Scope of Services) and *events* (e.g. Design Team Meeting), which helped them to **reveal divergent understandings** and engage into **breakdown** and **metaphorical interactions** to build mutual intelligibility. For example, these interactions helped the team to resolve an emergent misunderstanding around their responsibilities in the design of the *Water Proofing system* (see Appendix 4). According to the Design Manager (Contractor), these events also helped the team to avoid informal and *out of the record* interactions, which eventually could lead to decisions been *sneaked through*, and not shared with others. In this case, the use of tools like the *Scope of Services* and *DSM* during the *Design Team Meeting* events seemed to have been key to support the **breakdown** of the team's **perception of interdependency**, while it supported the continuous review of their **conception of changing action and resources**.

In the context of these events, further **breakdown** interactions took place to deal with emergent **misunderstandings** around the *Building Design* proposal, such as involving the conception of the *fire escaping strategy* (see Appendix 4), or the structural scheme suggesting the cantilever structure (see Appendix 4). In this case, it is important to highlight the use of **metaphors** as way to build mutual intelligibility among individuals with different background of experience. For example, in addition to the graphical tools (i.e. Sketch) the Architect used the **metaphor** of a *Big Truss* to explain to the rest of the team his structural proposal. A similar approach was adopted to discuss the natural ventilation scheme, in terms of how the building *breathe*s, and also to negotiate options for the floor finishes, in referring to a *car park precast finish* and the notion of *exposed softies*. The *Roadshow* events (see Appendix 4), as a *Design Strategy*, were key to support these conversations, by giving the team members the opportunity to link these abstract concepts to their potential physical objectivations into the buildings visited. Such interaction seemed also to have supported further alignment on the Consultancy Team's **perception of performance**, which then became reframed by those objective references of the expected output of the Building Project activity.

While the interaction around these *tools* and *events* seemed to have helped the Consultancy Team to overcome **misunderstandings** among the conceptions and perceptions of its own members, the adoption of a specific *Design Strategy* (see Appendix 4) seemed to have helped the team to overcome the limitations of the *Engagement Template* established by the *Operational Panel* (led by the Estates Department). In this case, the Consultancy Team seemed to have realised the inherent **systemic contradiction** between the formal *Engagement Template* and the Client's aspiration to contribute to the design (i.e. *feedback*), which was affecting the overall **perception of interdependency and performance** in the activity. Therefore, the Architects consciously adopted a strategy named 'Testing the Brief' to present four design options at an early *Engagement Meeting*, as a way to enhance the Client's feedback into a broader scope of Building Design proposals. This strategy can be seen as **breakdown** interaction, expanding the scope of the Consultancy Team's interpretations of the Project Brief (translated into Building Design proposals) and making them available to the Client Team's review and assessment (i.e. feedback), allowing both sides to overcome part of the limitations of the *Engagement Template* and increase the chances of reaching mutual intelligibility.

However, at the expected end of this instance (i.e. Stage 1, according to Project Programme), the Client Team indicated a **dissatisfaction** with the current state of the Building Project activity. The Dean described this as a set of **misinterpretations** (i.e. misunderstandings) by

the Consultancy Team around key concepts objectivating the Building Design proposal that were presented in the Project Brief (see Appendix 4). At that point, according to the Dean and the Staff Member, the Consultancy Team held wrong assumptions and did not completely understand the Client's **conception of changing action** objectivated in terms of concepts like *Open Spaces* and *Double Height Ceiling*, described in the *Project Brief 2 – Spatial Requirements*. For the Client Team, certain aspects of how these objectivations were embodied into the Building Design proposals of the Consultancy Teams had not been completely thought through. For example, how the conception of *Open Spaces* and *Double Height Ceiling* was balanced with Acoustics (i.e. *Noise*) and Functional requirements (i.e. *Studio deliver*) were not what the Client expected (see Appendix 4). This meant that the Client's conception of changing action was, at a certain level, in **contradiction** with the Consultancy Team's conceptions of changing action embodied into the Building Design proposal presented. Hence, the Client couldn't agree in *signing off the contracts* for the *tender settlement* at that point.

This major **contradiction** led the Dean to realise that he needed to interact with the *Operational Panel* to **review** how the Client Team objectivated the key constructs of collaboration at this instance of the Building Project activity (see Appendix 4). As a result, they changed their **conception of changing action and resource** by increasing the total dimension of the building and by adding the landscape design (i.e. Space), which overall required an addition to the original investment (i.e. Money), and an extension of stage 1 on the Project Programme (i.e. Time).

In addition to the reviews to the *Project Brief, Programme* and *Budget*, the Client introduced changes to the way their **perception of interdependency and performance** was objectivated into the *Engagement Template* and *Feedback strategy*. At this point, the Client Team seemed to realise how the previous *Engagement Template* affected the results of the activity embodied in the *Building Design proposals* presented. According the Dean and Staff member, they couldn't provide proper *feedback* due to the formal engagement, in terms of interactions embodied into *document exchange standards* and the format of the early *Engagement Meetings*. So, the *Operational Panel* decided to change the *Engagement Template* by adding a *User Group* (see Appendix 4), which, in principle, would provide more comprehensive and precise feedbacks on the further development of the Building Design proposal, during the extension of Stage 1. In order to support these interactions, a series of further *Engagement Meetings* were set between the User Group and Consultancy Team.

Such meetings allowed **breakdown interactions** to emerge between both teams, in which different interpretations of the *Project Brief* and *Building Design* proposals were further explored (i.e. described and explained). These interactions enhanced their capacity to reveal emergent **misunderstanding** between both teams' objectivations of **conception of changing action and resources**.

Moreover, in order to overcome the limitations of the *Engagement Template,* the Dean saw these new interactions as an opportunity to adopt a different *feedback strategy* which would not compromise the competition scheme. This feedback strategy could be seen as a change in the way the Dean objectivated the *Design Assessment,* as his **conception of changing action** at that instance of the Building Project activity. So, through a series of questions and further argumentations – in other words, **breakdowns** – the Dean seemed to have engaged in an exploration with the Consultancy Teams about how and why they had understood key concepts, such as an *Award Winning Building* and *Natural Ventilation* (see Appendix 4). According to the Dean, these interactions allowed them to build a ***proxy of understanding*** among both sides of the activity.

For example, the discussion around the adoption of a *Double Height Ceiling* and how that could be seen as an objectivation of the expected *Growth* and improvement of *Student Experience* involved a **breakdown** of different perspectives on these matters between both teams, and even inside the Client's Team (see Appendix 4). At this point, it was key the Dean's further explanation on how those objectivations were embodied into a spatial feature, which would, ultimately, be part of the broader objectivation of a *Cultural Change*. So, to help build **mutual intelligibility** on his perspective, across participants of both teams in the interaction, the Dean used two **metaphors**. The first referred to how, without the *Double Height Ceiling*, the building would look like an *Office Space* which, in his view, was unsuitable for creative activities. The second referred to a *Discipline Agnostic Area*, which he thought would precisely describe the functional nature of the new building (see Appendix 4).

Overall, besides the fact that these **breakdown** interactions and use of **metaphors** seemed to have helped both teams overcome the limitations of the previous *Engagement Template*, and work towards **shared objectivations** of the **conceptions of changing action** and **resources** in the activity, they seemed also to have improved the **perception of performance and interdependency** objectivated into the *Design Assessment* and new *Engagement Template* by the Client. This, particular, applied to the Dean, who, at the end of the extension period, was

'happy' with the Building Proposal presented, leading him to *sign off* the contracts and move to the next instance of the Building Project activity.

It is important to mention that this seemed not be the same perspective of the Staff Member, who, at this point, still seemed to hold a **dissatisfaction** with this instance of the Building Project activity. According to her, the new *Engagement Template* definitely allowed them to engage with the Consultancy Team into **breakdown** interactions over the *Building Design proposals*. However, the way that the feedbacks provided by the User Group, and originated from these breakdowns, were interpreted and addressed by the Consultancy Team was not how the Staff Member had expected (see Appendix 4). So, while these interactions may have revealed **misunderstandings** around the **conception of changing action and resources** between the User Group and the Consultancy Team, it seemed that, from the Staff Member's perspective, these misunderstandings weren't resolved, and led to a **poor perception of performance and interdependency** from her side. Consequently, from her perspective, there was a lack of 'collaboration' between the Consultancy Team and the Client, represented by the User Group at this point.

### 4.3.3.4.2. Divergent concepts of Collaboration in the activity

It could be said that some of these misunderstandings seemed to have emerged due to different ideas of what constitute collaboration among these key stakeholders. In this case, divergences in the way these individuals objectivated the key constructs of collaboration seemed to have been influenced by what they believe to be *collaboration*. Evidence of such divergent appreciative systems could also be observed in the way the Architect, Design Manager (Contractor) and Staff Member objectivated *collaboration* conceptually (see Appendix 4), and how that was embodied into certain tools, events, assembles and approaches.

In this case, the Architect's notion of collaboration seemed to match closely the Design Manager's (Contractor) definition, involving co-located interactions, which were clearly embodied through the *Design Team Meeting* and *Design Workshop* events on the project. On the other hand, the Staff Member's notion of collaboration as *good communication* seemed to have affected her expectations and, consequently, her perspective of lack of collaboration in the activity, as she felt that there was a lack of communication with the Consultancy Team. For her, good communication would entail full awareness of the reasons why decisions were reached, which, from her perspective, didn't happen the way that she had expected.

## 4.3.3.5. Key Findings and Propositions: Dynamics of Early Project Collaboration

The In-Depth Case Study showed that the Dynamics of Early Project collaboration can be interpreted as follows:

### (1) Dialectics: Dyad objectivations of the key constructs of collaboration

At the early stages of a Building Project activity, project participants tend to interact by objectivating the activity in terms of key constructs of collaboration: *perception of interdependency, perception of performance, conception of resource and conception of changing action* (see Figure 34, Figure 35 and Figure 36). At each instance of the Building Project activity, individuals tend to objectivate the key constructs of collaboration differently, according to how they interpret the situation (i.e. *situational objects*). Thus, as each individual interprets these constructs according to their own appreciative system, the activity emerges as a dyad, in which the set of individuals' objectivations establish a dialectical interaction towards the socio-construction of shared objects of activity.

### (2) Misunderstandings emerge as systemic contradictions hampering collaboration

It was possible to identify in the case study that divergent objectivations (i.e. interpretations) of the key constructs of collaboration in the Building Project activity can lead to systemic contradictions, thus hampering the activity and, eventually, triggering interactions to overcome these misunderstandings.

### (3) Breakdown interactions support the expansion of objects of activity (e.g. auxiliary and situational object) helping individuals to overcome misunderstandings

The study also showed that initiatives to overcome misunderstandings tend to involve breakdown interactions. These interactions involved individuals' further description and explanation of the way the key constructs of collaboration were objectivated by them in the situation. In a breakdown, individuals interact to expand their understanding of each other's interpretation over a certain object of activity, and how that is embodied into an artefact, event, assemble or approach. Thus, breakdown interactions tend to reveal the reasons why individuals' (or organisations') objectivations are contradictory in the activity, leading them to engage in further interactions to review and reposition their objectivations.
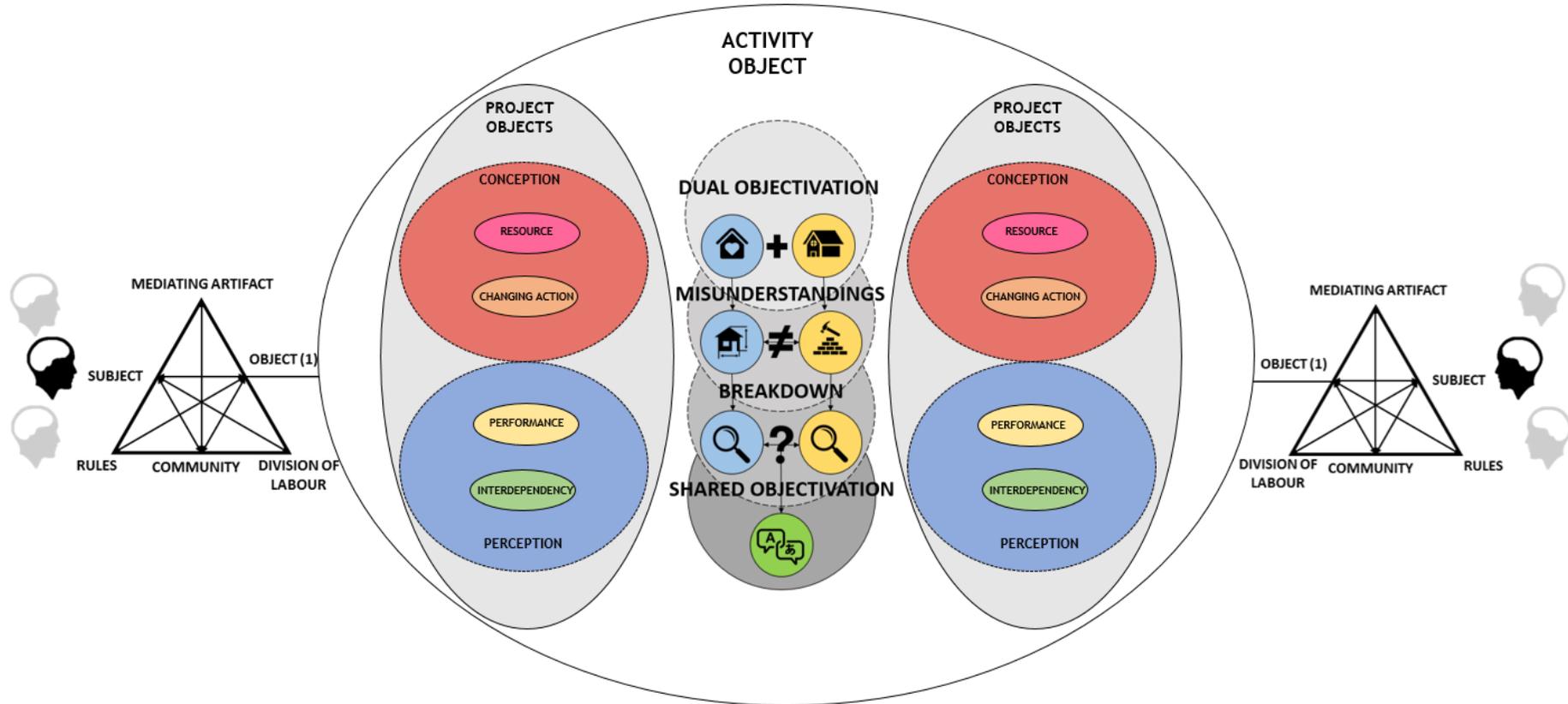
**Figure 37: Dynamics of Early Project Collaboration**

 *(4) Metaphors have a key role in bridging understanding across individuals' appreciative systems, leading to mutual intelligibility on Shared Objectivations*

In the dialectical nature of the Building Project activity, interactions to review individuals' objectivations aim at bridging understanding across different appreciative systems, through emergent shared objectivations in the activity. In these interactions, the use of metaphors to embody new/reviewed objectivations seems to play a key role in supporting mutual intelligibility among project participants.

 *(5) The dynamics of mutual intelligibility can be used to describe the dialectics of interactions involved in the socio-construction of collaboration in a Building Project activity*

The study showed that early project interactions can be related to the dynamics of mutual intelligibility: *(1) Dual Objectivations; (2) Misunderstandings; (3) Breakdown; and (4) Shared Objectivations*. Thus, Early Project *collaboration* can be seen as a socio-construct emerging from individuals' dialectical and situated interactions to resolve misunderstandings and construct the Building Project activity, as a set of shared objects of activity (Figure 37).

These findings also suggest that, contrary to what was previously conceived in the Exploratory Case Study (Figure 29), the dynamics of mutual intelligibility do not follow any particular order. The study showed that breakdown interactions can emerge before misunderstandings are revealed, and that metaphors can be used in advance in order to avoid potential misunderstandings. Thus, it is proposed that the dynamics of mutual intelligibility, within the dynamics of early project collaboration, should be interpreted in terms of their dialectical and situated nature, focusing on the pragmatic use of this theoretical framework as a reflective tool. Further discussion on how these findings indicate a better way to interpret Early Project collaboration in comparison to existing models is presented in the next chapter.

# 5. Discussion

## 5.1. Introduction

This chapter presents a discussion addressing the research gap described in the introduction (see section 1.4). Previous research had already identified and attempted to describe the role of interactions to resolve misunderstandings in supporting collaboration (Cross and Cross, 1995; Engestrom, 1995; Valkenburg, 1998; Stumpf and McDonnel, 2002; Vaaland, 2004; Forgues et al., 2009; Groleau et al., 2012; van Amstel et al., 2016; Forgues et al., 2016; Paavola and Miettinen, 2018). The findings from the In-Depth Case Study prompted a discussion about the efficiency of existing models of Early Project Collaboration. Thus, in this chapter the author argued towards the limitations of some of these existing models, and addressed the advantages of the proposed theoretical framework in interpreting the dialectical and situated nature of Early Project Collaboration.

## 5.2. Limitations of the existing models of collaboration

Previous researches have suggested an interpretation of early project collaboration by means of Rhetoric, suggesting that the resolution of misunderstandings involves participants' interactions to articulate *common knowledge* towards the creation of *shared mental models* (Cannon-Bowers et al., 1993; Cross and Cross, 1995; Lloyd and Busby, 2001; Stumpf and McDonnel, 2002; Forgues et al., 2009; Forgues and Koskela, 2009; Badke-Schaub et al., 2010; Dong et al., 2013b; Koskela, 2015; Koskela et al., 2018).

However, it can be argued that these initiatives are limited due to their epistemological perspective. This interpretation of Early Project interactions suggests that project participants are constantly involved in a persuasion process to convince the others of the value of certain actions (Cross and Cross, 1995; Cross, 2011). Thus, project participants need to interact over design semantics, which are justifications of design decisions and properties associated with performance and behaviour of design, to overcome potential misunderstandings (Maher et al., 1996).

In this context, the **notion of Rhetoric** has been traditionally used to explain the dynamics of collaborative interaction in terms of linguistic actions in project situations (Flores, 1982; Lloyd and Busby, 2001; Stumpf and McDonnel, 2002; Forgues and Koskela, 2009; Badke-Schaub et al., 2010; Dong et al., 2013b; Koskela, 2015; Koskela et al., 2018). From this point of view, collaborative interactions at early project stages can be explained by the methods of Rhetoric,

in which the project activity is considered a persuasion process between arguer and an audience (Stumpf and McDonnel, 2002). In this case, project participants tend to use graphic tools and verbal communication (Schon, 1983; Cross and Cross, 1995; Oxman, 2006; Donn et al., 2012) to build common ground (Gu et al., 2015; Koskela, 2015) on the early project situation.

More specifically, Rhetoric has been related to the idea that project stakeholders need to find a common language, which has been further related to the concept of *common knowledge* between individuals in terms of *shared mental models* (Badke-Schaub et al., 2007; Forgues et al., 2009) (for a description of *shared mental models* see footnotes 1 and 2, at section 1.4).

The main assumption of this interpretation is that project participants use argumentation to construct persuasive concepts, in which *knowledge* is considered guaranteed to be absolutely certain and reliable through the modes of formal logic (Stumpf and McDonnel, 2002). Hence, the Rhetoric perspective assumes an atomic idea of knowledge sharing, in which a *shared mental model* is ascribed to the entirety of the knowledge and belief structures associated with the project situation (Dong et al., 2013b). Consequently, successful collaboration is described in terms of the capacity of the teams to create these *shared mental models,* as a container of the group's knowledge, in which conceptual barriers, or conflicts of understanding, are identified and resolved among participants' individual perceptions (Forgues et al., 2009).

However, the assumption that *shared mental models* encapsulate all the knowledge shared by a team in collaborative interaction is questionable (Dong et al., 2013b). It assumes that project collaboration is dependent on individuals' enactment of their *knowledge*, which also presumes that *all knowledge* needed to solve a particular problem originates from the team members present at the situation (Dong et al., 2013b).

It can be argued that such positivist and reductionist perspective about the nature of knowledge is the biggest limitation of the Rhetorical model to interpret early project collaboration. Overall, the rhetorical interpretation of collaborative interactions seemed to have been influenced by traditional models of learning (e.g. Kolb, 1975) and knowledge creation (e.g. Nonaka, 1994) (Figure 38).

These models of learning and knowledge creation have been described in terms of cyclical processes of conversion and transformation. According to Nonaka (1994), knowledge creation can be described as a spiral of transformation, involving dynamic interaction between different modes of knowledge conversion (Figure 39).
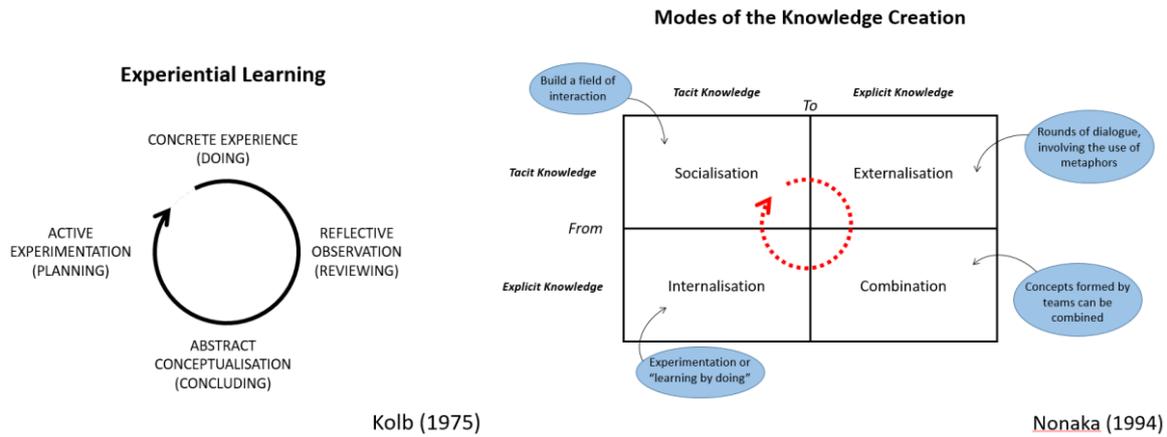
**Figure 38: Models of Learning (Kolb, 1975) and Knowledge Creation (Nonaka, 1994)**
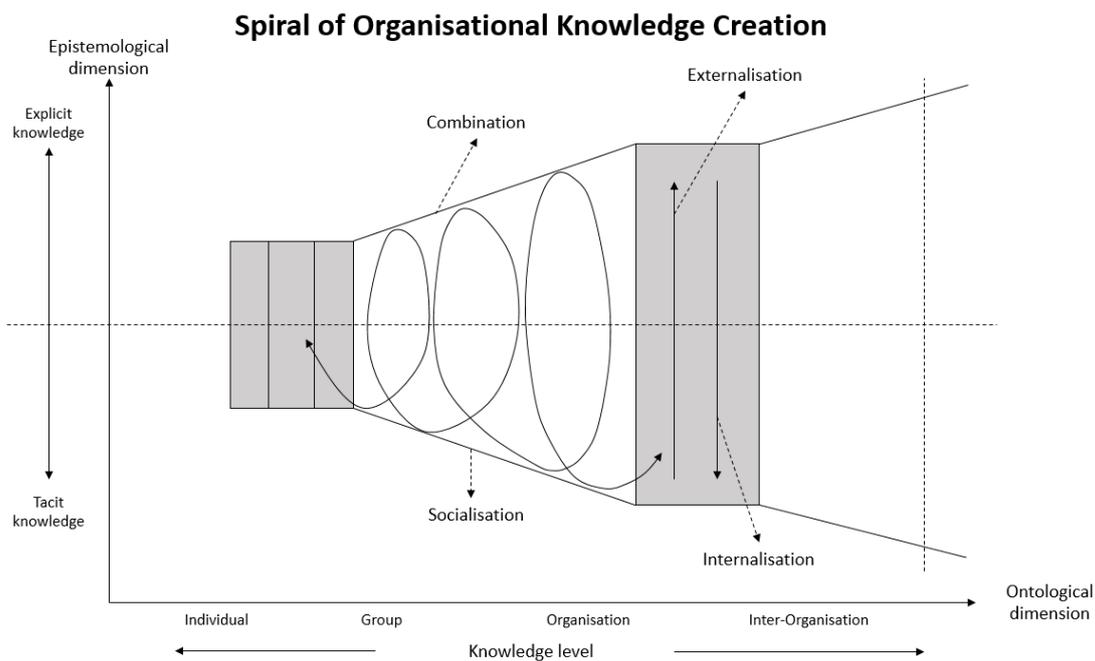


**Figure 39: Spiral of Organisational Knowledge Creation (Nonaka, 1994, p. 20)**

In this case, Nonaka (1994) also suggested that cyclical interactions among different knowledge conversion modes reflect similar cycles of traditional notions of learning, such as that proposed by Kolb (1975), in which the conversions between tacit and explicit knowledge can be related to a cognitive process of *externalisation* and *internalisation*. What Nonaka's *spiral* model of knowledge creation and Kolb's model of experiential learning seem to imply is that *knowledge* should be seen as a *thing* that is dynamically changed as it is converted into different modes (Snowden, 2002).

The consequences of such positivist and reductionist perspective towards the nature of *knowledge* in describing such interactions have already been discussed in section 2.3.2.1.

189

Within this conception, the notion of *shared knowledge* would signify a potentially enumerable body of implicit assumptions that support actions or utterances, allowing participants in an activity to understand each other's action (Suchman, 1987). Such idea implies that communication between speaker and listener (e.g. project participants) is made possible because of the existence of a *common stock of background knowledge*, in a way that what is said always requires reference to facts, as objective measures, shared by certain individuals (Suchman, 1987). Consequently, the notion of background assumptions also implies that *knowledge* should be considered as a collection of things that are there in the mind of the speaker, motivating particular action or linguistic expression, as well as the interpretation of those by the listener (Suchman, 1987).

However, since an individual's account of an action can only be articulated when the premises of the action are called into question, as the moment when these background assumptions are generated, there is no reason to believe that such background assumptions, as well as this notion of *knowledge*, are part of the actor's mental state (as stable mental representations) prior to action (Suchman, 1987).

This notion regarding the nature of knowledge seems to be implied in the notion of *mental models* (see footnote 2 at p. 21). In fact, it could be argued that the *taken for granted* aspect of these background assumptions would not be a manifestation of an individual's mental state, but rather something constructed outside of his or her head (Suchman, 1987), both socially and historically constructed. In this case, *assumptions* should be seen as an inherent condition embedded in individuals' background of interpretation (i.e. *Appreciative Systems*), and not as something leading to false interpretation of the world (Winograd and Flores, 1987). Moreover, since individuals always operate within the framework of such background of interpretation, there is no neutral viewpoint from which individuals can see their beliefs as things objectively existing in the world (Winograd and Flores, 1987). The reason for this is that *meaning* is fundamentally social and cannot be reduced to the meaning-giving activity of individual subjects (Winograd and Flores, 1987).

Therefore, as an alternative to the idea of *knowledge* as mental representations (i.e. *mental models*), an inquiry into collaboration, and how a collection of people make sense in an activity, should focus on the power of collective representations as analytic tools for understanding social interactions (Thompson and Fine, 1999). This means to abandon the traditional notion of *knowledge* and steer the discussion around to the situated aspect of *understanding*. Such

argument account for the nature of understanding and how it is socially constructed, especially considering its role in early project collaboration. Thus, instead of referring to a stock of background assumptions (i.e. *knowledge*), as a collection of things inside the mind, Winograd and Flores (1987) suggest that individuals' experience of the world is grounded in pre-understandings, as the result of previous experience within a tradition, and that without which understanding itself would not be possible.

Alternatively, in studying Early Project Collaboration, researchers have **interpreted these interactions from a socio-constructive perspective**. For example, Hey et al. (2007) suggested that the resolution of misunderstandings at early project collaboration involves cyclical iterations towards the synthesis of shared frames (Figure 40).

**The four phases of the framing cycle**
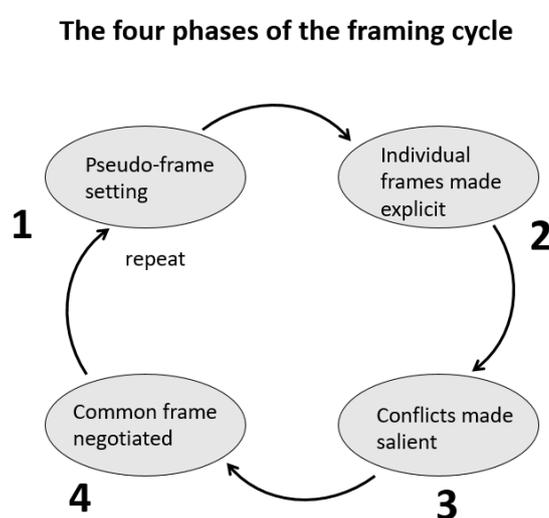


Hey et al. (2007)

**Figure 40: The four phases of the framing cycle (Hey et al., 2007)**

Hey et al. (2007) compared the ***Framing Cycle*** with previous suggested models like Schon's (1983), *Reflective Practice (i.e. naming, framing, moving and reflecting)* and Nonaka's (1994), *Knowledge Creation process (i.e. socialisation, externalisation, combination and internalisation)*. According to Hey et al. (2007), their model differs from Schon's model, because it allows each individual member to retain his/her own evolving *frame*, and 'agree to disagree', even as the team makes decisions using the *team frame* (i.e. shared frame) as their guide. In comparison to Nonaka's model, the framing cycle suggests a focus on the cognitive dimension of tacit knowledge, described by the notion of a *frame*, seen as individuals' *mental models* (Hey et al., 2007). The authors suggested that these models differ from Nonaka's in its

emphasis on the non-rational process of intra- and inter-individual frame conflict. In this case, individuals may not be aware of their own underlying assumptions, and such cycles emerge when conflicts between members' frames are made salient, which forces the team to negotiate before they can develop a shared frame (Hey et al., 2007). According, to Hey et al. (2007), this contrasts with Nonaka's rational interpretation of stages taken place more deliberately.

Similar discussion was developed by Engestrom (2008), in describing the *Expansive Learning cycle*. His model describes an action phase cycle, which, as well as Nonaka's model, sees collaboration evolve as escalating process towards knowledge creation, ascending from the abstract to the concrete (Figure 41) (Engestrom, 2008). According to him, collaborative interactions involve construction and resolution of successively evolving contradictions in an activity system.



**Figure 41: Sequence of epistemic actions in an Expansive Learning Cycle (Engestrom, 2008)**

Besides these similarities, Nonaka's and Engestrom's models seem to differ in the way that they consider negotiation and intention (Engestrom, 2008). According to Engestrom (2008), the *Expansive Learning* model emphasises the situated aspect of this phenomenon, suggesting that the formation of a shared object is a collaborative achievement, coming from intentional analytic and explanatory interactions. On the other hand, Nonaka's model of knowledge creation seems to take for granted these interactions, tacitly delegating intention and

negotiation to management, which meant that questioning and analysis were not included in his cycle (Engestrom, 2008).

Following these initiatives, one of the most recent attempts to interpret the resolution of misunderstandings towards collaboration from a socio-constructive perspective was proposed by Stompff et al. (2016). Their starting point was the notion of *Framing* as proposed by Schon (1983), and they have attempted to describe what participants do when they are faced with *surprises*, which emerge as divergences from their often implicit expectations in the activity (Stompff et al., 2016).

Surprises hamper the activity and they tend to trigger what Stompff et al. (2016) called *Reframing*. The authors described *Reframing* as an iterative process between *sense making* and *future framing*, towards interpretation and action (Figure 42). Basically, the reframing model suggests a process described in a cyclical way, in which teams first make sense of the situation at hand by (1) naming constituents, (2) reducing ambiguity, and (3) developing a new frame for future activities (Stompff et al., 2016).
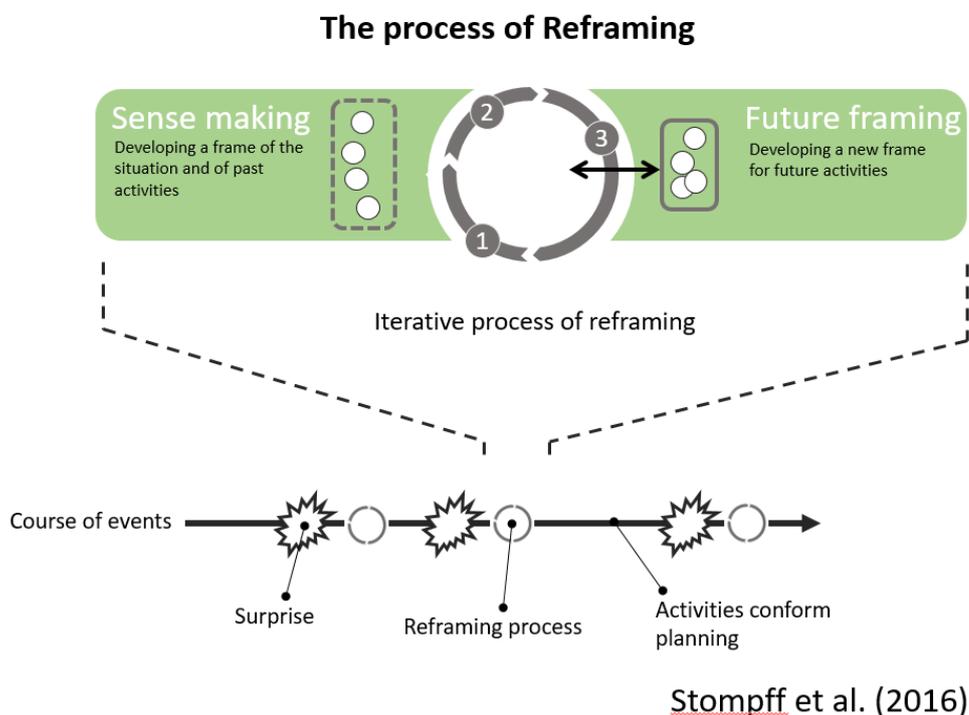


**Figure 42: The process of Reframing (Stompff et al., 2016)**

Overall, besides the fact that these socio-constructive alternative models of early project collaboration had criticised the positivist and reductionist nature of previous models of

knowledge creation, it seems that they couldn't decouple from traditional forms of representation (i.e. interpretation) of the phenomenon, in terms of cyclical models. The problem with these 'socio-constructive' cyclical models is that they cannot avoid describing the phenomenon from an individualistic perspective, in which collaborative interactions seem to mimic the heuristics of human cognition in terms of iterative cycles that imply the separation between *mind* and *action*, in terms of internalisation and externalisation, which leads to further distinction between theory and practice.

As was described in section 2.3.2.1, such distinction is incompatible with the socio-constructive perspective of human activity and collaboration, and can be seen as a contradiction, limiting the interpretation of the phenomenon. This argument relates to metaphysical assumptions and their influence on epistemology and professional practice, as discussed by other authors (Dewey, 1934; Schon, 1983; Snodgrass and Coyne, 1992; Dorst, 1997; Koskela et al., 2017 – see section 2.2.2). In this thesis, it is suggested that, to overcome these limitations, and to better interpret the nature of early project collaboration, it is necessary to adopt a pragmatic perspective, and propose a way to represent the situational and dialectical nature of these interactions (see section 2.4.3).

## 5.3. Towards a 'group-level framework' to map the dialectical and situated nature of collaborative interactions

Following the previous discussion, in order to inquire into how individuals create meaning and act on shared conceptions (i.e. collaboration), first it is necessary to abandon the fundamental concept of analysis that considers the individual as a limited and faulty information processor (Thompson and Fine, 1999), and reposition our notion of rationality (Coyne, 2005). In this case, it can be argued that project activity is only very poorly explained by rationalistic models, that describe it in terms of goal setting, constraints, rules and state-space search (Coyne, 2005).

Alternatively, the socio-constructive and pragmatic perspective suggests that inquiry into human activity should embrace the interplay of diverse value systems, in a context of uniqueness and interconnectedness between criticality and authority of explanations (Rittel and Webber, 1973; Coyne, 2005). Following Dewey's *Pragmatist* argument in the *Art of Experience* (Dewey, 1934) individuals cannot help project their likes, dislikes, preferences, wonders, and disdain into a situation, which means that professional rationality cannot exist outside our judgement. Moreover, professionalism in project activities can be seen as a set of

expert judgements grounded in contexts, practice and media, for which the duality theory-practice constitutes a very crude descriptor: it is all practice (Schon, 1983; Coyne, 2005).

This entails seeing *problem setting* as a contingent, fraught, and consensual task for which there is no authoritative set of rules, criteria, or methods (Coyne, 2005). In this case, a *wicked problem* shouldn't be seen as a deviation from the well-understood world of puzzles, which have goals and solutions, but rather that puzzles are diminished versions of 'wickedness' (Coyne, 2005). The pragmatic perspective inverts this and, instead of calling project situations as 'wicked problems', which suggest aberrance, it refers to 'human practices', 'contingency' and 'sociality' (Coyne, 2005).

Moreover, such perspective suggests that what is commonly called *analysis* should be interpreted as a series of emerging narratives constructed on the part of the analyst in the context of rival propositions (Coyne, 2005). Practitioners need to interact to revise and adjust these narratives to construct something mutually agreeable, and overcome an inevitable resistance to one or other narrative (Coyne, 2005).

More importantly, rival interpretations (e.g. *problem formulations*) are not exclusive or fixed, nor reconcilable through some concept of a *unitary public welfare* (Rittel and Webber, 1973), as a standard model of project rationality, which seems to be implied in the cyclical models of collaboration presented earlier.

A socio-constructive and pragmatic perspective assumes that human activity results from the meanings that people attribute to their own and others' actions in society, in a constant and dynamic collective process of meaning attribution (Weber, 1930 apud 2007; Schutz, 1932; Dewey, 1884; 1938; Berger and Luckman, 1966; Silverman, 1970) (see section 2.3.2.2). According to Schon (1983), such interactions depend on a collective self-reflective awareness about the way participants interpret the project situation (e.g. as 'a problem').

Project participants should become critically conscious of these individual interpretations, and they should be able to assess the accuracy in which these interpretations fit to the project situation and enable them to reach mutual intelligibility (Schon, 1983; Snodgrass and Coyne, 1992). The notion of a collective self-reflective awareness can be related to what Endsley (1995, p. 36) defined as *situation awareness*, as individuals' constructive perception of the elements in the environment within a specific time and space, along with the understanding of their meanings and the projection of their status in the near future.

Therefore, a socio-constructive and pragmatic perspective to interpret early project collaboration should avoid replicating aspects of rationalist and reductionist models based on traditional notions of human cognition, which are focused on the individual (see section 2.3.2.1). Thus, inquiry into collaboration should be focused on a group-level framework, in which the group acts as the selective context for human meaning systems (Thompson and Fine, 1999). Such interpretation assumes the irrelevance of trying to state any objective existence of knowledge (see section 2.3.2.1), but rather it focuses on shedding light on the set of individuals' interpretive and situated actions to objectivate *collaboration* and, consequently, dialectically construct the project activity. This means that human cognition should be recognised as a contextual social experience, and research should focus on the role of individuals' interpretations in collaborative project activities, considering how participants' socio-construction of different ideas about the activity is affected by their practical experiences and skills (Snodgrass and Coyne, 1992).

## 5.4. Activity Theory and the Dialectical and Situated nature of Project Collaboration

As described in section 2.4.1, Activity Theory can provide the means to interpret the socio-constructive and pragmatic nature of project collaboration. Previous researchers had tried to interpret collaborative interactions in construction by referring to Activity Theory (Groleau et al., 2012; van Amstel et al., 2016; Forgues et al., 2016; Paavola and Miettinen, 2018) as described in section 1.4.

However, it can be argued that these initiatives have been limited, and did not provide a full comprehension of the dialectical and situated nature of the project collaboration. Mostly, because they fail to provide a full comprehension of the dialectical nature of project participants' interpretive interactions (i.e. objectivations).

Besides the fact that these researches have addressed the emergence of misunderstandings, as systemic contradictions in collaborative interactions, they did not fully explore the dynamics involved in the resolution of these misunderstandings. One reason for that is they have restricted their focus on investigating how certain types of embodiment (i.e. mediating artefacts), such as innovative procurement methods, project delivery strategies, digital technologies, and design representations, can support and increase the efficiency of interactions to resolve misunderstanding among project participants, and consequently improve collaboration in project activities.

So, while existing researches seem to question *what* and *how* artefacts can support the resolution misunderstanding, they did not seem to address the question of *why* they do so. In this case, for these authors, the answer to *why* these artefacts seem to support the resolution of misunderstanding in collaboration, is that they still seem to rely on traditional notions about the nature of knowledge. Consequently, this means that, on a theoretical level, existing research didn't fully explore the implications of the dialectical and situated nature of Activity Theory (see section 2.4.1, and Figure 13), and had implied that collaborative interactions can be explained by mimicking traditional models of knowledge creation, which are based on models of human cognition centred on the individual, aligned with the notion of *mental models* and described as iterative cycles (Figure 41) (e.g. Engestrom, 2008; Forgue and Koskela, 2009; Forgues et al., 2016).

The findings from the In-Depth Case Study showed that the Activity Theory can be used as a framework to propose a more comprehensive interpretation of the Dynamics of Early Project Collaboration. As a framework, it considers project participants as partnering activity systems striving for mutual intelligibility around the socio-construction of their interactions through a series of objectivations. In Activity Theory, *collaboration* involves reaching mutual intelligibility on shared objects of activity.

## 5.5. A new framework to interpret the Dynamics of Early Project Collaboration

The main feature in this framework is the dyad interaction between individuals' interpretations about the project activity. In this case, the Activity Theory framework allows the mapping of the dialectics of individuals' objectivations of the key constructs of collaboration in the project situation (Figure 43). Such framework also allows the interpretation of the situated nature of these interactions at different instances of the project activity (Figure 34, Figure 35 and Figure 36).

More specifically, in the In-Depth Case Study, the proposed framework allowed the author to map the historical construction of the project activity in its different instances, and highlight how *collaboration* was socially constructed by a collection of individuals' interpretations embodied into a set of artefacts, events, assembles and approaches (see section 4.3.3).
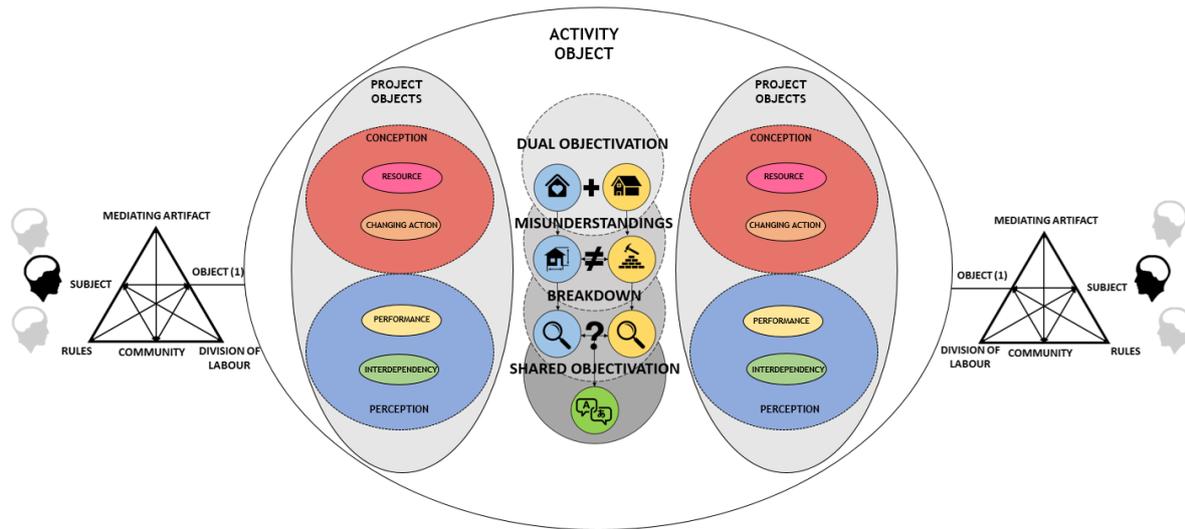
**Figure 43: Dynamics of Early Project Collaboration**

The *Storytelling* describing the *Conversation Analysis* (see Appendix 4), together with the Discussion (see section 4.3.3) and Cognitive Mapping (Figure 34, Figure 35 and Figure 36) presented earlier, can be seen as an exploration of the utility of the framework in revealing the dialectical and situated nature of early project interactions towards the socio-construction collaboration.

In the In-Depth Case Study, the framework was used to identify and map how the key constructs of collaboration (see section 2.4.4 and Table 9) were dynamically objectivated in the different instances of the activity, through what can be called *Situational Objects*. The Cognitive Maps also showed how these Situational Objects then become embodied into a set of artefacts, events, assembles and approaches (see section 4.3.3, Figure 34, Figure 35 and Figure 36).

Moreover, the framework revealed when certain objectivations, as individuals' interpretations of certain activities, had a 'life span' longer than the activity, and were seen as *institutions* (see section 2.4.1.3). In relation to that, the In-Depth Case Study showed that such *institutions* tend to be taken for granted, and their 'utility' in the activity remains unquestioned. Eventually, some of these *institutions* became a source of misunderstandings among project participants, as was the case with the *Engagement Template* (see section 4.3.3.4).

In addition, the In-Depth Case Study showed that the proposed model of ***Dynamics of Mutual intelligibility* in combination with the proposed framework can** help to interpret how early project collaboration progresses dialectically, once misunderstandings emerge among individuals' objectivations (Figure 43).

In this case, the adoption of Activity Theory framework helped the author to overcome the limitations (see section 5.2) recognised in the first version of the model of the Dynamics of Mutual intelligibility proposed at the end of Exploratory Case Study, which was still under the influence of traditional models cognition, and propose the second version of the model which was embedded in the overall framework of the Dynamics of Early Project Collaboration (Figure 44).
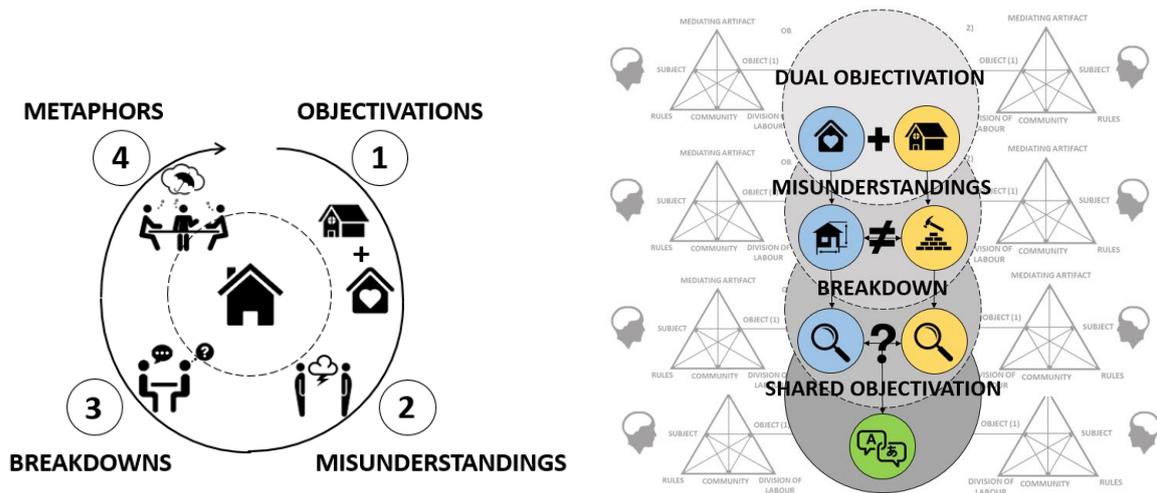


**Figure 44: First and Second version of the model of Dynamics of Mutual Intelligibility**
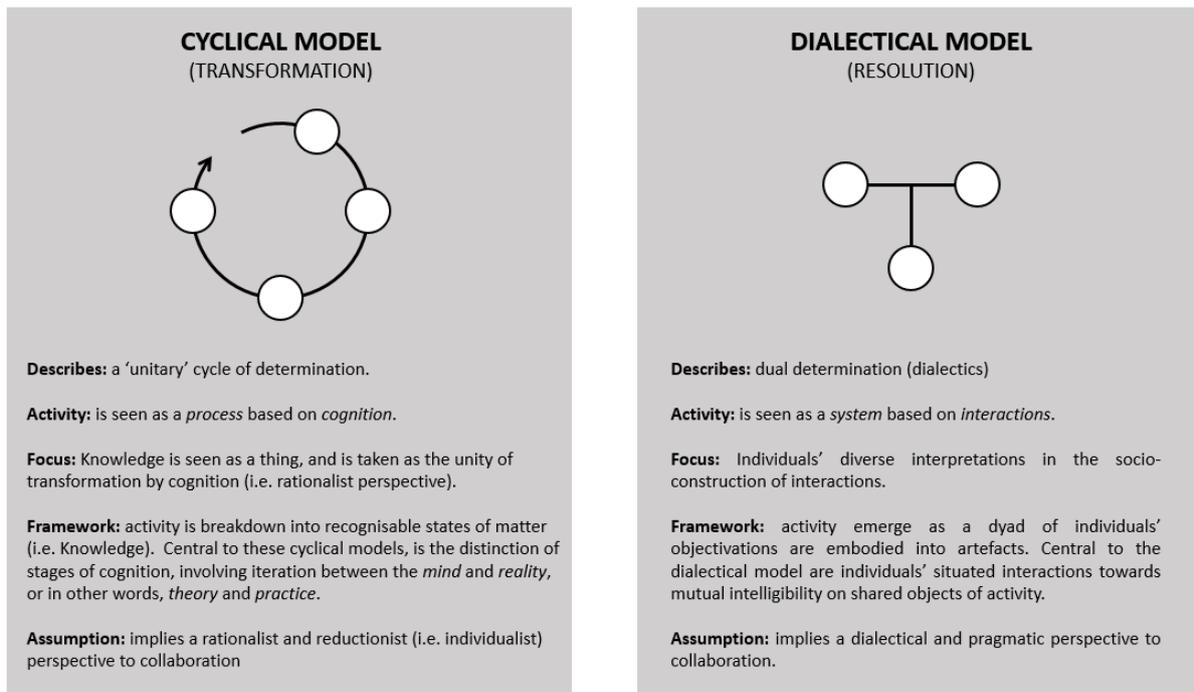


**Figure 45: Comparing Cyclical and Dialectical Models of Collaborative Interactions**

The second version of the Dynamic Model of Mutual Intelligibility suggests that the resolution of misunderstandings should be interpreted as a dialectical and situated interaction following Hegel's model of dialectics (see Appendix 5), which is embedded in the third generation of Activity Theory framework. The second version model also suggests that individuals' continual interpretive interactions tend to lead to mutual intelligibility around shared objects of activity.

## 5.6. The proposed theoretical framework as collective reflective tool

The findings obtained from the use of the framework in the In-Depth Case Study align with the socio-constructive perspective about human interaction and collaboration proposed by Dewey (1938), Berger and Luckmann (1966), Heidegger (1962), Schon (1983), Winograd and Flores (1984), Suchman (1987) (see sections 2.2.5, 2.3.2.1, 2.3.2.2 and 2.3.3.3). Moreover, the findings suggest that the proposed theoretical framework also aligns with the Pragmatism maxim, suggesting that we create our world in activity, and there is no knowledge standing without activity. All we have is interpretive interactions.

As was identified in the In-Depth Case Study (see section 4.3.3), the Dynamics of Early Project Collaboration should not be interpreted in terms of an expected sequence of events. Rather, it should reveal the two sides of an activity, and the type of emergent interactions (e.g. *breakdowns* and *shared objectivations*), thus allowing researches and individuals to reflect on the direction and purpose of the activity (Figure 43).

In this case, it can be argued that a better understanding of what and how individuals used to progress with these interactions in the situation could have allowed the same individuals to address the question of *why* there were emergent misunderstandings, and *why* they were resolved in a specific way in that situation. The means to ask and answer these questions were missing in the previous model of Early Project Collaboration.

Therefore, a key contribution of the proposed theoretical framework is that it 'rejects' the traditional assumptions that collaborative interactions involve a cyclical transformation of knowledge (seen as *thing* and as *process*), going through different stages of 'cognition'. Rather it assumes that, from a pragmatic point of view, the 'representation' of such heuristics is meaningless – in other words, is useless in sole descriptive terms. Thus, based on the situatedness and 'unpredictedness' (i.e. wickedness) of collaborative interactions, the 'utility'

of such model is only relevant as to be used as a self-reflective artefact, that project participants could use to support the social construct of their interactions towards shared objects of activity.

## 5.7. Summary

Based on the finding from the Case Studies, this chapter discussed the limitations of existing collaboration models, developed based on traditional notions of knowledge creation and learning. The discussion was focused on the limitations of these models in describing collaborative interactions in terms of iterative cycles of cognitive processes (Figure 45). The main argument presented is that the interpretation of collaborative interactions provided by these models is incompatible with the dialectical and situated nature of collaboration. Thus, it is argued that, in order to better understand collaboration, we should abandon the traditional notion of rationality based on the individual, implying a separation between mind and reality, and that we should be able to interpret collaborative interactions through a group-level framework (Figure 43).

In the last section of this chapter, it was discussed how the proposed theoretical framework can not only offer a way to interpret the Dialectical and Situated nature of Project Collaboration – and, consequently, overcome the limitations of previous models – but it could potentially be used as a self-reflective tool supporting project participants to review and improve collaboration in practice.

# 6. Conclusion

## 6.1. Introduction

This chapter presents the conclusions that are drawn from the findings of the research. In this chapter, these insights are linked to the research problem, aim and gap. Key limitations of the research are indicated. Contributions are discussed in terms of the theoretical implications of these findings, and the practical implications with recommendations to improve Early Project Collaboration. Suggestions for further research are also presented.

## 6.2. Addressing the research problem, aim, objectives and questions

### 6.2.1. Research Problem

As was stated in the introduction chapter, misunderstandings among project participants hamper early project collaboration in construction (see section 1.3). In order to address this research problem, the author identified how project participants tend to resolve misunderstandings at early project stages.

### 6.2.2. Research Aim

Thus, following an overall interpretivist perspective, a Case Study approach was adopted, aiming at improving the understanding of Early Project Collaboration in Construction, by expanding current interpretations of the interactions involved in the resolution of misunderstandings among project participants.

### 6.2.3. Research Objectives and Questions

The overall inquiry was structured in a series of research objectives, which were embodied into a set of research questions that helped to frame the situation of study. Different questions were drawn to address different instances of the overall inquiry (see Figure 20, p. 120). Hence, they supported the selection of specific research techniques and procedures adopted throughout the research activity (see section 3.3.1 and 3.4).

Following the establishment of these research objectives, the overall inquiry activity was divided into two distinct instances: one *exploratory* and the other *explanatory* (Figure 21, p.121). The objectives and questions addressed at the *exploratory instance* of the research supported the development of an explanatory principle, constructed as a theoretical framework,

and which was further investigated empirically at the *explanatory instance* of the research activity.

The exploratory instance of the research activity focused on addressing objectives 1 and 2.

**Objective (1):** ***Identify and analyse how collaboration has been addressed in construction projects.***

This objective supported the initial interpretation of the research setting, in terms of helping to identify the research problem and research gap around the topic of *collaboration in construction projects*. This objective was addressed through a review of the literature aimed at answering two questions (Q1 and Q2):

Q1: *How has collaboration been addressed in construction projects?*

The answer to this question was presented in the literature review chapter (see section 2.2), and it led to the identification of diverse conceptualisations of collaboration in construction. The analysis of the underlying assumptions embedded in these definitions of collaboration allowed them to be clustered according to three 'metaphors of collaboration', in which collaboration is traditionally seen as a *Mechanism,* as an *Organisation*, or as a *Social Construct* (see section 2.2.2). Hence, it was contended that such ideas of collaboration operate as appreciative systems (Vickers, 1965; Checkland, 2005), framing the way individuals interact in a project situation (see section 2.2.3, 2.2.4 and 2.2.5).

## Table 10: Three different conceptions of collaboration in construction

| | MECHANISM | | | ORGANISM | | SOCIAL CONSTRUCT | |
|---|---|---|---|---|---|---|---|
| **In Construction, Collaboration addresses:** | Communication Problem among Project Participants | | | The "Fragmented" nature of construction projects | | The challenge of create something together, in a context where individuals interpret (see) "things" differently | |
| **Collaboration is addressed as:** | Problem-solving activity | | | Problem-solving activity | | Interactions to promote change (course of actions) | |
| **Aim** | work on interactions between human and "machine", combining human cognitive capacities with computer systems (e.g. softwares, platforms) | | | provide a better context for integrated teams | | Reflect upon individuals objectivation (of collaboration) | |
| **Objectives** | Develop communicative and coodinative capabilities of information systems (as tools to support collective problem-solving) based on standardization strategies | | | promote organisational changes (changing traditional systems of work based on roles and responsibilities) by developing organisational structures | | Achieve social construction of shared meanings in a situation of functional interdependence | |
| **Collaboration is seen as:** | Media Framework | | | Organisational Framework | | Concerted Actions | |
| **Manifested in:** | Information processing system ( an environment), previously designed with a specific purpose | | | Relational system (an intitutional artefact), previously designed and controled by "managers" (relies on leadership) | | A set of common understandings (which is always underdevelopment), in which the continuous co-production of common objectives generate the interactions | |
| **Core function** | information processing = a set of operations (e.g. breakdown of the activity) | | | relationship = a model of interdependence (e.g. process) | | co-production = ability to act collectively towards common goals | |
| **Key Collaborative Features** | produce | communicate | coordinate | Interdependence | Control and Adaptation | Sense-making | Choice / Negotiation / Compromise |
| **Implications (implies)** | Information as "carrier" of knowledge | Relies on predetermined structures to exchange | Integrated set of tools (Interoperability) | High task interdependence, in which outcomes become equally distributed (i.e. collection of skills) | Group goal or individual purposes are predetermined by a central brain (managers). Implies a sense of control and predefined responsibilities. | Ability to collectively construct the activity | Individuals display will to choose their goals and means. Choice to system functions are distributed and interdependent (*Social dilemmas* - |
| **Embodied into** | **standard computer representations** | **data exchange standards** | **Intelligent Agent Systems** | **(New) project management (strategies, methods, approaches)** | **(New) procurement routes (Contractual arrangement)** | **Mutual intelligibility** | **Situation awareness** |
| **Description** | Manipulation of pre-defined objects based on Shared Ontology | | | Institute early and frequent feedback (to adapt), and the development of unified culture (i.e. shared rules and norms) | Support commercial alignment (shared profit and risk), promoting shared responsibilities, resources and rewards | Collaboration is not one thing (different configurations in different situations for different players) | Collaboration emerge from autonomy and free-will of project participants, thus the "relationship" is always underdevelopment |

Q2: *What are the common problems related to Early Project Collaboration?*

In relation to Q2, it was also identified that diverse interpretations of collaboration, as well as different interpretations over certain aspects in the project activity in construction, tend to lead to misunderstandings among project participants, hampering early project collaboration in construction (see section 2.2.6).

Thus, in order to grasp how misunderstandings configure problems at early project interactions, a second part of the literature review chapter explored the *context, origin, consequences* and *potential solutions (i.e. resolution)* for this phenomenon (see section 2.3). Following the different ways of interpreting collaboration in construction (see section 2.2.2), this sub-section explored misunderstandings in Early Project Collaboration from a socio-constructive perspective. In this case, such exploration analysed how the **context** of misunderstandings on early project collaboration can be interpreted as *Social Dilemmas* (see section 2.3.1). The **origins** of misunderstandings are related to the way individuals interpret the world through *Objectivations* (see section 2.3.2). It was contended that the situated nature of such interpretive interactions leads to the questioning of traditional notions of what constitute *knowledge* and, consequently, reinforces the appropriateness of referring to the notion of *understanding* as a key aspect of the socio-construction of meaning (see section 2.3.2.1). Based on previous research, examples of how divergent objectivations are embodied into linguistic and graphical artefacts at early project interactions, and how they can generate misunderstandings, were presented (see section 2.3.2.3, 2.3.2.4 and 2.3.2.5). As a **consequence**, misunderstandings emerging from diverse objectivations over an aspect in a project activity can be seen as *systemic contradictions*, in the inherent *dialectical construction* of the activity (see section 2.3.3). Thus, the **resolution** of misunderstandings tends to involve interactions towards *breakdown* and bridging divergent interpretations objectivated in the project activity through the use of *metaphors*, eventually building mutual intelligibility among project participants (see section 2.3.4).

**Objective (2):** *Understand the emergence of misunderstandings at early project interactions and how they tend to be resolved.*

Following an interpretive research approach, this objective also supported an initial and explorative inquiry into the nature of misunderstandings at early project interactions through an empirical study into a real-life context of the phenomenon.

The Exploratory Case Study aimed to answer questions Q3 and Q4:

Q3: *How and why do misunderstandings emerge at Early Project Stage?*

The Exploratory Case Study (see section 4.2) revealed that, at early project interactions, in this case at collaborative design event, misunderstandings emerged when individuals interpreted aspects of the project activity (e.g. design topic) in different ways. Such divergence of interpretation was revealed when individuals interacted through different forms objectivations (e.g. linguistic and graphical) (see section 4.2.3). One important aspect of such interaction revealed by the Exploratory Case Study was that such misunderstandings were not ignored, and became sources of further interactions to overcome the divergences on interpretation and construct mutual intelligibility (see section 4.2.3.3).

Q4: *How do misunderstandings tend to be resolved?*

The Exploratory Case Study also revealed that, when individuals identified the incompatibility between the two diverse interpretations (i.e. objectivations) as misunderstandings (see section 4.2.3.3), they tended to engage in breakdown interactions that allowed them to expand and review their objectivations collectively. Such breakdown interactions were marked by the questioning behaviour of the participants towards reviewing underlying assumptions embedded in the linguistic and graphical objectivations presented and being developed (see section 4.2.3.1). Such reflection helped project participants to review their objectivations, and eventually expand their original interpretations.

The Exploratory Case Study also revealed the use of metaphors as a way that individuals interacted in order to avoid and/or overcome misunderstanding by relying on underlying understandings (i.e. *appreciative systems*) and the transposition of common concepts into different contexts, which helped them to build mutual intelligibility and construct shared objectivations.

Thus, the exploratory case study led to the proposition of a first version of a theoretical framework describing the resolution of misunderstandings at early project interactions, in terms of the dynamics of mutual intelligibility (Figure 29). At that point, the resolution of misunderstandings within collaborative interactions was interpreted as an iterative cycle, involving the following interactions among project participants: (1) *objectivations*; (2) *misunderstandings*; (3) *breakdowns*; and (4) *metaphors* (see section 4.2.3.3).

The findings from the exploratory case study contributed to the reflection presented in the Synthesis of the Literature, with further formulation of the theoretical framework (see section

2.4.4, Figure 18), which was then used as a base for the In-depth Case Study (see section 4.3). Hence, the explanatory stage of the research activity focused on addressing objectives 3 and 4.

***Objective (3): Propose a better way to interpret collaborative interactions at early project stages***

This objective directed the inquiry into the 'utility' and further development of the proposed theoretical framework that, as an explanatory principle, potentially would be able to provide a better interpretation of collaboration interactions to resolve misunderstandings at early project stages. This inquiry was addressed through the Synthesis of the Literature (see section 2.4) and the In-Depth Case Study (see section 4.3) aiming to answer the following question (Q5):

Q5: *How is Early Project Collaboration constructed?*

This objective began to be addressed by the questions raised upon the findings and limitations of the Exploratory Case Study (see section 4.2.3.3). In this case, while the description of collaborative interactions in terms of iterative cycles suggested a certain order in which these interactions seem to happen, progressing towards the resolution of misunderstandings, there was not sufficient evidence from the exploratory case study that this is always the case (see section 4.2.3.3). Moreover, the cyclical model (Figure 29) couldn't thoroughly describe the dualistic nature of the emergence of different objectivations made by project participants in the activity, since it represents the interactions as a unity being transformed across different 'stages' (see section 5.2).

Such limitations meant that fundamental aspects of a socio-constructive perspective of project collaboration, namely the *situatedness* and *dialectics,* were not represented in that initial proposition of a theoretical framework (see section 5.3). Thus, further inquiry into how these aspects could be interpreted in the study of early project interactions was developed through the Synthesis of the Literature (2.4) and In-Depth Case Study (4.3).

The discussion presented in the Synthesis of Literature (see section 2.4.1) suggested how Activity Theory offers a framework to interpret the *situatedness* and *dialectics* of collaborative interactions in a project activity. This builds on Dewey's (1936) *Theory of Inquiry*, as a dialectical model for a project activity, that was merged with the third generation of Activity Theory, to be used as a framework of inquiry into the dialectics of the socio-construction of early project collaboration (2.4.3). Hence, the argument is made on how this framework allows the inquiry into the dynamic construction of project collaboration through the objectivations of

207

key constructs of collaboration (see section 2.4.4), namely the *perception of interdependency; perception of performance; conception of resource;* and *conception of changing action*. In this case, the framework suggests that the situated aspects of these interactions can be interpreted in terms of the embodiment of individuals' objectivations of these constructs into artefacts, events, assembles and approaches (see Figure 17, p. 112).

The In-Depth Case Study involved the application and assessment of the proposed theoretical framework to inquire into the socio-construction of project collaboration. The data obtained from document analysis and from the interviews allowed the mapping of key stakeholders' interactions to objectivate collaboration in the project situation (i.e. Situational Objects) (see section 4.3.3, Figure 34, Figure 35 and Figure 36). The analysis revealed that such interactions operate as a dyad of objectivations, in which both sides of the project activity embody their interpretation of the key constructs of collaboration into artefacts, assembles, approaches and events (see section 4.3.3 and Appendix 4).

The mapping of these interactions allowed the identification of the dynamics involved in the emergency and resolution of misunderstandings around the key constructs of collaboration, in the project activity (see section 4.3.3.5). The case study showed that the progression from divergence on dual objectivation around aspects of the project collaboration (e.g. *Engagement Template* or an aspect of the *Building Design Proposal*), to the construction of mutual intelligibility on shared objects of activity, does not follow a set of specific steps, and it cannot be described as unitary cycle. The findings suggest that mutual intelligibility can be reached at a *breakdown* interaction without the use of metaphor, and *metaphors* can be used to imply mutual intelligibility even before a misunderstanding emerges. In this case, within the overall framework of project activity, the resolution of misunderstandings can be described as a set of situated interactions progressing dialectically, towards mutual intelligibility on shared objects of activity (seen Figure 37, at section 4.3.3.5). Therefore, Figure 37 can be seen as an answer to the research question (Q5) in that, based on the findings from the In-Depth Case Study, it shows how collaborative interactions at early project stages involve the *Dynamics of Mutual Intelligibility*, in which misunderstandings are resolved and shared objects of activity are generated, within the dialectical and situated nature of the socio-construction of the project activity, describing the *Dynamics of Early Project* Collaboration.

Overall, the findings from the In-Depth Case Study allowed the discussion (see Chapter 5) on how the proposed interpretation of the Dynamics of Early Project Collaboration in construction can address the gap identified in the literature, summarised in Q6:

Q6: *How to better interpret Early Project Collaboration?*

The discussion presented in Chapter 5 sets out the theoretical contribution of this research by identifying the limitations of previous models of collaborative interactions (see section 5.2), highlighting the advantages of adopting the proposed theoretical framework as a dialectical and situated model to interpret these interactions (5.3, 5.4 and 5.5). In this case, the discussion also addresses the potential practical implications of the proposed theoretical framework, from a pragmatic perspective, to be used as a collective reflective tool supporting collaborative interactions in construction projects (see section 5.6).

## 6.3. Research Contributions

Research contributions are reviewed from both the theoretical and practical viewpoints. Theoretical contributions are considered on how the research findings addressed the research gap, advancing the current understanding of early project collaboration. Practical contributions are discussed in terms of recommendations towards the application of the proposed theoretical framework in practice, as well as in relation to best practices identified through the Case Studies, indicating potential ways to improve early project collaboration.

### 6.3.1. Theoretical contributions

Early project collaboration is a poorly understood phenomenon (see section 2.2), in which emergent misunderstandings around the activity can hamper interactions among project participants (see section 2.2.6). In this context, previous research identified that current interpretations of how emergent misunderstandings are resolved are limited and do not provide sufficient understanding on how to improve early project collaboration (see section 1.4 and 5.2).

Therefore, in order to address this research gap, an extensive literature review was conducted into how collaboration has been described in construction and other related areas, which allowed the identification of a set of diverse interpretations of collaboration, described in terms of metaphors of collaboration (see section 2.2.2).

The emergence of diverse interpretations of collaboration seems to be based upon the social and historical construction of diverse appreciative systems, framing the way certain individuals

and professional disciplines understand and operationalise collaboration in practice (see section 2.2.1). The notion of appreciative systems and the socio-constructive nature of this interactions, described by the notion of *objectivation*, is presented as an explanation of why individuals interpret the collaborative phenomenon differently (see section 2.3.2). This also explains why often the context of collaborative interactions involves misunderstandings among project participants coming from different professional backgrounds (see section 2.2.6).

Thus, by developing a socio-constructive theoretical framework based on the Activity Theory (see section 2.4.1), and applying it to interpret a real-life situation through an In-Depth Case Study (see section 4.3 and Appendix 4), this research aimed at providing a broader and deeper interpretation of how misunderstandings are resolved and how they affect the construction of early project collaboration.

Findings from the Case Study are presented describing how the proposed theoretical framework can be used as a way to interpret the socio-constructive nature of early project collaboration, in terms of dialectics and situatedness of these interactions (see section 4.3.3.5).

In Chapter 5, further discussion is presented on how these findings addressed the research gap, contributing theoretically to the topic. The discussion highlights the key theoretical contributions:

- The **limitations of the existing models of collaboration**, which have tried to explain these interactions based on the individualistic (rationalistic and reductionist) models of cognition (i.e. cyclical models) (see section 5.2).
- Hence, it is discussed how such interpretation seems to be **incompatible with a socio-constructive perspective** of the phenomenon (see section 5.3).
- Alternatively, the author discussed how the proposed theoretical framework presents **advantages** when **compared to the existing models** (see section 5.4 and 5.5), and contributes in expanding the understanding of the dynamics of early project collaboration by considering the dialectics and situatedness of interactions involved in the dynamics of mutual intelligibility.
- The main advantage is that it theoretically contributes towards a **pragmatic perspective** of early project collaboration, and thus it is suggested that the framework could be used by project participants in practice as **tool to map, reflect and steer their collaborative interactions** in the situation (see section 5.6).

Moreover, as the core of this theoretical framework involves a broad interpretation of the nature of project activities, it is contended that it could be further applied to different project situations other than Construction Activity. Thus, the framework could be seen as a general Pragmatic Model of Project Collaboration. In this case, further research should explore the utility of this model to other contexts of project practices.

## 6.3.2. Practical contributions

It is contended that a practical contribution of this research regards the potential use of the proposed theoretical framework as a collective reflective tool. Findings from both case studies provided guidance and lessons learnt about how project participants could potentially use the theoretical framework to support collective reflection in their collaborative interactions. This guidance and lessons can be related to recommendations specifically to interactions involving the Dynamics of mutual intelligibility: *Dual Objectivations, Misunderstandings, Breakdowns, Shared Objectivations*.

### 6.3.2.1. Dual Objectivations

The proposed model (Figure 43) could be used by project participants as a framework to **map and track how the key constructs of collaboration have been objectivated in the project**, and how these constructs have been embodied into artefacts, assembles, events and approaches.

Findings indicated that, on both sides of the construction project activity, participants seem to rely on long-lasting objectivations –in other words, *institutionalisations* – as a way to imply stability, and mutual intelligibility, into the activity (see section Discussion4.3.3). Such institutions can be seen embodied into the organisational structure (e.g. roles and assembles), as well as into traditional artefacts (e.g. Project Templates) employed in the activity.

However, the dialectical and situated nature of projects suggest a collective reflection of project participants upon these institutions and their continuous utility in the new projected situation.

### 6.3.2.2. Misunderstandings and Breakdowns

By using the framework as a map of the project's objectivations, participants would be able to **recognise potential misunderstandings** among the different aspects of the project activity, and how these diverse understandings become embodied into a potentially contradictory set of artefacts, events, assembles and approaches in the activity.

Points of misunderstanding on the map would be highlighted triggering **breakdown interactions**, to question and review underlying assumptions, and potentially leading to an expansion of participants' understanding about that matter.

The Case Studies showed that certain events, involving face-to-face interactions, can help the participants to identify misunderstandings early on in the project activity. In particular, the *Roadshow events* were a good example that helped a Consultancy Team to explore potential misunderstandings emerging from different interpretations of Project Brief documents.

These events can support the Consultancy Team's members to overcome divergent objectivations of the perception of interdependency and performance by embodying them into real-life examples of Building Projects. In those events, team members from a diverse range of disciplines can objectivate their interpretation of the Client's Specifications for a project, and then, more clearly, realise the differences of understanding among them.

In these interactions, the questioning behaviour seems to be a key element, which is further dependent on individuals' skills to expand their interpretation of a certain aspect of the activity, through linguistic and/or graphical objectivations.

The adoption of certain tools can inherently engage project participants into breakdown interactions. In the In-Depth Case Study, for example, the use of the *Scope of Service* by the Contractor was a way to establish a breakdown of the design task deliverables among the Consultancy Team. Similarly, the *Design Structure Matrix* was used to help the team to break down the interdependencies and responsibilities for design decisions among them.

Moreover, the dialectical nature of these interactions seems to reflect a constant positioning and repositioning from both sides of the project activity, towards compromise on the economic output of the activity, in terms of benefits and drawbacks. Thus, the client and service provider should constantly break down their expectations and guarantee that they continue moving towards a shared object of activity.

In this context, the proposed framework could be seen as a dynamic model of the project activity, as a *Map*, that would be under constant revision. Thus, taken-for-granted attitudes should be avoided, and *institutionalised objects* should always be the focus of breakdown interactions. Questions should be made upon their continuous suitability in this specific situation.

Project participants' contribution to map their interactions would lead them to reflect upon their interpretation of the activity, as well as upon each other's interpretations. Such interaction expectedly would support an increase of the participants' *situation awareness*, and lead them to take measures to resolve potential misunderstandings among them.

### 6.3.2.3. Shared Objectivations

In this collective reflective interaction, resolution of misunderstandings depends on individuals' construction of shared objectivations. These interactions are marked by individuals' purposeful initiatives to bridge two or more appreciative systems (see section 2.3.4.4), by using metaphors (speaking and writing). On some occasions, metaphors can be supported by further reference to graphical elements (e.g. drawings/sketches, images, 3D objects).

Metaphors can be used to support the breakdown of interactions and reveal diverse understandings among project participants, which eventually leads these individuals to reconceive their objectivations, as well as the embodiment of those objectivations in the activity. However, metaphors can also be used in advance, as a way to avoid potential misunderstandings.

Overall, it is recommended that the adoption of the proposed theoretical framework would stimulate and support the enactment of these interactions among project participants. As a collective reflective tool, it would allow project participants to dynamically reposition their interpretation of the project activity towards mutual intelligibility, supporting the socio-construction of collaboration. Moreover, such initiative could be seen as a way that project participants could dynamically assess their collaborative performance and, consequently, steer their interactions to more efficient practices.

## 6.4. Key limitations

Collaboration, as a research topic has been addressed in many different fields of research (e.g. Organisational, Learning, Healthcare, Management), as was indicated in section 2.2. Thus, one limitation of this research was around the specific fields of research that were excluded from the work for practical reasons. Such limitation was addressed in the literature review by focusing on identifying definitions of collaboration in fields of research that have been historically relevant to design and construction research. The criteria involved in justifying the selection of these references was described in section 3.4.1 and Appendix 2.

A second limitation of this research regards the Case Studies approach and the type of projects investigated. This refers to the selection of the cases and the value-biased nature of this approach. On this matter, as was indicated in sections 1.5 and 3.3.2, the selection of the cases assumed that a context of relational procurement method in construction projects (see description on section 2.2.4) provides a better environment for collaborative interactions, especially at early project stages. So, the researcher looked for case studies in a context of relational procurement routes (e.g. IPD in the Exploratory Case Study and Competitive Dialogue in the In-Depth Case Study, see section 3.3.2).

Another limitation regarding the case studies and type of project involved the engagement of the researcher. In principle, the partnership arrangement involved in this procurement method allowed the presence of the researcher to not be seen as a threat to their commercial relationship. However, due to legal reasons (i.e. to avoid disrupting the competition), the researcher was only allowed to engage with the project participants at the end of the early project stage. As was indicated in section 3.4.4, this limitation was addressed by the research technique adopted to conduct the interviews with the key project participants, which retrospectively inquired into their interactions in the project activity, providing evidence of how they socially constructed early project collaboration.

The fourth limitation of this research can be related to the validation of the final framework. In this case, following an interpretivist epistemological approach, rigour and evaluation of the proposed theoretical framework is addressed by the UA requirement of methods (see section 3.6.1) and evidence is presented through the Story Telling technique based on the content of the Communication Analysis. Further generalisability of these findings should be explored in terms of further research on the use of the proposed framework in supporting early project interactions in different contexts (see section 6.5).

## 6.5. Suggestions for Future Research

Following the previous discussion about the potential application of the theoretical framework in practice as a collective reflective tool to support early project collaboration (see section 6.3.2), it is suggested that future research should explore the adoption of this framework in three different practical settings: *Change Experiments; a Collaboration Game;* and *a Digital Socio-Constructive Collaborative Platform.*

### 6.5.1. Change Experiments

In this sense, the author believes that initiatives aligned with practical experiments using Activity Theory, like *Change Experiments* (Engestrom et al, 1996, Akesnova et al., 2014; Forgues and Lapalme, 2017), could provide the means to assess the utility of this framework as a reflective tool, supporting the socio-construction of project collaboration. Such exploration would take further the argument of the pragmatist perspective upon the proposed theoretical framework, and it could also lead to initiatives towards Action Research.

### 6.5.2. Collaboration Game (supporting Learning and Training)

Further research should explore adapting the proposed theoretical framework as a way to introduce notions of collaboration to students and professionals related to construction. In this case, it is suggested the adaptation of the theoretical framework into a simulation activity in a format of *a game*.

The game would lead the students and/or professionals to reflect upon their underlying understanding of collaboration in construction. It is suggested that a key aspect to be explored in the development of such game is the simulation of the context of collaboration, in terms of *social dilemmas*. Thus, further investigation on how to abstract this aspect into a game situation for construction projects is necessary.

### 6.5.3. Digital Socio-Constructive Collaborative Platform

Further research should also explore the potential use of the proposed models as a framework for a computational system. In this case, it is suggested that the system would work as an open online platform based on the collaborative creation of projects. Individuals would be able to set projects according to their location and timeframe. In this system, projects could be created by collectively setting the key constructs of collaboration (i.e. *interdependency, performance, resources and changing actions*). Thus, each individual who is interested in participating in this project needs to input in the system what constitutes these constructs to them, and how they become embodied into tangible objects (e.g. events, assembles, approaches and artefacts). A key aspect of this system is that all project participants can see and comment on the others' input in the system. This should bring about reflection and discussion on the resolution of potential misunderstandings among project participants. Moreover, the system should be able to automatically generate a map of the current state of individuals' interactions in the project.

# References

Ackoff, R. L., and Emery, F. E. (1972). *On purposeful systems: An interdisciplinary analysis of individual and social behaviour as a system of purposeful events*. Tavistock, London. p. 288.

Adamu, Z. A., Emmitt, S. and Soetanto, R. (2015). Social BIM: Co-creation with shared situational awareness. *Journal of Information Technology in Construction*, 20, 230-252.

AIA (1995). *AIA Document D200. Project Checklist.* The American Institute of Architects, 1735 New York Avenue, N. W., Washington, D. C.

Aksenova, G., Tahrani, S., Forgues, D. and Kiviniemi, A. (2014). Use of collaborative platform to facilitate informal design communication: case study. *Symposium COMMON'14*. University of Liege, Belgium.

Alexander, C. (1964). *Notes on the Synthesis of Form* (Vol. 5). Harvard University Press.

Alvesson, Mats (2003). Beyond neopositivists, romantics and localists: a reflexive approach to interviews in organizational research. *Academy of Management Review*, vol. 28(1), pp. 13-33.

Anumba, C. J., and Evbuomwan, N. F. (1997). Concurrent engineering in design-build projects. *Construction Management & Economics*, *15*(3), 271-281.

Anumba, C. J., Baron, G., and Evbuomwan, N. F. O. (1997). Communications issues in concurrent life-cycle design and construction. *BT Technology Journal*, *15*(1), 209-216.

Anumba, C., Ugwu, O. O., Newnham, L., and Thorpe, A. (2002). Collaborative design of structures using intelligent agents. *Automation in construction*, *11*(1), 89-103.

Appley, D. G., and Winder, A. E. (1977). An evolving definition of collaboration and some implications for the world of work. *The Journal of Applied Behavioral Science*, *13*(3), 279-291.

Arias, E., Eden, H., Fischer, G., Gorman, A., and Scharff, E. (2000). Transcending the individual human mind—creating shared understanding through collaborative design. *ACM Transactions on Computer-Human Interaction (TOCHI)*, *7*(1), 84-113.

Arnheim, R. (1993). Sketching and the Psychology of Design. *Design Issues*, *9*(2), 15-19.

Arup, O. (1970). Architects, Engineers and Builders. *Journal of the Royal Society of Arts*, *118*(5167), 390-401.

Badke-Schaub, P., Neumann, A., Lauche, K., and Mohammed, S. (2007). Mental models in design teams: a valid approach to performance in design collaboration? *CoDesign*, *3*(1), 5-20.

Badke-Schaub, P., Goldschmidt, G., and Meijer, M. (2010). How does cognitive conflict in design teams support the development of creative ideas? *Creativity and Innovation Management*, *19*(2), 119-133.

Ballard, G. (2000). Positive vs. Negative Iteration in Design. In: *Proc. 8th Ann. Conf. of the Int'l Group for Lean Construction*. Brigthon, UK.

Ballard, G. (2008). The lean project delivery system: An update. *Lean Construction Journal*, *2008*, 1-19.

Bardram, J. (1998). Designing for the dynamics of cooperative work activities. In *Proceedings of the 1998 ACM conference on Computer supported cooperative work* (pp. 89-98). ACM.

Beckett, S. J. (2017). The Logic of the Design Problem: A Dialectical Approach. *Design Issues*, *33*(4), 5-16.

Berger, P. L., and Luckmann, T. (1966). *The social construction of reality: A treatise in the sociology of knowledge*. Penguin UK.

Bertelsen, S. (2003a). Construction as a Complex System. In: *11th Annual Conference of the International Group for Lean Construction.* Virginia, USA, 1-.

Bertelsen, S. (2003b). Complexity - A New Way of Understanding Construction. In: *11th Annual Conference of the International Group for Lean Construction.* Virginia, USA, 1-.

Bertelsen, S., and Emmitt, S. (2005). The client as a complex system. In *13th International Group for Lean Construction Conference: Proceedings* (p. 73). International Group on Lean Construction.

Bertelsen, S. and Koskela, L. (2005). Approaches to Managing Complexity in Project Production. In: *13th Annual Conference of the International Group for Lean Construction.* Sydney, Australia, 19-21 Jul 2005. pp 65-71.

Bittner, E. A. C., and Leimeister, J. M. (2013). Why Shared Understanding Matters-Engineering a Collaboration Process for Shared Understanding to Improve Collaboration Effectiveness in Heterogeneous Teams. *System Sciences (HICSS), 2013 46th Hawaii International Conference*. 106-114.

Blackler, F. (1993). Knowledge and the theory of organizations: Organizations as activity systems and the reframing of management. *Journal of management studies*, *30*(6), 863-884.

Boaz, D. (2015). *The Libertarian Mind: A Manifesto for Freedom*. Simon and Schuster.

Boton, C., and Forgues, D. (2017). The need for a new systemic approach to study collaboration in the construction industry. *Procedia engineering*, *196*, 1043-1050.

Brereton, M. F., Cannon, D. M., Mabogunje, A., and Leifer, L. J. (1996). Collaboration in design teams: How social interaction shapes the product. *Analysing design activity*, 319-341.

Bridges, A. (2007) Problem based learning in architectural education. In: *Proceedings of CIB 24th W78 Conference* Maribor 2007. CIB (International Council for Building).

Briggs, R., Kolfschoten, G., Gert-Jan, V., and Douglas, D. (2006). Defining key concepts for collaboration engineering. *AMCIS 2006 Proceedings*, 17.

Bruner, J. S. (1957). On perceptual readiness. *Psychological review*, *64*(2), 123.

BSI (2016). BS 1192:2007+A2:2016 – Collaborative production of architectural, engineering and construction information. Code of practice. British Standards Institute, United Kingdom.

Bucciarelli, L. L. (1984). Reflective practice in engineering design. *Design studies*, *5*(3), 185-190.

Bucciarelli, L. L. (2002). Between thought and object in engineering design. *Design studies*, 23(3), 219-231.

Bucciarelli, L. L. (2003). Designing and learning: a disjunction in contexts. *Design Studies*, *24*(3), 295-311.

Bucciarelli, L. L. (2009). The epistemic implications of engineering rhetoric. *Synthese*, *168*(3), 333-356.

Buchanan, R (1995) Wicked problems in design thinking. In: Margolin, V. and Buchanan, R. (eds) *The idea of design*, MIT Press, Cambridge, MA pp 3-20.

Buckingham, W. (2011). *The philosophy book*. Dorling Kindersley Ltd.

Burgess, Robert G. (1982). *Field research: a sourcebook and field manual*. London: George Allen and Unwin.

Burnett, M. (2009). Using competitive dialogue in EU public procurement. Early trends and future developments. *EIPAScope*, *2009*(2), 17-23.

Cannon-Bowers, J. A., Salas and E., Converse, S. (1993). Shared mental models in expert team decision making. *Individual and group decision making: Current issues*, *221*.

Camarinha-Matos, L. M., and Abreu, A. (2007). Performance indicators for collaborative networks based on collaboration benefits. *Production planning and control*, *18*(7), 592-609.

Cardoso, C., Badke-Schaub, P., and Eris, O. (2016). Inflection moments in design discourse: How questions drive problem framing during idea generation. *Design Studies*, *46*, 59-78.

Checkland, P. (1994). Systems theory and management thinking. *American Behavioural Scientist*, *38*(1), 75-91.

Checkland, P. (2005). Webs of significance: the work of Geoffrey Vickers. *Systems Research and Behavioral Science: The Official Journal of the International Federation for Systems Research*, *22*(4), 285-290.

Cooke, N. J., and Gorman, J. C. (2006). Assessment of team cognition. *International encyclopedia of ergonomics and human factors*, 270-275.

Cooper, R. G. (1994). Third-generation new product processes. *Journal of product innovation management*, *11*(1), 3-14.

Strauss, A., and Corbin, J. (1994). Grounded theory methodology. *Handbook of qualitative research*, *17*, 273-85.

Coyne, R., and Snodgrass, A. (1993). Cooperation and individualism in design. *Environment and Planning B: Planning and Design*, *20*(2), 163-174.

Coyne, R. (2005). Wicked problems revisited. *Design studies*, *26*(1), 5-17.

Creswell, J. W. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications. 273p.

Cross, N., and Cross, A. C. (1995). "Observations of teamwork and social processes in design." In: *Design studies*, *16*(2), 143-170.

Cross, N., Dorst, K., and Christiaans, H. (Eds.). (1996). *Analysing design activity*. Wiley.

Cross, N. (2011). *Design thinking: Understanding how designers think and work*. Berg.

Crotty, M. (1998). *The foundations of social research – meaning and perspective in the research process*. Australia: SAGE Publications Ltd.

Dalsgaard, P. (2014). Pragmatism and Design Thinking. *International Journal of Design, 8*(1), 143-155. Retrieved from: http://www.ijdesign.org/ojs/index.php/IJDesign/article/viewFile/1087/604

D'Amour, D., Ferrada-Videla, M., San Martin Rodriguez, L., and Beaulieu, M. D. (2005). The conceptual basis for interprofessional collaboration: core concepts and theoretical frameworks. *Journal of interprofessional care*, *19*(sup1), 116-131.

Dawes, R. M. (1980). Social dilemmas. *Annual review of psychology*, *31*(1), 169-193.

Dearborn, D. C., and Simon, H. A. (1958). Selective perception: A note on the departmental identifications of executives. *Sociometry*, *21*(2), 140-144.

den Otter, A., and Emmitt, S. (2008). Design team communication and design task complexity: The preference for dialogues. *Architectural Engineering and Design Management*, *4*(2), 121-129.

Deutsch, M. (1949). A Theory of cooperation and competition. *Human Relations*, 2, 129-152.

Dewey, J. (1884). Kant and philosophic method. *The Journal of Speculative Philosophy*, *18*(2), 162-174.

Dewey, J. (1934). *Art as experience*. Ed. Perigee.

Dewey, J. (1938). *Logic: The theory of inquiry.* New York: Holt, Rinehart & Wiston.

Dong, A. (2005). The latent semantic approach to studying design team communication. *Design Studies*, *26*(5), 445-461.

Dong, K., Doerfler, J., and Fowler, T. (2013). The interdisciplinary design studio: Identifying collaboration. In *Proc., Building Technology Educators Society Conf.* 141-148.

Dong, A., Kleinsmann, M. S., and Deken, F. (2013). Investigating design cognition in the construction and enactment of team mental models. *Design Studies*, *34*(1), 1-33.

Donn, M., Selkowitz, S., and Bordass, B. (2012). The building performance sketch. *Building Research & Information*, *40*(2), 186-208.

Dorst, K., and Dijkhuis, J. (1995). Comparing paradigms for describing design activity. *Design Studies*, *16*(2), 261-274.

Dorst, K. (1997). *Describing design: a comparison of paradigms*. Technische Universiteit Delft.

Dorst, K., and Cross, N. (2001). Creativity in the design process: co-evolution of problem–solution. *Design studies*, *22*(5), 425-437.

Dorst, K. (2006). Design problems and design paradoxes. *Design issues*,*22*(3), 4-17.

Dougherty, D. (1992). Interpretive barriers to successful product innovation in large firms. *Organization science*, *3*(2), 179-202.

D'souza, N. (2016). Investigating design thinking of a complex multidisciplinary design team in a new media context: Introduction. *Design Studies* (46), 1-5.

Durkheim, E. (1893). *The division of labour in society*. W.D. Halls, New York: Free Press (1997).

Easterby-Smith, M., Thorpe, R., and Lowe, A. (1994). The philosophy of research design. *Improving educational management through research and consultancy. London: Paul Chapman*.

Easterby-Smith, Mark, Thorpe, Richard and Lowe, Andy (2002). "Management research: an introduction". Sage Publications Ltd.

Eastman, C., Eastman, C. M., Teicholz, P., Sacks, R., and Liston, K. (2011). *BIM handbook: A guide to building information modeling for owners, managers, designers, engineers and contractors*. John Wiley & Sons.

Eckert, C., and Stacey, M. (2000). Sources of inspiration: a language of design. *Design studies*, *21*(5), 523-538.

Eckert, C. M., Blackwell, A. F., Bucciarelli, L. L., and Earl, C. F. (2010). Shared conversations across design. *Design Issues*, *26*(3), 27-39.

Edmonds, E. A., Candy, L., Jones, R., and Soufi, B. (1994). Support for collaborative design: Agents and emergence. *Communications of the ACM*, *37*(7), 41-47.

Egan, J. (1998). *Rethinking Construction*. Construction Task Force Report for Department of the Environment, Transport and the Regions.

Eisenhardt, K M. (1989). Building Theories from Case Study Research. The Academy of Management Review. Vol.14(4), pp.532-550.

Eisenhardt, K. (1991). Better stories and better constructs: the case for rigour and comparative logic. Academy of Management Review, vol. 16(3), pp. 620-620.

Emw50@cam.ac.uk. (2015). Change-vs-cost.png. Retrieved March 24, 2019, from https://www.cisl.cam.ac.uk/graduate-study/sustainability-leadership-labs/images/copy_of_images/Change-vs-cost.png/view

Endsley, M. R. (1995). Toward a theory of situation awareness in dynamic systems. In: *The Journal of the Human Factors and Ergonomics Society*, 37(1), 32-64.

Engestrom, Y. (1987). Learning by expanding. *Helsinki: Orienta-Konsultit Oy*.

Engeström, Y. (1995). Objects, contradictions and collaboration in medical cognition: an activity-theoretical perspective. *Artificial intelligence in medicine*, *7*(5), 395-412.

Engeström, Y., Virkkunen, J., Helle, M., Pihlaja, J., and Poikela, R. (1996). The change laboratory as a tool for transforming work. *Lifelong Learning in Europe*, *1*(2), 10-17.

Engestrom, Y., Brown, K., Christopher, L., and Gregory, J. (1997). Coordination, cooperation, and communication in the courts: Expansive transitions in legal work. *Mind, culture, and activity: Seminal papers from the Laboratory of Comparative Human Cognition*, 369.

Engeström, Y. (1999). Activity theory and individual and social transformation. *Perspectives on activity theory*, *19*(38).

Engeström, Y. (2001). Expansive learning at work: Toward an activity theoretical reconceptualization. *Journal of education and work*, *14*(1), 133-156.

Engeström, Y. (2008). *From teams to knots: Activity-theoretical studies of collaboration and learning at work*. Cambridge University Press.

EP & CEU. (2004). Directive 2004/18/EC of the European Parliament and of the Council of 31 March 2004 on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts. *Official Journal of the European Union*, *47*(L134), 114-233.

Ericsson, K. A., and Simon, H. A. (1993). *Protocol analysis*. Cambridge, MA: MIT press.

Faniran, O. O., Love, P. E., Treloar, G., and Anumba, C. J. (2001). Methodological issues in design-construction integration. *Logistics Information Management*, *14*(5/6), 421-428.

Fink A. (1998) *Conducting research literature review: from paper to the internet*. Thousand Oaks. Sage.

Fischer, G. (2004). Social creativity: turning barriers into opportunities for collaborative design. In *Proceedings of the eighth conference on Participatory design: Artful integration: interweaving media, materials and practices.* Volume 1 (pp. 152-161). ACM.

Fleming, D. (1998). Design talk: Constructing the object in studio conversations. *Design issues*, *14*(2), 41-62.

Flores, F. (1982). *Management and Communication in the Office of the Future*. University of California, Berkeley.

Forgues, D., and Koskela, L. (2009). The influence of a collaborative procurement approach using integrated design in construction on project team performance. *International Journal of Managing Projects in Business*, *2*(3), 370-385.

Forgues, D., Koskela, L., and Lejeune, A. (2009). Information technology as boundary object for transformational learning. *Journal of Information Technology in Construction (ITcon)*, 14, 48-58.

Forgues, E. C., Carignan, V., Forgues, D., and Rajeb, S. B. (2016). A Framework for Improving Collaboration Patterns in BIM Projects. In *International Conference on Cooperative Design, Visualization and Engineering* (pp. 34-42). Springer International Publishing.

Forgues, D., and Lapalme, J. (2017). Research issues in attempting to support an architecture firm transition from fragmented CAD to BIM collaborative design. In *International Conference on Cooperative Design, Visualization and Engineering* (pp. 185-192).

Garcia, R., and Calantone, R. (2002). A critical look at technological innovation typology and innovativeness terminology: a literature review. *Journal of Product Innovation Management: an international publication of the product development & management association*, *19*(2), 110-132.

Gaski, J. F. (1984). The theory of power and conflict in channels of distribution. *Journal of marketing*, *48*(3), 9-29.

Gergen, K. J. (1985). The social constructionist movement in modern psychology. *American psychologist*, *40*(3), 266.

Gharajedaghi, J., and Ackoff, R. L. (1984). Mechanisms, organisms and social systems. *Strategic Management Journal*, *5*(3), 289-300.

Gill, J. and Johson, P. (2002). *Research Methods for Managers.* 3rd edition. Sage Publications. 234p.

Goldschmidt, G. (1991). The dialectics of sketching. *Creativity research journal*, *4*(2), 123-143.

Gray, B. (1989). *Collaborating: Finding common ground for multiparty problems.* San Francisco, CA: Jossey-Bass.

Gray, B. (2004). Strong opposition: Frame-based resistance to collaboration. *Journal of Community & Applied Social Psychology*, *14*(3), 166-176.

Green, S. D. (1996). A metaphorical analysis of client organizations and the briefing process. *Construction Management & Economics*, *14*(2), 155-164.

Groák, S. (1994). Is construction an industry? Notes towards a greater analytic emphasis on external linkages. *Construction management and economics*, *12*(4), 287-293.

Groleau, C., Demers, C., Lalancette, M., & Barros, M. (2012). From hand drawings to computer visuals: Confronting situated and institutionalized practices in an architecture firm. *Organization Science*, *23*(3), 651-671.

Gu, N., Singh, V., and London, K. (2015). BIM ecosystem: the coevolution of products, processes, and people. *Building information modeling: BIM in current and future practice*, 197-210.

Hart, C. (1998). *Doing a Literature Review: Realising the Social Science Research Imagination.* Sage. 230p.

Haymaker, J., Keel, P., Ackermann, E., and Porter, W. (2000). Filter mediated design: generating coherence in collaborative design. *Design Studies*, *21*(2), 205-220.

Heidegger, M. (1962). *Being and Time.* Translated by John Macquarrie & Edward Robinson. New York: Harper & Row.

Hey, J. H., Joyce, C. K., and Beckman, S. L. (2007). Framing innovation: negotiating shared frames during early design phases. *Journal of Design Research*, *6*(1-2), 79-99.

Hill, L. A., Brandeau, G., Truelove, E., and Lineback, K. (2014). Collective genius. *Harvard business review*, *92*(6), 94-102.

Holsti, O. R. (1969). *Content analysis for the social sciences and humanities.* Reading, MA: Addison-Wesley.

Howell, G., Macomber, H., Koskela, L., and Draper, J. (2004). Leadership and project management: time for a shift from Fayol to Flores. In *Proceedings of the 12th Annual Conference of the International Group for Lean Construction (IGLC-12)*. pp. 22-29.

Howell, G.A. (2013). Uncertainty, Organizational Structure & Collaboration: Questions for Research. In: Formoso, C.T. & Tzortzopoulos, P., *21th Annual Conference of the International Group for Lean Construction.* Fortaleza, Brazil, 31-2 Aug 2013. pp 23-31.

Hsu, W., and Liu, B. (2000). Conceptual design: issues and challenges. In: *Computer-Aided Design*, *32*(14), 849-850.

Huxham, C., and Vangen, S. (2000). Ambiguity, complexity and dynamics in the membership of collaboration. *Human relations*, *53*(6), 771-806.

Jankowicz, A. D. (2000). *Business research projects*. Thomson learning.

Johnston, R. B., and Brennan, M. (1996). Planning or organizing: the implications of theories of activity for management of operations. *Omega*, *24*(4), 367-384.

Jonson, B. (2005). Design ideation: the conceptual sketch in the digital age. *Design studies*, *26*(6), 613-624.

Kagioglou, M., Cooper, R., Aouad, G., Hinks, J., Sexton, M., and Sheath, D. (1998). Final report: Generic design and construction process protocol. *University of Salford, Salford*.

Kaptelinin, V., and Nardi, B. A. (2006). *Acting with technology: Activity theory and interaction design*. MIT press. 333p.

Kaufmann, F. (1959). John Dewey's theory of inquiry. *The journal of philosophy*, *56*(21), 826-836.

Kelly, G. (1955). Personal construct psychology. *Nueva York: Norton*.

Kerlinger, Fred N. (1979). "Behavioural research: a conceptual approach". Holt, Rinehart and Winston.

King, Nigel. (1998). *Template analysis. In: Qualitative methods and analysis in organizational research*. Ed. by Symon, G. and Cassell, C. Sage publications, London, pp. 118-134

Kiviniemi, A. (2005). *Product Model Based Requirements Management* (Doctoral dissertation, Ph. D. Thesis, Stanford Univ).

Kiviniemi, A. (2011). Distributed Intelligence in Design. In: *Distributed Intelligence in Design*. L. John Wiley & Sons, Ed. Oxford; Blackwell Publishing Ltd, pp. 125-135.

Kleinsmann, M. (2006). *Understanding collaborative design*, PhD. Thesis, Delft University of Technology, Delft.

Kleinsmann, M., and Valkenburg, R. (2008). Barriers and enablers for creating shared understanding in co-design projects. *Design studies*, *29*(4), 369-386.

Kokotovich, V., and Dorst, K. (2016). The art of 'stepping back': Studying levels of abstraction in a diverse design team. *Design Studies*, *46*, 79-94.

Kolb, D. (1975). Towards an applied theory of experiential learning. *Theories of Group Process.*, 33-56.

Koskela, L. (2000). *An exploration towards a production theory and its application to construction*. PhD Thesis. VTT Technical Research Centre of Finland.

Koskela, L., Ballard, G., and Howell, G. (2003). Achieving change in construction. In *Proceedings of the International Group of Lean Construction 11th Annual Conference (IGLC-11)* (Vol. 22, p. 24).

Koskela, L. J., and Kagioglou, M. (2005). On the metaphysics of production. In *Proceedings of 13th International Group for Lean Construction Conference.* (pp. 37-45).

Koskela, L. J., and Kagioglou, M. (2006). On the metaphysics of management. In *Proceedings of the 14th Annual Conference of the International Group for Lean Construction* (pp. 1-13).

Koskela, L. (2015). Where rhetoric and lean meet. In: *Proc. 23rd Ann. Conf. of the Int'l. Group for Lean Construction*, Perth, Australia. 527-535.

Koskela, L., Pikas, E., Niiranen, J., Ferrantelli, A. and Dave, B. (2017). On Epistemology of Construction Engineering and Management. In: *25th Annual Conference of the International Group for Lean Construction.* Heraklion, Greece, 9-12 Jul 2017. pp 169-17.

Koskela, L., Arroyo, P., and Ballard, G. (2018). Designing as a court of law. In: *Proc. 26 th Annual Conference of the International*. Group for Lean Construction (IGLC), González, V.A. (ed.), Chennai, India, pp. 614–624.

Krippendorff, Klaus (1980). *Content analysis: an introduction to its methodology*. Sage publications. London.

Kvan, T. (2000). Collaborative design: what is it? *Automation in Construction*.V.9.409-415.

Kuhn, T. S. (1962). *The Structure of Scientific Revolutions.* Chicago: University of Chicago Press.

Latham, M. (1994). *Constructing the team.* Department of the Environment. 130p.

Lawson, B. (2005). Oracles, draughtsmen, and agents: the nature of knowledge and creativity in design and the role of IT. *Automation in construction*, *14*(3), 383-391

Lawson, B., and Dorst, K. (2009). *Design expertise*. Oxford, UK. Elsevier Ltd. 321p.

Leon, M. and Laing, R. (2014). *Application of a conceptual stages design protocol for early collaborative design through computer-based mediation*. *OpenAIR@RGU*. Available from: http://openair.rgu.ac.uk

Li, W. D., Ong, S. K., Fuh, J. Y., Wong, Y. S., Lu, Y. Q., and Nee, A. Y. (2004). Feature-based design in a distributed and collaborative environment. *Computer-Aided Design*, *36*(9), 775-797.

Lincoln, Y. S., and Guba, E. G. (1994). Competing paradigms in qualitative research. *Handbook of qualitative research*, *2*, 163-194.

Lloyd, P., Lawson, B., and Scott, P. (1995). Can concurrent verbalization reveal design cognition? *Design Studies*, *16*(2), 237-259.

Lloyd, P. (2000). Storytelling and the development of discourse in the engineering design process. *Design studies*, *21*(4), 357-373.

Lloyd, P., and Busby, J. (2001). Softening up the facts: engineers in design meetings. *Design issues*, *17*(3), 67-82.

Love, P. E., Skitmore, M., and Earl, G. (1998). Selecting a suitable procurement method for a building project. *Construction Management & Economics*, *16*(2), 221-233.

Lu, S. and Sexton, M. G. (2004). Appropriate research design for investigating innovation in small knowledge-intensive professional service firms. *In:* Khosrowshahi, F (Ed.), *20th Annual*

*ARCOM Conference*, 1-3 September 2004, Heriot Watt University. Association of Researchers in Construction Management, Vol. 2, 733-9.

Lurås, S. (2016). Systems intertwined: A systemic view on the design situation. *Design Issues*, *32*(3), 30-41.

Macionis, J. J., and Gerber, L. M. (2011). *Sociology*. 7th ed. Toronto: Pearson Prentice Hall. 153-54.

Macmillan, S., Steele, J., Austin, S., Kirby, P., and Spence, R. (2001). Development and verification of a generic framework for conceptual design. *Design studies 22*(2) 169-191.

Maher, M. L., Cicognani, A., and Simoff, S. (1996). An experimental study of computer mediated collaborative design. In: *Enabling Technologies: Infrastructure for Collaborative Enterprises. Proceedings of the 5th Workshop*. 268-273.

March, S.T. and Smith, G.F. (1995). Design and natural science research on information technology. *Decision Support Systems* Vol. 15, Nr. 4, 251 – 266.

Mattessich, P. W., and Monsey, B. R. (1992). *Collaboration: what makes it work. A review of research literature on factors influencing successful collaboration*. Amherst H. Wilder Foundation, 919 Lafond, St. Paul, MN 55104.

Mertens, D. (2005). *Research and evaluation in education and psychology. Integrating diversity with quantitative, qualitative, and mixed methods* (2nd ed.). Thousand Oaks: Sage Publications Ltd.

Miles, Matthew B. and Huberman, A. Michael (1994). *Qualitative Data analysis. An Expanded sourcebook*. California: Sage Publications.

Miles, M. B., Huberman, A. M., and Saldana, J. (2014). *Qualitative data analysis: A methods sourcebook*. 3rd.

Morgan, G. (1980). Paradigms, metaphors, and puzzle solving in organization theory. *Administrative science quarterly*, 605-622.

Moscovici, S. (1984). The phenomenon of social representations. In R. M. Farr & S. Moscovici (Eds.), *Social representations.* Cambridge, England: Cambridge University Press. pp. 3-69.

Mossman, A., Ballard, G., and Pasquire, C. (2011). The growing case for lean construction. *Construction Research and Innovation*, 2(4), 30-34.

Nardi, B., Ed. (1996). *Context and Consciousness: Activity Theory and Human-Computer Interaction*. Cambridge, MA: MIT Press.

Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization science*, *5*(1), 14-37.

Ostrom, E. (1998). A behavioral approach to the rational choice theory of collective action: Presidential address, American Political Science Association, 1997. *American political science review*, *92*(1), 1-22.

Oxman, R. (2006). Theory and design in the first digital age. *Design studies*, *27*(3), 229-265.

Paavola, S., and Miettinen, R. (2018). Dynamics of design collaboration: BIM models as intermediary digital objects. *Computer Supported Cooperative Work (CSCW)*, *27*(3-6), 1113-1135.

Paletz, S. B., Schunn, C. D., and Kim, K. H. (2013). The interplay of conflict and analogy in multidisciplinary teams. *Cognition*, *126*(1), 1-19.

Paletz, S. B., Chan, J., and Schunn, C. D. (2017). The dynamics of micro-conflicts and uncertainty in successful and unsuccessful design teams. *Design Studies*, *50*, 39-69.

Paranandi, M. (2014). BIM as a Catalyst to Foster Creativity through Collaboration. *Building Information Modeling: BIM in Current and Future Practice*, 237-249.

Parrish, K., Wong, J. M., Tommelein, I. D., and Stojadinovic, B. (2008). Set-based design: case study on innovative hospital design. In: *Proc. 16th Ann. Conf. of the Int`l Group for Lean Construction*, Manchester, UK, 413-424.

Pathirage, C. P., Amaratunga, D., and Haigh, R. (2005). Knowledge management research within the built environment: Research methodological perspectives. Available at: http://eprints.hud.ac.uk/id/eprint/22699/1/262_Pathirage_CP_KNOWLEDGE_MANAGEME NT_RESEARCH_WITHIN_THE_BUILT_ENVIRONMENT_IPRC_2005.pdf

Peng, C. (1994). Exploring communication in collaborative design: co-operative architectural modelling. *Design Studies*, *15*(1), 19-44.

Peng, C. (2001). *Design through digital interaction: Computing communications and collaboration on design*. Intellect Books.

Pikas, E., Koskela, L., Treldal, N., Ballard, G. and Liias, R. (2016). Collaboration in Design – Justification, Characteristics and Related Concepts. In: *24th Annual Conference of the International Group for Lean Construction.* Boston, USA, 20-22 Jul 2016.

Poirier, E., Forgues, D., and Staub-French, S. (2016). Collaboration through innovation: implications for expertise in the AEC sector. *Construction management and economics*, *34*(11), 769-789.

Polanyi, M. (1958). *Personal Knowledge*. Chicago, IL: The University of Chicago Press.

Pritchard, D. (2014). Knowledge and understanding. In *Virtue Epistemology Naturalized* (pp. 315-327). Springer International Publishing.

Putnam, L. L. (1986). Contradiction and paradoxes in organizations. In L. Thayer (Ed.), *Organizational communication: Emerging perspectives*. Norwood, NJ: Ablex Publishing Corporation. (Vol. I, pp. 151–167).

Putnam, L. L., Fairhurst, G. T., and Banghart, S. (2016). Contradictions, dialectics, and paradoxes in organizations: A constitutive approach. *The Academy of Management Annals*, *10*(1), 65-171.

Qin, S. F., Wright, D. K., and Jordanov, I. N. (2000). From on-line sketching to 2D and 3D geometry: a system based on fuzzy knowledge. *Computer-Aided Design*, *32*(14), 851-866.

Radcliffe, D. (1996). Concurrency of actions, ideas and knowledge displays within a design team. *Analysing design activity*, 343-364.

Remenyi, D. S.J., Swartz, E., Money, A. and Williams, B. (1998). *Doing Research in Business and Management: An Introduction to Process and Method*. Sage Publications. London. 309p.

RIBA (2013). *RIBA plan of work 2013*. Editor: Dale Sinclair. Published by RIBA, 66 Portland Place, London.

Rittel, H. W., and Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy sciences*, *4*(2), 155-169.

Rittel, H. (1984). Second-generation design methods. *Developments in design methodology*, 317-327.

Rittel, H. W. (1988). *The Reasoning of Designers*. IGP. 1-9.

Robson, C. (2002). *Real world research*. USA: Blackwell.

Rooke, J. A., and Kagioglou, M. (2007). Criteria for evaluating research: the unique adequacy requirement of methods. *Construction management and economics*, *25*(9), 979-987.

Rooke, J., Molloy, E. M., Sinclair, M., Koskela, L., Siriwardena, M., Kagioglou, M., and Siemieniuch, C. (2008). Models and metaphors: complexity theory and through-life management in the built environment. *Architectural Engineering and Design Management*, *4*(1), 47-57.

Saad, M., and Maher, M. L. (1996). Shared understanding in computer-supported collaborative design. *Computer-Aided Design*, *28*(3), 183-192.

Sanders, E. B. N., and Stappers, P. J. (2008). Co-creation and the new landscapes of design. *Co-design*, *4*(1), 5-18.

Saunders, M., Lewis, P., and Thornhill, A. (2009). *Research methods for business students 5th edition*. Perntice Hall.

Schon, D. A. (1963). *Displacement of concepts*. Routledge.

Schön, D. A. (1983). *The reflective practitioner: How professionals think in action* (Vol. 5126). Basic books.

Schön, D. A. (1984). Problems, frames and perspectives on designing. *Design Studies*, *5*(3), 132-136.

Schön, D. A. (1992). The crisis of professional knowledge and the pursuit of an epistemology of practice. *Journal of Interprofessional Care*, *6*(1), 49-63.

Schön, D. A. (1992). The theory of inquiry: Dewey's legacy to education. *Curriculum inquiry*, *22*(2), 119-139.

Schon, D. A., and Rein, M. (1994). *Frame reflection: Toward the resolution of intractable policy controversies*. Basic Books.

Schöttle, A., Haghsheno, S. and Gehbauer, F. (2014), Defining Cooperation and Collaboration in the Context of Lean Construction. In: *Proc. 22nd Ann. Conf. of the Int'l Group for Lean Construction*. Oslo, Norway, 1269-1280.

Schrage, M. (1995). *No more teams! Mastering the dynamics of creative collaboration*. Doubleday Dell Publishing Group, Inc. New York, NY. 241p.

Schutz, A. (1932). *The phenomenology of the social world*. Trans. G Walsh and F Lehnert University Press Evanston Ill, Northwestern.

Schutz, A. (1962) *The Problem of Social Reality* (Collected Papers, Volume 1) M. Natanson (Ed.) Marinus Nijhoff, The Hague.

Seuring, S., and Müller, M. (2008). From a literature review to a conceptual framework for sustainable supply chain management. *Journal of cleaner production*, *16*(15), 1699-1710.

Sexton, M. G. (2000). Sustainable built environments and construction activity through dynamic agendas. *PhD Thesis, Research Institute for the Built and Human Environment, University of Salford*, UK.

Sexton, M. G. (2003), A supple approach to exposing and challenging assumptions and path dependencies in research. *Keynote Speech of the 3rd International Postgraduate Research Conference*, Lisbon, April 2003 – www.scpm.salford.ac.uk/bf2003/sexton_keynote.pdf

Shea, G. P., and Guzzo, R. A. (1987). Group effectiveness: what really matters? *Sloan Management Review (1986-1998)*, *28*(3), 25.

Shelbourn, M., Bouchlaghem, N. M., Anumba, C., and Carrillo, P. (2007). Planning and implementation of effective collaboration in construction projects. *Construction Innovation*, *7*(4), 357-377.

Silverman, D. (1970). *The theory of organisations: a sociological framework*. Basic Books. 246p.

Simoff, S. J., and Maher, M. L. (2000). Analysing participation in collaborative design environments. *Design studies*, *21*(2), 119-144.

Simon, H. A. (1969). *The sciences of the artificial*. Cambridge, MA. 231p.

Simpson, J., and Weiner, E. S. (1989). Oxford English dictionary online. *Oxford: Clarendon Press. Retrieved Dec*, *07*, 2018.

Singh, V., Gu, N., and Wang, X. (2011). A theoretical framework of a BIM-based multi-disciplinary collaboration platform. *Automation in construction*, *20*(2), 134-144.

Smart, P. R., Mott, D., Sycara, K., Braines,D. , Strub,M. and Shadbolt, N. R (2009). Shared Understanding within Military Coalitions: A Definition and Review of Research Challenges. In: *Knowledge Systems for Coalition Operations*, Southampton, UK.

Smart, P. R. (2011). Understanding and shared understanding in military coalitions.

Smith, A. (1776). *An Inquiry into the Nature and Causes of the Wealth of Nations* (No. 25202). Printed at the University Press for T. Nelson and P. Brown.

Smith, K. H. (2005). Problem-based learning in architecture and medicine: comparing pedagogical models in beginning professional education. In *21st National Conference on the Beginning Design Student, University of Texas at San Antonio* (pp. 24-26).

Snodgrass, A., and Coyne, R. (1992). Models, metaphors and the hermeneutics of designing. *Design issues*, *9*(1), 56-74.

Snowden, D. (2002). Complex acts of knowing: paradox and descriptive self-awareness. *Journal of knowledge management*, *6*(2), 100-111.

Sonnenwald, D. H. (1996). Communication roles that support collaboration during the design process. *Design studies*, *17*(3), 277-301.

Stempfle, J., and Badke-Schaub, P. (2002). Thinking in design teams-an analysis of team communication. *Design studies*, *23*(5), 473-496.

Steen, M. (2013). Co-design as a process of joint inquiry and imagination. *Design Issues*, *29*(2), 16-28.

Stompff, G., Smulders, F., and Henze, L. (2016). Surprises are the benefits: reframing in multidisciplinary design teams. *Design Studies*, *47*, 187-214.

Stumpf, S. (2001). *Analysis and representation of rhetorical construction of understanding in design teams' experiential learning* (Doctoral dissertation, University College London).

Stumpf, S. C., and McDonnell, J. T. (2002). Talking about team framing: using argumentation to analyse and support experiential learning in early design episodes. *Design studies*, *23*(1), 5-23.

Suchman, L. (1987). Plans and situated actions. *New York, Cambridge University*.

Suwa, M., Purcell, T., and Gero, J. (1998). Macroscopic analysis of design processes based on a scheme for coding designers' cognitive actions. *Design studies*, *19*(4), 455-483.

Suwa, M., and Tversky, B. (2003). Constructive perception: A metacognitive skill for coordinating perception and conception. In *Proceedings of the Annual Meeting of the Cognitive Science Society* (Vol. 25, No. 25).

Tang, H. H., Lee, Y. Y., and Gero, J. S. (2011). Comparing collaborative co-located and distributed design processes in digital and traditional sketching environments: A protocol study using the function–behaviour–structure coding scheme. *Design Studies*, *32*(1), 1-29.

Thompson, L., and Fine, G. A. (1999). Socially shared cognition, affect, and behaviour: A review and integration. *Personality and Social Psychology Review*, *3*(4), 278-302.

Thomson, A. M., and Perry, J. L. (2006). Collaboration processes: Inside the black box. *Public administration review*, *66*, 20-32.

Thomson, A. M., Perry, J. L., and Miller, T. K. (2007). Conceptualizing and measuring collaboration. *Journal of Public Administration Research and Theory*, *19*(1), 23-56.

Tjosvold, D., and Tsao, Y. (1989). Productive organizational collaboration: The role of values and cooperation. *Journal of Organizational Behavior*, *10*(2), 189-195.

Tomelleri, S., Lusardi, R., and Artioli, G. (2015). The metaphors of collaboration, or the social construction of collaborative interactions between health professionals. *Acta Bio Medica Atenei Parmensis*, *86*(1Suppl), 7-18.

Trousse, B., and Christiaans, H. (1996). Design as a topos-based argumentative activity: a protocol analysis study. *Analysing design activity*, 365-388.

Tversky, B., and Kessell, A. (2014). Thinking in action. *Pragmatics & Cognition*, *22*(2), 206-223.

Tzortzopoulos, P., Cooper, R., Chan, P., & Kagioglou, M. (2006). Clients' activities at the design front-end. *Design Studies*, *27*(6), 657-683.

Tzortzopoulos, P., & Cooper, R. (2007). Design management from a contractor's perspective: The need for clarity. *Architectural Engineering and Design Management*, *3*(1), 17-28.

Vaaland, T. I. (2004). Improving project collaboration: start with the conflicts. *International Journal of Project Management*, *22*(6), 447-454.

Valkenburg, R. C. (1998). Shared understanding as a condition for team design. In: *Automation in construction*, 7(2), 111-121.

Valkenburg, R., and Dorst, K. (1998). The reflective practice of design teams. In: *Design studies*, 19(3), 249-271.

van Amstel, F. M., Hartmann, T., van der Voort, M. C., and Dewulf, G. P. (2016). The social production of design space. *Design studies*, *46*, 199-225.

Van Maanen, J. (Ed.). (1995). *Representation in ethnography*. SAGE Publications, Incorporated.

Vickers, G. (1965). *The art of judgment: A study of policy making*. Basic Books.

Vygotsky, L. (1978). Interaction between learning and development. *Readings on the development of children*, *23*(3), 34-41.

Walsham, G. (2006). Doing interpretive research. *European journal of information systems*, *15*(3), 320-330.

Wang, L., Shen, W., Xie, H., Neelamkavil, J., and Pardasani, A. (2002). Collaborative conceptual design—state of the art and future trends. *Computer-Aided Design*, *34*(13), 981-996.

Weber, M. (1930). *The Protestant Ethic and the Spirit of Capitalism*. New York: Charles Scribner's Sons.

Weber, M. (1949). "Objectivity" in social science and social policy. *The methodology of the social sciences*, 49-112.

Weber, M. (2007). Stanford Encyclopedia of Philosophy. Available at *URL: http://plato. stanford. edu/entries/weber/, свободный*.

Webster, J., and Watson, R. T. (2002). Analyzing the past to prepare for the future: Writing a literature review. *MIS quarterly*, xiii-xxiii.

Whelton, M., Pennanen, A. and Ballard, G. (2004). Fostering Collaboration and Learning in Project Definition: A Case Study in Workplace Planning. In, Bertelsen, S. & Formoso, C.T., *12th Annual Conference of the International Group for Lean Construction.* Helsingør, Denmark, 3-5.

Whorf, B. (1956). *Language, Thought and Reality: Selected Writings of Benjamin Lee Whorf*. Edited by John Carroll. MIT Press.

Wild, A. (2002). The unmanageability of construction and the theoretical psycho-social dynamics of projects. *Engineering, Construction and Architectural Management*, *9*(4), 345-351.

Winograd, T. and Flores, F. (1986). *Understanding computers and cognition: A new foundation for design*. Adison-Wesley Publishing Company, Inc. 207p.

Wirth, L. (1940). Ideological aspects of social disorganization. *American Sociological Review*, 5(4), 472-482.

Wirth, L. (1948). Consensus and mass communication. *American Sociological Review*, 13(1), 1-15.

Wittgenstein, L. (1967). *Philosophische Untersuchungen. Philosophical Investigations;* Translated by GEM Anscombe. Reprinted. Blackwell.

Wood, D. J., and Gray, B. (1991). Toward a comprehensive theory of collaboration. *The Journal of Applied Behavioral Science*, *27*(2), 139-162.

Yin, R. K. (2013). *Case study research: Design and methods*. USA. Sage publications.

Zimina, D., Ballard, G., and Pasquire, C. (2012). Target value design: using collaboration and a lean approach to reduce construction cost. *Construction Management and Economics*, *30*(5), 383-398.

# Appendix 1: Interview Protocol

## Interview Protocol

**Interviewee:**
Address:
Date:
Time:
Interviewer: PhD candidate Danilo Gomes
Supervisor: Professor Patricia Tzortzopoulos

*Purpose: Investigate a multidisciplinary practice at Early Project Stage to understand the interactions to resolve misunderstandings and how they support the construction of collaboration.*

### General questions:
1. How the Project started for you? Can you describe what were your activities so far?
2. What do you think about the evolution of the proposal? What are the key elements of the current design proposal?

## Perception of the Situation

### Perception of Interdependency
3. How did the Project Team come up together? Why did you decide to join this team? Or How did you become part of this project?
4. What is the purpose of this project? And What do you expect to get from this?

### Perception of Performance
5. Are you aware of how each participant can potentially contribute for the project?

## Conception of the Changing Actions

### Conception of Resources
6. What do you think that each participant contributed (as a pool of shared resource) so far?
7. How do you think that these contributions were made interdependent (like coordinated)?

### Conception of Changing Action
8. What the participants have created and used so far to support the set of activities (to use the resources) in the project?
9. What are the activities that you felt that you were really engaging with the other participants?

## Reflection-on-Action
### Limitations and Barriers
10. What would you consider are the limitations and barriers encountered so far?
### Positive Aspects
11. What do you think it represents a positive outcome of the current project?
### Potential Changes and Suggestions of improvement
12. If you could suggest any change for the current project (or even considering future projects) what do you think it could done differently?

### Conceptual understanding of Collaboration
13. If you have to define what would you consider as the essence of collaboration? What you think a successful collaboration represents?

# Appendix 2: Key publications on Collaboration

**Table 11: Key publications defining collaboration as a *mechanism***

| Date | Name | Title | Citations |
|---|---|---|---|
| 1994 | Peng, C. | Exploring communication in collaborative design: co-operative architectural | 76 |
| 1994 | Edmonds et al. | Support for collaborative design: Agents and emergence | 148 |
| 1996 | Saad and Maher | Shared understanding in computer-supported collaborative design | 137 |
| 2000 | Kvan, T. | Collaborative design: what is it? | 533 |
| 2000 | Simoff and Maher | Anaylsing participation in collaborative design environments | 142 |
| 2000 | Haymaker et al. | Filter mediated design: generating coherence in collaborative design | 46 |
| 2002 | Anumba et al. | Collaborative Design of structures using intelligent systems | 194 |
| 2002 | Wang et al. | Collaborative conceptual design - state of the art and future trends | 663 |
| 2004 | Li et al. | Featured-based design in a distributed and collaborative environment | 173 |
| 2006 | Kleinsmann | Understanding collaborative design | 101 |
| 2008 | Kleinsmann and Valkenburg | Barriers and enablers for creating shared understanding in co-design projects | 192 |
| 2011 | Eastman et al. | BIM handbook: A guide to building information modelling for owners, managers, designers, engineers and contractors | 4204 |
| 2011 | Singh et al. | A theoretical framework for a BIM-based multidisciplinary collaboration platform | 366 |

Source: Google Scholar

**Table 12: Key publications defining collaboration as an *organisation***

| Date | Name | Title | Citations |
|------|------|-------|-----------|
| 1977 | Appley and Winder | An evolving definition of collaboration and some implications for the world of work | 162 |
| 1987 | Shea and Guzzo | Group effectiveness: what really matters? | 474 |
| 1989 | Tjosvold and Tsao | Produce organizational collaboration: The role of values and cooperation | 108 |
| 1992 | Mattessich and Monsey | Collaboration: what makes it work. A review of research literature on factors influencing successful collaboration | 1549 |
| 2000 | Huxham and Vangen | Ambiguity, complexity and dynamics in the membership of collaboration | 506 |
| 2006 | Briggs et al. | Defining key concepts for collaboration engineering | 184 |
| 2007 | Camarinha-Matos and Ab | Performance indicators for collaborative networks based on collaboration benefits | 79 |
| 2008 | Sanders and Stappers | Co-creation and the new landscapes of design | 2388 |
| 2016 | Poirier et al. | Collaboration through innovation: implications for expertise in the AEC sector | 15 |

Source: Google Scholar

**Table 13: Key publications defining collaboration as a *social construct***

| Date | Name | Title | Citations |
|------|------|-------|-----------|
| 1893 | Durkheim, E. | Division of Labour in Society | 18389 |
| 1904 | Weber, M. | Objectivity in Social Science | 22500 |
| 1938 | Dewey, J. | Logic: The theory of inquiry | 6095 |
| 1940 | Wirth, L. | Ideological aspects of social disorganization | 64 |
| 1948 | Wirth, L. | Consensus and mass communication | 216 |
| 1966 | Berger and Luckmann | The social construction of reality: A teatrise in the sociology of knowledge | 51782 |
| 1972 | Ackoff, R. and Emery F. | On purposeful systems: An interdisciplinary analysis of individual and social behaviour as a system of purposeful events | 1649 |
| 1973 | Rittel and Webber | Dilemmas in general theory of planning | 12833 |
| 1983 | Schon, D. | The reflective practitioner: How professionals think in action | 59656 |
| 1993 | Coyne and Snodgraas | Cooperation and individualism in design | 44 |
| 1995 | Schrage | No more teams! Mastering the dynamics of creative collaboration | 526 |
| 1997 | Engestrom et al. | Coordination, cooperation, and communication in the courts: Expansive transitions in legal work | 223 |
| 1998 | Bardram | Designing for the dynamics of cooperative work activities | 279 |
| 1998 | Valkenburg and Dorst | The reflective practice of design teams | 481 |
| 1998 | Ostrom | A behavioral approach to the rational choice theory of collective action: Presidential address, American Political Science Association | 540 |
| 2002 | Stempfle and Badke-Schaub | Thinking in design teams-an analysis of team communication | 540 |
| 2002 | Bucciarelli, L. | Between thought and object in engineering design | 253 |
| 2004 | Fischer | Social creativity: turning barriers into opportunities for collaborative design | 196 |
| 2007 | Thomson et al. | Conceptualizing and measuring collaboration | 416 |
| 2010 | Badke-Schaub et al. | How does cognitive conflict in design teams support the development of creative ideas? | 70 |
| 2014 | Hill et al. | Collective genius: the art and practice of leading innovation | 75 |
| 2015 | Adamu et al | Social BIM: Co-creation with shared situational awareness | 17 |
| 2016 | Stompff et al. | Surprises are the benefits: reframing in multidisciplinary design teams | 4 |

Source: Google Scholar

# Appendix 3: Exploratory Case Study
## Storytelling and Conversation Analysis

**Event 1 – Objectivation: Introducing the *Design Charrette* activity**

The activity started with AL1 explaining to other participants that, previously, the Design Charrettes activities were like Design Reviews, but now the company was trying to do develop a more "*collaborative process*", in which they would engage in designing and sketching together in these sessions.

> (AL1) …*So for folks that are visiting from outside the office we are starting to do more Charrette because we have this Canopy wall so... How Charrettes were working at this office is… that they were really more design reviews… when we first moved in and so we're trying to make this a more collaborative process so we actually do design and sketch. So the last time we did… ...that worked out pretty well, we broke up into two teams because of it seems to make sense of how many people were here… and so I printed out some of the drawings that I sent out yesterday so that we can you that to sketch over it and trace and use inked pen.*

Such explanation presented by AL1, can be seen as way to outline her interpretation of the proposed activity. For her, that seems to be a way of objectivating *collaboration* in the project activity. So, this initial verbalisation can be seen as a type of objectivation interaction, in which '*collaboration*' as the object of activity is addressed by AL1, and then her verbalisation become subject to interpretive actions of the other participants.

In addition to that, as AL1 seems to be putting forward the office perspective on this matter, as certain habitual way of operating in the activity, this could also be interpreted as initiative to institutionalise "collaboration", as a long-lasting objectivation, in these Design Charrette activities.

This can be noticed, when AL1 indicated to other participants that during the activity, they usually break into teams considering how many people is involved in the task. Later in the activity they end up forming two groups of four individuals (Groups A and B).

**Event 2 – Objectivation + Metaphor: *Briefing***

Following the introduction of the activity and before forming the groups, AL1 presented the brief for this Design Charrette activity, along with some drawings and images to be used as reference. This material had also been sent through email to the participants, previously to the

activity. So, AL1 started describing the context of the project situation (Figure 46), and setting the purpose and objectives of this specific project activity. Her presentation was supported by a set of drawings and images displayed on the wall and on the working tables (Figure 46). The whole briefing took about 10 minutes.

During this presentation, AL1 made references to the *Schematic Design (SD) Workshop* that was held the week before, as another Design Charrette activity. In that occasion, AL1 and AL2 have met with the project consultants, general contractor and the client: The Medical Centre. She described that, it was a one-day workshop, where they discussed about a "*bunch of systems*" all at once at SD level. According to AL1, the result of that workshop was a "*foot plan*" and a preliminary volumetric scheme of the M.O.B. building, produced as a SketchUp model (Figure 46). AL1 also mentioned that they also got more feedback from the Medical Centre in the following days of that last Design Charrette activity. AL1 and AL2 also put forward to the other participants, some "reference images" from other building projects that were provide by the client, as aesthetical references for this project.
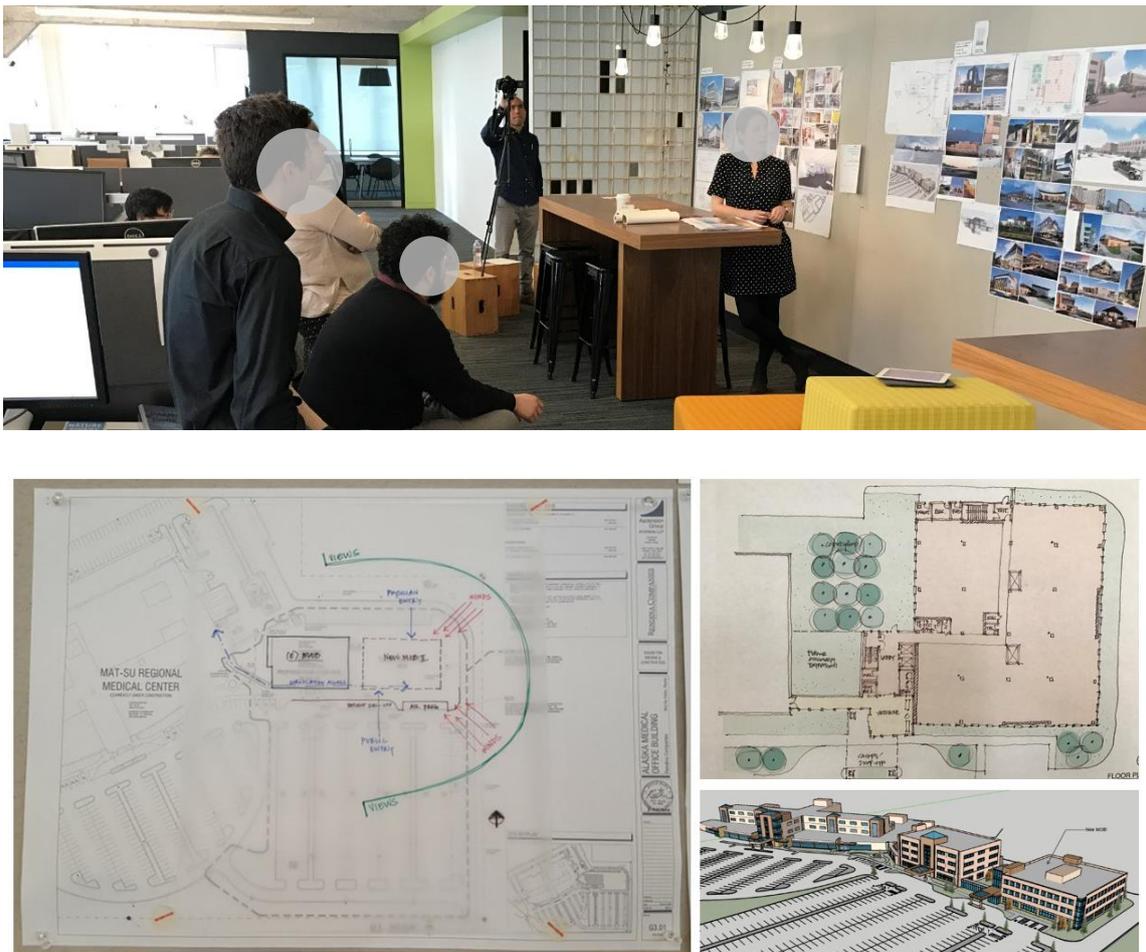


**Figure 46: Briefing 1**

**Figure 47: Briefing 2**

According to AL1, the material included in this briefing, was really the result of all those previous interactions in the activity. Thus, considering this previous work, AL1 and AL2 indicated that there was an opportunity, and also a requirement of the project at this stage, to explore what the building would look like. This argument seemed to have set the main purpose of this Design Charrette activity.

Overall, such *briefing* can be seen as an objectivation event, in which participants' interactions are focused on AL1 and AL2 expression of their interpretation of the current state of the project activity through verbal and graphic artefacts. At this event, the *location plan*, the *"foot" plan*, the *SketchUP model*, and the *reference images*, can be seen as a set of mediating artefacts used by AL1 and AL2 to support the objectivation of their interpretation. Thus, these artefacts become references to other participants, as a comprehensive summary of the previous interactions (e.g. thoughts and decisions), and establishing *auxiliary objects* within the project activity.

The elaboration and use of these artefacts is based on commonly known representation standards, which tend to facilitate the construction of mutual intelligibility among project participants. In presenting these artefacts, AL1 and AL2 put forward an argument for their interpretation of the objects of activity, in terms of their perception of the current state of the situation, as well as, of their conception of how to change the situation (i.e. the design solution).

In this case, AL1 and AL2 clearly presented to the group four objects of activity, translated into four keywords, regarded as *Design Topics*: *Existing Campus; Punched Windows; Curtain Wall + Glazing; and Materials.* So, in addition to the initial verbal description and graphical material provided, AL1 presented these four keywords as the main things that she wanted the group to think about, and take into consideration in the activity. These four keywords were put

in the white wall in the back of the room to highlight the "*topics*" that should be under focus on this Design Charrette activity (Figure 48).
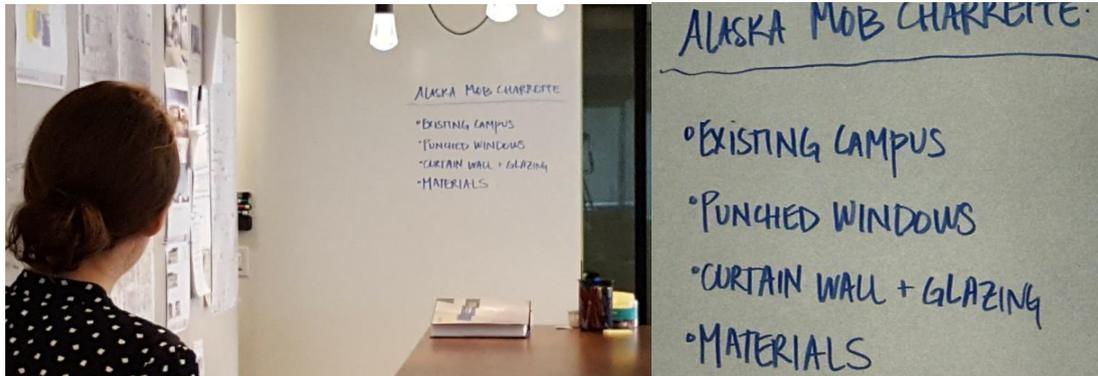


**Figure 48: Briefing 3**

According to AL1, a general description of the intention and meaning of these design topics were sent previously through email, but the researcher didn't have access to that material. So, continuing the *briefing*, AL1 started to describe the four design topics as:

(1) *The existing campus*. According to AL1, this was referred to how the elements of the existing campus design could be translated into the new M.O.B. project. She mentioned that there were many things that were key for the identify of their campus at the moment. For example, the colour pattern could allow them to maintain continuity, but also it could allow having new designs. Another aspects of identity, could be related to the fact that the buildings have punched windows, glazed corners and the canopy, which according to her could be explored in many different ways.

(2) *Punched windows (1$^{st}$ Rule of Thumb at 3:30)*. AL1 explained to those that may were not familiar with the design of office buildings, how this is the usual way they design this type of window. By referring to the floor plan drawing, she explained that they typically follow standard dimension and modularity to match the design of the façade with the plans. Consequently, each room got a window. She also explained that there was some flexibility in these modularity, which seems to be a way to suggest to the other designers where there was opportunity to design something different. She mentioned that there could be interesting ways one could have that as kind of "*camouflage*", in a way that it does not match what is happening behind in terms of material (e.g. glass or wall).

(3) The *Curtain Wall and Glazing*. AL1 referred to them as key elements in the Central Lobby, as the entry space of the building (indicated in Figure 49). She mentioned that they already had this element in the previous project (She showed one of the pictures in the wall as an example of a false lobby in a project). According to AL1, the challenge in this case was how to make it more *contemporary* (this has meaning that needs to be understood and shared by the group) and not just repeat what they had done before.

According to AL1 and AL2, the feedback they had got from the client, indicated that the clients were enjoying the idea of having glass in the corner of the building, as it was in the current proposal (in the South-East corner of the building). In specific, AL1 indicated that the clients were curious about the use of glass in that specific corner. In addition to that, AL1 mentioned that their argument to the clients was that they could rent out that space, because of its higher value.



**Figure 49: Briefing 4**

(4) *Materials*. AL1 indicated that at that moment the project was going to be made of same type of material from the other buildings in campus. So, according to her, there was a chance that probably that was going to be the same material choice on this project for the most part.

Overall, during this initial *briefing* event, AL1, who was the one who established these *design topics*, presented hers and AL2 intentions, motives and factors related to project and how they could be considered in this activity. During the *briefing*, there was no questioning or discussion from the other participants in relation to these topics.

So, these series of objectivations made by AL1 and AL2 about the project and the way it was presented to the group seems to imply and try to confirm that these "material" (i.e. artefacts) should represent an initial shared object of activity among the participants. This initiative seems very clear in AL1 concluding remark of the *briefing* event:

*"So, when you think of campus design, this is something that we presented to the clients. ...If you think of the campus... you have your set of buildings that were done early on and then you also have the new version of what the campus can be so this is an opportunity to do something similar for their project and we have presented this project as it is the 'cousin'*

*building to their MOB that they already have and not the 'twin'… so… so… that is the basic set up."*

Interestingly, AL1 uses the metaphors of a "*cousin building*" against the one of a "*twin*" building to convey the main idea of the purpose of the Design Charrette activity, which is to focus on the design of the building envelope. In this case, the metaphor is an invention, based on the displacement of a concept (Schon, 1963), like the aesthetical appearance of the people to buildings, which is used to summarise and convey understanding about the main object of the activity. Thus, potentially supporting mutual intelligibility in the task.

At this stage (6min. on the activity), AL2, which was also involved in the previous stages of the project, made a rhetorical question to AL1 in order to confirm if those four key elements should be the focus of the design session. AL1 replied confirming, "*yes*", and giving the drawings and images (e.g. perspective images and orthographic drawings: floor plan and all the elevations) of the current state of the project for the participants. AL1 indicated that they were expecting that the participants could use these drawings and images to support their own sketching during the task (Figure 50).
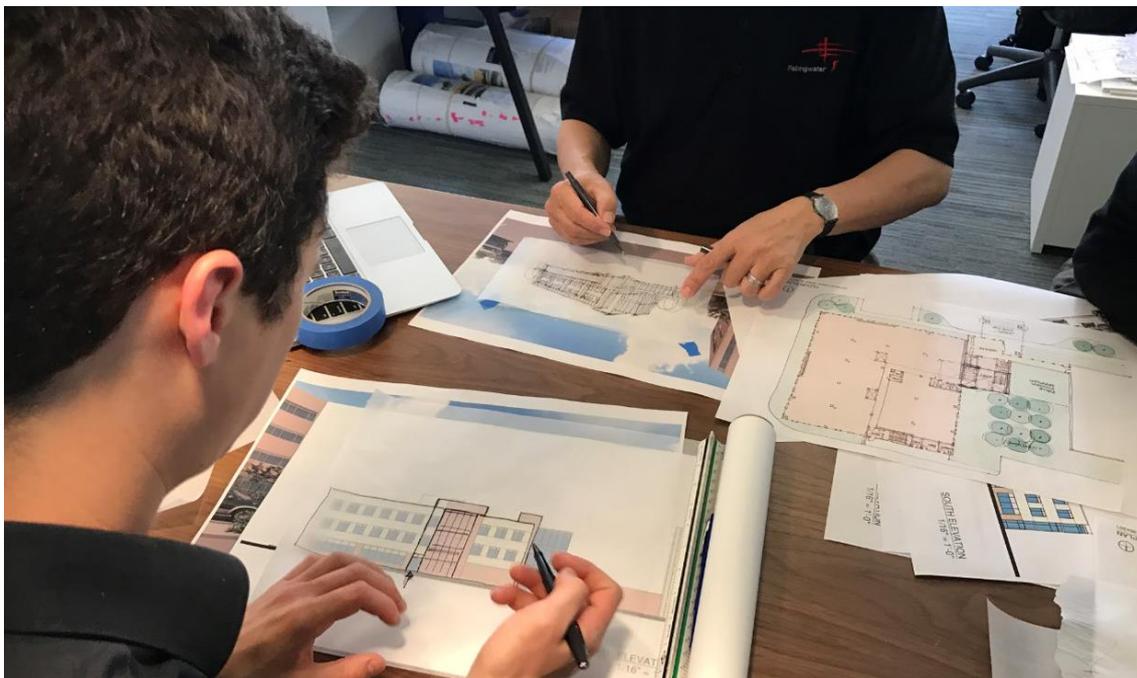


**Figure 50: Briefing 5**

Following this *briefing*, AL1 suggested that the participants should then split into two groups to explore possible design ideas. Under this new arrangement, there were some interactions in terms of discussions over the proposed design topics and other emergent topics. In addition to

that, when the participant formed two independent groups, each Architect Leader (AL1 and AL2) assumed the role of team leader in each group.

**Event 3 – Breakdown:** *Extending Briefing*

Just before breaking into separate groups, AL1 asked if anyone had any question about the project brief. So, one of the architects, AL3 asked:

(AL3) "*Do you have something to say about the lobby? What could they say about the lobby? You don't address the lobby…*"

(AL1 replied looking at AL2, as expecting him to support her argument) *They liked!?... right?!?*

(AL2 confirmed AL1 perception) *Yes, they liked!... They did… They do want us to put a pyramid that on this building.*

(AL1 explained) *Great!... I didn't really want that to be the focus of the charrette…* (Everybody laughs for a couple of seconds) *…I don't want to tell everyone to drop the pyramid…*

(AL2 continued) *I just thought I have…* (inaudible)

(AL1) *They have this pyramid element* (Showing images in the wall – Figure 51) *in all their existing projects. … You actually can't see it when you enter the building, but… that was the comment.*

(GD then ask) *Does it represent something?*

(AL1 then explained to whole group her point of view on the matter) *My hunch is that it was a design motive from the first architect that did both buildings because they're surrounded by mountains* (Gesture for surrounded) *sort of like 'DAA' has those potent tensile structures… that is the kind of evokes the mountains… I don't think they needed to do that necessarily in this project* (smiling), *but they did and… That came up in our meeting: "where is the pyramid in our project? How is it related to the other project?" …Yeah… So, if you want to take a step on that… please… I am not* (inaudible)…

**Event 4 – Breakdown + Metaphor**

The previous questioning behaviour of GD may be seen as an indication of she trying to get a particular understanding of the design situation. GD question seems to explore what is the '*art*

7

*context*' on the existing buildings and what are client's intentions in terms of art for the project. Through such exploration GD seems to expect that a lead on how she could contribute on this design activity:

(GD asked) *Do they have any other existing art program or (inaudible)?*

(AL1 replied) *I don't know about the art necessarily... (sound... ammm)*

(AL2 added) *I think nothing that jumped out... We didn't see any major piece of work ...their biggest feature in the hospital is a big fire place in the lobby, which when you think about it is right over there...yeah*

(AL1 continued) *...and when people sit in front of that fireplace pretty very rarely... it really blocks your view from the registration behind it. ... I don't know... people seem to use it.*

(AL2) *So, they say I'll meet you in the fire place and just wait over there. So, it is a big deal... The M.O.B. is a developer building, so... even though hospital users and their own (inaudible) have to use the back... so that we have to think about art work that nobody can see in the M.O.B.. But you have some locations to talk about major piece of artwork in the lobby.... (inaudible) elevators lobby (inaudible).*

In this occasion, when AL2 replied to GD by making reference to "*a developer building*", it seems that there are many assumptions embedded in the idea of "a *developer's building*" related to the characteristics of the design and usage of the building, which consequently should be implied by GD and the other participants' interpretation of that term. By making this reference, AL2 seems to expect that the GD understands many aspects of the "art context" of this project situation.

(GD replied) *Yeah!!* (Knocking the head – agreeing) *...Good!*

(AL1) *We have some opportunities to do some cool art... If you have any ideas... Yeah!?!... I am thinking if there is anything else on the plan that I wanna talk about it... Again there is a courtyard in between the existing MOB and our project... this is "AV" (inaudible)... So you think about...* (AL1 using the drawing on the wall + gestures) *on this elevation and on the west elevation what people will actually see from this building here... I think the pine trees are... (inaudible)... I just wonder... through that outfits that people are aware of that...* (Pointing on the drawing - Figure 51) *This wall on the first floor will be a solid wall, because*

*they will eventually do an expansion on the oncology… but here… so the upper floor should have glass because it then you have this views out to the courtyard and… this huge mountain… So it will be kind of nice!* (inaudible)

So, AL3 and GD questions seem to have triggered an 'expanded' explanation of the Project Brief. This allowed project participants to perceive that there was a lot of undescribed reasons for the current state of the design, in terms of floor plan, that could not be obviously assumed from reading the drawings or from the initial verbal presentation.
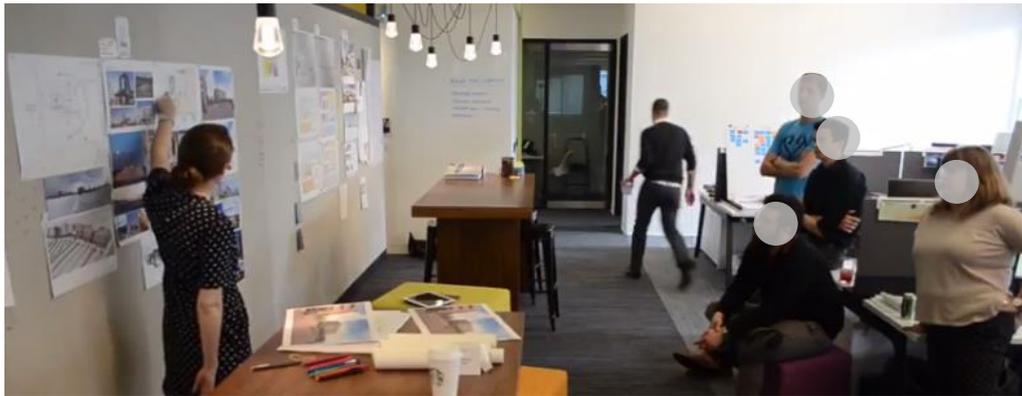


**Figure 51: Event 4**

Such questioning, seems also to have stimulated AL1 to reflect about her own actions in *briefing*, reviewing and expanding the description of the project situation:

(AL1) *I should also mention that would be staff parking at north… So this elevation is not to be forgotten… we have to spend a lot of time thinking about that… but just wanted to throw that out there for if anyone when you see the north elevation you see that has been some thoughts, but… If there is no other question I think we can breakout in teams.*

**Event 5 – *Time Frame***

AL2 then ask about the *Time Frame* of the task. It seems that, at this stage he assumed the role of time "tracker" to help AL1 in make everybody aware of the "structure" of the activity. So, AL1 replied establishing 30 min for each group to work on their proposals. At this stage, AL1 also indicated that after this time each group would share their ideas with all the participants.

**Event 6 – Breakdown: The *Courtyard***

A4 started looking closer at the drawings and images in the wall. AL1 then joined A4, near the wall, and provided an extended description about the project situation.

(AL1) *Yes, these are all inspirations… and we just like… (inaudible)*

(A4 replied indicating something that may not be totally clear to her) *I think I just… I am* (pointing to the courtyard in the foot plan) *… the courtyard…*

(AL1 then provided a deeper description - Figure 52): *Yeah!!... I think because … it is pretty cold in Alaska… You know what… They cover the passage ways… to go from one building to the other… So you can actually see it* (pointing to a drawing on the wall) *… Here, there is one… linking to the existing M.O.B. there (inaudible) … so this is all corridor. So, we have done the same thing… so you got this one-story high… probably you got one-story window… so this is all beautiful views to the south (inaudible)…So… yeah…   And the entry, we also look to the west side* (inaudible)*… towards this side…* (inaudible)*… because they have really strong winds coming from this direction* (gesture to indicate winds coming from northeast over the drawing) *and actually they have windows on the south. The winds can be so strong that the doors can't actually close.*
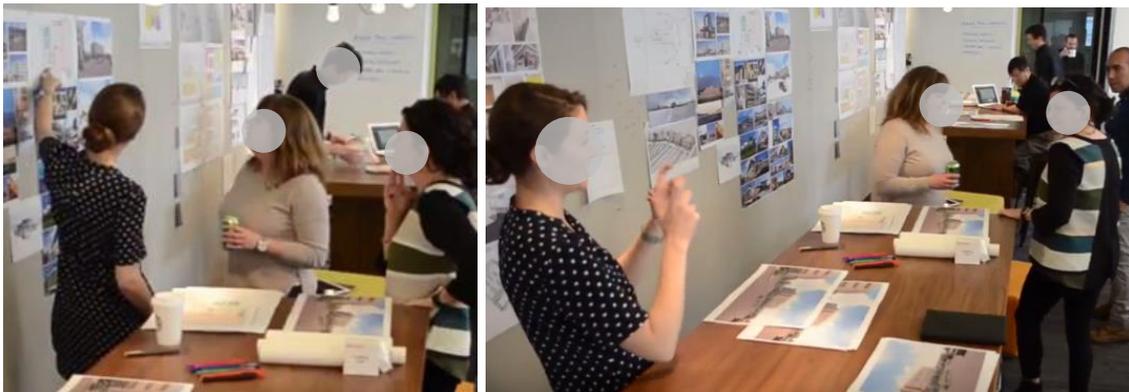


**Figure 52: Event 6**

(A4) *OK!*

(AL1 then add) *So, we got some feedback over* (inaudible) *on this place* (pointing to the west facade and courtyard area on the drawing). *So is actually believed that…*(inaudible). *We felt the winds when we were there last week…Yeah!!... I like couldn't even take a picture for more than a few seconds without like getting like knocked over…It was crazy!!*

**Event 7 – Grouping – *Exploration Mode***

From this moment on, the participants were divided into two groups working independently. One group was formed by AL1, A4 and GD (Group A), and the other was composed by AL2, A3 and A5 (Group B). At 13min after the start of the activity, AL2 asked AL1 about the

"*SketchUP Model*", and where it could be found in the system. AL1 replied indicating that it was in a shared drive under the project file root.

### Event 8 – Objectivation: Design *Strategy*

In Group A, AL1 started the interactions by trying to discuss the ways the group could objectivate their conceptions through design artefacts. She did so, by expressing her preferences, on how she prefers to think (i.e. design) on this kind of task, saying that she usually works with elevation drawings (i.e. orthogonal drawings). Considering that others may prefer to work differently, she also prepared some perspective images to support them in the activity (Figure 53).



**Figure 53: Event 9**

So, after arguing that there can be different ways to conceive different "forms", AL1 objectivate her *strategy* in the task:

> (AL1) *So the (inaudible)… the interesting ways that we can hold different forms from here… how transits to this mass in here… ahm…. My basic… My strategy was to break the three stories up to two pieces… this one piece and this is another piece (*Using the elevation drawing to show this idea to A4 mainly, but also to GD) *… This is the elevator tower… So, this is a little higher in silver and this is (inaudible – "steer") tower in the back… So I thought those would be next the green elements, but… You are free to sketch whatever you want* (Gesture of hands-up).

### Event 9 – Breakdown: *Curtain Wall*

A4 ask for a better description or a confirmation of what they should consider as "*curtain wall*" in the project, and AL1 replied with her interpretation. In this case, the questioning behaviour

of A4 seem to trigger a breakdown interaction between her and AL1, to further describe and define the *design topic: curtain wall*.

(A4 then asked something inaudible): *What should/would be curtain wall?*

(AL1 replied): *Yes! This will actually be curtain wall on this… what should be curtain wall. I don't know about these down here…they have curtain wall there in the first floor. At least will for… (inaudible)… Another thing I am thinking now is about how the project meets the ground? …They have an issue right now where the (inaudible) is… it is grade (inaudible) and they have a mould issue right now. So… My guess is that they are gonna want stone in the bottom of metal panel. Where the snow gets in (inaudible) against the building… (10secs pause) … I'm just going to start sketching like… maybe should… just the windows strategy and how the lobby plays into it.* (AL1 setting the elevation drawing and tracing paper for her).

In this event, AL1's views seem to be considered as an authority in the situation, and no one question her argument. Thus, as participants started to work on their proposals, one of them (A4) went on and started to get a closer look at the drawings and pictures on the wall. At this point, A4 expressed that something may not be "*totally clear*" to her. Without letting A4 exactly describe her "*doubt*", AL1, as the group leader, started to provide a deeper description (in particular to A4 and GD, who are the other members of this group) of the project context. In this case, a misunderstanding was emerging from A4 interactions (i.e. interpretation) with previous design representations (i.e. somebody previous objectivations) and her own perception of the situation. So, AL1 thought that what was lacking to A4 was more "information", so she tried to provide a "deeper" explanation of the situation to A4 and GD, which can be seen as a breakdown event.

Then, AL1, A4 and GD started to work in silence (at this point, another Architect Leader, AL3, who works at the same office came to their table and made some comments that were inaudible). GD and A4 were sitting on the table and "working" individually (without speaking to each other) on their drawings. Both were using tracing paper. AL1 was away of the table for a moment, while she had to speak with a visitor. AL1 then came back to the table, re-joining her team. But the team (Group A) kept working in silence.

**Event 10 – Objectivation: *Floor height***

Following this, AL1 seems to recognise the need to provided further and more precise information in terms of floor height dimensions. So, while she was working on the elevation drawings, AL1 commented on height of each floor:

(AL1) *Also the floor heights are 15 ft on the first floor… and 14 and 14 if that helps* (Showing the 2nd and 3rd floor in the elevation drawing).

This comments can be seen as an extra objectivation interaction, in which AL1 indicate how an aspect of the building project, was objectivated in terms of *floor height*. For AL1, such objectivation, which was embedded in the drawings and images, may not been clear interpreted by the others, and that seems to be why she felt it needed to further described verbally.

**Event 11 – Breakdown: "Group Activity"**

In Group A, while they were working in their individual drawings, they had also engaged in an informal chat about the office routine (AL1 mentioned that: *…someone is "between projects"*). Then, when the other Architect Leader in the office (AL3) approached and temporarily joined Group A (Figure 54), AL1 tried to briefly describe what each of the group members was doing at the time and what were their individual strategies in the activity.

**Event 12 – Metaphor: *Hospital windows***

Interestingly, the interaction to describe the *Group activity,* seem to have led AL1 and A4 to realise that the way the windows were designed in the previous buildings make them look like "*hospitals*", which seems to be something they didn't want to replicate. In this event, AL1 tried to rationalise why the previous architects may have done that, considering that they were specialised in hospital projects.

(AL1) *So right now the existing MOB has these (inaudible – maybe: small windows or small room numbers) …that does not really match their (inaudible) style* (Showing the existing situation on 3D model – image). *I don't want to do that!*

(A4) *It's very like the 'hospital'… that MOB.*

(AL1) *It is… It is. And the architect who did that MOB and medical center is specialized in hospitals… so you can tell that that MOB was an afterthought… yeah*

(A4) *Make it looks like a hospital…*

(AL3) *They really just drew a plan…* (inaudible)

(A4) *Yep!*

By using the word *Hospital*, as reference to the aesthetical aspect of the windows in the façade, AL1 seems to imply a common understanding from the other group members, based on their previous experience with this type of buildings. The use of this reference seem to have the same effect of a metaphor, in which a concept, in this case an image, is transferred and adapted to another context.

Considering the previous three events, the progression from the questioning behaviour and asking for a better description about one of the four design topics (i.e. *curtain wall*). This led to the use of another metaphor: *Hospital* to support the social construction of a shared perception of the situation, which then was followed by the use of the term *Break* to support mutual intelligibility in the conception of the changing action. In addition to this linguistic objectivations, AL1 was also using graphical tools (i.e. drawings) as mediating artefacts, to objectivate their perceptions and conceptions, which end up leading them to interact over another design topic: "*punched window*" (Event 14).



**Figure 54: Event 11 and 12**

**Event 13 – Breakdown:** *Site context*

At this stage A4, asked about the surroundings of the place.

(A4) *What is there to do in this place?*

(AL1 replied) *It is basically mountains and displays and then if you drive 10 min to the west you will be in Wasilla and if you drive 20 min to the east you are gonna be in a place called Palmer which is really (inaudible) state fair happens…*

**Event 14 – Objectivation + Breakdown**

In the following moments, AL1 started to comment on her design move, and she used the word "break" to convey the idea of what changes she was trying to achieve with the design of the windows and the façade:

(AL1) *I am making a punched window look… it feels like it breaks (inaudible) the mass nicely… for being so long… (inaudible: I think I am being dyslexic of not seeing things) …*

(A4 then interacts with AL1 replying) *I think they are separate things… and you know they are… (inaudible) …. A long portion of punched window…*

(AL1 agrees) *Yeah!*

(A4 added) *"This is expensive!"*

(AL1 then used the elevation drawing to show A4 (Figure 55) that) *This…. So, they use both widows… is this thing right here… this 6' by 6'… this is the 9' for* (inaudible: "boilian") *and that is the 3 foot… So…. Yeah*

(A4 demonstrated that she is following the idea) *And (inaudible)… the windows have been (inaudible)…*



**Figure 55: Event 14**

In this case, the use word "*break*" can also be seen as metaphorical interaction, in which the reference to the action of breaking is used in different context, to help her to convey an understanding among the group about her proposed conception of the design of the windows and façade.

Interestingly, the metaphor led to a confirmation action from A4, which in her own words, rephrase AL1 conception. Then, the interaction evolved to another breakdown, in which AL1 further described the dimensions of the modularity of the windows.

**Event 15 – Objectivation + Misunderstanding + Breakdown: *Building Entrance***

While the group was exploring the modularity of the windows in the façade, as a breakdown event stimulating further objectivations made by AL1, A4 realised that her interpretation (i.e. understanding) of another aspect of the current situation was wrong.

(AL1 was exploring and sharing some of her ideas - showing in floor plan drawing): *You just* (inaudible).... *This is the only on the first floor, and the over floor lobby is actually just back here. ...So, this* (using the elevation drawing to show) *is actually... in the east elevation...it should actually pop back to here* (indicating with a pen the position in the elevation drawing) *That... actually I am working on that elevation* (she picks a new sheet of tracing paper). *I'm gonna think about it.*

(A4 then points to the drawing and argue) (Inaudible) *I thought it was the last one...it makes me think…* (short pause) … *I mean I didn't realised we were entering on this side of the building…*

(AL1 replied): *Really?! ... Why?*

(A4 than try to explain why she thought that way) *I don't know... just because the canopy is just so... non* (inaudible: *discrete lay down*) *right now. It should just ...*

(simultaneously GD agreed) *Yeah… Yeah!*

(A4) *... it looks like the enter... it was the lobby and then anything else is hide behind it…*

(At this moment AL1 also agreed) *"Yeah! Aham"* (But then she tried to grasp why A4 thought that way - while drawing in a new sheet of paper): *Well, the vestibule… which goes out here is* (inaudible) *red. It is kind took too far back in…* (short pause 5 secs + A4 said

something inaudible like "*play with it*") *...like a pyramid maybe?! ...* (drawing) *…Like that!* (Laughter)… *Yeah!!*

(A4 then offer a confirmation) *Perfect!*

In this event, A4 engaged in a conversation with AL1, exploring the drawings and images, to try to reach another understanding about the situation. What seems to have happened at this moment is that the breakdown interaction revealed a contradiction between A4 and AL1 interpretations, thus leading A4 and AL1 to reconsider assumptions they have made about the current situation of the design scheme.

**Event 16 – Objectivation + Breakdown: *Contemporary* and *Building Tenants***

From this moment on, for most of the remaining time in the activity, AL1, A4 and GD worked individually in their drawings. During this time, there was a moment, when A4 asked about something inaudible, but it then sparkled a conversation about their ideas of what means to be *"contemporary"*. Once again, the interaction started with AL1 how she objectivated the notion of '*contemporary*' in the design of the façade:

(A4 started a completely inaudible: A4 asked something to AL1)

(AL1 then reply) *Humm… Yes! So that is the floor line* (showing and pointing at A4's drawing) *...and I just looked that... it's this thing in here* (showing the picture on the wall) *and tried to make a little less "chunky"* (with emphasis).

(A4 signs) *Its better!*

(AL1 added) *You know! Trying to make it a bit more... **contemporary**...* (3 secs pause) *You end up getting everything because the building is three stories, the horizontality is not going to be an issue.* (Inaudible: "fix word") *saying that. ...So I was think of... is there a way to express **verticality** in this? Where it's really not that long.*

(8 secs pause)

So, such objectivation interaction sparkled another breakdown, as reflective action to further describe and question certain aspects of the current state of the project activity, like their considerations about the future tenants of the building:

(A4 then continued) *What I mean is half we are thinking it's (inaudible: "geral wall")*

(AL1 drawing and explaining (Figure 56)) *Yeah! Here is the "eye"... ...You're gonna see the stair going up like this...* (A4 said something inaudible) *Yep!!...Yep!! ... The landing has a nice view out to the courtyard here.*



**Figure 56: Event 16**

All participants drawing in silence (1 min).

(A4) *I keep wondering if nobody knows if* (inaudible).... *Like everything going up... to the top floor and drops off* (many things inaudible).

(AL1 completed) *Aham... Yeah! They are my favourite. You can't really touch on their...* (3 secs pause) *...Yeah! Yeah! That is sort of what was actually today to... Try to think about these things.*

All participants drawing in silence (30 secs). GD moved to the wall to look at some pictures.

(AL1 then added while drawing the elevation) *Also you can tell that our first work really wasn't about the "hunch"* (inaudible)... *It was just kind of put a general language in there.... I think this is different here... Here there is a lot of glass that might not even be necessary... "gambler".*

(GD then ask about the possible users of the building) *Did you say... do they know what.... do the tenants will be or there is any... something... what...?*

(AL1 replied) *They know that there is going to be a bunch of small doctors from the existing campus. They are going to bring their office. And they are gonna have a* (inaudible) *doctors they are gonna bring in… ahmm…* (3 secs pause)*… There is also gonna be a group of "admins" spaces I think…. From the hospital side… I think might be with the building coming* (inaudible)*… they will take a bit of the portion of the "fork"… I don't think there is gonna be any "ladder" or anything like that …but... they wanna to* (inaudible: maybe *"wait"*) *to rule to campy facility… which I think it is a good deal they gain a lot of like spaces before they need… research facilities for… (inaudible) engineering because what they have in there …. Just physicians doing…*

(A4 seem to agreed) *"huhumm".*

**Event 17 – Time tracking**

After that, AL2 then asked how much time they still got in the activity. AL1 replied saying that they had 5 more minutes to complete this stage. After seconds she realised that they could use 10 more minutes, because they would be able to have more time to discuss. Then, participants from group A kept working in silence for approximately 3 min.



**Figure 57: Event 17 and 18**

**Event 18 – Objectivation: *Pyramid***

AL1, A4 and GD started to playfully talk about the idea of the *pyramid* and how in their views it does not fit to current concept of the design. This was mostly AL1's perspective (Figure 57). On this very open conversation, GD suggested the idea of putting a sculpture in the courtyard. It can be noticed that, at this stage the notion of a "*pyramid*" was still an open concept in the project, and the following discussion indicated individuals' objectivations on how this idea can be materialized in the situation.

(GD) *Maybe it could be just a sculptural object on the courtyard?!...*

(AL1) *That would be wonderful and…. Yes!!.. Like a fountain…*

(GD laughed and added) *… I was thinking like a black, charred wood* (making gestures with her hands – Figure 58) *in a plinth*

(AL1 laughed and agreed) *Yeah! That would be cool…*

(GD) *Like that would be really great… is in it cool?*

(AL1) *Yeah! And that would be kind like a tiny little "pyramid"…* (inaudible)… *it would be like we're done.*

(GD) *Yes!* (Inaudible)

All participants drawing in silence (30 sec). Then, AL1 support the "Pyramid" argument:

(AL1) *Yeah* (shaking head negatively*)!... It "should" be crazy…* (3 secs pause)… *I like the idea of making a sculpture on it though. That is really strong.*

(GD) (inaudible)… *right here!... here!* (Point on the drawing, showing to A4*)… (more inaudible).

(A4 joking about it) *Put a pyramid on their columns there…* (inaudible)



**Figure 58: Event 18**

In this event, it can be said that mutual intelligibility was constructed about an emergent design topic: the *pyramid*. According to AL1, the pyramid was an aesthetical architectural feature

from the existing buildings on campus, and the client did not specifically suggest how they would fit that feature in the new building. At first, AL1 was against putting this as an architectural feature in the building (Event 3), then at this time, GD seems to have an insight in conceiving the pyramid as a Sculpture, and not as a building element. In order to construct such shared objectivation about the *pyramd* object in the project, AL1 and GD had to engage in a dialectical interaction involving their own way of objectivating the *pyramid*. Such interaction was only possible by the articulation of the right mediating artefacts (e.g. drawings and gestures), helping them to reach mutual intelligibility.

**Event 19 – Breakdown: *Façade***

AL1 then suggested that they had to figure out how to balance the bottom portion of the building façade. In this breakdown event, AL1 revealed that this was something that came as an afterthought (Figure 59 and Figure 60). According to A4 they needed to think about the transition of the two surfaces – because in her perspective it still looks kind "*flat*". This discussion helped both participants to reveal their own interpretation about this matter.



**Figure 59: Event 19**

**Figure 60: Event 19**

**Event 20 – Time Tracking: Start of the *Presentation Mode***

At 30mins from the beginning of the activity, AL1 asked everyone to start pinning-up their sketches on the wall (Figure 61).
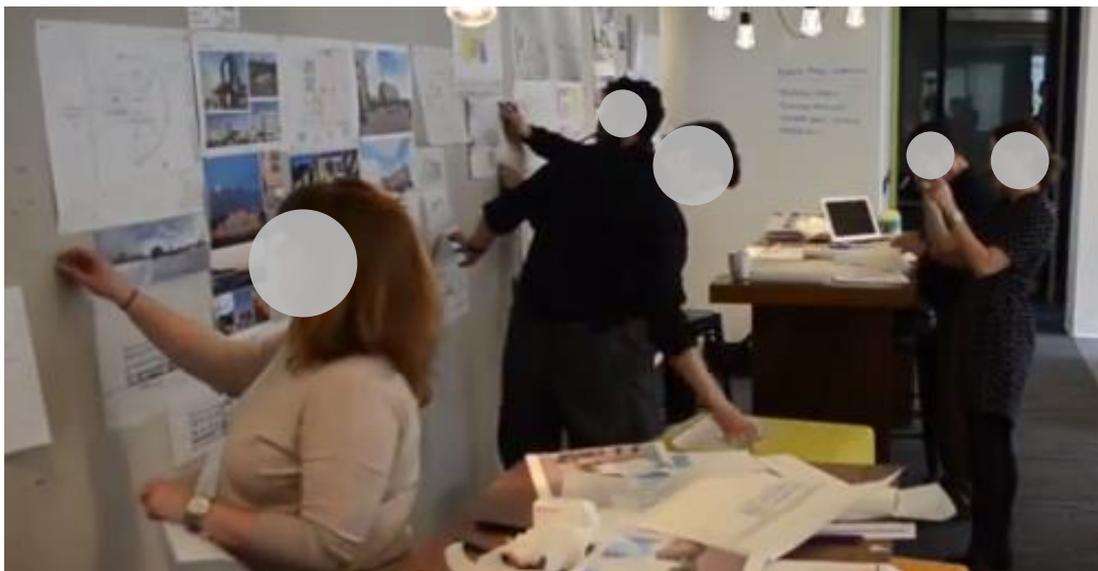


**Figure 61: Event 20**

From this point on, each participant went on and presented their individual design proposals for M.O.B. project to the whole group. This series of events, can be interpreted as objectivation interactions, in which individuals' interpretations are put forward to the other participants. Each individual, seem to focus on not only in describing their proposals, but also in presenting the justifications for those decisions. Eventually, as it is indicated in the following events, some of these objectivations led to breakdown interactions, linked to questioning behaviours, expanding individuals' understanding and, potentially, leading to the resolution of emergent misunderstandings about the objects of activity.

**Event 21 – GD Presentation:** *Pyramid as Sculpture in the Courtyard*

(GD was the first one to present) *Ok… So I am just… I was thinking from the environmental… graphic… and art opportunities, the places where we can identify some of those things… so I was thinking* (showing the spots on the drawing – Figure 18) *the covered walkway there, could be… custom glass lighting or some art pieces with… we could do a vinyl* (Inaudible: "course") *or we could do a metal panel that is curved in the half side…. We give more visibility for the internal side…. It could also be an opportunity for the "stairs"/starring* (Pointing to AL1– making "visual" connection – and referring to previous discussion). *… Like yeah… "what we could do?" …as an art piece… like an "audible" art piece… kind of balance that with…* (pointing again to the drawing).
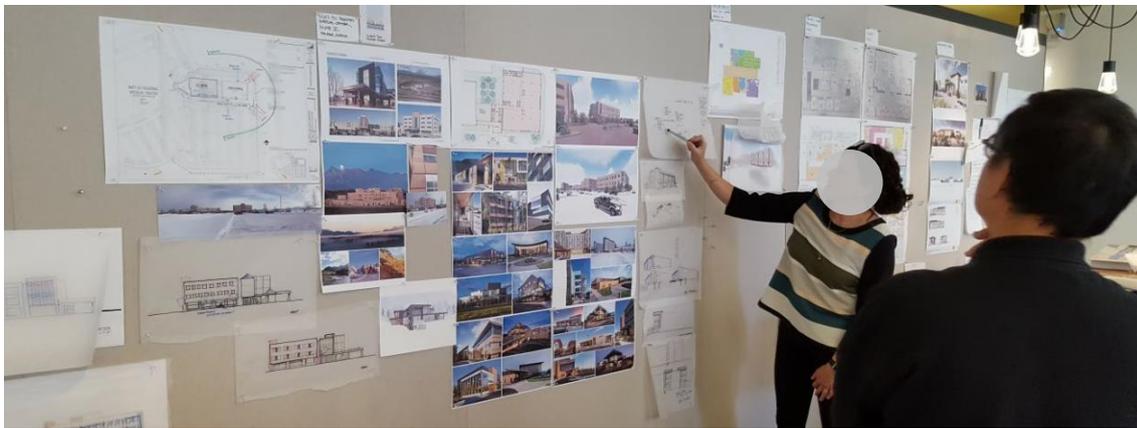


**Figure 62: Event 21**
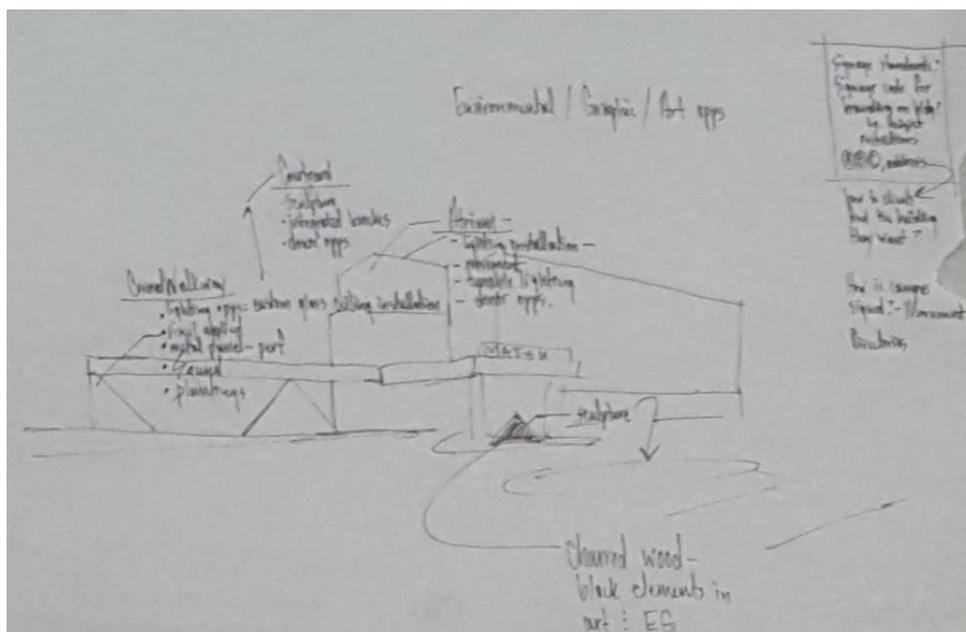


**Figure 63: GD Final Scheme**

(AL2 replied) (inaudible)… *can we choose to go on this… was not about??…*

(GD) *Something… something that will "temper", the crazy* (making gestures) *…right? …that way… right?... Cause I know that we have that in "both" existing buildings too. ...Than I was thinking in the courtyard of course fit in a sculpture in the garden… benches and also…* (inaudible)*… gathering opportunities. ...a kind of interesting things out there… if that's… …come up something they would want…. And also an atrium… I think that could be a great* (gesture)*… ahmm… vertical lightining installation... again that could be something that "smooth" (*very expressive gesture with her hands: a movement as indicating to slow down*) … as their way the wind is like this…. As a way to slow in there somehow... ahmm… tuneable lighting would be great to be sensitive to their daylight…lack of daylight… and again a lot of opportunities… We're talking about the sculpture maybe be of charred wood element, so it would remain black... ...so the charcoal would be kind of raw…  And we could that and that* (pointing at the drawing)*... …in the drive-through or out here… …rather than putting the pyramid in the building.*

(AL1 then gave her feedback) *I like that!*

(AL2): *You do? …*(Inaudible) *… Nice to see a different perspective….* (4 secs).

**Event 22 – AL2 Presentation:** *A pyramid on top of the elevator lobby in the roof*
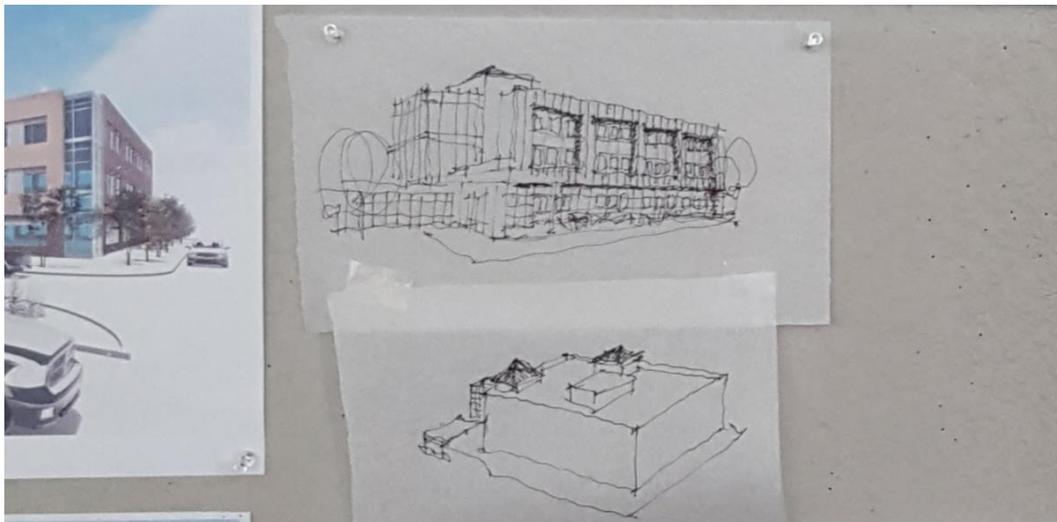


**Figure 64: AL2 Final Scheme**

(AL2) *I did the next one* (Figure 64). *Just a quick thing. I was just trying to play with where we could put the pyramid… if we have to do it* (laughter from AL1)*…I think it end up doing it maybe… and my idea would be meet the glass "cube" in here* (pointing at the

drawing)… *and ends the elevator lobby over the roof… and just put it on out there…* (gestures)… *so that works… in the plan view* (showing another drawing) *you would actually not be here but you'd be here… and by doing that you've actually sort of…kind of… made it not as prominent… but this is not more prominent… cause we put it here its fine…by putting it over here you've not made that prominent… I think that is away of integrating it in…*

(AL2 continued) *Something that A3 and I have been working on together also… that actually also…with A5… The whole idea of making this front element and this back element… Kind of….* (gestures) *because that is actually…if that is the entrance for this whole parking lot… So is really not a back entrance it is actually a front entrance…and I think some of these schemes that you are gonna see… sorts of how can the two relate to each other?… so I just did the pyramid… it shows me ways that they need to be thought about together… and I think as go through here you can see some new element… that is just it…idea!*

(AL1 seemed to agree) *Huhum …Yeah! That is just great!*

**Event 23 – A5 Presentation – Pyramid (abstracted)**



**Figure 65: A5 presenting his ideas**

(A5 showing his drawings on the wall – Figure 65 and Figure 66 ) *Yes! So I am just definitively taking the same problems as AL2… Mmm… I kind of went the opposite way as far as trying little of those… …ahmm… …I kind of used the double height glass vestibule as an opportunity to…kind of… abstract the pyramid… …I am trying to do something "funky"… …maybe it's one (inaudible: "slate") with the roof on it… or maybe both planes… …depending on the clients…I don't know what they found about that… …And going on with AL2… …I am really focused on that back entrance… …as pretty much the same allure/language to the*

*front… …ahmm… …one key was creating that glass almost like the expansion of the visual in the corner there…*

(AL1 agrees) *Huhumm…*

(A5) *…as another entrance piece … as little "match" solid (inaudible)…*

(AL1) *This is the north elevation right here?*

(A5) *Yes!*

(AL1) *Ok…nice!*

(A5) *And what I am gonna do is kind of like inverse that!?... And have exposed stairs and so I went to the main entrance and end up then to "dissolve" to the ramp around this…(inaudible)…*

In this occasion, the use of the word "*dissolve*" carried out the role of a metaphor to imply the kind of movement and transformation that the ramp would have in the design proposal. This linguistic action seems to have the same impact of the use of metaphors in design interactions.
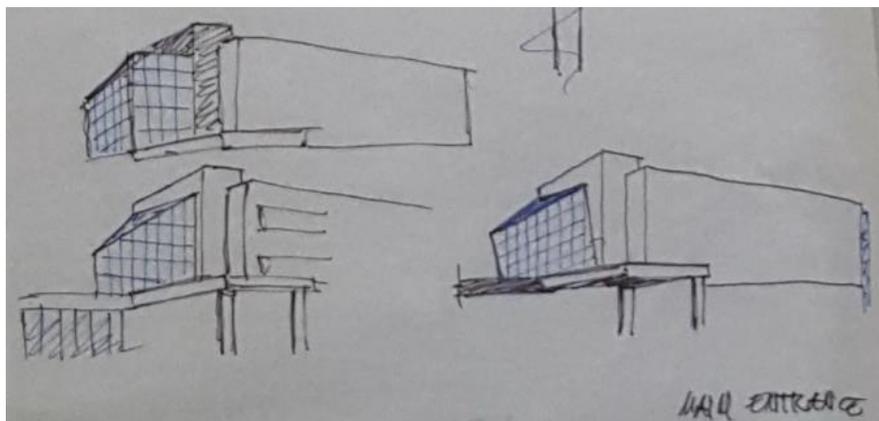


**Figure 66: A5 Final Scheme**

(AL1) *Humm… Yeap!!*

(AL2) *…And then you can take that to a "similar alignment" to the front…*

(AL1) *Exactly!*

(AL2) *So I think that would be both "networks" …that doesn't look differently in the front…*

**Event 24 – A3 Presentation:** *Façade materiality*

(A3 showing his drawings with a lot of gestures – Figure 67) *And then from me… I was working with some materiality… …So, I was thinking that maybe… …All this… … just visualizing the perspective in the building we have… …we are… …I thought that maybe this whole area it is part of this area too…*

(AL1 signed with her head agreeing)

(A3) *Then like this layer and then this layer up-front it due it to coming in…*

(AL1 expression agreement) Uhumm...

(A3) *So it is like when this new layer I nearly though it could be the metal panel going this way or horizontal (inaudible)…. …But then you see that, maybe the stone going up and breaking that… …so that means this is something happening behind that layer…*

(AL1) *Sure! Sure!*

(A3) *This is one layer we are putting in behind… …Ahm… …But then… …And then you can bring the same height of the window… …with the window span through or something like dimmer down… …maybe it's dark grey or something that it doesn't jump that much in the eyes… so it is more like this big windows kind of thing… …but then… …and then you see…*
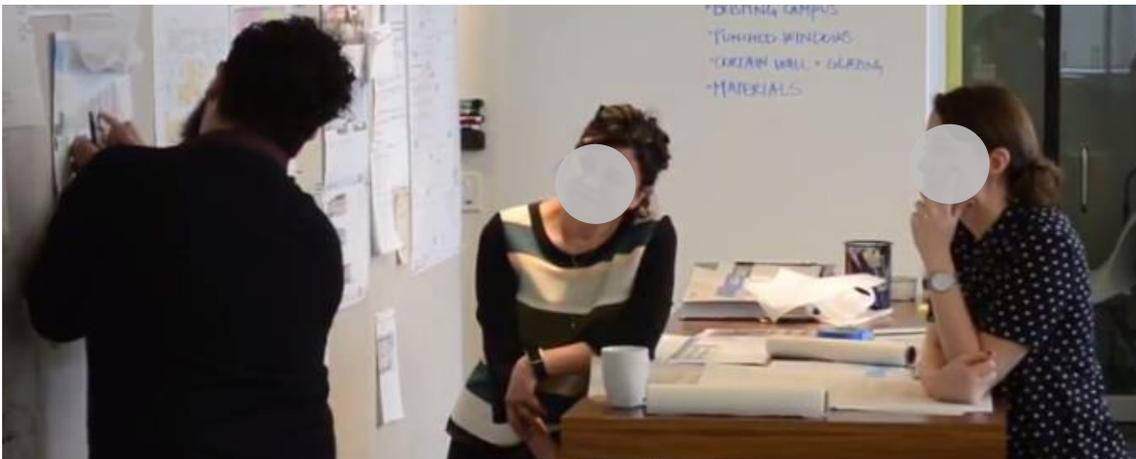


**Figure 67: A3 presenting his idea**

(A3 kept using the drawing as reference along with many gestures) *…also in the corner… …maybe the stone or whatever material they use…going up… I like that! …If this is one layer and then this one came in as new material… metal or whatever… …I went from there to maybe…now the metal bends a little bit in the end and…*

27

(AL1) *It is fun!*

(A3) *I don't know* (inaudible) *them … and now the metal also connects in the middle… cause I don't know (inaudible) …. if this whole window …I don't know if it is adequate or not… but then how the metal comes down… You see the remains of the stone maybe going in… …corners of it… …This put our playing around…*

(AL1 agreed) *huhum…*

(A3) *…and this glass corner with the span and* (inaudible the expands) *well and you know it gives… …well and… …it gives the continuity… …But then it feels like it is part of the whole underground, underneath layer that is happening… …You know this is just an idea…*

(AL1) *No, no, I got it… It is a nice "vibe"!... with a...*

(A3 and GD said it together) *Yeah! Yeah!*

(AL1) *The materials and the existing conditions too. Were you thinking that… …that top element is metal? Is that what those vertical lines represent?*

In this interaction is worth noticing some kind of confirmation behaviour to check mutual intelligibility, through questioning. In this occasion, AL1's questions indicated that she is searching for confirmation on her understanding of the behaviours and materials selected by A3.

(A3 came back to the wall and showed on the drawing and more gestures): *Yeah! Yeah! Yeah!... Maybe that is good… …It could be a different material… …whatever… …it feels like maybe this could be a deep underneath layer and something is happening on top of it…*

(AL1) *All right!*

(A3) *ahm… …I mean… …it gives you the problem of how you… …how is this connection over here and now how this one over here… …I mean… …we have this glass vestibule… …it could just be with the thickness…I don't know...maybe it could have hooks or whatever… attaching this whole area...*

(AL1) *That is cool!*

(A3) *I mean…*

(AL1) *That is cool! I always thought that we need to make it a bit more tridimensional rather than... it is looking flat... you know?... And now it is pretty flat... the design. So...there is a lot of good ideas here... (5 secs pause) ...Cool!*

(A3) *Yeah!*

**Event 25 – A4 Presentation: *Objectivation + Contradiction + Breakdown about the building entrance***

A4 used the opportunity of the *presentation* to expose how she had a different understanding of one aspect of project situation at the beginning of the activity. This specific event indicated how individuals at early project interactions can construct different interpretations about the objects of activity from the mediating artefacts:

(A4 showing her drawings on the wall – Figure 68 and Figure 69) *So... ...before I just... ...the main thing... ...I was firstly focusing on the windows... ...and sort of looking at... ...more... ...instead of having a grid very horizontal... ...a few sort of grouped done... and that whole group become sort of pushed back versus just at the windows themselves... ...I was thinking that maybe... ...You know... ...if you push that back in a sort of having a metal panel... ...if you wanna do that in the center right here...*

(AL1 agreed) *ahamm...*

(A4) *Sort of just to break-up all the beige... you know...* (everybody laughs for 2 secs)
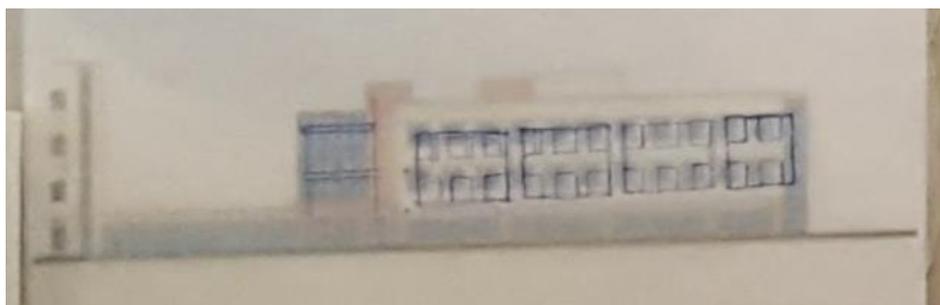


**Figure 68: A4 Final Scheme**

(AL1) *There is a way we can break-up the beige, which is to introduce a different material* (inaudible: face or office).

(A4 showing her drawings on the wall – Figure 68 and Figure 69) *Yeah! ...And so... ...That was sort of my idea behind... ...it all relate a little bit to the bottom floor... ...oh... ...It is just because it is broken up in the floor sections and... ...that is sort of the main thing I was*

*focusing on… …and then I would say through my perspective… …When I first look at it I did not know where your entrance was… …just because the entry is so similar to rest of it… …I thought for sure you are entering from this side… next to the building… …first I thought this is your front* (showing the place in the drawing*)…*

(AL2) *Like that corner?*

(A4) *Yes! Like this was your front…right here!*

(AL2 unexpected reaction) *Ow!? Ow!?*

(AL1) *Interesting! Ok! Ok!*

(A4) *I mean clearly this is you big piece!* (showing and pointing the element on a perspective picture) …*but I don't… …just because how it was… …it seems like… …that wasn't noticeable like… you can see it…*

(AL1) *Yeah!*

(A3 - pointing and making gestures over the drawing and picture) *Cause it feels like this glass is happening over that* (inaudible)… *maybe we should bring it up front… to have a prominence or like…*



**Figure 69: A4 Presenting her idea**

At this point, A3 and A4 then try to explain why and how she may have got to that understanding of the current state of the project situation:

(A4 pointing and making gestures over the drawing and picture): *Maybe just cause the vestibule feels so far from it in only one floor… that this seems like the main "entrance" in this….*

(A3) *Yeah!*

(AL1) *Right!*

(A4) *And cause it is so clear I guess it kind of look like…*

(AL1 pointing and making gestures over the drawing and picture): *Yeah! Fine! I totally get that! …It is almost like this area needs to be a little further in front and bigger… For you to feel like this is the main entrance versus the* (inaudible)… *You can't even really see it from here…* (gestures)…*Can you?... It is just sat too far back...* (Walking away from the wall)

Interestingly, the emergent misunderstanding (i.e. contradiction), followed by a breakdown interaction revealing individuals' reasons on why both of them understood the situation differently, seem to indicate a way that participants tried to find mutual intelligibility and agreement in a shared objectivation.

**Event 26 – AL1 Presentation: *Elevation in the courtyard + the pyramid***

(AL1 moving to the wall again to present her drawings – Figure 70): *Ahmmm… …mine… …Really quick… …I was thinking about the elevation in the courtyard… This wall here…and how the masses kept broken up with this solid wall on the first floor… …and also I started thinking how the pyramids could go… …This is the similar language they have over the current canopy… …This is a lot more subtle if read this as a big mass... …And just keep thinking how different materials could be applied… …sort of what you have been talking about "A3" and "A4"… …about the… …you know... reading what is behind on the elevation… …And I really like "GD's" comment about potentially having a sculptural piece or a fountain or something on the courtyard… …that is the pyramid element… …and that could be kind of fun… …and I was also thinking about how could we balance out this bottom mass… …whatever that's end up being… …because right now it is not that we really thought about it to be honest… …it is just slightly different in terms of the windows facing... …so than I was trying to think about more ways to break this up a little bit… …better this not so… …just all glass* (gesture)… *ahn… Yeah!*
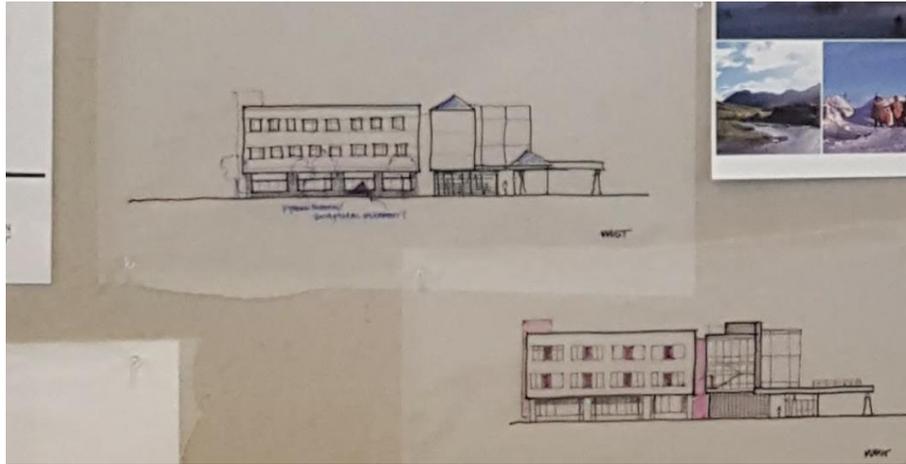
**Figure 70: AL1 Final Scheme**

**Event 27 – Conclusion (Plus and Deltas): Reflections and Feedback on the activity**

AL1 then started to conclude the activity and moved to the white wall in the back of the office to discuss with the whole group, and collectively try to establish the pluses and deltas (Figure 71 and Figure 72 at approximately 1 hour of session: 1:01:49).

(AL1) *Well… thanks guys! ...Ahm… ...Any other comments, feedbacks or thoughts?... Can we do a quick plus delta?* (AL1 moves to the wall where the plus and delta would be written) *...Just so we did one last time and we thought it was really helpful…   ...and I will erase this… ...maybe not… ...maybe latter... this is not erasing... ...I tackle with widex or something... ahmm… ...Pluses? Deltas?*
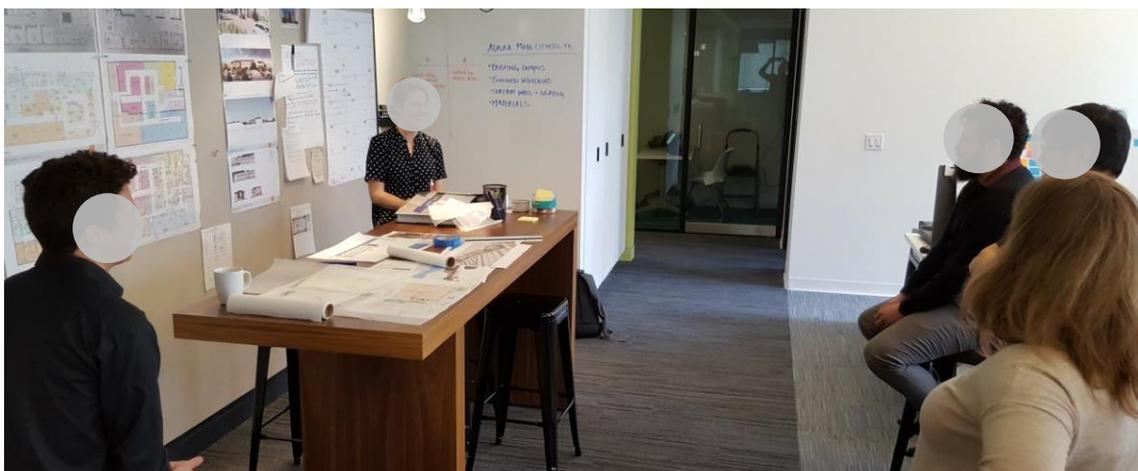


**Figure 71: Final discussion**

(AL2) *I liked a lot… pluses… I liked a lot of different ideas in a very short time. That was a real plus. A lot of different perspectives. A lot of different ways of looking at the same thing. It is a lot of good feedback to sort of how could we take it to next step.*

(A3) *And I think that is because we have a lot of material to work with… like flat* (inaudible: convention sheet) *…and also 3Ds… …I mean perspectives… …and also floor plans… that's good. So a lot of materials… …different to work on.*

(AL2) *Delta would be… ...I wish we had a SketchUp model that was up on the screen… …that we people could go and rotate and move around… ...and use to help them sort of... "oh I need to look at that side of the building and I need to see this"… and we would be able to see the entrance again in some sort of thing… ...and sometimes it work in this 3D visual* (AL2 uses gestures to suggest a rotation).

(AL1 agreed) *Huhum*

(AL2) *That would be just helpful then… Just add that part…*

(AL1 agreed again) *Huhum… Ok!.*

(AL1) *So feedback from the last time was… …is that I didn't send out anything for people to prepare in ahead of time…  …was it helpful this time? Did you even have a look at it?*

(A3) *I did…*

(A4) *I would say at least was nice to have just the context of it… …like ok… ...like this is the side of the other buildings… so you are not coming on 100% blind…*

(AL1) *Yeah!*

(A4) *And even if you don't have the elevations…or 3D views…just…*

(AL1) *Yeah! Ok!*

(AL2) *We actually… …This is our second one on this project… ...So similar context we already have worked that before…*

(Both AL1 and A4) *Yeah!*

(A3) *But it was nice… I think it helped.*
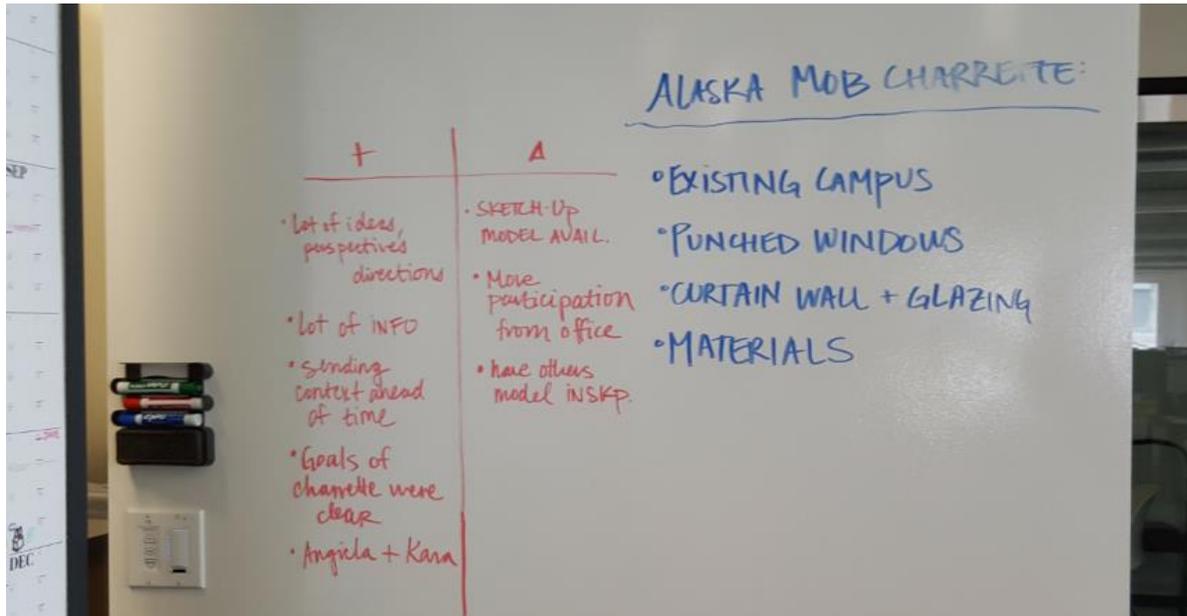
**Figure 72: Plus and Delta on the wall**

During this conclusion (i.e. *debrief*) AL1 commented on how the email sent in advanced helped people to have a better idea of what the focus of the charrette would be. Also, the fact of bringing people from different discipline, like GD, seem to have helped to provide a different perspective and feedback in the activity. AL2 commented that it would have been more dynamic if they had more people (from this office) involved. Then, AL1 asked if the group felt that they had enough time. The group agreed that they could "*always use more time*", but they also agreed that "*it is what it is*", and AL2 added that:

(AL2) *It forces you to think quicker, so there is a plus in that, and also forces you to find the essence in what you do. We don't need to get involved into details. **The main purpose is to give us ideas**... ...like where to put the pyramid and more.*

At the end, A5 suggested that it would be difficult to produce SketchUP models in the time frame of a Design Charrette. Eventually, maybe if you are working in terms of massing, it could be a possibility for some people, but not everyone.

Then, AL1 closed the session by thanking everyone for their participation, and for giving these feedbacks (1:07:05). After this, AL1 gave the opportunity for the researchers to ask some questions to the participants.

**Post-session conversation between researcher and participants:**

**Researcher Question (1):** *Is there any division of the group of participants in terms of roles (considering different backgrounds)?*

AL2 replied saying that "GD" is a Graphic Designer (Artist). The rest of the group are all architects.

**Researcher Question (2):** *Is there difference in terms of the position in that project? Who is actually working in that project?*

AL1 replied saying that it is her and AL2, and another person from the office in Alaska that are direct engaged in this project. But, once more, AL2 explained that the whole idea of the design charrette activity is to bring a lot of different views together.

**Researcher Question (3):** *In terms of the time frame of the project, you mention that this was the 2nd Charrette, how was the first one and how many more do you have?*

(AL1) *Yes, so SD (Schematic Design) started a couple of weeks ago, and the construction starts in August (2017). So, it is really fast. I don't know what is the total schedule for design in terms of weeks…*

(AL2) *We probably gonna have one more like this…as we move to a bit more detailed… Because we are gonna use these sketches to come up with an overall cost for the project and see what is buildable… …and when that happens and, then if it is on budget, then we go and start studying… …we go into more detail… …what are the schedules…*

**Researcher Question (4):** *So the SketchUP model that you have right now is it based on the 1st Charrette that you had in Alaska?*

(AL1 Based on the 1st Charrette and here) *The 1st Charrette was actually based in here before we went.*

(AL2) *Actually this is the 3rd Charrette. We had one here with team in house, then we had one over there with all the engineers (in Alaska), and this is the third one in here. You know we had one in April with all the engineers and owners were here, and we are probably gonna do another one in here.*

**Researcher Question (5):** *Do you think you can describe what was the focus of each of those 3 charrettes?*

(AL1) *Yeah! The focus of the first one was site plan. So basically we brought the site analysis and got people to work where would this building go… …where are the overall massing schemes… …that was very general… …then from there we got the massing and we talked with the engineers and they were looking at systems. So, they were looking at mechanical, structural… …where the electrical room goes, which the result was this* (pointing to figure 3) *and this one (the charrette) was exterior… …purely exterior design…*
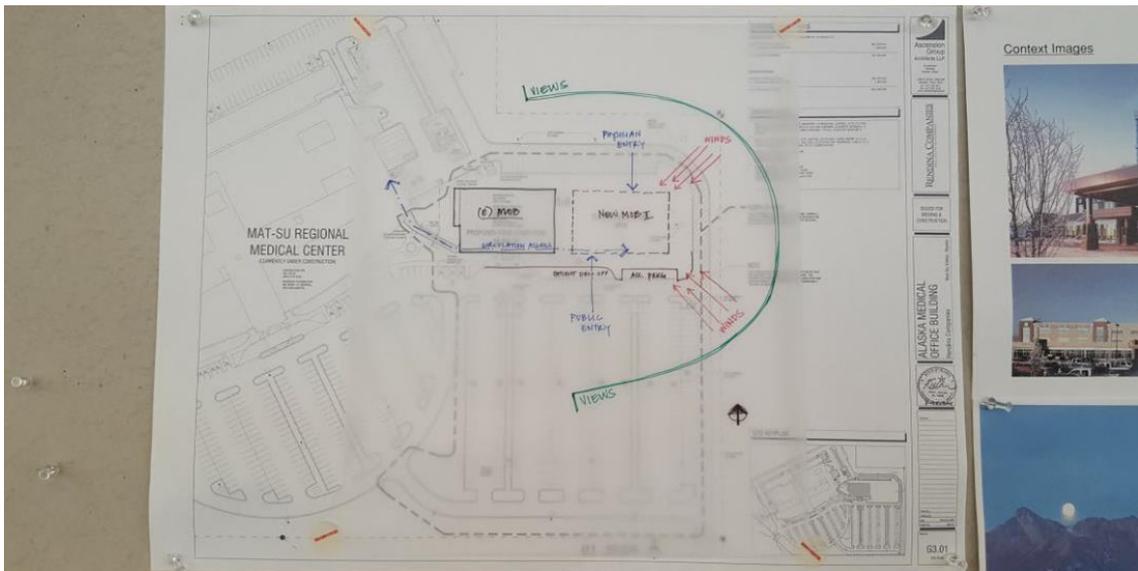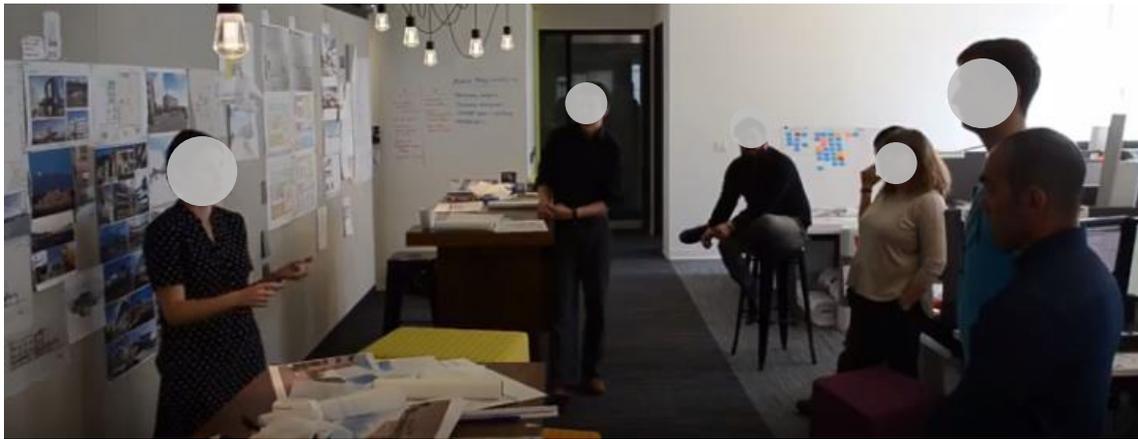




**Figure 73: Post-session conversation between researcher and participants 1**

(A3) *I think that it is why this* (pointing to list of topics written on the wall) *is so important the goals that we hit… …that guides us to what we have to look at the project that we have in the charrette… and don't start to through crazy ideas because they are there, we don't… …You don't wanna change anything… …you just want to help… …So that is why this is so important…*

(AL1) *So as the design progress… …we are probably gonna have a charrette for Lobby design and maybe more signage and way finding… …more of an interior focused… …once we kind settle on the exterior… …I don't know there is probably a few more that we could "charrette" a little bit.*

**Researcher Question (6):** *So, regarding the floor layout… …basically the technical rooms and things like that get "clarified" by the other teams, right?*

(AL2) *Yeah!... This has changed from a week ago* (Pointing to figure 3)… *…Yeah! So, it looked different. The other charrette totally changed these buildings. That is probably the third or fourth scheme of how this thing layout. Considering all the infrastructure they are getting and trying to fit in… and having the engineers saying "ow, ow" we change the road so we can do the building this way. So there were a lot of changes…sort of…*

**Researcher Question (7):** *So in terms of discussion and conversations with the engineers and clients… Do you think that the methods, like using drawings and pictures, they worked? Or do you think they generated more conflicts during this discussions? Do you think it was natural to work with Engineers?*

(AL1) *Yeah! Very much though! …I think that… I don't know how engineers typically work on the SD phase, but I think they appreciated that it was very collaborative and that we came together for one day and just hashed everything out… …we talked about everything rather having a series of emails or phone calls back and forth… …we were working in the room like this face to face… …and you go down the list of every trade and say what you need and what you need from us, what are you thinking for your systems.*

(AL2) *Actually wasn't just engineers… …We actually have a contractor and the mechanical subcontractor… …so we had the actual people who is gonna build it… …and then someone would say "well this is what I would like" and then somebody else would say "well, have you thought about this?" … So there was a lot of different takes between all the people that is designing and building it... and all the systems and exteriors… …and the owner, who is gonna pay for it.*

**Researcher Question (8):** *Could they interact with the sketches or…?*

(AL2) *Oh yeah! Yeah! They were working with the whole screen on the wall… …and then actually sketch on top of it… …and then took a picture of it… …and then move on to the next one.*

(AL1) *So like based on our discussion for example… …this plan used to look a really different and the mechanical engineers said "I need a room this big" so I drew a box in there… …drew where the air handling units will go, drew where the ducts will go, drew where the "main streams" will go… …It was very sketchy… …and I send it out to everyone in the minutes of the meeting… …rather than just text… …and they could see… …this is what we talked about… …this is where we agreed to put the electrical rooms… …this is where we agree to put the machine room for the elevator… You know… …So it is all sketched out as part of our… I don't know... Is like the document we came out at the end of the meeting... …And from there, Curtis took that information, digested it and came up with the new plan…Yeah!!...So that is the result of a lot of work. Yeah!*
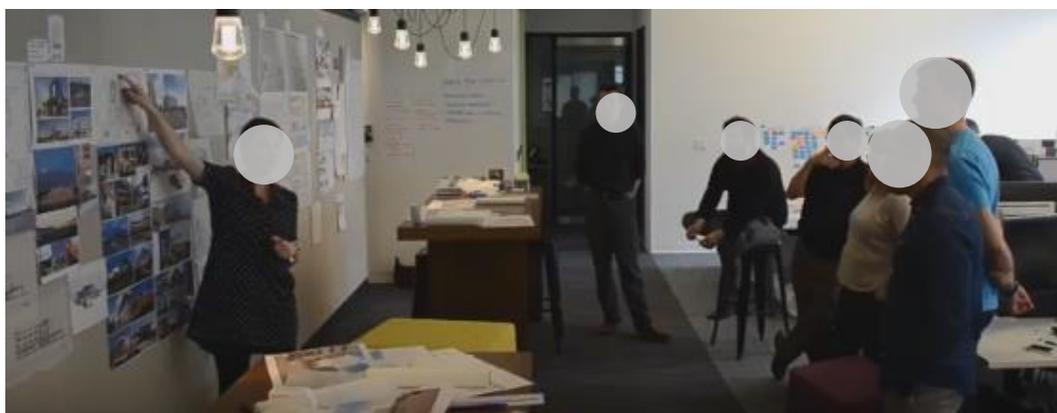


**Figure 74: Post-session conversation between researcher and participants 2**

The post-session conversation provided a broad understanding on how the overall project had progressed so far, and how the design charrette activities were key to allow different stakeholders to engage in interactions to socially construct the objects of activity (e.g. *infrastructure* and *technical rooms*). Moreover, it is possible suggest that based on AL1 and AL2 comments, the previous design charrettes seem to have involved similar dynamics of interactions, as observed in this session. Project architects, clients, engineers and contractors came to interact with different interpretations and requirements, which were objectivated within the context of the group, leading them to engage in breakdowns interactions and new conceptions about course of actions. Another interesting aspect of the socio-construction of the project activity that can be inferred from these comments, is the fact that those objectivations that became agreed at the end of each design charrette are taken to next one with certain rigidity. These could be interpreted as a type of institutionalisation, in which these objects of activity are taken for granted in the next design charrette, which means that they usually are less subject to be questioned and reviewed.

# Appendix 4: In-Depth Case Study
## Storytelling and Communication Analysis

## Business Case

### *Perception of Interdependency*

During the *Business Case* instance of the *Building Project* activity, the participants' perception of interdependency seems to have been objectivated by certain *assembles*, in terms of teams and panels, that were put in place by University's institutional operation. In this case, according to the Staff Member:

> *"Obviously I was very aware that we were planning on get involved to the building... and obviously as a member of the SMT (Senior Management Team) ... we were told that... we were fighting for buildings... so as to say... so asking the VC (Vice-Chancellor) could we have the building... so once got the "go ahead", I was than involved in describing what aspects..." (pg. 01)*

> *"Ow, I am sorry, this is the Senior Management Team. So that is like... ...obviously... ...The Heads (of Departments), "Social" Deans and the Dean, we meet... But we used to meet at three... two weeks... So we check through the requirements of the School..." (pg. 03)*

In these two fragments from the Staff member interview it is possible to notice how her perception of being interdependent in this situation relied on the fact that she was part of the assemble, which in this case was already in place, namely the *Senior Management Team* (SMT).

Another important feature of these assembles, is that participants were expected to realise their role in being part of that project activity (i.e. the *School Operational Project*), and expecting them to understand why there were involved in that activity (answering the question *Why am I involved?*). As the Staff Member explained:

> *"I think, as my perspective... You know... somethings I want... somethings I don't want... cause obviously, I want the PGR (Postgraduate Researchers) that... I was a bit hesitant of including in this building because we have a very good space in ABB ("A" "B" Building), which we could keep there... we had the opportunity to stay in that building... us moving to this new building, and when I spoke to the Dean, and it would be a great opportunity because than our students don't feel isolated from the rest of the School... so, it would be good to be able... that ours*

*students integrate with rest of the School, rather than been stuck in a very boring, (inaudible), sterile environment, which where they are presently, they are not engaged in anyway... not, not necessarily... obviously with their own supervisors, but... to just be exposed to the work of the rest of the School, so they are quite isolated where they are... so it is a great opportunity... and I had hope that those Research Centres to be set up in there, but unfortunately due to a lack of space, and I have not been able to do that... So, there is a bit of win-lose kind of a situation or compromise situation, which is just fine... So I think is just important to certainly if I am champing a particular area of the School, which I am doing, is to make sure that if I am good at being included a part of that as I can possibly achieve... I want also to comeback once the building have been built in a few years' time and go, we just had to compromise to what we go, you know... I feel like I fought too for them... particularly, obviously... I have not won from the perspective of the Research Centres, but for the students we have got space... I just continue to fight to make that that space it is appropriate... that is fit for purpose the space... rather than just moving the students from a very good room facility that they have now to one that they wouldn't about to flourishing... it would be just completely waste of an opportunity if that wasn't the case..."* (pg. 04)

In parallel to that, the Dean also referred to *assembles* (i.e. "*panels*") that were established in the specific situation, with the purpose to support interactions at the *Business Case* instance of the project activity:

*"Maybe I should say how are structured as a client... "* (pg. 01) *"So, to put in another terms, the evaluation panel for the design proposals was constituted of the Dean, the Deputy Vice-chancellor, the Vice-chancellor and Director of Estates... "*(pg. 01) *"The panel is not a working panel. It is a decision-making panel... The panel is a decision-making panel in opposition to an operational panel..."* (pg. 02)

From the Dean's comments it is possible to understand how the University, as an institution, is used to assembled "*Panels*" to deal with project situations. In this case, it is worth noting that the purposes of each assemble is to allow individuals to perceive themselves as interdependent actors in the specific project situation and in the overall institutional operational activity (e.g. the *evaluation panel* and the *operational panel*). From the way it was mentioned by the Dean and the Staff Member, these type of interactions, between *assembles in project activities*, seems to be a standard procedure within Institutional Activity. Hence. it seems that these assembles were institutionalised as objectivations of individuals' perception of a functional interdependency within the activity, in a way that these assembles were established with an embedded idea that its members are interdependent among them.

Therefore, besides the fact that there is no indication of individual choice in participants becoming interdependent in the Business Case instance of the Building Project activity, it can be argued that when these individuals had applied to become part of the University (i.e. as a member/employee of the organisation), they had already made the choice to become an interdependent actor in the overall institutional activity. So, when individuals are assigned by other members on a higher hierarchical level of the institution, to become part of an assemble, there is implied a choice of becoming interdependent in the overall institutional activity. It can be argued that this is one of the reasons why this type of organisation can be considered an institution, because of their organisational "constancy" that is implied in its way of being.

## *Perception of Performance*

Still during the *Business Case* instance of the Building Project activity, there were the interactions between the *SMT*, as a *Conception Panel*, and the University's Board of Directors (including the Vice-Chancellor, The Deputy Vice-Chancellor and the Dean of the School), as an *Evaluation Panel*, to agree in the case of the need to change the current situation of the *School Operation Project* and how to change this situation. Since, the argument on how to change the situation was built around the proposal for a New Building, then the outcome of such discussion was expected to be an agreement or not in moving to a *Building Project* instance of the activity.

In this situation, within the institutionalised operational activity of the University, whenever it is projected the need to build, refurbish, acquire, maintain or demolish "spaces" (i.e. facilities) that support educational activities, it is put in place by the University an *Operational Panel*, as it was mentioned by the Dean:

> *"…So, we basically have a department of estates, which is responsible for procuring all estate provision facilities on behalf of the University… of the department of the University department…" (pg. 01)*

In this case, The *Estates Department* "holds" individuals that are responsible for all the activities mentioned above in the realm of the University institution, however, their activity is most of the time, contextualised through an assemble, which is put in place, whenever a *School Operational Projects* lead to the need to change or maintain spatial features of University's estate provision of facilities, which can be seen as one type of *resource*.

Thus, the fact that the University has in place, within its institutional frame such pool of individuals, that eventually are assembled in certain situations, suggest that there is embedded on the objectivation of an *Estates Department*, a perception of their inherent collective skills to accomplish the task of procuring and operating Building Project activities.

Therefore, as well as the perception of interdependency seems to be embedded in nature of the assembles referred before, as members perceive themselves as interdependent actors, the socio-construction of a perception of performance seems also to be relied upon the configuration of those assembles. More specifically, this seems to be built upon individuals' perception that they, as a collection of individuals, are able to perform in the project activity. Moreover, participants on the assemble are relied to be the "champions" on each relevant area subject to the project. As it can be observed in the Staff Member comment:

> *"...So when the Dean selected the Team (Staff Team), we wanted to make sure that it was a rep. of each areas... so obviously I was in charge of this area... So I relay the requirements that I needed..." (pg. 01)*

## *Conception of Resource*

During the *Business Case* instance of the project activity, the conception of what is to be considered a *resource*[12] in the activity, is also objectivated through the shared responsibility of an assemble, in this case, again referring to the University's Board of Directors as the *Sponsors* of the Building Project activity. Such interpretation can be drawn from the Dean's comment:

> *"...and then the client, or the sponsor for that project, was effectively the Dean, the Deputy Vice-chancellor (who the director of estates reports to), and also the Vice-chancellor." (pg. 01)*

As well as from the point of view of the Staff Member, when she referred to the interaction between *SMT* and the Vice-Chancellor:

> *"Obviously I was very aware that we were planning on get involved to the building... and obviously as a member of the SMT (Senior Management Team)... we were told that... we were fighting for buildings... so as to say... so asking the VC (Vice-Chancellor) could we have the building... so once got the "go ahead", I was than involved in describing what aspects..." (pg. 01)*

---

[12] Resources, can be interpreted as a stock or supply; assets that can be drawn on by a person or organisation in order to function effectively (Cambridge Dictionary)

In this case, answers for questions like: How much we can afford to invest? Or How much are we willing to invest? Seem to have been embedded in the assemble of an *Evaluation Panel*, and more specifically, it was implied in the highest hierarchical role in the University organisation (i.e. the Vice-Chancellor). So, the individuals of this panel were supposedly the ones who were in charge of controlling the pool of resources (i.e. money, time and space) in this instance of institutional activity.

While it seems straight forward to logically imply that higher positions in the hierarchical structure can functionally control the application of resources, as money for example, in a centralised and objective way (all the University's financial resource were centrally managed and accounted as one). In the other hand, to consider *Time* and *Space*, as resources can be very subjective and contextual, requiring an understanding of its functional application in the particular situation. Consequently, the appreciation of a conception of resource also came from the *SMT* (the *Conception Panel*), which is deeply involved with the *School Operational Project* (the context situation) and that objectivated what was believed to be lacking as a resource for the continuous development of the School Operational activity. Thus, the conception of '*Space*' as a key lacking resource can be observed in the Staff Member description of the 'motives' for the Building Project proposal:

> *"It is just… as far as I am aware… it is we are short on space… it is a big problem at the moment… and a lot the spaces that we use as studio and class facility are owned by individual disciplines or departments and they are not utilised… some of them struggling more than others… and then you can argue that actually some spaces (inaudible)… but sometimes they are extremely busy because they a particular big group of students at a particular point of the week and the rest is busy… but everybody seems to own their own spaces and don't want to share these facilities… So, is really lack of space… so we need to think more cleverly how we can use space more wisely, so… And also, we are as, as a School we are spread across five buildings… so you never see some students, so you never see some staff members… and is about bring us close together, sharing resources, spaces I mentioned earlier… and it is just about being a lot more clever in the way we work… cause obviously we want to grow, and bearing that this new building is not necessarily as bigger as we would like it to be, but certainly it will accommodate our continuing growth… so we do have to be a lot clever in the way we do… to change the way that we work at the moment…" (pg. 03)*

Similarly, the Dean's comment in referring to the *School Operational Project* suggests how '*Time*' was also conceived as key resource in aligning the proposed Building Project Activity with the overall School Operational Activities:

*"… and by January the whole thing runs smoothly, that is why… and also in addition to that, of course, we have to look at the relocation of staff from here… That is a different project that is where the staff is gonna go… So is kind of a complex programme together as whole…and we haven't really looked at the whole yet. We have looked at just the delivery of the building… So starts a new phase… as soon as the construction starts… we need to do the planning now of how our staff are gonna move, where they are gonna move, … we need to remodel the Queens Street Studio (building), we need to identify time scales… when we are gonna move the students… you know…what are the risk of not being ready."* (pg. 07)

In such way, the conception of what constitute the pool of resources to be applied in the activity became distributed among the project participants. More importantly, a collective conception of what were the resources at this instance of the project activity, was negotiated and balanced within the context of the overall institutional operation (e.g. "*we were fighting for buildings…*"), requiring a deep **explanatory interaction** (i.e. a Breakdown), from the part of the Conception Panel about the reasons why the lack of such resource constituted a problematic situation, supporting the argument for a New Building Project.

## *Conception of Changing Action*

Moreover, such detailed description of the situation presented above, not only shows what one of the Staff members (from the *Conception Panel: SMT*) saw as one of the key lacking resources in the *School Operational Project*, but also indicated potential ways in which she (and we can imagine the whole team) envisioned that the situation could be changed. Thus, it seems to be an evidence that usually people find difficult to separately describe what is that they see as problematic in a situation and the ways in which they project the necessary changes to that situation (i.e. resolution).

The purpose of the Business Case instance of the Building Project activity, as the first instance on a changing activity, is to get an agreement, within the organisational template of the University institution, to engage in a New Building Project activity, as the way to resolve the arguably problematic situation of lacking certain resources, as presented by the *SMT*. As it was mentioned before, within the institutional framework of this University, once there was an agreement to move to Building Project Activity (which could include the development of a new building or refurbishment of existing property), the standard procedure was to assemble an *Operational* Panel, including in its majority members of the Estates Department. This *Panel* then, becomes responsible for managing the following instances of the Building Project activity, as it was indicated by the Dean:

> *"In terms of operations we had an operational panel which included: The Dean, the Associate Director of Estates, it included the Director of Estates in some cases, it included the University Planner, who was responsible for looking at planning applications, master planning and those aspects, we had two quantity surveyors and surveyors in general who were responsible for managing the process, on behalf of the client… so they are recruited by us and have been working with us across a number of projects…so we represent the clients team… and we were taken part of those meetings for the development of the designs…" (pg. 02)*

Therefore, it can be interpreted that in the *Business Case* activity a *Changing Action* is objectivated by the emergent assemble of the *Operational Panel*, which then indicated the agreement of the parties (i.e. *SMT* and University Board of Director) in moving on with the Building Project activity. This objectivation also indicated the reliance of the project participants that, the *Operational Panel*, as an assemble will perform (as usual, because of their specific role in the Institution) to deliver the expected change to the *School Operational Project*: more and better space within expected budget and time.

What seems to be key at this instance of the Building Project activity, was for the project participants to realise that, if there wasn't an agreement and, consequent approval on the "Business case" presented, there wouldn't be a need to procure a New Building Project and, consequently, the need to assemble of an Operational Panel, and that is why, the formation of this '*project team*' can be considered an objectivation of the *Changing Action* conceived in this instance of the Building Project activity. The overall *Changing Action* objectivated, as it was mentioned before was the emergence of a *Building Project* Activity, which is the focus of this inquiry.

# Setting the Building Project Template

## *Perception of Interdependency*

### *Competition Advertisement*

From one side of this instance of the Building Project activity, the perception of interdependency seems to have been objectivated by the *Competition Advertisement*. According to the Dean:

> *"I mean it was advertised on European Journal…" (pg. 01)*

> *"Yeah…It was… I mean… We had to advertise for a month. So I had to create the brief as part of the advert. So the brief went together with the advert and the technical specification… And then we had the Interested Part saying "I want to take part in this"…" (pg. 03)*

These two fragments from the Dean's interview, suggest that he saw the *Competition Advertisement* as an opportunity for the individuals, through professional organisations outside the University, to manifest interest in participating in Building Project activity. This also suggest that those individuals had the choice to perceive themselves as functionally interdependent in the activity, by replying to advertisement.

Since, the *Operational Panel* decided to configure the Building Project Activity as a *Competition*, then it implies that eventually a certain number of professional organisations are going to bid to become the ones who will conceive and deliver the Building Project Design and Building Project Realisation instances of the activity. So, from the perspective of the Operational Panel, as the client, the manifested interest to participate on the Building Project Activity, leads them to be perceived the other participants as "Competitors", at this stage. As indicated by the Staff Member:

> *"…and apparently those Competitors tendering the process… whether was… ..I think two or three companies, in the "short run", however, two dropped down… and it is just one company involved in that… and at that Stage, we were shown the Design, for the first time…" (pg. 02)*

Further on, the implications and potential contradictions (misunderstandings), emerging from adopting a *'competition'* approach to the Building Design instance, are discussed.

***Organisational Roles and Assigned Roles***

In the other side, initial interactions from the part of the potential project participants on the competition emerged within the frame of the organisational templates of 'consultancy' companies (e.g. General Contractors, Architectural Practices, Structural Engineers and Building Systems Engineers). According to the comments for the Design Manager (Contractor), in this case individuals playing certain roles in the organisation, were usually *assigned* to specific projects, which were seen as different jobs in the company: From the perspective of the Contractor:

> *"Me, personally, I have only been involved from RIBA Stage 3… so that has been involvement, mainly from Jason, previous to that… but my involvement started at RIBA Stage 3, where I was invited back into our office from a previous project, so I finished the job down in Nottingham and come back into the office and they said: "this is your next job" …(pg. 01)*

Following this comment, it is possible to say that, when players are assigned to jobs, it implies that someone in higher position in the organisational template made the choice to involve that person in that specific project. In this case, the decision to be engaged in the project (at this instance, in the competition) was not necessarily made by the individuals who eventually will be directly engaging in the activity.

It seems, that when individuals were assigned to a project, the need to 'depart' from their general role in the organisational template of their companies (e.g. as Architect), and assume a particular role to comply with the project activity (e.g. as the Design Lead Architect or the Technical Lead Architect), as it was described by the Architect:

> *"It is worth mentioning that there was myself and a colleague, that it would be the Architects working on this building… My colleague, CHARLES, his is probably more of kind of "Design lead" and I'm more a "Technical Lead", so I don't know what difference that makes, for what we are gonna discuss… But we are still both involved in the process…" (pg. 01)*

And the Design Manager (Contractor):

> *"The final say, ultimately seats with the Bid Manager, so that will be FRED, he… You know, he is basically controlling me, if you like… because I am only really focusing in the Design, while he has got the "whole picture" … …you know… …so there is also a "win strategy" to consider… You know if you go in a competitive situation you gotta try to bring some innovation to it… something that is gonna give us an edge… So, he is sort of in control of that… So, ultimately, he has the final say… although he's got people above that tell him and they will tell him what to*

*do… So, in the end of the day, it is to "the top of the tree" with the "MD" or at least the Pre-Construction Director for CONTRACTOR… well, CONTRACTOR have the final say, cause we… well, technically we are not employing the Design Team, but actually we are controlling them…" (pg. 09)*

Thus, these interactions seem to indicate that their perception of interdependency in the activity, is partially objectivated by their choice to be part of a conceived organisation in the context of the Building Project activity. Such choice seems also to indicate that those individuals comply with the activity own 'rules'. This once again shows how some instances of existing Organisational Templates tend to influence the perception and conception, as well as the structural artefacts individuals use to objectivate collaboration in the project activity.

**Objectivation: *Team assembles (Contract Lead Team is key)***

Assigned roles, only make sense when considered within an *assemble*, as the *Consultancy Teams*. So, from the '*consultancy'* (or in the other words the service provider) side of the Building Project activity, a *Team Assemble* was conducted at this instance, and it can also be related to socio-construction of the perception of interdependency and performance in the activity.

The assemble of Consultancy Teams involved the establishment of functional interdependences among team members and their activities to align their purposes. In this specific case, the *Operational Panel* opted for a procurement route in which the Contractor Organisation was supposed to act as "leader" of the Consultancy Team. In such a way, it was the responsibility of the Contractor Organisation to assemble the team of consultants according to the procurement specifications, described in the competition advertisement. Thus, considering the Contractor Organisation's role in assembling the team, the following fragment of the Design Manager (Contractor) interview, described how the *Consultancy Team* was assembled:

*"I think we've made a Team, because we worked together in the "X" Building previously… So, we got approval working relationships again with the Structural Engineer, the same Structural Engineer in the "X" Building, so we got confidence in working together, because we have worked together before… we pulled a different Building Services Engineer, again from our supply chain, we have a number of designers around our supply chain… we speak to them, see which one you want still work, if you like, the one that seems to be keen and more capable of doing it, it is probably the one we will engage with… likewise when it comes to selecting the sub-contractors we will go out to the market, from our selection… from our list of approved contractors… and*

*those are the ones that we have worked before, and we know we can deliver on cost of the product and deliver on time... and then we will engage with them. ...And I am only acting as a facilitator, just to make that all parties come together, they all talk to each other... to insure that they... you known... that the proposal is put together... satisfactory. (pg. 04)*

This suggest that one of the factors affecting *Team Assemble* was the socio-construction of the **Perception of Performance** by the potential team members, considering their previous shared experienced. Positive impressions on previous interactions on similar situations, seem to be key for the Contractor Organisation to offer a position to an individual or organisation in the Consultancy Team. As the Design Manager indicated, the Contractor Organisation seem to have a pool of potential partners, which they call "*list of approved contractors*". Such '*selection*' of those partners, then seems to be based on the Contractor Organisation perception on the ability of those potential partners to "*deliver on cost... and on time*".

In this case, it is not only the Contractor Organisation that needs to construct this perception of interdependency and performance at this instance of the Building Project activity, but each potential "partner" need also to realise their own ability to perform in the task, as well as, their ability to potentially perform as a *Team*. The socio-construction of such perceptions lead to their acceptance or not to be part of the Consultancy Team. As it can be interpreted from these fragments of the Architect's interview:

*"...We were approached by CONTRACTOR, heading of... of the back on the success on the "X" Building, we thought we already have the relationship with University so did the CONTRACTOR, it gone relatively well as a Project, the University was happy with that, so we thought: "Well, right that is quite a strong team". So, that it is why we kind of put ourselves forward on that perspective." (pg. 02)*

*"... I was the... Myself and CHARLES again... and it was the first time CHARLES and I worked together ("X" Building) ... and it was the first time CHARELS and I worked for the University. So we were brought in because us... CHARLES and I both have a kind of "specialism" in Education and we designed... we came up with the Design Concept for the "X" Building together and presented it in 2014... and we have worked with a Contractor called "DT" back then... "DT" Construction... and we won that competition first of all, then "DT" went through administration and CONTRACTOR ended up building it for the University in the end. ...But... Yeah! That is a long-standing relationship..." (pg. 09)*

*"So, everybody that we were looking at selecting on the Team of people that University had worked with before, really... So, even the Structural Engineer that we had on the Team, they were*

11

*the Structural Engineer for the "X" Building… They were the Structural Engineer for the… "Central Services Building" …you know the one with the Student Union, which we weren't involved in, but the Structural Engineer was… So, he has got a long-standing relationship with the University… They know it is somebody they can Trust… …The Fire Engineer that we had, has worked in both "X" Building and Central Services as well, so they got a good relationship with COUNCIL Building Control, also REGION'S Fire and Rescue Service… and, you know, it is key to be able to have people that have that kind of relationship, cause as soon as we come up with the Design Concept, you can pick the phone to them and say: "Look, we've got this Design here, it is not "standard", it is gonna have to be a Fire Engineer solution. Are you comfortable with that Design approach on this?" …So, if you got them to say: "Yeah! We will be happy with it if you get on that route" "…and straight away you are de-risking the project. So, the Contractor is happy that you getting the "Thumbs up" from the right people. We are not selling the scheme to the University, we are getting Planning Permission, and you go to Building Control and they go: "Well, you can't do that! Come on…" "…So it is go to have people…" (pg. 08)*

So, at this instance of the Building Project Activity, The Consultancy Team can be seen, at the same time, as one of the objectivations of **the collective perception of interdependency and performance**. This is directly perceived by the potential members of the team, but it is also indirectly perceived by the Operational Panel, as the client, which objectivated through the Procurement Statement their minimal requirements (i.e. Pre-qualification criteria) for the Consultancy Team to apply for the Building Project activity, as it was mentioned by the Dean:

*"…Then we asked the supply chain to integrate around the contractor, so it was a contractor lead consult team. So it was contractor's responsibility to bring together the architect, the M.E. people, the planners and the landscape architects… You know the whole of that team together…"*

**Objectivation:** *Scope of Service (Roles and Responsibilities of the Consultancy Team)*

Interactions to assemble the Consultancy Team were managed by the Contractor Organisation through which they call *Scope of Services*. According to Design Manager (Contractor), this was a Design Management Tool, that the Contractor Organisation usually uses to 'divide' the whole scope of work (as they interpreted from the procurement documents) among the members of the Team assembled in a Building Project Activity:

*Yes! It has to be… you know… Before we can appoint the Design Team the Scope will be agreed… So, we send it out to them and say: "Will you sign up this?" and they will say: "Well, I will not be happy 100, 99% to this, because of this, this, this… so, I don't like it… or I can't do it…" …And there will be a dialogue… It worth point out that, actually, at the point where we*

*developed the Brief, in Stage 2, we don't have an order from the University, so we can't place orders with the Design Teams… So they are all working at risk… and nobody is getting paid… So it is very difficult to "pin people down" to deliverables… where we all aim for common goal, we haven't got any "teeth", if you like… So, if the Architect doesn't draw it, you cannot go down and say: "We are gonna in breach your contract, so we are not going to pay you"… cause we ain't paying him anyway… all that happens is that if the Team fails, nobody gets the job… But once we get to the point where we were in contract, than all of this documents will so be bounding to an appointment, which is like sub-contract, if you like… now we will tide them down to delivering a set of deliverables… in line with the Information Requirements Schedule, that haven't talked about yet… (pg. 07)*

*"…In the Concept, we do have the Scope documents but they are not as contractually biding as… so, how we say, it is all we working on "good will" really… because everybody understands that if we don't win the job, there is any job and nobody gets any money, you know…" (pg. 07)*

The services as listed hereunder are agreed by the Architect and are fully included within the agreed fee. The services are to be provided in accordance with terms and conditions of this agreement, and in strict accordance with the time periods as set out in the agreed Design Programme and or Information Required Schedule.

| Sched Ref. | Services | Scale (min) | RIBA Stages | | | | |
|---|---|---|---|---|---|---|---|
| | | | Stage 0 – 2 Strategy, Brief & Concept | Stage 3 Developed Design | Stage 4 Technical Design | Stage 5 Construction | Stage 6 Handover & Close Out |
| **1.0** | **Brief, Design Statements, Reviews & Reports** | | | | | | |
| 1.1 | Review and comment on Employer's Requirements and any additional information provided by ████████ or Client or other Consultants, including Statutory Authorities, for adequacy, error or conflict. | - | ✓ | ✓ | ✓ | | |
| 1.2 | Advise ████████ of any aspect of the Employer's Requirements that in the Architect's opinion requires further clarification in order to fully determine the brief. | - | ✓ | ✓ | ✓ | | |
| 1.3 | Carry out such studies as may be necessary to determine the feasibility of the Employers Requirements. | - | ✓ | ✓ | ✓ | | |
| 1.4 | Review the Employers Requirements and the Architectural Design therein. Produce the design in strict compliance with the Employers Requirements. Produce a list of Derogations and Clarifications where the contractors proposals Architectural Design does/ will not meet the Employers Requirements. | - | ✓ | ✓ | ✓ | | |
| 1.5 | Review the Employers Requirements and architectural design and identify gaps in the information provided. Provide marked up drawings/ information & schedule of gaps. | - | ✓ | ✓ | ✓ | | |
| 1.8 | When Employers Requirements are not available, develop and update 'The Brief' based on client discussions and any documents issued. The Brief will be used in lieu of employers requirements to develop the design. | - | ✓ | ✓ | ✓ | | |
| 1.9 | Visit Site & Surrounding Area & Prepare Evaluation Reports. | - | ✓ | ✓ | ✓ | | |
| 1.10 | Finalise and Validate Project Brief & Objectives. | - | ✓ | ✓ | | | |
| 1.11 | Seek Design Brief and Concept Approval. | - | ✓ | ✓ | | | |
| 1.12 | Produce the Architectural Design Statement / Philosophy. | - | ✓ | ✓ | ✓ | | |
| 1.13 | Provide comments on the scheme with regard to general proposals in relation to Building Regulations, Planning Approval any other statutory requirements. | - | ✓ | ✓ | ✓ | | |
| 1.14 | Produce DDA / Accessibility Statement & Audit. | - | ✓ | ✓ | ✓ | | |
| 1.15 | Produce design information as reasonably required to inform the Design Life & Life Cycle process. | - | ✓ | ✓ | ✓ | | |
| **2.0** | **Design Development, Tender Action & Contractor Proposals** | | | | | | |
| 2.1 | Produce Feasibility studies/reports for different options, including presentation material for the building and site proposals. | - | ✓ | | | | |
| 2.2 | Undertake space planning and building usage/ circulation exercises. | multi | ✓ | ✓ | | | |
| 2.3 | Produce sketches for preliminary cost plan. | multi | ✓ | ✓ | | | |
| 2.4 | Produce outline specification for preliminary cost plan. | - | ✓ | ✓ | | | |
| 2.5 | Liaise with Main Contractor in producing Cost plan. | - | ✓ | ✓ | | | |

**Figure 75: Fragment from the Scope of Service Document from the Contractor**

In this case, it could be said that *Functional Interdependence* does seems not simply emerge from the team assemble, but rather from the objectivation of their purposeful interactions while designing course of actions towards shared purposes. In order to achieve mutual intelligibility in the activity, individuals need to externalise their ideas of the task and negotiate the way the group should interact, as they purposefully aim to achieve a common goal. Thus, from the Design Manager (Contractor) point of view, the team interactions and their correspondent mediating artefacts became objectivated and shared among the *Consultancy Team* through the *Scope of Service* (Figure 75).

## *Perception of Performance*

**Objectivation:** ***Pre-Qualification Criteria*** *(known as "the Marking Process")*

As it was mentioned earlier, the Operational Team, as the Client, also constructed their perception of performance, by objectivating measures to assess if the potential participants in the Building Project activity, could be considered able to perform. Thus, as part of the *Competition Advertisement*, the *Operational Panel*, in this case particularly led be the Estates Department, established the specific criteria which qualifies applicant teams, as it was described by the Dean:

> *"There are standards… …there was a specification list in a Pre-Qualification Criteria for the teams and the contractors, which was communicated by our states department." (pg. 01)*

> *"…And when the applications came in they use that criteria to evaluate… all the proposals. So there was a pre-qualification evaluation. And they have done based on that…" (pg. 01)*

The existence of such assessment criteria seems to have implied in the *Client*, a perception that qualified applicants can be assumed as "successful organisation", or in other terms, they were expected to be reliable, trustworthy partners in the Building Project activity, as it was mentioned by the Staff Member:

> *"You obviously… You know… they are very successful organisations and they did built successful buildings… I don't question how much…" (pg. 04)*

Interestingly, it could also be argued that in establishing (as the Client), and complying, (as the Consultancy Team), with some certain qualification criteria, both sides agreed in the terms of, not only of assessing previous performance, but more importantly, in establishing a common ground in the *Value System* that bounds the participants in the activity. In such a way, even if one of the parts did not get involved in the socio-construction of such "shared" *Value System*,

the fact that they agreed in participate could still indicate the dialectical nature of the activity. In this case, "truth" is situational, and it was mutually found in the recognition of a shared value system, that was initially proposed by the Client Team, and then accepted by the Consultancy Teams that is happy to apply to participate in the competition.

**Objectivation:** *Roles and Responsibilities*

Curiously, in the same way that the Operational Panel, as the Client, set the template of the Building Project activity to rely on the Consultancy Team, led by the Contractor, to deliver the Building Project, the Contractor seemed to have relied on the Architects to lead the Early Stages of the Building Design instance of the activity, which corresponded to RIBA Stages 1, 2 and 3. According to Design Manager (Contractor):

> *"Yeah! I chair the meetings… but in terms of the Design Lead, it is the Architect that leads, essentially, he understands "the nuts and bolts" of how this all works together better than me, I got an overall view of the process and I know who is doing what, but in terms of will something fit in? …you know, he is operating the CAD, he knows exactly what the issues are and he also lead in that…" (pg. 02)*

**Objectivation:** *P.Q.Q. (Pre-Qualification Questionnaires)*

Thus, in order to comply with the *Pre-Qualification Criteria* established by the Operational Panel, the Consultancy Team had to prepare a *Pre-Qualification Questionnaire* (*PQQ*). At this point, the Contractor, as the Consultancy Team leader, needed to present "*proven track records*" of its own work experience and from its subcontractors. According to the Architect, it worked as '*marking process*' that helped the *Operational Panel* to choose among applicant teams:

> *"Essentially… …I'll just explain the process that we were involved and… The start of the Competitive Dialogue, is that we have to submit a PQQ (a Petition), so a petition that you probably know about, answer to participate in the Tender… and the University goes through all those and look at responses from the respective contractors and pic… it choose five Contractors… (pg. 02) "… I don't know if you are interviewing anyone at the Estates (Department)…" (pg. 08)*

> *"…they will probably tell you about this, there is a Marking Process…" (pg. 09)*

> *"…Because I kind of… …haven't been involved in that process myself, but you get certain marks depending on how good your submission is. Now you got your submission where they have done all those buildings before for the University… you are gonna get good marks on that*

*session. It doesn't mean necessarily that you get good marks on your Design, but it puts you in a "good place". (pg. 09)*

These initiatives seem to have helped individuals and organisations to objectivate a shared perception of performance in the Building Project activity, providing certain control and bounded responsibility that project participants can perform as expected. For example, the Architect mentioned that:

*"It doesn't look… Well, don't get me wrong. It is not sure "fire wave win" in every job, but it gives everybody confidence if you delivered jobs before, and what we said we are going to deliver like the "X" Building… We did deliver and in that building, is pretty much as per the Concept Design, so…. You know, the "Fins" did end up twice as big, or with all the bracing on them across the outside, with crossed bracing holding it all together… No! It was how we drew it… and it gives people confidence that we can Design kind of "cutting edge" buildings with the rest of the Design Team… and we deliver what we say… you know… It is always going to stand in a good "Stead" … …because the way the… I don't know if you are interviewing Tim (Hosker) or anyone at the States (Department)… (pg. 08)*

In the same way, the Design Manager (Contractor) indicated that:

*"Yes! I think is fair to say that we've worked with all of them before… I mean, if you look at the ARCHITECTS, we worked with them before in a number of… not just the "X" Building, in another jobs… I don't think that we had with the Structural Engineer, but we worked with him on "X"… (inaudible: "Candles") we worked with them before, many in Manchester area, a Manchester based contractor…ah consultant… and when you look at the very key contractors that we are looking at, we got a Structural Steel Frame company, called "Z", every work over within years, I have putting up with them for five years, so the Company is used to them longer than that… So they a got proven track records with us… Cladding, a company called "R", again have worked with them for many years… Building Services wise, we have been talking to a company called "I", again got a proven track records with us… So, that is really the governing factor… We need confidence in the companies we are working with… have a track records… what we know that they can deliver… because that last thing we wanna do is to take "a stab in the dark" and go with a new company… because that is a risk to us... Having said that, there may be certain elements in some Designs, where the only way you can deliver what a client wants, you have got to go out to a new supplier partnering, because he is specifying a particular product or something in it that have not done it before, in which case you gotta bring some sort of "new blood" in…" (pg. 04).*

### *Conception of Resource*

**Objectivations:** *Project Target Cost (Possible Investment) + Project Dimension (area) + Project Time Frame (Programme)*

At this instance of the Building Project activity, the Client's conception of resource in the situation had evolved from the level of abstraction, embodied during the Business Case. The "evolution" in this case, is to consider a further level of 'determination', in which further objectivations are created to address the conception of resource in the task.

For example, for the Dean his conception of resource as *Money*, had evolved from an overall amount accounted to be sufficient to accomplish the overall Building Project Activity, to a further breakdown into '*portions*' to be paid to the Consultancy Team, as the service provider, as long as part of the activities are accomplished:

> *"...and then we can take it to Stage 1 of the process, which we pay all of them a certain amount of money to develop a proposal forward... And that was quite interesting because obviously create a very competitive environment which means that we... I'll say a bit more about that..."* (pg. 01)

In the same way, *Time* was considered another key resource that was further objectivated and aligned (i.e. made interdependent) with *Money*, as the Building Project activity was planned to fit into certain project stages. According to the Dean:

> *"...So, the difference in this process is that... we... The plan was to select...first of all to pay the initial selection of consult teams to develop an initial design, and at that point was selected five people, and those people were paid..."* (pg. 01)

Thus, the Operational Panel objectivated its conception of resource through the creation of a *Project Programme*, establishing a time frame of expected tasks in the activity and correspondent payments.

**Objectivation:** *Partners contribution (individuals' allocation and time)*

From the other side, the Consultancy Team was conceiving resources in terms of '*workforce*', which considered both how many people and for how long they were supposed to be engaged in a task. Once again, this suggest that *Time* was a major resource in the activity. In this case, before starting the Building Design instance of the activity, potential members of the Consultancy Team conceived how much they and their partners were willing to contribute in

terms of workforce (i.e. people + time). According to the Architect the initial contribution and engagement of the Consultancy Team was conceived in way that:

> *"…So, I would say the Architects took the lead, it is very much for us to come up with the Concept of the Building and the Design. The Structural Engineer and the MEP Engineer are basically at this point they are just standing back waiting for something to get hold off, then I'm coming up with the Initial Concept, the idea of the open plan area, the idea of the way the Lecture Theatres might work, or where the Entrances might be... It is not really for Structural Engineers and MEP to get involved on that stage… They did, some of the visits, they did participated…"*
> *(pg. 03)*

> *"…So, we predominantly wanted to get down in some kind of concrete frame room, and that became apparent that we won't be able to do that… …simply, because of the Programme… So, the University, has given a Programme and it said: This is when the Engagement process is gonna take place, this where we get the preferred Bid Stage, this is when we move on and go for Planning Permission, and this is when we want it to be finished by. …So this how you know how much time you have for building it, and there was no time to get on the Concrete Frame room…"*
> *(pg. 04)*

The Architect indicated that they preferred to come up with the Concept Design of the Building and, then they engaged with the other design professionals (i.e. Structural and MEP Engineers) to evaluate how those systems interact with the architectural concept proposed. In this case, it was key for the Consultancy Team, and in specific for the Architect, to be aware of what the Client's Team considered as resource: *Money* and *Time*. Thus, while the Consultancy Team seemed to prefer for some reason a Building proposal with a concrete frame, they end up realising that, because of the time restriction imposed by the Client's Project Programme, they would have to search for another solution (i.e. steel frame structure).

## *Conception of Changing Action*

At this instance of the Building Project activity, it can be noticed the emergence of a misunderstanding (i.e. contradiction) in the way parties within the Client team had conceived what are the necessary actions to change the situation. In this case, the Operational Panel, which was controlled by the Estates Department, had their way of conceiving the changing actions prevailed against the way the Dean and the Staff Member were conceiving the changing actions. According to the Dean:

> *"The School didn't decide that… They (Estates Department) felt it better if they control the process from the Estates (Department)… So then we can insure that we don't divulge any confidential information from one group to the next…" (pg. 04)*

This was closely related to the selection of the Procurement Method: The *Competitive Dialogue* (described in section 3.3.2.2). For the Estates Department this procurement method represented an advantage from previously adopted methods, like *Design and Build*, because it not only binds design proposals with the potential target cost of the construction, but at the same time, it allows the Client to evaluate and choose the winner amongst a set of competing proposals, which are expected to achieve the minimum requirements of quality performance. It seems that, one of the key factors for the selection of this procurement method, is that it implies closer interactions between designers and builders within a unique team – the Consultancy Team. Thus, in order to be procured, individuals and organisations had to assemble a Team, and apply for the competition. Hence, implied on this "format" there was also an idea, that designers and builders were required to 'collaborate' to develop the Building Project proposals.

**Objectivation: *Procurement Method and Design of the Project Activities* (*Process and Deliverables*)**

According to Dean, the *Competitive Dialogue*, as the procurement method, was presented to Client's Team in this project by the Estates Department within its role to lead the Operational Panel, as a way of improving the usual procedure of procuring Building Project activities in the University:

> *"the process that is followed for this project is what is called Competitive Dialogue, which has some changes for the previous process… The Design and Build process, normally follow a stage for selection of people to be taken forwarded or a person, a winning, a consult team coming together… and then, the client works with that consult team to develop the final solution." (pg. 01)*

> *"… they have selected five (5) teams… And then what was said was "OK", so let's have a look on some of the initial designs… (and then we can take it to Stage 1 of the process, which we pay all of them a certain amount of money to develop a proposal forward… … I'll say a bit more about that…" (pg. 01)*

In these fragments, the Dean indicated that different from the previous time (referring to a previous Building Project that also applied a Competitive Dialogue method), the participants would be paid a certain amount of money in each stage of the process, as they move on through

the Building Project Activity. This could be considered an indication of a review on the terms of this procurement method, in which the *Conception of Resource* was imbalanced in the previous situation. This seem to have affected the way the Consultancy Team engaged in the activity, maybe suggesting that a misalignment (i.e. contradiction) in the conception of resource led them to apply less people. Thus, the *Perception of Performance* could also be divergent, because the Consultancy Team didn't perceive much return in terms of resource.

a "negative" perception lead them to apply less workforce, or that the level of performance was lower because they didn't perceive much "return" in terms of resource – risk and reward).

Another important aspect of the adopted procurement method is that it requires the *formalisation of the interactions* between the Client, as Operational Panel, and the Consultancy Teams, at this stage as the competitors. Thus, in order to make the competition process as fair as possible, all the interactions (e.g. engagement and communication) between the Operational Panel and the competitors need to follow standard procedures.

For example, the Client's conception of what needs to change in the situation needed to be objectivated in a way that it could be communicated to all the competitors equally. In this case, the Operational Panel established that these were to be described in the *Project Brief document*, which then was communicated to the competitors approved in the *Pre-Qualification Criteria*.

From the perspective of the Staff Member, such *formalisation of the interactions*, limited the Operational Panel in engaging with the Consultancy Teams in the socio-construction of the conception of what needs to change in the situation.

> *"...and I think also cause of the way the University structured the Tendering process etc... that we would not have that in add... very much... and I am pretty sure all my colleagues would like to be more engaged in giving feedback... I don't think we have not be given the opportunity (inaudible)..." (pg. 04)*

> *"I wasn't engaged... Was probably at the start of this detailing requirements of what we got now and what we need in the future, that when I felt as Team in the School that we did a very, as far as we could... as I said, there certain elements that I would like to include but, that I felt that we did very well..." (Pg. 07)*

> *"...and we kind of came in agreement, and I did suggest that while we were on the early meetings that... Sorry, the Dean suggested that some of us could go and visit some places, to get an idea, which I know DEAN did do and so thought of few of them... But I did make a suggestion that perhaps we could create some "Pin interest board" ...you know like, so you could actually*

*see images… …you know… because obviously, we can't afford all to travel, but… we can actually come with some suggestions of what is could like or… you know… and create a "Pinterest board" …you know… In PGR room, I would like this corridor, this kind of space, so with this different chairs… …you know, like… someone with this kind of involvement… you know… but, because time was lacking, we weren't able to do that… but I think that would have made this process far more richer… You know like… the Architect could have our ideas or knew them…that I meant to a very quiet place and then… you know… they couldn't interpret this… but as I said, time was very restrictive, but it was just this different part that hasn't been done very well… you know… we had regular meetings about it, it was a very open process… we talked in our own units…"* (Pg. 07)

Overall, this condition of the procurement method, seems to have created a perception of lack collaboration between some members of the Operational Panel (e.g. Staff Member and the Dean) that felt that they could have contributed more in the activity, by providing more specific feedback to the competitors' proposals during the Building Design instance of the activity. Interestingly, while the Staff Member felt that in the interactions within the Client team to conceive the *Project Brief* they were successful, they did not felt the same regarding their interaction with the Consultancy Teams.

Another consequence of the objectivation of the project "needs" in a *Brief*, emerge in the other side of interaction, considering the Consultancy Team. As the Building proposal was led by the Contractor, but the Concept Design was supposed to be conceived by the Architects, it emerged another level of objectivation of the client's need, in which the Contractor 'translated' their intake in what was that the project brief. According to the Design Manager (Contractor):

*"… so understand the brief, so we can disseminate that out to the Design Team… Having said that, at the point that I got involved, the Design Team was already currently being involved for three to four months, previous to that…" (pg. 01)*

So, initially the Contractor was concerned to disseminate the Project Brief and wait the Subcontractors, as members of the Consultancy Team, to develop that into proposals, that they eventually had put forward to the Client:

*"...As far as I know, there is only been one brief, but then it may have been internal dialogues in the University… prior to that to decide what is that Brief is gonna be… but, at some point we actually went out to the market to invite contractors to develop the Brief into proposals… (pg. 01)*

**Objectivation: *Project Brief***

This initiative to formalise the client's needs was further objectivated, in terms of two different types of brief, according to the Dean:

> *"There were two types of brief. The first brief was some Performance criteria, and the second brief was what we want as client for the building. (pg. 02) ... So one was the criteria about performance and the other was the brief that I wrote, which I said what I want out of that building..." (02).*

Each of those was elaborated under the responsibility of different members within the Operational Panel. One of them was considered the *Performance Criteria*, and it indicated general performance requirements, which followed specific building standards (e.g. European Union Standards), that were specified by the States Department. The other one was elaborated by the Staff Members of the School, and it indicated a specific conception of what needs to change in the School Operational Project, in regards to its functional requirements and spatial needs.

So, once the Consultancy Teams were approved to participate on the competition, they received the Project Brief. In this case, the Consultancy Team conception of the changing action was constructed based on their interpretation of the Brief. As the fragment below from the Architect's interview indicated, they focused on the main features identified in the Brief (e.g. a '*collaborative environment*'). The Architect also mentioned the '*accommodation schedule*', which can be seen as another way of objectivating their conception of changing action in a mediating artefact, in terms of spatial requirements. Further on in the activity, limitations on these mediating artefacts and the lack of interaction to expand on design topic and achieve mutual intelligibility, which caused problems (e.g. delay and rework). in the activity

> *"So, we are one of five, and on that Stage once you have been successful in getting through the Competitive Dialogue Stage, is that when we were sent the initial Brief... and the Brief was quite open, just a few pages but it explained what the building was about, and what intentions were in terms of this sort of... kind of "collaborative environment" and explaining what... it came with an accommodation schedule, and that gave us the option to start thinking about ideas..." (pg. 03)*

**Objectivation: *Project Brief (1) – The Performance Criteria***

According to the Dean, from the Client perspective, the establishment of Performance Criteria, regarding the conception of building proposals, was a way that member of the Operational

Panel, especially Building Surveyors from the Estates Department, had used to evaluate and grade the Building Proposals, according to energy consumption, materiality, constructability and other 'technical aspects':

> *"I wasn't part of evaluating the technical aspects of the design… So, the technical aspects were done by the Surveyors, the Associate Director and other people… because every team had to submit their response according to the performance criteria that were identified… I never saw those (inaudible)… but they were graded according to a grade of… against the performance criteria." (pg. 02)*

> *"…The Performance criteria included energy consumption, utilisation… it included the usage of appropriate material and the pallet of materials… it included heat gains… it included constructability… choices about 'shell and core'…all the technical aspects… M&E… all the technical aspects, they were part of the performance criteria…" (pg. 02)*

> *Researcher: Is this coming like a standard for (the European…)?*

> *The Dean: I am not sure actually… Maybe ASSOCIATE DIRECTOR OF ESTATES DEPARTMENT will be able to help you. I am not sure but basically as the university we will have a number of standards that we need to meet in terms of sustainability and so on… So the building was identified as a "BREEAM-maximum building" so it needed to hit the "pre-m maximum" as criteria…and also it was part of our sustainability drive within the university… (pg. 02)*

According to the Dean, these evaluations had followed a commonly known criteria, based on well-known EU standards, which can be seen as way to objectivate a *Shared Value Systems* in the context of the activity. Interestingly, these criteria and evaluation procedure, which seemed to be crucial for the Competition part of the activity, were not fully understood by all the members of the Operational Panel (e.g. the Dean and Staff Member). In a way, part of these members seemed to have relied on the expected performance of the other members of the Operational Panel to choose and run these evaluations.

Interestingly, from the Consultancy Team perspective, both Design Manager (Contractor) and Architect seem to interpret the *Project Brief 1 – Performance Criteria* differently. For the Design Manager (Contractor), the Brief that matters were the Performance Specification Criteria, which may be an indication that the focus of the Contractor was on conceiving the Building Project Cost, as these specifications have a huge impact on the building cost, in terms of material and building techniques, as well as, the overall dimension of the building (e.g. '*how many square meters we need*'):

> *"...So, for me, it is really getting up to speed with Brief, that was the first thing I need to understand... it is what the employers requirements... so what we contractors need to provide... what information we got in terms of brief really... (pg. 01) ...They call it "The employments requirement", I don't know if you have seen them for the "A" Building (*THE NEW BUILDING*), but it is a performance specification really... it says: "this is how many square meters we need, this is how many people the building is got to be for, these are the criteria that we need to comply with..." (pg. 01)*

Moreover, from the way that the Design Manager (Contractor) had read the brief, it seems that the focus of his appreciation seems to be overly oriented to quantitative measures of what the building should be.

In the other hand, for the Architect, the *Project Brief 1 – Performance Criteria*, or what he called "*Well-being Standards*", were not the main issue in terms of the Client's requirements, as these should be something that is "naturally" considered in every building design. For him, these aspects seem to be smaller than answering to the spatial and functional requirements:

> *"...But we, ...Part of ourselves, pitch... for other things on the agenda like, we are looking into compass with "this, this, this", the M&E looks... there is this thing called the "Well-being Standards", it is quite a new thing. I don't know if knew that." (pg. 07) "...So, these are a set of Standards that we always need to attain for the Well-being, which we were trying adopt in the Design, so... Yeah! I think that was another aspect that kind of worked... ...So (inaudible) there is to have good and to go in and say: "This is your building! This is what you are having!" ...Because, you know... they are just gonna go... you know..." (pg. 07)*

**Objectivation: *Project Brief (2) - Spatial Requirements** (for the School Operational Project)*

The conception of *Project Brief (2) - Spatial Requirements*, was under the responsibility of the School, and the Dean took the lead to set how they would conceive what needs to change spatially to support the development of School Operational Project, and how that could be objectivated in a formal document that would be made available to the Competitors. So, the Dean laid out the general concept of these changes and asked key Staff members of the School to contribute with their views on what should be those changes, or in other words, what should be the New Building:

> *"...which I said what I want out of that building... which I distributed to all staff and I said this is what we are doing we had a "a way day" September last year with all staff... and everybody started to think what they wanted from the building, what are the key characteristics... we tried to engage the staff of the school in our process." (pg. 02)*

So, from the perspective of the Dean, the activity of conceiving this *Brief*, was collaborative, in a way that it gave the opportunity for '*all*' the staff of the School to contribute in his conception.

For the Dean, the whole project activity was supposed to be more than a New Building Project. In his own words: "*we tried to drive a cultural change…*". It should involve new ways of operating, in a new version of the School Operational Project. Thus, it was required a cultural change, allow School Staff members to reconceive fundamental ways of appreciating their activities as a community of practice, leading to changes in the existing *Value Systems*. In order to achieve mutual intelligibility in conveying these new understandings and arguing for the change, the Dean used a *Metaphor* (e.g. a *"discipline agnostic area"*) to describe and qualify these spaces:

> *"The only reason I was important in that process is because we tried to drive a cultural change as part of the building… So one of the aims and benefits (Purpose) of the new building is to allow interdisciplinary work and what I call in the brief as a discipline agnostic area… What discipline agnostic means? It means the building… it should not say this is COURSE A, or this is it… it is all about… all the students being engaged in utilising all spaces and being able to feed from each other… …So three or four years after the operation in the new building, our students should be far more competent that any other student that comes from another university, because it would have an appreciation of COURSE B when they work in COURSE C… it would be able to have an appreciation of COURSE D when they work in COURSE C… they would be able to be an appreciation of COURSE E when they work in COURSE A… So it is more about creating the spaces that they don't have the Label behind, necessarily…" (pg. 08)*

These intentions had ultimately to be objectivated in a way that it could be equally made available to the Competitors. So, following the approach adopted to the other *Brief* documents attached to the Competition Advertisement, the *Project Brief (2) - Spatial Requirements* was formalised into a textual format. Once again the language chosen in this text seem to have had a key role to support mutual intelligibility in the task.

According to the Staff Member, each of the individuals (School Staff) selected to contribute in conceiving the *Project Brief (2) - Spatial Requirements*, was there assuming a position of responsibility (which is also linked to the perception of Performance), in which they were considered to be the appropriate individuals to relay the requirements on each of the "key areas" of the School.

> *"... so once got the "go ahead", I was then involved in describing what aspects... my requirements, obviously related to my job, which in charge of research and all the PGR students... So when The Dean selected the Team (Staff Team), we wanted to make sure that it was a rep. of each areas... so obviously I was in charge of this area... So I relay the requirements that I needed... the research needed... and also what our PGR students need... So it was very... ...quite early on..." (pg. 01)*

The Staff Member added that, the Dean took the responsibility to manage this *briefing* task, and a technician helped him to operationalise the task and objectivate the results into a formal document:

> *"Ok! Obviously the needs of the School were articulated in the brief, which largely The Dean put it together with the help of the Technician, of the requirements... and actually the SMT (Senior Management Team) helped a lot... we actually stated the minimum and maximum requirements for each space, and we started talking about some adjacencies and where things needed to be near... in very, probably, more detailed description brief that you would expect... because in some ways we are considered the educated client, because we are from the construction background, ... So I don't know from the Architectural point of view if that was quite restrictive or not... I don't know... but, from my mind, as we tried to articulate more because it is more what we needed, as best as we could... rather than influencing on the design..." (pg. 02)*

In those interactions, the Staff Members were asked to specify the minimum and maximum requirements for each space. They even considered, in general terms, the conditions of adjacencies of spaces. In a way, the Staff Members seemed relatively confident that they did a '*good job*' in producing a detailed description of the spatial needs for the new School Operational Project. From the comments above, it seems that there was embedded within the Staff Group an assumption that they were supposedly in a better condition to perform in this task, as an '*educated client*', because of their background in Architecture and Construction.

However, it seems that there was a perception among the Staff members that this *briefing* as an interaction with the Consultancy Team, was limited by the way it was objectivated, as formal document. Moreover, even the way that individual requirements from the Staff Members were gather and translated seem to have been limited by the way the briefing was conducted. Thus, it could be said that, since the project aimed for more interdependency, they may have had benefited of a more "constructive" and interdependent form of "briefing". According to the Staff Member:

*"It is just… as far as I am aware… it is we are short on space… it is a big problem at the moment… and a lot the spaces that we use as studio and class facility are owned by individual disciplines or departments and they are not utilised… some of them struggling more than others… and then you can argue that actually some spaces (inaudible)… but sometimes they are extremely busy because they a particular big group of students at a particular point of the week and the rest is busy… but everybody seems to own their own spaces and don't want to share these facilities… So, is really lack of space… so we need to think more cleverly how we can use space more wisely, so… And also, we are as, as a School we are spread across five buildings… so you never see some students, so you never see some staff members… and is about bring us close together, sharing resources, spaces I mentioned earlier… and it is just about being a lot more clever in the way we work… cause obviously we want to grow, and bearing that this new building is not necessarily as bigger as we would like it to be, but certainly it will accommodate our continuing growth… so we do have to be a lot clever in the way we do… to change the way that we work at the moment…"* (pg. 03)

From the fragment above, it was possible to notice how a few aspects of the *Project Brief (2) - Spatial Requirements* were objectivated in the argument presented.

One of the aspects of the expected '*cultural change*' was related to a change in the '*ownership*' behaviour from some of the Staff Members. As traditional teaching and learning practices, the attitudes and perceptions of these individuals have deep historical and social roots and are not easily changed. This seems to be pictured by the Staff Member comment, as a culture of individualism and isolation: *"... but everybody seems to own their spaces and don't want to share these facilities".* Thus, if above is assumed to be 'true' by the Client team, this does not necessarily mean that there was a lack of space, since some of the spaces mentioned could had been shared among modules and disciplines.

Another important concept that emerged in her discourse, is the idea of bringing people together, under a unique building, as opposed to the current fragmentation around the campus. Again, this cannot be directly interpreted as a '*lack of space*', but as a more subjective quality of the overall existing space, that belong to the University.

A third aspect that was objectivated on her discourse, that was a bit more evident in the *Brief* was the notion of growth for the School. In this case, current number of students were compared with projections for numbers increasing in the following years. So, that was a key factor in the ways the School Operational was projected to change, and 'growth' was central aim in that:

*"All we did was literally state, put a list together of all the activities we needed… and that is why it would be very good if you could see TECHNICIAN, he will be able to give you that list, and the minimum and maximum square meter, of the space that we needed… …As far as I now in that document there was no articulation of… I think that was a slightly to some ext… TECHNICIAN got really good table of each space requirements there was all technical requirements that you put down… if, for example, you need high power or it was very heavy equipment, was a way to articulate that on this diagram, but there wasn't… for example the PGR room, there wasn't a way that I could articulate our needs, which OK, we only need computers, we only need… You know…it is very basic in the whole scheme of things, but for example, Noise, I would have put that down if I had the opportunity, so some of this additional needs, there was no way I could articulate that I the original brief." (pg. 05)*

From the fragment above, it was clear that the *Project Brief (2) - Spatial Requirements*, was objectivated in written document, focusing in describing the school spatial requirements, listed in a table (Figure 78) aligning spatial and technical requirements (e.g. power supply, equipment) for each room. However, from the Staff Member perspective, such way of objectivating the *Brief* seem restrictive and incompatible with way the *Project Template* had set the *Engagement* with the Consultancy Teams. Thus, it was not possible for them to objectively articulate some of their specific needs (e.g. *Noise*).

Furthermore, according to the Staff Member, the process of '*disseminating the cultural change*', as indicated in the fragment below, was a change driven by a top-down approach, in which School members were confronted with the notion of '*sub-utilisation of spaces*', leading to a discussion over the School spatial requirements:

*"The list was quite… done quite comprehensively… and it was exposed to the whole other building project team, from the client side, quite a number of times and we engaged staff and we fully said that: "Ok, that is what we have now" and they could also say: "this is what we have now" "In the future, this is gonna be this… or it is gonna be shared with this person"… and you know… we provided data for staff to say: "Well you can share that space, because you are only using that in time table and you are the only user.. so you could share that" …So, there was a lot of discussion on… and it was very clear articulated and staff was all aware of what our requirements were… So, as a document who… To be it was a very comprehensive document, that like I said had some aspects that I think it lack… it was very comprehensive because than all could understand… It was just bad how that was interpreted in the final design…" (pg. 06) "…in the situation, so… I think as a brief it was pretty much as comprehensive as the Staff within the School could get to, but it is just it…"*

> *"...So, as a document who... To be it was a very comprehensive document, that like I said had some aspects that I think it lack... it was very comprehensive because than all could understand... It was just bad how that was interpreted in the final design..." (pg. 07) ... I think as a brief it was pretty much as comprehensive as the Staff within the School could get to, but it is just it... (pg. 07)*

Overall, it seems that from the Staff Member perspective, the briefing task was done in the best way possible, and problems only emerged from the designers' interpretation of the *Brief* document, and the process which didn't the possibility to discuss the utterances of the *Brief*.

**Objectivation: *Design Programme*** *(viability of the service proposition)*

At this instance, the Consultancy Team worked upon ways to also elaborate their conception of how to change the situation. Of course, this was influenced by the way they understood what was it that Client wanted and expected to change in the situation, and what was seen as the main resource to apply on this changing activity. Thus, in this case, for the Contractor the key resource seemed to be the *Money* and *Time*.

*Time*, seemed to have been objectivated in a similar way that it was conceived by the Client's Team, when the Consultancy Team mirrored the *Project Programme* presented by the University, with a proposed *Design Programme*, *Pre-construction Programme* and *Building Programme*. This seems to have supported their interactions to temporally align the tasks of individual stakeholders within the Consultancy Team, according to the Design Manager (Contractor):

> *Ow Yeah! We had to prioritise, cause the actual process of pointing people takes time, to get terms and conditions agreed, you got to make inquiries out, they got to submit a price, we got say: "What is right and what is not right" ... ...and there is a dialogue to be had... So we have to prioritise what the deliverables are gonna be... and basically use the Programme to do that... "So we need to have Architect on board by this Stage..." "...So we need the Structural Engineer by this Stage" "We need Service Engineer by this Stage" "...and we use that to prioritise. Likewise, is the supply chain, we go out those packages that got the longest leadings or that are needed up front, first and so the last important stuff, you know... finishes... and then you... that will be addressed last. ...And that is pretty Standard stuff, and then we work a Pre-Construction Programme..." (pg. 05)*

This set of programmes created by the Contractor organisation seemed to have helped them to appoint of the members of the Consultancy Team. According to the fragment above, the

Programme seemed to have allowed the Contractor to control the deliverables of each participant in the Consultancy Team and prioritise their contributions over *Time*. Thus, it also seemed to have bounded interdependency of responsibility across the Team.

However, from the Design Manager (Contractor) comment is not clear how this Programme was conceived and how much the other Team Members (e.g. the Architect and Engineers) were engaged and shared this conception. Thus, if only the contractor could conceive and 'control' these programme of tasks, this would limit the overall interaction, in which the other team members also conceive the changing action. Hence, from the fragment above, there seemed to be implied in the discourse of the Design Manager (Contractor) an idea that the *Programme* should follow a certain standard, as a usual way of working within the Contractor Company, which might be related to a notion of *habitualised procedures*, as an *institutionalised* object.

In other hand, at the same time that the *Procurement Method* presented an objectivation of the Client's conception of change in the Brief, in terms of their Perception of Resources, including the allocation of *Money* and *Time*, as a *Project Programme*, specifying certain stages. The Architect seemed to indicate certain misunderstanding about the proposed set of project stages does not "align", with the standard notion of stages within the Community of Practice (e.g. the RIBA Plan of Work), which could be seen as *Shared Value System* regarding a notion of *building project stages*:

> *"...well, the way the thing was, and the University referring to "Stages" as, Stage 2, which is University's Stage 2 submission, wasn't necessarily related to RIBA Stages, so... The RIBA Stage 2 submission, we just put it into July, ended on July and beginning of August, that was to RIBA Stage 3, but the University called it Stage 2... ...Because the Competitive Dialogue, was split into 2 Stages, and it had nothing to do with RIBA Stages..." (pg. 02)*

**Objectivation: *Design Strategy 1 – Roles and Responsibilities***

At this point, the Contractor indicated that besides its role as the Team Leader in the overall Building Project activity, the Architects were supposed to take the lead in developing the proposal for the Building Design instance of activity, which was set as the First Stage of the Project Programme, and referred to RIBA Stage 2, 3 and 4. So, in these interactions, while the Architects lead the design task, the Contractor stayed a side controlling it, as it can be noticed from the Design Manager (Contractor) comments:

> *"Yeah! Well, clearly, the Architect is leading the design process, we will be at the way controlling it... So, He initially is the most important player, cause until he has got a Concept,*

*nobody else really can do anything, so he is the "first player",… we than need to get the MEP and the Structural guys to feed in to what the Architect is doing, so they become progressively more important, as the project goes on… just to making sure that what the Architect is detailing has got sufficient allowance in its Structure and MEP… and then later in the project other things will come like: Acoustics, Fire… and, I am trying to look at other specialists… there are too many specialists… and then they will come to verify if what everybody is doing is right… and then there is other "consultants", a sort of less key players, but things like "Pream" will come into, we are gonna have a consultant for them… (pg. 12) …we are gonna a Planning Consultant to get things through Planning approval, and then vary other specialists, not really consultants… …I suppose there are things like the SI (inaudible)… we need to get additional Survey Information done, you know, or you might need some testing to be done, and then you got…" (pg. 13)*

In such a way, the Contractor seemed to have tried to '*guarantee*' that what the Architects were conceiving had '*sufficient allowance*' from the Engineers. So, the contractor was overlooking everybody to '*verify if everybody is doing right*'. Such verification interaction seemed to be objectivated through the establishment of *Design Reviews (Design Team Meetings)*:

*"Yeah! Depending on what they are… you know… really you need to get your Concept Design somewhere near before you start going to your Acoustician… and if you say to your Acoustician: "What your requirement is?" and He says: "What? I need something to look at…" …You got to get it to a certain level of detail, so the other people will understand what it is that you are trying to achieve and then comment into it… …And then probably the last phase is getting to supply chain in, cause they are really looking at Detail, rather than Concept… Again, just making sure that what has been drawn it is achievable, and we got the right amount of zones for services above sealing, and cladding, how much insulation we need in the wall… "Is the wall thick enough?" … you know… The supply chain feed into that…" (pg. 13)*

**Objectivation: *Design Strategy 2 - Roadshow Strategy** (Design Contextualisation)*

One of the first interactions within the Consultancy Team, that was led by the Architects, was the *'Roadshow'* strategy to get to know examples of similar Building Project situations (e.g. references and precedents). Interestingly, the Architect seemed to indicate that these *roadshow* events happened before the Consultancy Team had access to the *Project Brief*. Thus, before even knowing what the Brief was, the Consultancy Team had already started to discuss how the building project could be done, based on the inquiry of these precedents. According to the Architect, that was also an opportunity to engage with other members of the Consultancy Team:

*"...Now, what we did, which was probably what you saw in the presentation, which may has be quite different from other tenders we did, was we set off in a kind of "roadshow", we went around all the UK visiting the best schools, what we believe is the best about X, Y and Z and glean some of the best ideas... so we went to "C" University, we went to Bath, we went to Manchester, we went to Liverpool, we went to Birmingham... and pull all these ideas into this kind of "melting path"... so, straight away, we were already enriched with ideas and different approaches of the building... So when we start reading the Brief, we could kind of think about, how we could respond to that..." (pg. 03)*

*"...It is not really for Structural Engineers and MEP to get involved on that stage... They did, some of the visits, they did participated... so, for example, we went to the "D" School, which CONTRACTOR had built themselves, they had... because it always difficult to get entry into this places and get behind the scenes, you can always get to the public site, but getting beyond that, you have to have the right contacts. So, CONTRACTOR were facilitating that one and we brought "H" with us as well, the MEP Engineers. So, they were able to walk around and actually witness the exposed concrete "softies", because we knew that that was something... well, we have seen in other buildings, and why was that... if you have "exposed softies" where do your Services go? ...are they on display or are they hidden? ...if they are hidden, how do you hide them? ...how would you get light into the spaces?  ...cause we came to find that a lot this spaces they are double height... 6 meters high ceilings... how would you light the space? How do you get ventilation to work in there? How would you get the acoustics work? ...So you are right, actually... there were other disciplines attending... While, they were at this point, they weren't necessarily informing the Design, they were certainly... we were already having the conversations about the ways the building "breathe" and it led themselves in all this precedents building visits to be did... and by the same regard, the Contractor was on as well... So, he was looking in understanding... you know... What other Schools of X,Y and Z had done. So, they were already getting a feel for the kind of pallet of materials, the kind of structure. ...So, we predominantly wanted to get down in some kind of concrete frame room, and that became apparent that we won't be able to do that...  ...simply, because of the Programme... (pg. 03 and 04)*

These *events* allowed the members of the Consultancy Team to meet and interact face-to-face in spaces with the supposed expected 'quality' of the Building Project situation that they were facing. Thus, this also can be seen as way for them to socially construct their perception of performance, in which this examples can be taken as common references of 'quality', helping them to build a Shared Value System.

From the comments above, the Architect seemed to see these events as something complementary to the *reading of the brief*, in a way that this would have amplified their understanding of what was conceived by the Client Team in the *Brief*, and helped to conceive how they could have responded to that *Brief*.

**Objectivation – *Design Strategy 3 – Responding to the Project Brief and Engagement Method***

According to the Architect, they decided to adopt an 'unusual' design strategy for the Building Design activity, based on their previous experience with this kind of procurement method:

> *"…So when we start reading the Brief, we could kind of think about, how we could respond to that… so when we met in the First Engagement, we already had, we were basically testing The Brief, you know what I'm saying: "How do you wanna this space to work?" "Do you want to be quite open?" "Do you want views of different people working in different environments?" "Do you want everyone to be not in your own space, but working in a… …collaborative environment… but, enabling that cross (inaudible: virtualisation) of ideas…"*
>
> *…So, we already have that, and that is what we worked with in the First Engagement, and than it grew from there, so about the time that we had the Second Engagement, we came to the table with 3 or 4, putting forward 4 Design options… …which we could than test with DEAN and the Estates Department in terms of the approach to the Brief, each one it was quite different as well, so… The way we approached in the office was, we almost had 4 different people (inaudible) ideas in different ways, and then they kind of… we kind of talk about them as a Team, but… By doing that you end up with four different… quite different approaches, and we could "table" that and get… you know…. Test that with the Client and get a feel for which one is kind of working for them, and which ones weren't… Is this what?" (pg. 03)*

In this case, the Architects decided to carry on the conception of four ideas for the Building Design proposal in parallel. According to him, this strategy was conceived as a way to explore design alternatives, but at same time to facilitate the discussion with the other design disciplines and the contractor, as well as, with the Client Team, considering the format of the *Engagement Meetings*.

In his words, they were "*testing the brief*", in a way that they were posing questions for the Operational Team, as the Client Team, during this first engagement meetings to advance their interpretation of the conception of change. Thus, such initiative might indicate that for the Architect, the *Brief* as it was presented in the documents, was not enough. Moreover, it may

also reveal that this instance of the Building Project activity (i.e. Early Project Stages) required certain level of dialogue, even if it was a sort of confirmation of an understanding about the concepts expressed in the document.

So, for the *2nd Engagement Meeting*, then the Architects' strategy was to '*put forward*' to the Operational Panel 4 Design Options, and "*test their approach to the Brief*".

> "*Yeah! Interesting question… You turn to find that, when you are developing a building for a Client… and specially if it is in Competitive Dialogue, you don't want to get it wrong. You want to make that you are delivering the building that they want. They got to "buy in" to that building. You almost… you always need your Client to feel as though they contributed to that. Because when start to making choices themselves… they need to be informed choices, so that is why you need to tell them the Pros and Cons of chosen… making these decisions… and they making certain choices, and its got to develop the building themselves, and start to get ownership of that building, because it feels it is their design in many ways. And that is always going to be "the way to the heart, isn't it?" of the person who are we designing for… because in the back end, they will like: "We kind of designed that! Didn't we?... Because we choose that kind of (inaudible: element)" …Well, it works for everyone. Not everything that they select will work, but we need to get back to them in the next Engagement and present… you know… So, it might choose a bit of that design and bit of that and say: "We don't like what that is doing, cause it is all open plan, I don't like how it looks… But we really like how this looks, but actually not to keen on the way that you come in the Entrance area, it feels a bit dark and pokey, where this porch in forces causes a really big opening..." So you: "Right! So, you wanna (inaudible – 23:18), a big openning in the Entrance… and that is what you want… You want an open plan over there, and he likes it in a "A"… …And you go away and come up with an option that merges some this in. Brilliant! As an architect would…   …But we've got to understand the "bigger picture", that everything we are doing got to be affordable… Cause the last thing the University want is the Contractor let the Architect to put a proposal forward, which can't even be afforded for money amount of money… So it can't even be carried away… And it's got to work through the… It is got to work Structurally, obviously, and from the MEP perspective… But we, …Part of ourselves, pitch… for other things on the agenda like, we are looking into compass with "this, this, this", the M&E looks… there is this thing called the "Well-being Standards", it is quite a new thing. I don't know if knew that." (pg. 07)*

**Figure 76: Example of a Design Team Meeting (image provided by the ARCHITECTS)**

From the fragment, The Architect seemed to indicate that each of these proposals came from 4 different architects – as competing concepts – within the Consultancy Team. As he mentioned, they could have resolved each one was better fit for the project situation within the Team, but they had chosen to 'test' that with the Client, as way to 'capture' more feedback about what the Client wanted. This design strategy was relevant, because it indicated that the Consultancy Team, specially the Architects, felt limited by the *Engagement Method* that was put in place by the Client, following to the Procurement Method adopted, which should promote "fairness" among competitors. In such a way, the Architect have argued that, this *design and engagement strategy* allowed further interaction by the Operational Panel, which would have felt that they had contributed in making the design decisions, when they expressed their views about each of the 4 options.

According to him, this design strategy allowed the Client Team '*to get ownership*' of the Building Design. Eventually, the conversion around the 'pros and cons' of each Design Option, seemed to have helped the Design Team to better grasp what the client wanted, and Consultancy Team to better interpret what was already objectivated in words (i.e. linguistic

signs) in the Brief document. The objectivation of their interpretation of the Project Brief into four different conceptual design schemes seemed to have help the Architects and Clients to reach certain level of mutual intelligibility in the activity.

Besides that, the Architect also mentioned that this was not thought in isolation and it did not only involve the conceptual ideas of how the space should be, but actually how the Consultancy Team, could convey those ideas into a feasible proposal. In this case, this interaction also took into consideration how the Consultancy Team conceived *Money* as resource. Thus, such interaction required from the Consultancy Team, the elaboration of such Design Options, as well as, the further synthesis of those options in a unique Building Design proposal that complied with the Project Programme, including the application of resources: *Money* and *Time*; as well as, with the Perception of Performance, objectivated in the performance criteria established on the *Project Brief (1)*.

## Moving to next instance of the Building Project Activity (Perception of Development)

**Objectivation: *Procure (successfully) a "collaborative design process" with multi design proposals***

From the Client Team perspective, this instance of the Building Project activity was finished when they felt that they had set the template for the following instances of the Building Project Activity. In that case, what the Operational Panel have done was to set a procurement method based on a competition scheme, that would provide the Client with a set of Building Design Proposals (i.e. Concept Design) within the expected performance criteria established by them. According to the Dean:

> *"... they have selected five (5) teams... And then what was said was "OK", so let's have a look on some of the initial designs... (pg. 01) And that was quite interesting because obviously create a very competitive environment which means that we... I'll say a bit more about that... (pg. 01)"*

So, at the end of this instance of the Building Project activity, the Dean and the Estates Department felt confident that the conception of how to change the situation, from their point of view objectivated through the establishment of the Procurement Method, was successful. Implied on this argument, was an idea that the University, as the Client, would benefit from being able to choose among a set of potential Building Design proposals, which should emerge from "**collaboration**" within the Consultancy Teams.

In the other hand, such perception seemed not be shared with the Staff Member, who clearly did not agree with the way the conception of change was 'over formalised', in terms of the Project **Brief and Engagement Strategy,** specifically, in regards to the way that members of the Staff of the School would be able to interact with the Consultancy Teams, in the early engagement activities. According to the Staff Member:

> *"…It didn't feel like it was a collaborative design process or… I just said, because it seems that, the way this project is structured it has different layers of clients into the hierarchy… and we are perhaps in the lowest of that chain… and we have been asked when is necessary, but not as a major need… I think that is a little bit disappointing and just worries me… when we do have the building that addresses everybody needs…" (pg. 05)*

**Objectivation: *Business Sustainability* (Next job + raise portfolio)**

From the part of the Consultancy Team, the end of this instance of Building Project activity involved an alignment between their perceptions of interdependency and performance among the individuals in order to become "a Team" in the situation, as well as, an alignment of their conceptions of the changing actions with the Client's Team conception of the Building Project activity.

In specific, to become a competitor meant to be able to compete for the job. Thus, as part of the established Procurement Method, competitors were paid for each project stage they have participated. So, even if in the end they were not selected to move to next stage, they were paid for their service, and they knew from the beginning how much they would get paid on each stage. That led, specially, from the Contractor point of view, to the recognition that Money, is was driven their perception of development (i.e. success) on the situation. According to the Design Manager (Contractor):

> *"I should make some money! (Laughter) …That is the bottom line… Honestly! That is… obviously, it is all about reputation, we are looking for repeated business… so it is not just about making a profit, we've got to maintain a relationship with the client… we've gotta deliver a good product… otherwise, we are ain't not gonna get any future work, are we?... (inaudible)… we won't get any more work… We want to deliver on time… we want you guys to get what you want… So we wanna make sure that we meet the Brief, cause that is all part of delivering the thing on time…" (pg. 05)*

As another important measure of success at this instance of the Building Project activity, was mentioned by both, Design Manager (Contractor) and Architect, as the intention to build up

their Portfolio in working with Higher Education Building Projects. So, their participation on this project adds on to a long term development of their professional practice with expertise in this kind of projects. According to the Architect:

> *"Well, what we are looking to do is to build up our Higher Education Portfolio, so… certainly on this office we have done a lot of Primary School, Secondary Schools and… quite a few Colleges now… and has only been in the last three years that we've really been "tapping" into Higher Education Market… So, since than we have done some work for "UPlan", we have done work at "B University", "G University" and we got a project down in Birmingham… But in real as a Practice you need to build up a Portfolio of Work, so than when you go in for a "PQQ", as we said right in the start, and the University says to you: "What experience you've got in designing buildings for University" or… they might be more specific and say: "Have you got any experience designing X, Y and Z buildings? Or you got any experience designing… you know… School… Business School?" …which was like the "X" Building… Then, you know… that is in our Portfolio, so… They are all built… and, you know… and the "X" Building was a "Bream" Excellent Building as well, so that will help. So, we can use this for future submissions and we can also… The "X" Building is going in for every award possible… it will be going for the "RICS", the "RIBA", the (inaudible) awards, the "LABC" which is a local Building Control one, but… you know… it's the first step… and we are gonna be (inaudible: talked to)… so, that raises the Profile of the Company and what we do, so… that is a big benefit…" (pg. 09)*

So, the participate on this activity, was expected to increase their experience on delivering this type of building project, which consequently could be perceived as a "competitive advantage" when they would apply for another project (i.e. '*future submissions*'). This would increase the perception of performance of individuals and organisation. Hence, as the Architect mentioned, when their previous work was awarded by certain institutions (e.g. RICs and RIBA) their perception of performance raised in a way that, their work was "valued" not only in the project situation by the client's perception, but in a larger context of the community of practice. In this case, such awarding situation, could be seen as an objectivation of a Shared Value System, indicating a sense of *developmen*t upon the value systems in place in that community. Such appreciation may support in future situations the emergence of individuals' assumptions about perception of performance of these practitioners and organisations.

# Building Project Design

## *Perception of Interdependency*

**Objectivation:** *Roadshow Events*

As it was mentioned in the previous session, the '*Roadshow*' events promoted an important engagement within the Consultancy Team, from the perspective of the Architect. According to him, as Engineers were not expected be engaging at that stage, their involvement on these visits increased the collective perception of interdependency within the Consultancy Team.

> *... It is not really for Structural Engineers and MEP to get involved on that stage... They did, some of the visits, they did participated... so, for example, we went to the Manchester School of X, Y and Z, which CONTRACTOR had built themselves, they had... because it always difficult to get entry into this places and get behind the scenes, you can always get to the public site, but getting beyond that, you have to have the right contacts. So, CONTRACTOR were facilitating that one and we brought "H" with us as well, the MEP Engineers. So, they were able to walk around and actually witness the exposed concrete "softies", because we knew that that was something... well, we have seen in other buildings, and why was that... if you have "exposed softies" where do your Services go? ...are they on display or are they hidden? ...if they are hidden, how do you hide them? ...how would you get light into the spaces?*

In this case, Consultancy Team members started to feel like a team earlier, and they were able to discuss '*design possibilities*' using the reference of real life situations, as models of what they could conceive in the specific Building Project situation. So, for the Architect, the other members' presence and engagement in those events, was important to support the socio-construction their perception of interdependency because it allowed team members to discuss objectively important issues.

This all started with their predisposition and intent to participate, becoming interdependent in the task. In addition to that, the Architect mentioned that the Contractor, as the Project Team leader, had a key role in supporting these activities, taking the advantage of having access to some of the places visited by the Consultancy Team. In this case, is worth noting the role of the contractor in pushing some of these individuals and organisations to participate on these *Roadshow* events. The Contractor seemed to have used their *power of bargain*, to ask for the engagement of other disciplines. Thus, if they didn't get involved on this events, they won't be considered to be part of the team.

From the socio-constructive point of view, these events seemed to have been key for the Consultancy Team to achieve ***mutual intelligibility*** among its members. On these events, these individuals were able to discuss main concepts, and objectivate individuals and collective perceptions and conceptions through the identification and reflection on how they become manifested on the existing buildings. So, for example, when the architects referred to a concept, as '*exposed softies*', in these events they were able to point out and show how this idea can be objectivated in a specific situation.

In the other hand, the Architect acknowledged that these the roadshow events required from individuals and organisation to operate in different ways that they were used to. This is because the *Competitive Dialogue* procurement method was still not usual practice of procurement in Construction. He said that:

> *"... Especially when more work becomes available in the industry as a whole... People will gonna have less appetite to get onto Competitive route, because it is so much risk involved and you might not get the job in the end of it..." (pg. 16)*

In this situations, individuals and organisations tend to evaluate the potential balance between what they perceive as risk and reward, in the Building Project activity. So, it is impossible to have control over these individuals' and organisations' engagement at this stage on this type of procurement. Each one of them feed into the socio-construction of this perception of interdependency, affecting the way others perceive their interdependency in the situation, affecting their decision of how much they are willing to be engaged in the task.

**Objectivation:** *The User Group*

At this instance of the Building Project activity, the Client's perception of interdependency, which manifested in the previous interactions through the task of conceiving both types of *Project Brief* (along with a perception of performance supported by the participation of the Staff Members and Operational Panel in these tasks) have changed, indicating a sort of recalibration, led by Dean:

> *"...and then...so we arrived at the point of me to be more involved in the meetings... but at the point I was still raising two issues: (1) that we needed additional consultancy for working in one of the most challenging aspects... because we didn't even know what we wanted at that stage we needed to develop an understanding around some aspects; (2) And the second: was about the users..." "Now the view of our Estates Department was that as far as their concern I represent the users. Ok? And the point I was making was that I cannot represent the users 100%, because*

*there are details on the ground level that I would not be aware of. So what we need to do is to establish a user group that they can meet together and then comment of the design…which was a "No, no!" at the first phase. They said "there is no way we are gonna do that" (pg. 04) … But then I establish a group within the School…" (pg. 05)*

Thus, the unsuccessful evaluation of the first submission, made the Dean to reconsider the proposed "format" of the *Engagement Activities*, in which they evaluated the Consultancy Teams proposals. In terms of the perception of interdependency, as it was suggested by The Staff member, the Dean recognised that it was important to allow further engagement of the Staff (further than the Brief elaboration), because they were in a better position to discuss the detailed conditions of the School Operational Project, and then evaluate the proposals with more understanding of their own activities:

*"…So when The Dean selected the Team (Staff Team), we wanted to make sure that it was a rep. of each areas… so obviously I was in charge of this area… So I relay the requirements that I needed…" (pg. 01)*

This represented a change, in the original way that this aspect (i.e. object) of the *Building Project* activity was conceived by the *Operational Panel*. In this case, the main objective of the change seemed to be to increase the perception of interdependency of some of the participants, which for the Estates Department was considered enough, in the previous format. Such change, in theory, would allow Staff Members to increase their own perception of performance.

The Dean's impression at this point clearly showed how there was different understandings within the Client's Team, which were affecting severely their perception of performance on the Building Project activities. Thus, the Dean decided to assemble what they called the *User Group*, as an additional *Assemble*, emerging from the core of the SMT and others key staff members, to provide 'better' feedbacks into the current interaction of the Building Project activity. Later in the activity, this assemble would get involved in the *Engagement Meetings* with the Consultancy Team.

## *Perception of Performance*

While previously, the Consultancy Team objectivated their perception of performance around the pre-qualification criteria, based on their previous work experience, at this instance of the Building Project activity, the perception of performance was constructed (and constantly revised) based on the direct feedback of individuals' performance in the task. In this case, the

Contractor, as the contract leader of the Consultancy Team, took the responsibility to 'measure and control' the other members' performance. So, the Consultancy Team perception of performance seemed to have been framed by the *events* and *tools* that the Contractor have put in place to 'control' their interactions. According to the Architect:

> *"Well, everybody has contributed as it need to and if people weren't contributing there to (inaudible: open the game and saying so)… …there were times in the meetings that you went around the table and say: "I'm not getting the information from these and these guys… and you tell CONTRACTOR, because the CONTRACTOR is the Architect's Client, the Engineers' Client, the Landscape Architect's Client… they are the Clients as far as we are concerned… and the University is CONTRACTOR's Client… So, we worked for the Contractor… so if people aren't performing… you know… You got to "Shout up".  …so, what I am expecting to see is people really sort of "raising the game" coming up with really innovative solutions for how are gonna be creative…" "…So, what I'm expecting moving forwards is that everyone "holding their own" and has considered all of this aspects…  I mean for us as the Architects, we have been given the roles as "Lead Designer", so it is our responsibility to an extent to make sure that everyone… everything is Coordinated, and everyone has joined up…  (pg. 10)*

**Objectivation:** *Design Team meetings (events) – Face-to-face interactions*

One thing that supported the socio-construction of a perception of performance within the Consultancy Team, were the *events* like the *Design Team Meetings* and *Design Workshops*. At these events members of the Consultancy Team were able to express and explore their individual views and contributions towards other participants' contributions, or to identify the incompatibility among them.

Hence, team members were confronted with their individual perception of the performance, usually about the others contribution, and they had the opportunity to inquire, review, reposition and align these perceptions. For example, when the Architect mentioned that in some occasion, he revealed in one of these meetings that they were "*not getting the information from these and these guys*", it showed that the architects had an expectation of receiving that information that was not confirmed. This may have been related to two conditions: one, both player knew of the situation and they didn't produced and delivered the information; or two, the players didn't know that they were supposed to produce and deliver that information.

The fragment above, suggested that in these cases, it was, fundamentally, the 'responsibility' of the Contractor to manage the '*connection points*' (i.e. interdependencies) among the Consultancy Team members, which consequently seemed to have released the other team

members of concerning too much about this. At the same time, as the Design Leaders, the Architects were then expected to '*coordinate*' individuals' contribution at this instance of the Building Project activity.

For the Design Manager (Contractor), these *Design Team Meetings* and *Design Workshops* had a key role in supporting team members' interaction to reach *Design Coordination*. According to the Design Manager (Contractor), these were set as *events*, in which Consultancy Team members were engaged in face-to-face interactions to match and integrate their conception of changing actions:

> *"Key elements for me are insuring that they… the different design disciplines have engaged with each other sufficiently… So I need to make sure that what… You know in simple terms… that the Architect drawing matches what the Structural Engineer is detailing… and the Building Services will integrate with it… The last thing we wanna do is to submit something, and then when we get into Detail Design we realised that actually that won't fit in there, so we are gonna have to do something about it… So it is really making sure that Designers hasn't worked in silos, and gone off and done their own thing, and make sure they've worked together… and we addressed that through a series of Design Team meetings… essentially Workshops, where they come together and go through the process to ensure that there is nothing that… nothing in one design that won't work in the other in one way or another… Shall we say…" (pg. 02)*

The Design Manager (Contractor) overall perception of performance of the Consultancy Team and the other suppliers was good at the end of this instance of the Building Project:

> *"I think we have got a good Design Team on the job… you know… We've selected them based on their experience… The ARCHITECT in particularly had done a lot of work with the University, so they understand what the University's requirements are… so that definitively worked in favour of the scheme… and we've had a good engagement from the Supply Chain as well, which is a positive, because they are quite keen and sometimes you might find that there is a lot of work out there and actually go to, and these guys if there isn't a job right away starting tomorrow to get in advance, they are not that interested… But here that hasn't been a problem…" (pg. 14)*

On this matter, it should be taken in consideration that, at this point, the Consultancy Team already knew that they were the only Consultancy Team left in the competition, which seemed to have increased a lot their perception of performance, by knowing that they had a great chance of being appoint to the Building Realisation instance, of the Building Project activity.

**Objectivation:** *Scope of Service (Tool)*

The Design Manager (Contractor), also indicated that what contributed in guarantying the Consultancy Team's performance was the fact that they had put in place a *'robust documentation'*, by the use of what they called *Scope of Services* tool, which was used to clarify and specify '*what you do'*:

> *"I think the relationship have been very good… We have good relationships with the Design Team… They understood what we wanted, I think that was brought by having robust documentation… cause you know… if you got a Scope of work: "that is what you do it" …He sign up for it… we know what he is doing it… you can mapped it out… It is when you got some misunderstandings and gaps… you got last minutes panicking for them saying: "Ow, shit where is that?" and if you go back and says: "Can you do us this detail?" …For you know… where you are… …I think that was quite well to be honest… good Design Team…" (pg. 15)*

So, the Scope of Services (a spreadsheet document) can be seen as another objectivation of the perception of performance in the task, which helped the contractor to 'control' the tasks of the other team members.

**Objectivation:** *Operational Panel and the Building Project Template (Reviewing)*

At this point, the perception of performance of the School Staff Members regarding their ability to positively contribute in the Building Project activity, was undermined by the way the engagement with the Consultancy Team was formalised to fit into the procurement method. In this case, Staff members' contributions have been limited only to the briefing activity, and further engagement from the Client with the Consultancy Team, would have to happen through the *Engagement Activities*, in which only members of the *Evaluation Panel* were supposed to be present:

> *"And I don't know if it is just because we really are architects, because I think we were very competent, because obviously of other Schools and they have the Estates (Department) acting as a separate client as well, and obviously working with a professional team… so it was a kind of strange mix with us as a client and getting not to heavily involved… and obviously seeing the design plans, having a few initial meetings, and then us within the SMT talking about a few of the spaces, and then we realised that some spaces were missed etc…" (pg. 02)*

Thus, the perception of performance of the Staff Member at this instance of the Building Project activity, was low regarding the Operational Panel, and consequently, towards the Consultancy Team:

> *"The limitations… and also our ability to work with… the Professional team and the Collaborative Process that is where I think is critical, cause like I said, we got to put forward the ideas, we got very educated staff members, who got extremely educated students that could have feed into this process a lot more creatively…and it is just not achieved… If you look at the "X" Building and a lot of people can see a lot of flaws in that already, and it has not only been fully used yet… It looks great from the outside, but inside functionally isn't working correctly and… you know… only time will tell, but obviously, there are a lot of concerns… you know… The last thing we wanted to do is to be in the same position that, when we open our building… and I think that is basically due to the form of engagement…" (pg. 08)*

**Objectivation: Reviewing *Building Design Proposals* (Conception of Changing Actions)**

The Building Design Proposals (from all the competitors) was an important object for the Client Team, in which they build their perception of performance on the activity. Once again, this was influenced by the task carried out in the previous instances of the Building Project activity. For example, the Building Design Proposals were assessed against the Client's conception of changing actions, which were previously objectivated in terms of the *Project Briefs* (i.e. performance criteria and spatial requirements). According to the Dean:

> *"So, at the beginning we selected five, we it through up to the Stage 1… and there were a quite a number of issues at Stage 1 and (inaudible) forward… and there was quite significant delay on the project because at the end – all of this is confidential of course, not even to anybody, it just for you – at the end of Stage, where we were supposed be at Stage 1, we had the presentations from all five…teams (competitors)…and we didn't wanted to select any of them… we didn't feel that any of them was appropriate… it was bold enough… it was adventures enough… it was a game changer for the university…we didn't want another building like any other one… and we felt at that point maybe they understood the brief wrongly, maybe they were too conservative in the proposals they were putting forward, and some of them were under evaluated by the technical team, they were convinced they could not be built. So, from my perspective I did not have any visibility of that, the technical analysis was done separately by our Estates team… (pg. 02)"*

In such a way, when the Dean expressed his opinion on the results of the *Stage 1 – Initial Design*, he clearly referred to how his expectations were conceived in terms of the objectivations made in the *Project Briefs*, as parameters for his assessment of performance.

According to him, this seemed to have been the case for other members of the Evaluation Panel (i.e. *Technical Team)*, which indicated that their perception of performance over the Consultancy Teams' proposals was not sufficient too.

Interestingly, it is possible to notice his projection of the consequences, as negative outcomes, from the lower perception of performance, and how that would affect the other aspects of collaboration, for example, how this influenced the individuals' (in both sides of the activity) conception of resource: *Time*; by saying that the project would be delayed.

At this instance, not only the performance criteria and the space requirements (i.e. *Project Briefs*) were took into consideration to assess the performance of the Building Design proposals (and, consequently of Consultancy Teams), but also the criteria regarding planning approval, which is established by the Council. This assessment was considered responsibility of the *Planners*, which were part of the Operational Panel (as Estates Department staff members). According to Dean, these *Planning Requirements* were dealt in a way that the Planners very early in the activity interacted with the Consultancy Teams, to align their needs and expectations:

> *"It wasn't so much that... it is a fact... I mean we had planners involved from the beginning, so the Planner was making an input into the design all the time, to make sure that when we reach the stage of releasing the design it had a good chance of getting an approval... and that was the first thing..." (pg. 07)*

**Objectivation: Reviewing the *Project Programme***

The lower perception of performance at the end of the Stage 1, led the Dean to push for a re-conception of the *Project Programme*, and a recalibration of their conception of resource in the activity. The Dean in accordance with the Operational Panel (mainly referring to the Estates Department) decided to change the *Project Programme*, adding an 'extension period' for the Consultancy Teams to rework and re-present their proposals. According to him:

> *...So, we didn't selected anybody, which was an absolute disaster at that point... So we were at that stage, in which personally I was getting worried how we are gonna get a new building... will the university now say well forget it is too difficult... at to that point the university invested about 100.000 pounds... ahm... You know... maybe you shouldn't mention this amount in your writing... and just can say there has been an amount that we had to pay already... So if we had to stop the project we were at loss anyway, but obviously as the Dean of the School I wanted the project to carry forward, so... we challenged the teams again..." (pg. 03)*

This reflection seemed to have led the Dean, and the two panels in place, to review their perception of the resources available to this project activity, by adding another 100,000 pounds to the *Project Budget*. All this seemed to be based on their perception of risk in not achieving the expected development through the spatial changed in the School Operational Project. Because, as he mentioned, if they were to '*stop the project*' at that stage, they would have lost the amount of resource (i.e. *Money* and *Time*) applied so far:

> *…So, then after this Stage 1, we picked… I can't remember exactly… there was two (2) of them… which we took forward… but then, one of them have changed their Design Director, they brought a new person, to be more challenging and so on… but then they started almost all over again, right from the beginning… presenting conceptual designs again about choices… that was four months into the process… and you can tell that really they were just experimenting (perception of performance)… …I mean, to be cynical we thought about that they were only in the process just to get next amount of the money… so they weren't really committing themselves… some other projects were "OK" …you know… they were… parts of them were really interesting… but as a whole they never stud together… and they were uninspiring… and doubtfully if it's gonna be able to manufacturer or even working in it… …So than, that was kind of an interesting political kind of exercise… they left the process. So we were left with just one competitor… but we had to follow the same process in terms of selection… (pg. 05)*

At this point, the Dean seemed to reflect about the balance between the Client (i.e. University) perception of resource (i.e. 'amount of money') and the perceived purpose of the Consultancy Teams. For him the purpose of one of the competitor was to "*experiment*", and that in his view was not aligned with the Client intentions, and eventually led to a negative perception of performance on his side. Overall, at this stage, he felt that these competitors were not playing to win (and take this project in its further instances), but they were just expecting to get next payment regarding what they produced in this stage, independently of what the result of the competition would be.

Interestingly, The Dean mentioned the "politics" of these interactions, which may indicate that he didn't exactly agreed with that situation, or that that specific aspect of the Project Template didn't make sense to him anymore (as for that competitor to keep in the situation). Eventually, that culminated with a competitor leaving the project, and then only one was left in the activity.

***Conception of Resource -*** *Resource Commitment (Interdependence)*

**Objectivation:** *Market Testing (Costing task – applying Money as resource)*

At this instance of the Building Project activity, in order to assess (and stipulate) how much it would cost the Building Design proposal, the Contractor conducted a *Market Test*. As the Architect described:

> *"Cause they got to test… Market test the Building to understand if can they afford to build that Building for the money they… you know… the University have offered… And the only way they can do that is to test… Test the Market… and to do that by having a set of ceiling plans to…"*

The *Market Test* involved getting from the suppliers a 'real' quote on Building Realisation based on the current design. According to the Design Manager (Contractor), such task required commitment from the Contractor's supply chain to the cost presented. Later on, the cost established through *Market Test* composed the *Tender Settlement Proposal* (to be described later):

> *"and within that period we got to get what we call Market Testing done, which is essentially verifying the prices, cause at the moment we've got is costing done on Stage 3 information, which is not fully coordinated and it is not fully detailed… we've got to get Stage 4 information, and we to get out to the Market Place, get it costed, get firm prices back and agree that on the advance of the day we get award on the contract, cause we got to submit a price in the Tender Settlement Date,..." (pg. 15)*

Specially, on this type of procurement method, the consideration of cost impacted a lot on design decisions. Thus, the way Consultancy Team members discussed and valued aspects of cost, as resource, in the Building Design, can be noticed embedded in language and the use of analogies and **metaphors,** to imply common assumptions and experiences among these individuals. For example, when the Architect referred to "*car park precast finish*", which implied that others team members would grasp what that meaning in terms of cost and performance of the precast structure:

> *"…because there is all different finishes on Precast, it can't be "Car Park" Precast finish, it cost 10 pounds/m²… it need to be something a little more enhanced that cost 20 pounds/m², so you need to build that into the Cost Plan. …But has been offset by the fact that we are not gonna need to spend on the ceilings… So you are not paying for ceilings, because you spend the money getting the finishes right. But that works for the M&E strategy… So, collaboration really, was actually starting fairly early on in the building visits…" (pg. 03 and 04)*

**Objectivation:** *Fees, Payment and Rewards*

In terms of an overall conception of resource, the Architect indicated that, for the Consultancy Team, *Money* was a '*challenge*', especially, because of the procurement method (i.e. the competition):

> "I think it was challenging. You might have already heard this probably from the Contractor. The challenge is always… it is a Design Competition, and the University are only putting a sum of money on the table… so, I would say each of the Contractors probably spent at best a part of quarter of million pounds, it's 250.000 pounds Bidding the Project, and four of them don't get it. So, it is a million pounds spent there in this Competitive Dialogue Process, which is gone and has to be taken by the Contractors. So, it's their kind of… cause they gotta pay us and the engineers, the M&E… cause we spent… The Inception of this Project, was around about September last year… so we have been on this job for a Year now… and We are only just getting appointed now! So… …Yeah! But we have to take a bit of risk as well… so that all of our fees are reduced, everybody else's fee is reduced, just trying to cover basic costs really… …Everyone is kind of "limping along", not wanting to expose themselves too much but getting enough done, so than we can get our message across and get over the line, really, to win the job. Without exposing yourself to much and spending loads of money and then isn't… so, that is the challenge of Competitive Dialogue process, but if you speak to Tim, I'm sure he will tell you it is great deal for them, because he gets five designs on his table for not a lot of money… and you know what…They did end up paying 50.000 pounds to each of these… well, it seems right but it is (inaudible)…" (pg. 11)

In a way, it represented a risk for the competitors (i.e. Consultancy Teams), especially, for the Contractors, which had a 1/5 chance to be selected, but knowing that they were investing five times the amount they would be paid at the end of this stage even if they were not chosen. This stage took almost a year, considering the unpredictable delay.

According to the Design Manager (Contractor):

> "The biggest barrier that we have had at the moment, it is the fact that it has been a Competitive Tender, and it hasn't been an agreement to make payment, so everybody has been working at risk… So they have been reluctant to pull the correct level of resource or enough resource… it is like "they try to design with hands behind the back", because you know… you go, the Architect say: "No, we haven't won the job yet, I don't wanna spend to much time on it, and if we don't get it"… …you know, What happens when is at the door… So that has been a challenge… …Let's put it, as the biggest single problem that we have had…" (pg. 13)

Thus, the conception of resource, in terms of *Money* and *Time* (**in contradiction with the Client's conception**), was a bit more critical for the Contractor, and it demanded a certain 'voluntary' contribution from the other members of the Consultancy Team in '*reducing their fees*' and engaging in the task (i.e. workforce) earlier the usual:

> *"Yeah! I think it has been slightly… What has made this one more difficult than most is that we had to take the Design that bit further before we were awarded the contract, it is more usual… Or at least it has been an advantage for the client, that they will pay for the Design… cause, we clearly have to pay the Consultant some money, because that make our "Bras" nervous… so, they sort of "cut down" the amount of pay to the Consultants to the minimum, which that means the Consultant were a bit of: "Well, I don't really wanna give you a full service…I am only giving you half the service…"  …and that has been a challenge…  …Where is it, if the Client had said: "Ok, we like your Design we'll pay you up front… which is where it is going now, cause we have got to Stage 4, they are gonna pay us to do that, which will "unlock" it… it should be a full cooperation from everybody going forward… but this has been a bit of challenge during Stage 3… (pg. 14)*

Thus, a challenge for the Contractor, as the leader of the Consultancy Team, was to convince the other members to continue in the project and go "*a bit further*", and rework on the stage 1 proposals, before the Consultancy Team could be awarded the contract. From the fragments above, it is possible to say that **there were tensions within the Consultancy Team,** in balancing down how much team members were willing to give and engage in the task, and how much the Contractor, as the 'boss' was willing to pay to these 'consultants' at this point.

From the Contractor comment above, it is possible to imply that naturally, the willingness to participate and the conception of resource, considering *Money* as an expected reward, of the Team members was built comparatively to other business model for Building Project activities in the "market place" (e.g. Design and Build). The contractor seemed to have seen this situation as an imbalance in the relationship with the client, which eventually hampers their overall interactions in the activity.

**Objectivation:** *Reprogramming (Design Programme: Time as resource – and materials allocation)*

In the previous instances of the Building Project activity, *Time* was conceived as resource and it objectivated by the Operational Panel in the *Project Programme*. Thus, eventually, this objectivation was interpreted by the Architect, which affected how the Consultancy Team conceived the interdependency among resources. In this case, the way Time was objectivated

in the Project Programme seemed to have affected how the Architect conceived the material resources for the building:

> *"...simply, because of the Programme... So, the University, has given a Programme and it said: This is when the Engagement process is gonna take place, this where we get the preferred Bid Stage, this is when we move on and go for Planning Permission, and this is when we want it to be finished by. ...So this how you know how much time you have for building it, and there was no time to get on the Concrete Frame room... Because it takes longer to built the Concrete Frame than Steel... Steel is fast! It is just "assign onto my calendar"... ...it is just bolt it together and "off you go"... ...So that starts to inform the way that the building is going to be constructed and..."*

Thus, because of the Consultancy Teams were unsuccessful on stage 1, the Client 'reprogramming' of the project activity, compressed the time for the building design instance of the project activity in stage 3 and 4, which affected the Consultancy Team conception of *Time* as resource. According to the Design Manager (Contractor) that raised the project risk, as the costing activity demanded higher level of development and detailing of the design, which were already compressed in time. So, the cost was lacking reliability, specially from the higher positions in the contractor organisation, which seemed to be the ones that made the financial decisions:

> *"I think one of the things that has been a challenge is the time scales... been pretty tight... a very tight Stage 3, and very tight time for Stage 4 Design period... Just to give you an idea, we've gotta get Stage 3, well stage 3 is done, that was done within 6 weeks, which isn't really enough time, I don't think... and we've got Stage 4 now, we've got 14 weeks to do Stage 4, which is essentially getting it up to construction stages now, which is a quite tight a challenge now... and within that period we got to get what we call Market Testing done, which is essentially verifying the prices, cause at the moment we've got is costing done on Stage 3 information, which is not fully coordinated and it is not fully detailed... we've got to get Stage 4 information, and we to get out to the Market Place, get it costed, get firm prices back and agree that on the advance of the day we get award on the contract, cause we got to submit a price in the Tender Settlement Date, so... the Appointment Date is the 27th of November, so we got to Settle the Tender probably in two weeks in advance of that, and in order to settle in, we've got to demonstrate upstream that we got all the risks "boxed off" and the only way we can do that is by having a Design sufficiently advanced that we can turn around to our directors and say: "Here, it is a fully detailed Design and we had it costed up, and this is the cost and here is our margin, and it "has enough roses in the garden"..." ...Cause if you go to that meeting and say: "Well, we've got a 50% of a Design,*

*and got this, this, this that hasn't quite get sorted yet, but we have brought 20 grand to cover it…" …They are gonna be thinking: "Wait, hang on a minute, that is not the right number…" …and people get nervous…" (pg. 15)*

This perception that 'Design' was compressed, meaning that the Building Design instance of the Building Project activity was lacking *Time* as a resource, seemed to have been used as a justification for the Consultancy Team in terms of the critics on the Building Design proposals, as the Design Manager (Contractor) highlighted:

*"… so, it is very tight and, you know, in an ideal world we would have more time, but time… I think, it was given the time the University, obviously, got a date in mind for when they need to occupy the building. We've been given a construction period, which I think is 81 weeks, from starting on site, that is based on hard programme, if you like, of the activities… so, where you have all messy around is through the Design Stages, cause time has been "eaten up" with debating over what is going on, and then, we've lost a bit of time between Stage 3 and Stage 4, cause we've submitted Stage 4, and then they: "You didn't give us this, you didn't define that, we've asked for this bit of information and you didn't give us this…" …It has been about four weeks of "arguing", for lack of better word… (laughter)… But, essentially, negotiating, and only now that has come to end… So it is a kind "eating" on Stage 4, because the "start on site days" cannot move out, because that will affect the end date. So what is happening is that the Design Period is getting compressed in… …so… yeah! So we need to find a way to do it a bit better I think…" (pg. 15)*

**Objectivation:** *Workforce: people as resource (Skills – CAD – at subcontractor)*

In terms of workforce as resource dedicated to the activity, the Design Manager (Contractor) seemed to have had a full comprehension of how much each member in the Consultancy Team (e.g. individuals and organisations) have contributed quantitatively, in terms of amount of people engaged and time dispended:

*"In terms of actual resource?   …We have a full-time team on this, and its includes this Bid Manager, GREG, this "me", Design Manager, there is an Estimator full-time, there is a Planner full-time, it is us four… than, we also got two part-time Quantity Surveyors… …So, that is four full-time personal and four part-time personal as well… …Plus, Senior manager time as well,… So… Yeah… quite significant outlay, aren't they?" (pg. 08)*

The Design Manager (Contractor) seemed also to have recognised that some of the members of the Consultancy Team may have used less time of their workforce, but have offered more 'valuable' contribution in assessing and costing the design proposals:

> *"ARCHITECTS… I think clearly, ARCHITECTS have been putting much more time than any other Consultant… They have had a Project Architect working pretty much full-time on it, probably since earlier that I was involved, they have been working full-time on this job, since I am guessing, September last year, if not a little bit before that… and there is CAD resource, behind the scenes… which won't be full-time, but… you know… there has been a quite few drawings been produced so,… there is gonna be, say, 20% of a CAD's man time… If you duct the Structural Engineer, they had less involvement in it, they have only done a hand full of drawings and a few concept foundation layouts, and they have probably not much more than 2 to 3 weeks work for one man… And then the Building Services wise, not quite as much as the Architect, but they have a two man team, one on electrical and one on mechanical, working probably full-time for about six weeks, during the Stage 3, Development… but then, prior to that, probably part-time for a month, something like that… and then, on top of that, we had supply chain involvement from Structural Engineer, who has done the Steel frame Design, he has worked on it probably about three or four weeks full-time… and the other members on the supply chain, not putted a great deal of resources in terms of drawing, but they have done a quite bit of work in terms of the reviewing buildability and costing the proposals as well… So I wouldn't put a specific time against it, but it probably took a couple of weeks work on it…" (pg. 08)*

In this context, the Design Manager (Contractor) also seemed to refer to 'project documentation' (e.g. design representations), as another type of resource, which is closed related to notion of workforce as resource. In this case, that type of resource is mostly produced and handled by the Architects (i.e. CAD):

> *"Yeah! I chair the meetings… but in terms of the Design Lead, it is the Architect that leads, essentially, he understands "the nuts and bolts" of how this all works together better than me, I got an overall view of the process and I know who is doing what, but in terms of will something fit in? …you know, he is operating the CAD, he knows exactly what the issues are and he also lead in that… …What we do need to do, moving forward, and haven't done yet, is to bring BIM into the equation… I've got three… I'm sorry…we've got two BIM models, but we need to get an M&E contractor involved to get a BIM model developed for the building services, so we want to integrate that into the Structure and Architecture… …Cause at the moment, we've designed the M&E in 2D, which means, obviously, there is a concern when we get it into 3D and start to get clash detection, we might have some issues there… So that is something that we are gonna have to focus on the next Stage…" (pg. 02)*

**Objectivation:** *Project Budget - Increasing Project Scope (Additional Investment)*

From the Client side, the review of the Building Design proposals, with the perception of a low performance, led to Client to reconceive the *Project Brief* to increase the overall dimension of the building and to include the landscaping. These change to the Project Brief, consequently, let to a necessary increase on the amount of money to be invested in the project. In this case, according to the Dean, part of the money came from the School and other from the University:

> *"...we had to invest an extra 2 million pounds from the school to get what we wanted... after the Stage 1 first interview when we said we don't like any of them, that was the point we decided to put more money into it, so we can get something better... we also had to invest new money for the landscape, because it was an important part of the whole project... instead of looking at the two separately, we brought them in as one project... "(pg. 06)*

> *"...and the Landscape... the landscape around the building... I can show in the design in a bit... So the University puts a half million pounds, the School puts another 2 million pounds in order for us to get a building for 7.300 m2... ... so as opposed to 7.000 m2, which was the original brief... and there were many choices I had to make..." (pg. 06)*

This review of the conception of resources were aligned with a review of the conception of changing actions that emerge from the early interactions (engagement) with the Consultancy Teams. So, with the review of the *Project Brief*, emerged an interaction to review the conception of resource of the Client Team, and the decision from the *Evaluation Panel*, to put 'more money' into the Building Project activity.

In the other hand, for the Staff Member, *Time*, objectivated by the *Project Programme* was actually much more a limiting factor than the *Project Budget* (i.e. Money):

> *"You know ...a lot of things have been said that is "down to money, down to money"... Well, there is no point to spend extra amount of money on a building when is not fit for purpose... (pg. 03) "..."The limitations... obviously, time and the limiting factor of money... but, you know... I don't think money is completely limiting factor, because obviously you know the students... ...because if you set up a budget, you can be creative within that budget... So, I don't think money is the only limiting factor, but the time constraints have been key..." (pg. 08)*

### *Conception of Changing Action*

**MANAGING INTERACTIONS WITHIN CONSULTANCY TEAM (Contractors)**

**Objectivation:** *Team Management*

At this instance of the Building Project activity, the Design Manager (Contractor) used three tools to 'manage' (i.e. control) the interactions within the Consultancy Team: *Scope of Services, Information Requirements Schedule (IRS) and the Design Responsibility Matrix*:

> *"In terms of controlling the Architects…well, the Design Team we have the Scope of Services, Information Requirements Schedule, there also the a… I don't remember the name right now… the Design Responsibility Matrix… … so that all than say the Architect have to liaise with the Acoustic Consultant to identify what the acoustic criteria is and then they will also than say the acoustic consultant will assess the Architect's design for compliance with whatever standards is… Yeah! So it is more looking like that, rather than what the deliverables are… So that are the really three tools that we have."* *(pg. 09)*

Then, Design Manager (Contractor) used this tools to monitor how the Consultancy Team was performing through their interactions *Design Team Meetings*. According to him, team members needed to elaborate *'reports'* based on these documents, indicating how they were complying with their 'specification':

> *"Yeah! We control it through that… and through the Design Team Meetings we monitor how the design team is performing… so we ask them to do a report against those documents… it is mainly against time that we are looking at, so… The IRS (Information Requirements Specification) will say I will be producing these drawings by this date… than we will ask for an update… and they will say: "Yeah! I am down to deliver these drawings in two weeks' time, and I am now on 50% of the way through it, and I need this information from the other parties to do it, in order to achieve those dates" … …So, it is really just to make sure that there is no "blockers" … and that If there are any blockers, than we need to "unlock" them as quick as possible… Cause the last thing we want is wait for the day and nothing happens, the information…and then: "Ow, I am waiting for him to give this"… You know… because that ain't gonna work…"* *(pg. 10)*

Each of these tools seemed to have focused in controlling the Consultancy Team's interactions (and interdependencies) through prescribed set of tasks and criteria, following the Contractor standards. Also, these tools, like the IRS was based on the setting of a time schedule for the production and exchange of design representations. Interestingly, this seemed to have indicated

how the Consultancy Team (and each of its members) was constantly repositioning their **perception of the performance** of the group, against some an equivalent conception of their expected interactions on the project.

## Objectivation: *Design Programme (Artefacts) - Deliverables*

The Contractor used the *Design Programme* as way to establish and prioritise what are the *deliverables* in each stage for each member in the Consultancy Team. As it was mentioned before, the Design Programme was a key artefact to help objectivate the Contractors' *conception of resource* distribution and contribution, by defining the interdependencies in the suggested time frame of the project activity, which was also based on the interdependency of physical materials used to supplying those tasks. According to the Design Manager (Contractor):

> *"...So we have to prioritise what the deliverables are gonna be... and basically use the Programme to do that... "So we need to have Architect on board by this Stage" ... "...So we need the Structural Engineer by this Stage" "We need Service Engineer by this Stage" ...and we use that to prioritise. Likewise, is the supply chain, we go out those packages that got the longest leadings or that are needed up front, first and so the last important stuff, you know... finishes... and then you... that will be addressed last. ...And that is pretty Standard stuff, and then we work a Pre-Construction Programme, which unfortunately I didn't bring here with me, but if you wanna see any of these, I can ... it should done to the University anyway so I can probably get you a copy of them... So, I don't think I got the Programme in here... we have a Design Programme... it is not actually in these... I can send you that through... It maps out the process, showing what are key gates are..." (pg. 05)*

## Objectivation: *Scope of Service*

The Design Manager (Contractor) explained that during *Concept Design* their main tool (i.e. Artefact) to manage the Consultancy Team interactions was the *Scope of Service*. He said it came from a *Standard Scope of Service*. This indicate that this is a tool that have emerged in the socio-historical practice of the Contractor's organisation, as a Standard Operational practice, and used as common artefact within similar projects:

> *"Yes! So, we have a Standard Scope of Services, and we will adapt it to suite a specific project... cause obviously each project is bespoke and there somethings that are not relevant and there will be other things of the spoke that will need to be included in... So, we review that and amend it... and then send it out to the Design Team, for them comment on it..." "...So, the Scope of Services will be basically, the Architect will provide general arrangement drawings, he will provide*

*sections through here, here and here… and list out quite graphically what we are expecting them to do… and there are certain elements, where you get an overlap… One, that always seems to crock it is Water Proofing… is it the Architect? Is it the Structural Engineer? …And to me is really important that I "pin it down" because, when you found that nobody has done it, then you are in trouble… (pg. 06).*

The Contractor seemed to be the one who made the decisions on the content of the Scope of Service for this Project, by reviewing and adapting the Standard Template, and then sending this out for the rest of the Consultancy Team to *'comment on it'*. According to the Design Manager (Contractor), the *Scope of Services* then needs to be "agreed", which means team members may have not agreed with the Contractors conception at first, which trigger a "negotiation" process between players and contractor:

*"Yes! It has to be… you know… Before we can appoint the Design Team the Scope will be agreed… So, we send it out to them and say: "Will you sign up this?" and they will say: "Well, I will not be happy 100, 99% to this, because of this, this, this… so, I don't like it… or I can't do it…" …And there will be a dialogue… It worth point out that, actually, at the point where we developed the Brief, in Stage 2, we don't have an order from the University, so we can't place orders with the Design Teams… So they are all working at risk… and nobody is getting paid… So it is very difficult to "pin people down" to deliverables… where we all aim for common goal, we haven't got any "teeth", if you like… So, if the Architect doesn't draw it, you cannot go down and say: "We are gonna in breach your contract, so we are not going to pay you…" …cause we ain't paying him anyway… all that happens is that if the Team fails, nobody gets the job… But once we get to the point where we were in contract, then all of this documents will so be bounding to an appointment, which is like sub-contract, if you like… now we will tide them down to delivering a set of deliverables… in line with the Information Requirements Schedule, that haven't talked about yet…" (pg. 07)*

However, this did not mean that this negotiation happened among all of Consultancy Team's members at once. It seems that the contractor handled this negotiation individually, separately as a "*one to one*", with each of the key team members. It started as the expectations of the Contractor, as the team leader over the activities of the design team members:

*"…In the Concept, we do have the Scope documents but they are not as contractually biding as… so, how we say, it is all we working on "good will" really… because everybody understands that if we don't win the job, there is any job and nobody gets any money, you know…" "Yeah! Pretty fundamental… but I think that the Team must have thought that it is so fundamental that everybody was aware of it, but they obviously weren't… you know… so, really don't make any*

*assumptions…" "…but the idea is… that is that everybody than understands exactly who is doing what… because if you don't, you gonna… it is "a double bubble stuff" …or more importantly, you gonna miss them altogether… (pg. 07)*

At this point, the Contractor position seemed to be challenging, and the Consultancy Team, led by the Contractor, focused in dividing the whole 'payment' of stage 2, among its team members. This decision seemed to have influenced in the negotiation of the scope of service of each team member. So, team members realised that they were not entirely happy with the expected financial return (i.e. payment) in the task, and they might have felt undervalued, consequently, they may not entirely agree with their scope of service, as it was originally conceived by the Contractor.

According to the Design Manager (Contractor), a key factor was that the *Scope of Services* was not contractually binding the Consultancy Team. This would only happen when the Consultancy Team was *appointed*, and then the Contractor articulated another artefact to manage those interactions: *The Information Requirements Schedules*, which specify a set of deliverables among the team members.

Overall, for the Contractor, the *Scope of Services* seemed to have helped Consultancy Team members to "*understand exactly who is doing what*". As a document, it helped the team to objectivate their conception of changing action, as a list of tasks and responsibilities (i.e. who is going to do that). Hence, negotiation around these scopes were held in the Design Team Meeting events, in which team members were confronted with the definition of responsibilities and interdependencies. According to the Design Manager (Contractor), **the case of the 'Water Proofing' is a good example of how emergent conflicts in scoping were resolved:**

*"Yeah! I mean, the Scope documents… they just were documents that, basically, a list with activities down to the left side, participants along the top, and tick and boxes it says: "The GA drawings are gonna be done by the architect, Foundation drawings by the Structural Engineer, and detail is that"… …so that is essentially what it does… if there is any debate around who is doing what, that will tend to happen one to one within individuals concerns, but there are certain items where if the architect says: "I am not doing it!" …we ultimately need to find someone that will… So that, may well be a conversation between a number of parties that we have in the DTM (Design Team meeting)… well we got one right now, which we need sort of see who is doing the "Water Proofing Detail", which the Structural Engineer says: "I am not doing it!"… and I got the Architect saying: "I ain't doing it either!"… So, some moment along the road we are gonna have to unlock that one and decide who is gonna do it… So in that meeting there will be a*

*discussion about that... hum, face to face to them... (pg. 12) (This kind of situation can reveal a lot of the role of the "contractor" in the project). ...But generally speaking, it is just agreeing in terms of who is gonna do with that, just on a one to one, otherwise you tie the whole Design Team meeting up arguing about fine detail and wordiness, stuff like that..." (pg. 12)*

In the other hand, in the Architect's view the *Scope of Services* didn't play the important role mentioned by the Design Manager (Contractor). One of the things that he referred to was the fact that the *Scope of Service* was very much standard, and they already knew what they were supposed to deliver:

*"Scope of Service?!... Well, to be honest the Scope of Service is pretty generic... it is like a "list" of things that were expected from each discipline... so, I... The Architecture Scope of Service will be: "You need to do ceiling plans, you need to do "floor finishes plan", you need to do sections through the building, you need details of floor interfaces, wall interfaces, roof interfaces... ...and to be honest, the Scope of Services is the same one every job... So we don't even bother looking at it... I know what I need to deliver... But that Scope of Services, we don't really start to get into that till we start delivering the Project, to be honest... I don't even look at that for the purpose of going through the Engagement Process, it is all about Design and communicating, as Architects... communicating presentations to the Client that they can see, look at... CONTRACTOR don't even got a clue of what is gonna look good in the presentation... They can sit there with a Matrix and asking me "where the ceiling plan is?", but... as coming right in the end, when we finally got the "Scheme" that we wanted..."*

This is key example to show that, from the Architect point of view, the *Scope of Service* did not existed as a **shared object**. It was only useful for the Contractor, as a way to 'control' the interactions and deliverables. It seems that the Architect carried some assumptions related to tasks making part of the overall activity.

*Architect: "...Because we are employed by them (The Contractor), and they need a document that say what the "agreement" is... we are only gonna pay you X amount of money and we are gonna give you these drawings... You have to have that... Don't you?... Otherwise..."*

*Researcher: "Yeah! It is the kind of way they can control..."*

*Architect: "Control?!... To be fair... if you ask somebody to tile your bathroom and you turn up not putting skirting tiles on your bathroom... "Well, I thought I was gonna get skirting tiles?" ...and "Well, you never said you want skirting tiles..." "Well, I assume I was getting..." ...So, rather than people assuming, it is all written down! So, everybody understands!"*

Before the Consultancy Team won the competition and got appointed – under contract – they didn't felt that they were obligated to commit to this 'scheme'. Later, these commitments were used by the Contractor to 'guarantee' that within the Consultancy Team, they would get what they needed to be able to proceed with the *Building Realisation* instance of the activity. So, an important role in the Consultancy Team, was one of the *Project Estimator*, in supporting the other members of the Consultancy Team to reflect how their conception of resource (i.e. Money) was objectivated through *Costing* tasks on the Building Design proposals. As described by the Design Manager (Contractor):

> *"Quantities! Yes!... and understand what is to be doing... I mean, they do have an Estimator place in there,... They know what their Cost per Square meter roughly is for all the Curtain walls... So, their Estimating Team is very involved from the start, when we come up with these Initial Concepts... So, again they are only sat on the table as a said to you... The M&E Engineer would say: "Ow, I like that one because it is more efficient"... Structure, and you got the Structural Engineer to say: "Ow, I like that one because it is..." ...What is in (inaudible) of the Contractor is they will have an Estimator with them and he will go: "Ow, I don't like that one it's got to much glass, it is gonna cost you a fortune... I like this one because we can do all in brick and it will be much cheaper"... or he might don't like brick because he will say: "The cost of bricks ways is sky high..." and just want a panel to look good on the side or something that we can design off-site... a design-for-manufacture... by that you a system who is built on-site and who is brought outside, and (inaudible) on... So, again that will be influencing from that perspective, but... So, you don't have Estimator at start, but you kind of got an idea of things if they are on budget or off budget, and then when you really start going down that those "packages", that weren't packages, which we define in our Scope of Services... What the Contractors..."*

## Objectivation: *Design Structure Matrix (DSM) - Artefact*

According to the Design Manager (Contractor), the DSM helped them to "map" (objectify) the emergent interdependencies within the Design Team. As the Building Design proposal emerged from the Architects' individual work and further interactions with Structural, MEP Engineers, Planners and Cost Estimators (from the Contractor's organisation). The Design Manager (Contractor) needed to "map" the interfaces (that he or they had identified) among different aspect of this Building Design proposal, taking into consideration the role and responsibility of each member of the Consultancy Team in dealing with these aspects, and structure them in a Matrix:

> *"...the Design Responsibility Matrix, which is similar to the Scope of Service, it doesn't detail out the deliverables, it's looking more who is responsible for making certain... not decisions, but for making... you got to consider certain things like Building Control Application or Engagement with Fire Engineer, or Acoustic... so that all than say the Architect have to liaise with the Acoustic Consultant to identify what the acoustic criteria is and then they will also than say the acoustic consultant will assess the Architect's design for compliance with whatever standards is... Yeah! So it is more looking like that, rather than what the deliverables are... So that are the really three tools that we have."* (pg. 09 and 10)

The DSM seemed to have had a programmatic role, since it was used by the Contractor to indicate (or determine) who should be interacting with whom, in order to "resolve" any emergent issue in that interface, in the best possible way.

**Objectivation:** *Information Requirement Schedule (IRS)*

So, when the project moves to Stage 3 in the Project Programme (an equivalent to RIBA - *Development Design* and *Detailed Design*), the *Scope of Service* gave origin to what the Design Manager (Contractor) called *Information Requirement Schedule*, including dates for all deliverables:

> *"...the Information Requirements Schedule, that haven't talked about yet... but that is essentially, the Scope document expanded to include dates for all the deliverables... and that is essentially... and is also moving away from Concept Design, now into Detail Design... Now into Hand delivery, but that will essentially have the dates in line with our Construction Programme, so... take a typical activity, Cladding for instance, we know that that Cladding needs to be going in the building on that date on the programme...So, say that is 10 weeks to manufacture that cladding and detail designing it with the sub-contractor, so we need construction information from the Architect on that date... So, that is kind of what is driving that... But that is Detail rather than Concept..."* (pg. 07)

In that case, as a 'tool', the IRS can be seen as an evolutionary transformation of the Scope of Services, to better suit the Consultancy Team and, specially, the Contractor's conception of resource (e.g. Time). Overall, all these tools seemed to have helped the Consultancy Team to answer questions addressing key objects in the activity as: how long it will take? (Time) how much it will cost? And how much we will be paid for that? (Money)

**Objectivation: *Web-based Document Control System (Infrastructure) – Full Project***

In addition to these tools, the Contractor had put in place a Web-based Document Control System, called *Full Project*. According to the Design Manager (Contractor):

> *"Digital wise? Yeah! We use a Web-based Document Control System, I suppose that this what it is… it is called Full Project, if you come across it… it essentially, drawings are uploaded onto the system, and they go into workflows where depending on what the drawing is… and it has to be uploaded on the right workflow, otherwise it all goes wrong… …Let's say it is an Architectural General Layout, that will come to Morgan Sindall, for us to review it, … so, we will than review it, and if we are happy with it, we will approve it through the system… it is like a "traffic light system", so it goes on… …initially, it just got a "cue a check", it's little more than…Is it uploaded right? Is it got the right way up? Is it got the title block on? Is it got the right number? The date? …You know, all that sort of stuff... Once it has gonna through that process… It is than released by the Document Controller, and the Wider Team review it, and ultimately, the Design Manager votes… But, it is not possible to get other people… You can't have everybody voting in it, cause it wouldn't work… So, one person is responsible for voting… But I have to make sure that before I cast that vote, I have consulted with everybody else… and if we are happy with it, we approve it… and it goes Green, and that is approved… And (inaudible) goes back to the Architect, he knows that drawings has been approved, so he will (inaudible) to Construction Status and they can build to it…" (pg. 10)*

This system was based on set of "submission" and "review" tasks. The reviews were mostly done by the Design Manager (Contractor), which could "approve" or not these contributions. According to him, the web-based document control system had a "traffic light system" indicating the current state of these tasks.

> *"Yes, there is! It is not that brilliant to be honest. You don't get a visual… You can see a Workflow, but it doesn't really do much for you… What you need is of the "traffic light" just to tell you what Stage of drawings…"*

There was also what he called the "*Document Controller*", as an assigned role for the individuals responsible to "release" the document evaluation. The Design Manager (Contractor) was responsible for voting (i.e. assessing these documents and tasks). According to him, before he could "cast the vote", he would make sure to consult with everybody involved. One of the major criteria for this evaluation of drawings was related to if they were ready to support construction (i.e. feasibility and constructability aspects).

The visual aspects of *Full Project*, as a "workflow" system, was based on a "traffic light" scheme, that was actually a web-based *spreadsheet* with: *drawing number, date of upload and revision number*. The aim, according to the Design Manager (Contractor) was to reach what he called *Construction* Status, in which the design was considering "done" and construction could start, or in other words, the conception of Building Design was done and the Building realisation could start.

> *"Yeah! Pretty much! It is a Web-based Spreadsheet... So you see the drawing numbers, the date it was uploaded, the revision number, and then the "Traffic light" tells you what the status is at... And we need to make sure that before we build anything, that we have got it to Construction Status (Could this be related to the idea of "Systematic Completition") ...What you can do with the system is, although we are not particular good in doing it, because the Design Team don't like doing it, it is the bottom line... Is using the system to comment in each other's drawings... ...They tend to do it old school by just emailing this, and saying: "Well, what do you think of this? What do you think of that?" (pg. 10 and 11).*

In this case, what Design Manager (Contractor) considered to be a ***workflow* may probably not have been interpreted in the same way by other Consultancy Team members**, since he was referring to a spreadsheet. Design Manager (Contractor) suggested that ideally the system should have allowed to insert comments in each other's drawing, as way to register communication (legal consequences), substituting emails and other "informal" interactions:

> *"It is difficult than to control it... Yeah!... So we had to rely on the conversations on the Design Team meeting to record that... Cause the Architect will send something to the Structural Engineer saying: "This is where I need that column to go...", and it will be as a PDF sketch or whatever... you know what I mean... That works OK, but it is difficult to control it... But with the Full Project System, I don't see how you can do that... ... What we should be able to get to is using BIM to manage it better, cause than we will got a multi-filling process, and we haven't adopt BIM on this yet... But we are contractually obliged to it, we are gonna bring that in for the Stage 4... ...The only reason we haven't brought it in now, is that we have been working at risk, because it is not actually a live project. Yet, haven't been paid any money so,... our directors were saying: "We are not paying for a BIM manager and BIM model" ...cause... you know... "if the job goes away... and we spent extra a hundred thousands of pounds... and we got nothing to show for it"... And now that we've got a "Live project", if you like... or at least we've got the Pre-construction Service Agreement, we get the authority to spend the money, so... ...We are gonna get the BIM model, we already actually got a BIM model from the Architect, and a BIM model from the Structural Engineer, but nothing yet from the Service Engineer... but we are*

*gonna bring them together, "Federate it" together, and than we will do a formal clash detection... and through that there is a different workflow process, which I haven't used myself yet, but I am getting it through "Full Projects" and it should be more formally recording how the approvals will be happening... It haven't be things going behind the scenes it should all be through the model, where is, in the moment, a bit of "hybrid system" if you like... ...Formal approvals have gone through on the system, but actually the "nuts and bolts" to get on the drawings and the position where... where we are in a position to approve if you like, it have happened through the emails, which... It is the way it has been like that for quite some time... you know... People tend to do, what they are used to do, and that... (pg. 11)*

However, in reality **informal interactions represented challenges for the Contractor** because they are difficult to control. The emergence of those informal interactions represent a danger, from the Contractor point of view, because it could lead to **misunderstandings.** So, if someone "sneak through" a decision that was not shared with others, it could lead to situations that the course of actions "do not comply with the spec". Thus, according to Design Manager (Contractor), one way to avoid these "uncontrolled" interactions, was to concentrate this discussion within the *Design Team Meetings* events. In those events such the result of such interactions could be registered:

*"...But, it does have its dangerous, because it can get misunderstandings..." "Yeah! What we don't want is someone just to "sneak through" in a way it doesn't comply with the spec or we can't afford. Because then, when it does happen, we got to hand over the plans, and you see: "What the hell is that? That doesn't comply with the spec..." and we end up with a "snag" in the end of the job and someone will have to wipe out for whatever reason... so we clearly want to avoid that... (pg. 11)*

For the Architect, the *Full Project* system was seen as a repository with all '*up to date*' drawings of all Consultancy Team members. This could be seen as a set of all Consultancy Team's objectivations in relation to the Building Design. The system had an automatic override of old conceptions, which were saved in a unique place, in the cloud, and everyone could access that. According to the Architect:

*"So, we used "Full Project tool", where all our drawings and everybody else can download... When you upload your drawings it overrides the old issues, so... rather than email, everybody own drawings they are all saved in one place in the cloud... Everyone can go and access..." "...CONTRACTOR. The Contractor hosts that... that document control as... What we will be doing in a late stage is using programmes like Navisworks for coordinating the building and undertaking some sort of clash detection... (pg. 15)*

Interestingly, the Architect recognised that the system was under the control of the Contractor. He also indicated that it allowed then to set the ground for a BIM environment, which can be more efficient, enabling coordination to be done faster and sooner:

> *"I mean, BIM helps doesn't it? I mean it makes things a lot more efficient… I don't know if this is going to be one of your questions, but… All the sudden is everybody working in the BIM environment, it makes the thing much more efficient, and it enables us to coordinate faster, so than we can test…" (pg. 11)*

**Objectivation: *Design Team Meetings – Events***

According to the Design Manager (Contractor), at this instance of the Building Project activity, his role was to facilitate discussions between members of the Consultancy Team (i.e. Architects and Supply chain), and make sure they performed in the task:

> *"Yeah! I mean… I will facilitate discussions between the Architect and our supply chain, to make sure what the Architect is thinking can be delivered… and then, as an aside of that we want to make sure this sits within the Costs Plan... ...So that is what is really key! There is no point in start drawing something, showing it to the client, and the client says: "Ow, yeah! That is fantastic!" ...and then, when we actually cost it up, it is 10 million pound off the budget and we got back and actually say: "Ow sorry, we can't give you that, and it's gonna have to be this cheaper version" ...so, that realistically is the key from my point of view..." (pg. 03)*

So, he used to measure two aspects of individuals' interactions: (1) capacity - can it be delivered; and (2) is it within the *cost plan*. It seems that these events were supposed to support the construction of mutual intelligibility and compromise within the Consultancy Team before their overall conception of changing action, in terms of Building Design proposal was presented to client.

However, from this argument, it seems that it was not a particular concern of the main contractor the conception of a *Production System*, and how the Building Design proposal was affecting the Building Realisation tasks. At least this didn't seem to be perceived as a responsibility of the main contractor – that was something relied to the sub-contractors, indicated as the 'supply chain', by the Design Manager (Contractor).

Moreover, according to the Design Manager (Contractor) there was another important condition leading to the conception of the *Design Team Meetings*, which were '*Geographic Issues*' regarding the Consultancy Team assemble, that potentially would affect their performance in this project. The Consultancy Team was spread across the North of England.

Thus, from the Design Manager (Contractor) point of view, these events seemed to have been conceived as an artefact, that also helped to overcome the geographical issues limiting team members' interactions:

> *"… otherwise, it has been just a matter of… it has been a few Geographical issues, because of the Design Team is spread across the North of England… Yorkshire, particularly… We are based in Leeds, the Architects are based in Manchester… …most of the Design Team live in Manchester to be fair… we've got the M&E Consultants in Manchester, the Acoustician and the Fire Engineer they are in Manchester, The Structural Engineer is in Pontefract, so… It doesn't sound like is a big issue, but when you are trying to get people to a meeting… it always like: "Where it is gonna be?" …you know… "Can we do it the other day, cause I am struggle with…" …Because if everybody… you know because really successful projects worked when the whole design team being on the site… you know big civil types project, with everybody being in a big one cabin… that would have worked pretty well, you know… because the Structural Engineer if he's got an issue, he just shout to the Architects over there… Where is at the moment, you have to drive over to Manchester… having said that things are getting better now, with Skype and that sort of things… …Skype meetings are never quite good as face-to-face ones, but certainly better than what they were 10 years ago… and these sort of things when you share the screen and look up at things together… these sort of things they certainly help…. But, yeah!! I would say these were the two really big issues… I think biggest ones have been the Commercial side of things and a bit of just geography as well…" (pg. 13).*

According to the Design Manager (Contractor), they struggled to compromise and conceive these meetings (i.e. *when and where to meet*), which seemed to have been affected by the perception of resource, that the team members were willing to contribute in the activity: *time for travelling, duration of the meeting; money for transportation, etc*.

Furthermore, from the fragment above, it seems that for the Design Manager (Contractor) his perception was based on comparing the *Design Team Meetings* with his ideal of 'successful projects', in which participants of the consultancy team were all together on site working on the project in an intensive interaction (e.g. maybe based on his background experience). According to him, the potential benefit of a '*co-location*' situation would be that project issues would be quickly resolved. He mentioned that, at that point, '*people have to drive to Manchester*' to be able to discuss project issues. This indicated how his conception of resource, as the *Time* spent driving to the meeting place, was affected by the current arrangement of the Consultancy Team assemble. He suggested that this could also be balanced considering alternative conceptions for *meeting*, via Skype and other virtual means. According to him they

are never quite as good as face-to face, sharing the screen and look up at things together. Thus, at the end of this fragment he indicated that these type of events (i.e. *Design Team Meetings* and also the *Design Workshops*) seemed to have been conceived also as a way to create a forum to align the '*commercial side of things*'.

So, for the Design Manager (Contractor) the *Design Team Meetings* complemented the role of the *Scope of Services* in supporting his task to 'control' the interactions of the members of the Consultancy Team. Through these *meetings* the Design Manager (Contractor) monitored how the Consultancy Team was performing. This assessment seemed to be objectivated, in terms of interactions to produce and evaluate *Reports* against documents (e.g. drawings) and their delivery on time, which was linked to the IRS (Information Requirement Specification). As the Design Manager (Contractor) indicated:

> *"Yeah! We control it through that… and through the Design Team meetings we monitor how the design team is performing… so we ask them to do a report against those documents… it is mainly against time that we are looking at, so… The IRS (Information Requirements Specification) will say I will be producing these drawings by this date… than we will ask for an update… and they will say: "Yeah! I am down to deliver these drawings in two week's time, and I am now on 50% of the way through it, and I need this information from the other parties to do it, in order to achieve those dates" …So, it is really just to make sure that there is no "blockers" … and that If there are any blockers, than we need to "unlock" them as quick as possible… Cause the last thing we want is wait for the day and nothing happens, the information…and then: "Ow, I am waiting for him to give this"… You know… because that ain't gonna work…" (pg. 10)*

Thus, during the *Design Team Meetings*, individuals updated the Design Manager (Contractor) on their tasks related to Building Design and indicated possible "lack of information" to accomplish these tasks. It seemed that in such events, interdependencies among team members' interactions were revealed and expressed (i.e. **Breakdown**). For the Design Manager (Contractor), his role was to remove emergent '*blockers*' in these interactions (e.g. '*don't leave participants waiting*'). Interestingly, this also indicated how the Consultancy Team (and each its members) was constantly repositioning their perception of the performance as a *team*, against an equivalent perception of their expectations over individual members in the team.

Another key aspect of these events, seemed to be related to the meeting dynamic. The Design Manager (Contractor) said that he was chairing the meeting, but the Architect was the *Design Leader*. So, during the meetings the Architect seemed to be the one to led most of the discussion

around the conception of the Building Design, and how it required coordination of the individual team members' conceptions. Then, the Design Manager (Contractor) seemed to have been concerned with managing the overall tasks:

> *"Yeah! I chair the meetings… but in terms of the Design Lead, it is the Architect that leads, essentially, he understands "the nuts and bolts" of how this all works together better than me, I got an overall view of the process and I know who is doing what, but in terms of will something fit in? …you know, he is operating the CAD, he knows exactly what the issues are and he also lead in that…" (pg. 02)*

From the Contractor organisation, besides the Design Manager, another members participating on those meetings were, the Planner and the Estimators (02 Estimators). So, for the Design Manager (Contractor) this is a "high-level" meeting:

> *"Yeah! Well, again, the Design Team meetings have all the designers present, we also have our Planner, and we got ours Estimators there as well, so than everybody knows what is going on, what the key goals are…  …but, when it get… Well, generally speaking we have a Design Team meeting, that is a high-level meeting if you like, where we review the Brief, and then we will review where we are mainly in the Programme, I read what the deliverables and what takes to even by, so what … "how you guys doing?"… And so, we just go around the table and, each designers reporting on the Programme: "This is what I should have done by now… This is what I actually done" "**The reasons I haven't met the dates is, because of**… this has happened and that has happened, and I need this, this and this of these people" …And we go around, and then everybody will than understand what everybody else issues are, and we agree… plan if you like… what is something in reality, let's just… I mean agree in a plan… "How we will get back on time, if we lost any time"…Well, it may well be that everything is "roses in the garden", but this is rarely, usually there is always something going on…" (pg. 05)*

The Planner and Estimators have supported: the review of the *Project Brief*; the review of the *Design Programme* (current stage and participants reporting on the programme (e.g. reasons for not accomplishment and further needs); and the review of the *Deliverables (*e.g. what takes to deliver those). Thus, according to Design Manager (Contractor), the responsibility of the Planner is to put the programme together by facilitating the other participants' interdependencies (e.g. documents and time seen as resources within the team). This programing task started with the University's deadline for building to be delivered (i.e. *Time* as a resource for the client). So, as the *Price Submission*, was the last task of the Consultancy Team at this instance of the Building Project activity, the programme was conceived

backwards, considering the deadline for this last task. According to the Design Manager (Contractor), this was a '*two-way process*':

> *"Well, the Planner will put the Programme together, but he is really facilitating what all other members of the team are looking for... We obviously got deadlines to meet for the University, which is the ultimate driver, they will say: "You will submit your price by...X date" ...So we gotta work back from that... There is a two-way process where we will go to the Design Team and say: "Right! This are the deliverables we need to do... How long it is gonna take you?!" ...So it is a two-way process, if he says: "I need six weeks to do something", we are not gonna show as two weeks in the programme, because this is not achievable... So, there is a dialogue to agree the Programme, should we say... and, indeed, the deliverables and as well, are also the Scopes to be agreed as well... Because in that there are two issues: because everyone needs to know what they are doing... because there are certain elements where there is overlap... because of that there is something going on in a bit of what he is doing..." (pg. 06)*

These interactions seemed to have involved a dialogue to agree in the "Programme". Moreover, it seemed to emerge as **a dialectical process** in which, the deliverables (as the Scope of Service) and design programme are mutually conceived as two polarities of an object. Both, seemed to have been, respectively, addressed by questions as: how much time the participants need to accomplish that task? How much time do we have to accomplish these tasks? Such interaction seemed to have led to compromises on the conception and application of resource: *Time*, which may have involved the re-conception and agreement of what the deliverables were, defining the *Scope of Services*.

The Architect mentioned that one of things addressed within the *Design Team Meetings* was the ***Design Strategy*** for the initial conception of the Building Design, with the development of four different design schemes. According to the Architect, they have presented these schemes providing the '*Pros and Cons*' (explanatory actions) to inform other members of the Consultancy Team:

> *"...So, we gave them Pros and Cons, that helped inform them. There is a lot... So, because we had that dialogue as a Team, we were able to come to Engagements and present it as a Team. And we would talk, Jim and I would talk, and then the MEP Engineer would talk as well as with ASSOCIATE DIRECTOR (Estates Department) and the rest of the Estates Department." (pg. 06)*

For the Architect, the interactions to present and discuss the properties and the individuals' interpretations of those alternatives as a team allowed the construction of an "alignment", before they presented these to the Operational Panel (i.e. the Client):

> *"…So, it is very important that… you know, the M&E Engineers and Structure, and even the Fire Engineer had to start to get involved by Engagement 3 (Probably referring RIBA Stages). We have got the Fire Engineer appointed and he was looking at potential issues with the Design Solutions. So turn up saying: "Well, that is not gonna work! Because, you never gonna be able to get your means to where the escapes were, and you got 300 people on that floor." Say: "You got an "arm" that Cantilevers up here… and why you can't"… you know, in Fire perspectives, they like people to be able to escape this way, and like people to be able to escape that way… Well if you got nothing under here, you can only escape this way… So, that limit the amount of people you can have in that room, so…   So, that is really important, actually, that all this designs just got "chocks" on the table and everyone just feed until we know what worked for them and what didn't …and, you know… it is interesting that…" (pg. 05)*

The early engagement of the other members of the Consultancy Team on these meetings, as well as, in the Engagement Meetings (with the Operational Panel) was important. According to the Architect, his expectations about the other members (i.e. Fire Engineer) was for them to look at potential issues within the Building Design proposals presented. So, from the Architect perspective, it seemed that the role of the other members was mainly to assess the conception, and not necessarily be responsible for the conception. However, through dialogue, the *Fire Engineer* seem to have **explained the reasons why** that solution was not efficient from the perspective of '*fire escaping*', which then seemed to have led the Architects to re-conceive the Building Design **to resolve this conflict**. From the Architect fragment above, he mentioned that the Fire Engineer made suggestions on how that could be resolved in the existing Building Design proposals. This led them to conclude, that if that aspect of Building Design remained like that, that would affect another aspects of the Building Design, like the amount of people they could accommodate inside the building. Hence, through the Architect's comments it was also possible to notice the use of **metaphors, to describe the cantilever as an '*arm*',** helping to achieve *mutual intelligibility with the researcher* in the interview.

So, during *Design Team Meetings*, these conceptions of the Building Design, were objectivated and put on the table to everyone interpret in the context of team. In these interactions, team members tried to influence in which ways they would like the conception of the Building Design to develop. This may have indicated the argumentative nature of project interactions. The Architect mentioned that they didn't want to '*hide any fact*'. They wanted to measure it against the Client's perception over the Architect's argument of the pros and cons on those alternatives. Interestingly, the pros and cons could also be seen as an indication of the objectivation a *Value System*, that the Architect believed it was relevant for the client, taking

into consideration, for example, the *'amount of people in the building'*, *'flexibility of space for future changes'*, *'efficiency of energy consumption'*. In the context of these meetings, these aspects had to be presented with the reasons (i.e. explanatory interactions) why the Architect saw that as positive (what are the advantages?), and the same for the negative aspects (what are the disadvantages? For example, it *'cost more to do it'*):

> *"... Yeah! So, people will try to influence basically in which ways they would like the Design to go, but ultimately it did come down to the... what the Client wanted. Because we had to present these back... But, we even came with a Summary of all 4... we gave them pros and cons, so didn't hide any of these facts. We would say: "Positives are... You can get more people in this building... More flexible in the future if you want to make the building bigger... You can get more people in it, because this got more "stairs closed" (inaudible)... Disadvantages are... you know... it's gonna cost more to do it, because it got more "stairs closed" cause... ...the MEP is going to work better on this one, so it is more efficient... it is gonna easier to light it... because it is more glazing, so you can get more natural day light in there, and it is probably going to be cheaper to run, you know more energy efficient."   (pg. 05)*

## Objectivation: *Design Workshops* - *Events*

*Design Workshops* were events conceived to resolve the emergent issues related to the conception of the Building Design (e.g. building details) between members of Consultancy Team. Most of the time those events involved the Architect and members of the Contractor's supply chain (e.g. the Cladding Contractor). According to the Design Manager (Contractor) these were half-day workshops in which the supplier to provided more details to the Consultancy Team:

> *"Through the Design Team meetings the Architects and design team will be taking their actions away, but the Supply chain, unless we specifically invite them, generally not the Design Team meetings, but to the Workshops... ...so you might identify in the Design Team meeting that the Architect in order to progress theirs design will need a Workshop with, let's say it is cladding contractor to work up some details, so than we have a half day workshop... and then out of that workshop, the Architect will say: "Well, what I need to know what is gonna happen in here? What is gonna happen here?" ...and there will be an action for the supplier chain to provide some details... and in some cases, they provide the details themselves, in other cases, they would know who they will gonna go to for the cladding... so they actually got the manufacturer and say: "How would you fix this particular cladding in that scenario?"...and I will got a detailed prepared and they all sort of will be fed back in through the... well, through me, basically... to the Architect... (pg. 09)*

So, a series of *Design Workshops* were conceived to make a more efficient use of the Consultancy Team's time, allowing more focused discussion to be developed. In this case, the emergence of the *focus* of these sessions was key, because it emerged from what the team members objectivated as their perception and/or conception of what was relevant and interdependent among some of them. As Designer Leader, with a coordinating role, much of these focus emerged from and involved the Architect's tasks in the Building Design:

> *"…And then from that, we will schedule a Series of Workshops, cause usually when you go around and say to the Architect: "What do you need?" and They say: "Well, what I need my Structural Engineer to size his columns and beams, and whatever" …So we set-up a series of Workshops of the back of that, cause otherwise is not an economic use of everybody's time… You know if you got the Structural Engineer sat there, listening to a discussion about Air Handling units, he is not interested in it… he doesn't got much time to do it, so… …also to silo people off and to make sure that they come back together… sufficiently frequently to make sure that nobody else goes off and does something that doesn't work… and it just kind of… taking a step back… (pg. 05)*

## ENGAGEMENT: INTERACTIONS AMONG CONSULTANCY TEAM AND CLIENT TEAM

**Objectivation:** *Engagement Template (Document Exchange, Meetings Structure and Feedback)*

According to the Design Manager (Contractor) the *Template of the Engagement* with the Client (e.g. document exchange, meetings, feedback) can be a bit frustrating sometimes:

> *"Well, that is part of the problem, because it gets a bit frustrating when people think they understand the Brief, and then maybe the clients brief may not be well defined, and hasn't it communicated very well… So, the Architect will go away, …and haven't that here, but I had this on in numerous school projects, in particular where you get very frustrating because there is a lot of stakeholders in the process in the client side, and you get conflicting information, you get to one meeting with the School and they say: "Yes! That is what we want!" …and there will be a discussion, and the Architect will sketch it all and say: "Is that the kind of thing?" and they will say: "Yeah!" …and they will go away… and then they will present it to stakeholders, who look at the finances and whatever and: "Ow no, no, we can't do that, we can't do this" …and the Architects go: "What you want me to do" … "I got these guys telling me to do this… I got you telling me something else…" …It can get quite frustrating!... and it does lead to a lot of reworking, and obviously, reworking is costing me money and time…" (pg. 08)*

In this case, the Design Manager (Contractor) suggested that this didn't happened on this project, but specially in school projects where can exist a lot of stakeholders on the client side, "*conflicting information*" can emerge. Hence, he suggested that this can happen when "*people think they understand the Brief*", or it may also be the case that the "*client's brief may not be well defined, and hasn't communicated very well*".

Such comments may be seen as an indication of the Contractor over reliance in the role of the *Project Brief*, and its capacity of objectivating the Client's conception of change. In addition to these, he seemed to suggest that '***conflicting information***' may be emerging due to contrasting feedback (i.e. contradictions) within the Client's Team. In this case, the School may have described what they need, but then another member of the University's institution, which is responsible for financing, may look at the cost and say that they can't afford that, putting the Consultancy Team in a difficult position (i.e. frustrated), leading to 'a lot of rework', and costing more money and time for them.

The Architect seemed to have a specific strategy to present their conception (design proposals) for clients, and avoid these type of conflicts. According to the Architect, they tend to act as a "double" when presenting a Building Design proposal:

> "*That is how we do all the presentations… we kind of act like a "double" …But I kind of answer questions and focus on technical aspects like fire issues or acoustics, and then CHARLES will be talking more about the Architectural Vail and where the Concept came from… and… yeah! I mean, we presented these to the all Staff on Monday actually… and it was like an open day so we were the "X" Building presenting the Scheme to all the Staff so all the Staff gonna get a feel of the Building.*" (pg. 01)

Based on the division of roles within the Architects' Team (usually established by the Architectural Organisation), one assumed the role of 'technical leader' and the other the role of 'concept leader'. So when they came to engage with the Client, each of them was concerned in presenting and answering questions related to different aspects of the Building Design proposal. Technical aspects would be *acoustics* for example, and Conceptual aspects would *the architectural vail*.

So the Architects were the ones leading the *Building Design presentations* for the Client Team. In these interactions, different assembles were representing the Client as the project activity moved along. The first engagements involved the *Evaluation Panel*, then the *User Group* was engaged. So, in this context, in this **First Engagement Meeting,** as an event conceived as part

of the formal process of the *Project Template* by the Operational Panel, the Architect acted in a way trying achieve mutual intelligibility, in what he calls *'testing the Brief'*:

> *"...So when we start reading the Brief, we could kind of think about, how we could respond to that... so when we met in the First Engagement, we already had, we were basically testing The Brief, you know what I'm saying: "How do you wanna this space to work?" "Do you want to be quite open?" "Do you want views of different people working in different environments?" "Do you want everyone to be not in your own space, but working in a... ...collaborative environment... but, enabling that cross (inaudible: virtualisation) of ideas..."*

He described his **questioning behaviour as way to get confirmation** from the Client about the way they, as the Consultancy Team had understood the Project Brief. So, this can be seen as a kind of assessment of their shared objectivations, in which their Value Systems become also objectivated embedded in the framed questions. For example: "*How do you wanna this space to work? Do you want to be quite open?*"

In the ***Second Engagement Meeting***, the Architects presented the four Building Design options. Once again, the Architects' approach was what they referred as a '*test*', in which they evaluate the Operational Panel reaction to the four Building Design options as different ways to interpret the *Project Brief*:

> *"...So, we already have that, and that is what we worked with in the First Engagement, and then it grew from there, so about the time that we had the Second Engagement, we came to the table with 3 or 4, putting forward 4 Design options... ...which we could than test with Mike and the States Department in terms of the approach to the Brief, each one it was quite different as well, so... The way we approached in the office was, we almost had 4 different people (inaudible) ideas in different ways, and then they kind of... we kind of talk about them as a Team, but... By doing that you end up with four different... quite different approaches, and we could "table" that and get... you know.... Test that with the Client and get a feel for which one is kind of working for them, and which ones weren't... Is this what?" (pg. 03)*

When the Architect mentioned that they '*tabled*' these options, it seemed that it referred to them objectivating their conception, and expecting the Client's Team to respond on that as way to "*get a feel for which one is kind of working for them and which ones weren't...*". It may be the case that the ***Engagement Strategy*** conceived by Consultancy Team, was the way they found to respond, in a **dialectical process**, to the way the Operational Panel established, through the procurement method, the *Template of Engagement with the* formalisation of

interactions between Consultancy Teams, as competitors, and the Operational panel, as the Client:

> *"Yeah! Absolutely! You need to do that from the start... Because what you don't want is to push the Design on and then end up... you know, three weeks down the road, and you only got 6 Engagements, and then end of Engagement number 3 or 4, you find it that they don't really like it. You can't really do anything about (inaudible) so you go back to the drawing board than, and you are in a mess...  (pg. 07).*

In total there were 6 Engagement Meetings, between Client and Consultancy Team.

From the Client side, the Staff Member saw the ***Engagement Template*** as limited (i.e. the way it was objectivated), especially, because on her perspective it was not valuing the potential contribution of the School Staff, which was only allowed to get involved in the *conversations* too late in the project:

> *"...and then, obviously, the Design was done behind closed doors..." "...and apparently those Competitors Tendering the process... whether was... ..I think two or three companies, in the "short run", however, two dropped down... and it is just one company involved in that... and at that Stage, we were shown the Design, for the first time... but I felt sometimes at that meeting that a lot of the design had already been decided, and certainly the exterior has been, so to speak, finalised... and didn't seem to dictate a lot of movement in the interior layout at that stage... or quite close they were like... "You couldn't play that... or... You can't do that"... It looked quite restrictive in the way how much we could influence or change that design..." (pg. 02)*

So, after their contribution in conceiving the *Project Brief*, The School Staff was only brought back to engage again in the Building Project activity, when there was only one Consultancy Team remaining in the competition. At that point, the winning Building Design proposal was presented to an assemble of School Staff Members, which would then become the first version of what the Dean called the ***User Group***. This *assemble* was supposed to assess the Building Design proposal and provide feedback. According to the Dean, these particular members of the School Staff **would have more capacity to perform this evaluation**, since they would have more experience with the final user of the New Building: other School Staff and Students.

However, the Staff Member overall perception of the way these *Engagement* interactions were objectivated was negative, because she felt that the Consultancy Team was too restrictive and not open to change:

*"I felt sometimes at that meeting that a lot of the design had already been decided, certainly the exterior has been, so to speak, finalised…".   "I think it has been very much… a "drip fed process", rather than an ongoing engagement, I feel… we were given a little bit of information, a little bit of feedback… although that feedback could not be taken up that far… and they suddenly get the most down the line you see something else, and you never been involved in that… in the evolution and discussion… So, in some ways… I know it has been frustrating for some staff, particularly the Architectural Staff, because I feel that they could have benefit of this process a lot more… and I feel like… You know… if they could engage a lot more, some of the decisions we could got it right… you know?" (pg. 02)*

In her opinion, some staff members were frustrated, particularly the Architectural Staff, because they thought that the Consultancy Team, and even the Operational Panel could have benefited of their contributions based on their experience with this king of building project. Thus, her level of dissatisfaction with the *Engagement Template*, even took her to question the quality of the Building Design proposals: *"some of those decisions we could got it right…"*. This type of reaction could have been influenced by the Staff Member implicit assumptions about the *Engagement interactions*, which may have led her to compare the current Building Project activity with traditional construction project templates, which usually rely on a much closer engagement between Client and Consultancy Team:

*"You know …It is a very weird relationship, because obviously not everyone can have a say… because you can never make a decision where everyone gets involved… But I do feel as a Team, I think we could have more as a say, or more of involvement or feedback..." (Pg. 04) "So it is just necessary this ongoing engagement, which we haven't had at all… and like I said I haven't seen a second version of the plans. …I just have been told that it was moved, which is great, but I can't tell you if anything else has moved… and who is next to what… (pg. 07)*

According to the Staff Member, the *Engagement Template* could have been changed:

*"I think that is very simple to fix… just more like regular frequently engagement and meetings with the Architectural Team… than, if we were able to see the design regularly or at least have details sessions where we could feedback to them or with them, we all want the building, we all have the same angle, we all want it to be fit for purpose, so why don't we work more collaboratively together... It's just seems like them with us is like being a pain or… it seems like the design inflicted on us, rather than… You know… maybe people will never build in their lives, but to give that brief, what we all know how… it was all reasons for us to criticise, but we all wanted the same solution but… even if they took a day, or two half a days, or rush some regular interviews to meet with us the users, I think is so important and vital… and also, it is just not…*

*cause I completely understand that not every idea can be taken on board but if we can understand how these decisions were made and evolved, than we can accept it... You know... Because we know that "OK!" ...For example, if I understood why the PGR room have to be open in planning and, for example, there is no other possibility etc. Perhaps, that is way I could have accepted... or, you know... were there... if I could come up with some more creative solution to support that... and that wouldn't be an issue... but it's not being a very engaging process... to say the very least to be... quite frankly." (pg. 05)*

Overall, the Staff Member indicated that, both Consultancy Team and other Staff members would have benefited from more engagement and feedback on the Building Design proposals. For example, the following fragment shows how in her perspective this could have helped them to reach mutual intelligibility:

*"I completely understand that not every idea can be taken on board but if we can **understand how these decisions were made and evolved, then we can accept it..."***

Thus, this also indicates that the **misunderstanding** may have emerged because of the way *Engagement* was objectivated. In this case, Staff Members may have become aware of the conception of the Building Design proposal, but they may have not understood why that was conceived in that specific way.

The Dean seemed also to have had issues with the way *Engagement* was objectivated at this instance of the Building Project activity. In this case, his criticism was not directed to the Consultancy Team, but to the way *Engagement* was objectivated in terms of *formal interactions* (e.g. Document Exchange):

*"...and then...so we arrived at the point of me to be more involved in the meetings... but at the point I was still raising two issues..." (pg. 04) "I used to get the design sent by email... I used to go through the design and arrive on the day, it was called the Discussion, and it was part of the formal process. ...and it was the meeting that the Consultancy Team used to run, so basically it was their agenda, we were there to be shown the work and not to tell them anything specifically... so they used to come in say "this is what we want to show you" ...they used to start with an overall thinking and philosophy, moving to the designs floor by floor, identify some of the solutions, they have to present their work plans... so the production plan and... is that achievable? Can you they do it within the time scale?... and cost plan... they had to show the choices of different materials... All those things carry cost implications... you know..." (pg. 05)*

The *Engagement*, as a formal process, started with the Dean and the other members of the Evaluation Panel receiving the initial Building Project Design proposals via email. This first

interaction with the Consultancy Team conception of the Changing Actions in the Building Design project did not had an additional support from Consultancy Team verbalisation (i.e. discourse) to present and explain the proposal and develop a dialogue with the Client Team. According to the Dean:

> *"It was three (3) months… and at the beginning…and that is worth noting in terms of "common understanding" …I wasn't part of those discussions with the Consultancy Teams… but I used to get files in terms of designs and other things… "do you any question about this or about that?" (pg. 04)*

Then, later on, the Dean was invited to take part on those *Engagement Meetings* (i.e. *Discussion*), as part of the *Evaluation Panel*, when he watched the Consultancy Teams' presentations and could not comment in anything specific about their proposals, in order to not hurt the fairness of the competition. Hence, questions and comments from the Evaluation Panel were more around the feasibility of the proposals, involving mainly time, cost and material performance.

So, the *Engagement Template* was conceived in such a way that the interactions between the Consultancy Teams and the Client Team could happen through the exchange and presentation of documents. This was something that made the Dean uncomfortable:

> *"…and then came a point, in October, I think it was November, where they wanted me to commit in being happy with something without me having a conversation with teams about what they mean… on which point I refused to sign off the designs, which than kicked off a process about me being part of the committee that looked at the design development…" (pg. 04) …and of course, than through that we almost had to kick start the process again… because some of the assumptions that they were making they were wrong… other were all right… but some of them were wrong…" (pg. 04)*

In this case, the Dean was supposed to **Sign-off** the Building Project Design proposal, which he refused to do so. It seems that his conception of Changing Actions at this instance the overall Building Project activity was in **contradiction** with what the Consultancy Team and Operational Panel had conceived. Thus it led him to work with Operational Panel to reconceive of the ***Engagement Template***, in which then the Dean became part of the committee that looked at the Building Design development.

The Dean's role in these *Engagements*, was of a key 'Client' within the Operational Panel. His input changed the operation of this team, and consequently affected its conception. According to Dean, this led to a lot of rework in the Building Project activity:

*"we almost had to kick start the process again"*.

Also, for him, the previous *Engagement Template*, led the Consultancy Team to make some **wrong assumptions** about what the School needed and wanted, in terms Changing Actions:

*"other were all right… but some of them were wrong."*

All these comments from the project participants, including Consultancy Team and Client Team, showed how a certain aspect of the Building Project activity, in this case the *Engagement* was objectivated and interpreted differently causing misunderstandings in the situation, which eventually, led to interactions to reconceive the *Engagement Template* in order to improve participants' perception of development.

**Objectivation: *Building Design proposal – Concepts and Sketches***

*The Architects interpretation of the Brief and the General Conception of the Building Project*

The Architect's description of his conception of the Building Design proposal was highly based on the reference to existing buildings, that were visited as part of the *Roadshow* events described earlier. For him, those were exemplar cases of 'success', and he seemed to use this reference as way to find mutual intelligibility with the researcher based on a shared experience. Based on the documentary evidence identified (e.g. The PowerPoint document the Consultancy Team used to present at the *Engagement Meetings*), a similar approach, seemed to have been adopted by them in presenting their conception of the Building Design proposal to the Client Team. **These explanatory interactions** (i.e. **breakdowns**) seemed to have helped them in persuading the Operational Panel towards the way they objectivated of the aspects of the Building Design proposal[13]. For example, he suggested what would be a dialogue among students and School staff using the space. He also used a comparison with the current situation to build his case on the conception of the new building:

---

[13] It is key to consider that the Architect's interview happened after the final concept for the Building Design proposal was submitted, and this not necessarily represented the Architects initial perceptions and conceptions in the Building Project Activity.

*"I'll try, but this is more CHARLES thought…(laughter) …So, you probably want to refer back to that way, where you… But, essentially the Concept was for… well from… basically taking words out from the Brief document, so… Interdisciplinary learning, collaborative environment, sort of "cross virtualisation of ideas", so sharing ideas, so… Concept to the Building was all about being very opened and… very much… being able to… get views across and see what everybody else is doing, so you learn often from people… So it might that be that the COURSE A person is coming across the people making Architectural models… And what we've found when we went to "Reavenburgh", for example, in London, was the Model Room, it didn't have COURSE A with a model making area, and COURSE B model making area, and COURSE C with a model making area… Was everybody with one model making area that everybody went to… and by pulling the resources, it means that you have much better equipment in there… So, that everyone got much bigger pile of money to buy equipment and don't need as many Technical Staff, because they can all just be in one place…  …But the real advantage was that, you mixed up all this people, all these different skills set… Somebody is in there making the models, for an COURSE B model and then walking across he sees somebody with a certain fabric and says: "Well, that is an interesting fabric… What are doing with that?" and "Well, I making a dress of it…and this fabric does such thing"… "And what if you go on your model?"  …All the sudden, everyone is talking, everyone is helping each other… and you might think: "I don't actually… I don't mind being able to use that fabric on my building, cause that works really well, as something as "TFT roof type" thing, but I don't know how to use it or…" "Well, come over here and I show you…"  …So, everyone is learning on the back of each other… and I think that is the essence of what the building is about… is getting everybody… At the moment you are all in the "Examiner Building" or spread around, and there is not that opportunity for people to cross pass of each other and to learn with each other… (pg. 07)  "…Now is balancing that against, making sure that you are making spaces with all "dust films" and the noise and the rest of it doesn't affect the rest of the building. So, it is just making sure that you still get the views, you still got the opportunity for people to use those spaces, but it is not… You can still teach, you can still learn in that building… …So is that what the essence of it is about… So it's all…you know… You got Central Courtyard, Central Atrium, everyone got views across… You got a "Ribbon of accommodation" that (inaudible: "Wraps") from the outside… and actually that is really flexible as well, in terms of if the University want to change the building in use… which they do do… You can "chop that open" and change around in the future. (pg. 07)*

The fragments above indicated how these different objectivations within the conception of the Building Design were intricate. Moreover, it can be seen as an indication of the Architects' priorities on the conception of the Building Design proposal, in which other aspects as "*noise and the rest*" would have to be balanced in a later stage. His comment that "*you can still teach,*

*you can still learn in that building…",* seemed to reflect his interpretation about the *functionality* of these spaces, which were objectivated in the concept of ***open spaces***. Such aspect, seemed to be related to another key aspect of their conception of the Building Design, when the Architect referred to the fact that it was *"really flexible as well, in terms of if the University want to change the building in use…".*

The Architect described that initial conception of the Building Design was proposed by Architects' Team, and other members of the Consultancy Team (e.g. Structural and MEP Engineers), in his opinion, were not to be involved on this stage:

> *"…I'm coming up with the Initial Concept, the idea of the open plan area, the idea of the way the Lecture Theatres might work, or where the Entrances might be… It is not really for Structural Engineers and MEP to get involved on that stage… (pg. 03) …cause we came to find that a lot this spaces they are double height… 6 meters high ceilings… how would you light the space? How do you get ventilation to work in there? How would you get the acoustics work? …So you are right, actually… there were other disciplines attending… While, they were at this point, they weren't necessarily informing the Design, they were certainly… we were already having the conversations about the ways the building "breathe" and it led themselves in all these precedents building visits to be did… and by the same regard, the Contractor was on as well… So, he was looking in understanding… you know… What other Schools of X, Y and Z had done. So, they were already getting a feel for the kind of pallet of materials, the kind of structure. …So, we predominantly wanted to get down in some kind of concrete frame room, and that became apparent that we won't be able to do that…  simply, because of the Programme… So, the University, has given a Programme (pg. 03 and 04)*

According to the Architect, certain aspects (objects) of the conception of the Building Design, as the fact that '*a lot of this spaces they were double height – 6 meters high ceilings*' led the Architects to consult with other members of the Consultancy Team. The questioning behaviour (i.e. **Breakdown**), in the Architect's fragment above, seemed to indicate the emergence of interactions to discuss the objectivations of these aspects of the conception of Building Design: *"How would light the space? How do you get ventilation to work in there? How would you get the acoustic work?"*

For the Architect, at this point, these interactions with other members of the Consultancy Team were informing how the Building Project could be realised:

> *"…So that starts to inform the way that the building is going to be constructed and… Whiles, the M&E Engineer at this point was saying to us: "That is all fine guys, but if we are gonna have*

*"exposed softies" really, we don't wanna a metal deck, with concrete on top, like we did on the "X" Building. We want to see "exposed softies". Cause that actually is gonna help us with the ventilation and thermal mass strategy for heating and cooling the building." ...So we said: "Right, OK! So we need to come up with a Design than that is a Steel frame, we know that, but has exposed concrete, and that is when we start talking about "Precast" as an option. ...So, all this discussions taking place between... Structural Engineers now getting involved, MEP dictating that to a certain extent, where than saying to the Contractor in we are going down to the "exposed precast room", it can't be the "prec"... ...because there is all different finishes on Precast, it can't be "Car Park" Precast finish, it cost 10 pounds/m²... it need to be something a little more enhanced that cost 20 pounds/m², so you need to build that into the Cost Plan. ...But has been offset by the fact that we are not gonna need to spend on the ceilings... So you are not paying for ceilings, because you spend the money getting the finishes right. But that works for the M&E strategy... So, collaboration really, was actually starting fairly early on in the building visits..." (pg. 03 and 04)*

On these "*conversations*", the way aspects of the Building Design were objectivated through **metaphors** within the team, seem to have helped them to achieve mutual intelligibility among them. For example, they referred to how the building would "***breathe***" to address aspects of natural ventilation. According to the Architect, the *Roadshow events* helped to support this type of 'conversations' around emergent objectivations related to the conception of the Building Design. For the Design Manager (Contractor), this was crucial to "*getting a feel for the kind of pallet of materials, the kind of structure*", which helped them to grasp and assess the potential cost and time necessary to build that design.

Another example of a conception objectivated through a **metaphor**, was the reference that the Architect made to a "***car park precast finish***". This seemed to have implied an idea in the Consultancy Team an understanding of the relationship between the floor finish and the cost of building it. By referring to the example of a Car Park finish, which probably was something the Team Members could easily recall, as a common experience, and achieve mutual intelligibility. This conception of the *Changing Action* embedded in cost, led them to reposition their **Perception of Interdependency**, since they considered that, even if this option costed more in comparison with other options of flooring finishes, it would save money in another system (e.g. roof system).

So these conversations, developed in terms of each member of the Consultancy Team trying to describe the consequences of such conceptions, as aspects of the Building Design, in regards their own disciplinary field, as a background experience. For example, the M&E Engineer was

concerned with the 'exposed softies'. In this case, as the Architect mentioned, the visits to building examples, helped the team to agree in what they meant with '*exposed softies*'. Thus, socio-construction of project-based terminology, as situated interaction, was key to achieve **mutual intelligibility** within the Consultancy Team. These interactions also affected the socio-construction of the Consultancy Team's **perception of interdependency**, when they considered how the conception of the *floor finishes* were affecting other building systems, which decisions were under the responsibility of other team members (e.g. Structural Engineers and Contractor).

For the Architect, that was an example of how the Consultancy T**eam members collaborated at this instance of the Building Project Activity.** These interactions happened between the first and second engagement meeting:

> *"Yeah! Yeah! Before we haven't even got a Building agreed, we were already talking about how potentially we could build. Because,… you know… that start to inform the kind of design you could have. For example, you have already seen the Design that we come up with, with the 17 metre cantilever… and we have had to go down the route of the concrete frame building, it won't be… it wouldn't have one of those, because we couldn't have designed the "Truss" …It has to be a Steel Frame Truss like system, to enable you to do that… Concrete does have limitations, but does have other benefits…" (pg. 04)*

For the Architect, the biggest limitations in the conception of the Building Design seemed to have been *Cost* and *Time*:

> *… The problem we've had, and it is predominantly because of the "Volume", so aren't you looking at the scheme… and I know all the other contractors had turned head to this and said: "This is an issue". While you look at the building and say it: "Right! Look 7500 m² and we got all this money. We should be able to get a quite good building for that money." …and we probably if all the ceilings were 3 metres high, but because we are all 6, you are gonna have pay for all the envelope… you know, all the "Volume". For heating and cooling that volume. All the sudden the budget doesn't look as quite as good as it did before... (pg. 05)*

In this case, the conception of Building Design seemed to have been deeply affect by the way the Consultancy Team interpreted *Cost* and *Time* as the way the Client objectivated their conception of resource. For the Consultancy Team, that was objectivated through the conception of *Building Cost*, considering the amount of money available for construction (i.e. Building Realisation instance of the activity).

The fragment above indicated how the Consultancy Team constructed their **conception of Changing Action** by balancing the interdependency between their **conception of resource** (i.e. *Money*), and how this was interdependent with their conception of the Building Design project. In this case, the conception of resource necessary to build 7.500m2, was totally changed when they consider the unusual of height of the floors (from the usual 3m high, to 6m high, which he called "double height" ceiling).

This interaction seemed to have emerged as a revelation through **a breakdown**, for the Architect:

> "...all the sudden the budget doesn't look as quite good as it did before...". "So, we came up with a 17-meter Cantilever... some of our Engineers might got to (Gesture and expression: Signs "Puff"): "It's not gonna work! We got to stick a column in the end" ... We came up this solution, which you see is like a "Big Truss", has a long bouncing back to enable it to the 17-meter Cantilever in the front... (pg. 09) ...(JOHN – the Architect grabs a piece of paper – Figure 77)... Yeah! You know... Essentially, on this one Elevation is like this (sketching)... And that is the Intermediate Floor and that height is 5 meters and this like 7 meters... and what you see is sort of "doing this" (sketching the vertical and diagonal structures) ... So that is where the column is and that is the extended cantilever... and then you got a column here and column here... and so... you know that is all designed like this, which is like a "Big Truss" ... ...so how that turns out to bend over that way (sketching the curved arrow)... so that is pulling that up there, and pushing that down there... So that is your "Back Span" and that is your Cantilever... I'm not trying to teach you... I know you are familiar with this... But my point is than they come up with that as a solution to enable us to do that, and the same with the M&E Engineers we wanted them to come up with really innovative solutions for how they are gonna fit the ventilation around the building or actually... if we could go down natural ventilation route, how we can do it... You know: "By having the Central Atrium is that gonna work?"... Now what are we expecting in the future is for people not to start saying: "Ow! I got a problem now" ...or just realise that in doing this: "I have designed that and that is gonna deflect by a 100mm at the end" ...and: "Ow! this is glazed!" ... and I: "Ow! I can't deflect 100mm, because the glass can only tolerate 20mm, so we are gonna have..." (pg. 10)
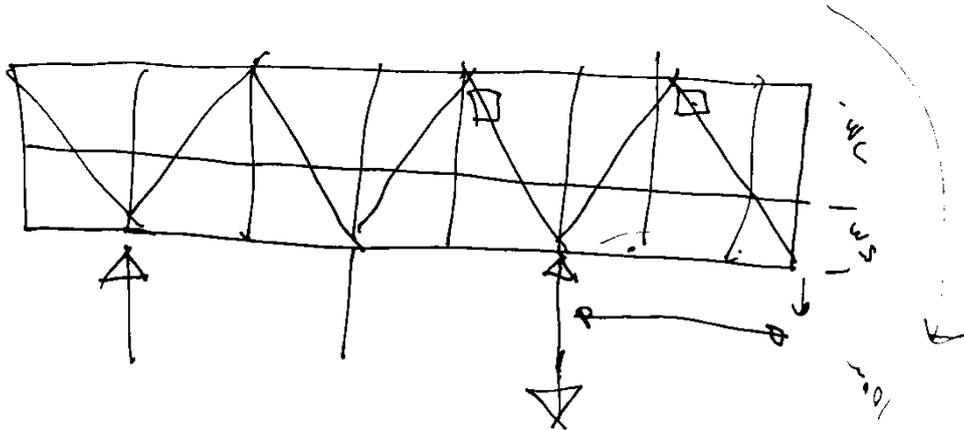
**Figure 77: Architect's scheme to explain the cantilever structure**

In the fragment above, the Architect described his conversation with the Structural Engineers to conceive the *Structural Scheme*. This was another example of the **use of a metaphor**, as a way to objectivate an aspect of the Building Design. In this case, the **'Big Truss'** reference was a very strong metaphor used by the Architects to enable their negotiation with the Structural Engineers, achieving mutual intelligibility on a shared concept emerging in the Building Design.

The Architect mentioned that they were expecting similar interactions with the other members in the Consultancy Team (e.g. M&E Engineers). In this case, interactions seemed to have started with any other aspect of the conception of the Building Design presented by the Architects. For example, the *Central Atrium*, which led the Architects to expect the M&E Engineers to "*come up with really innovative solution*", and to ask the engineers to help them to conceive something to enable their Building Design to move on.

For the Design Manager (Contractor), the initial conception of the Building Design was not easy. According to him, the Veil proposed for the facade was "*causing a few headaches… it looks nice but it doesn't do anything…*". For him, that specific aspect of the Building Design proposal will cause maintenance problems (e.g. it will be difficult to clean):

> "*Yeah! There is one or two things in that… that Vail is causing us a few headaches… it looks nice but it doesn't do anything… The problem with it, it is cleaning behind it… you can't…*" (pg. 15)

This is an example that, as the Building Project activity evolved, not all participants, in this case from the Consultancy Team, had agreed on the way the Building Design was objectivated. Thus, certain aspects of the Building Design can carry contradictory views to the following instances of the activity.

**Objectivation: *Building Design proposal - Preliminary Evaluation***

In this instance of the Building Project activity, while at one side the Consultancy Team conceive their proposal for the Building Design, at the other side, the Client Team interacts to access this proposal against their conception of Changing Actions.

In this case, the Staff Member comments below indicate how she had assessed the Building Design proposal against her own conception of a specific aspect objectivated in the Building Design: *The Postgraduate Research (PGR) room*. As it was mentioned before this was the aspect concerning her own expertise with the University institution. Her initial conception started to be objectivated when she contributed in the conception of the *Project Brief*, in which this was objectivated (manifested) in terms of specifying room dimensions and technical requirements (e.g. equipments**), in the Project Brief artefact:**

> *"... but certainly in the original plan and brief is out the PGR and where is located... and variated the space... I was told that that was an error and that was a great location, because we were at the balcony outside, and I was trying to ensure that that balcony was only for the PGR room and etc... trying to secure an excellent space for our Admin, they had to be closed off and not open plan... obviously... You know the architects were like: "no, no, no, we can't... bla, bla, bla"... in the meetings that we had with them... However, ever since, obviously both (inaudible) very much with The Dean since then and the room has changed now to be of the (inaudible) designs and moved to the end of the building, so it is a very sealed up room... I think the students would prefer... obviously we don't have the benefits of being in the balcony etc... But, we be right off with close up than noise of the rest of the building... I also spoken to the... Director of Graduate Education in the "X" building, because their students... although the PGR students are tooked away around the corner, is still in open plan... and they are finding... You can't really test it now...because the building has not been used that much, but you find that actually students are not using the space... and they are struggling from noise... even though it is not a fully functional building... So, I am glad that it has been listened to, and we that changes..." (pg. 01)*

She pointed out, that initially when the Consultancy Team presented the initial conception of the Building Design conception, the *PGR room* and *Admin* was ***unsatisfactory* in terms of noise**. It was initially located in a good position and with an access to a "private balcony", but

then, she was told that that was an error, and due to the general *open floor* feature of the Building Design and the noise requirements, the *PGR room* was moved to the end of the building, which according to her: *"it is a very sealed up room"*. In order to support her argument of how *noise control* was an important feature in the PGR room she referred to the example of low noise control performance of similar spaces in an existing building in the University.

From the comments above, it can be noticed that the Staff Member *feedbacks* over the Consultancy Team's conception were based on criteria, as a **Value System,** coming from her own appreciative system, and how it influenced her own interpretation of the *Project Brief*. Thus, her interpretation and assessment of the Consultancy Team's conception of the Building Design was framed against this Value System. More specifically, this led her to focus her concern in assessing the aspect in which she contributed. However, how was related or affected by some other in the Building Design were not indicated.

At this point, these divergent interpretations (based on different appreciative systems) about the conception of Changing Actions (i.e. Building Design proposal), seemed to have emerged as a set of **misunderstandings** among the Client Team and the Consultancy Team. For example, the Staff Member commented on how certain aspects of the Building Design (e.g. "***double height ceiling"*** and ***"open plan"***) may have been interpreted differently:

> *"...So,... You know, like... and when the design came and we saw... You know, there was a double height sealing, it was open plan, these things aren't necessary for us, but there was no way we could articulate that, because... obviously, the more you give, the more is difficult for the design team to work with... But with on the one we were given, when we first saw the solution, it was a kind of closed one, and that is it..." (pg. 06)*

It seemed clear that she didn't agreed on how those aspects the conception of the Building Design, were objectivated and how they were affecting her topic. Most importantly, she (and other Staff members) couldn't even argued on the consequences of those Changing Actions. This created a general perception on the Staff Members, which were at this point part of the *User Group*, that the conception of the Building Design proposal presented to them was not open to be reviewed:

> *"...So, as a document who... To be it was a very comprehensive document, that like I said had some aspects that I think it lack... it was very comprehensive because than all could understand... It was just bad how that was interpreted in the final design... some spaces were smaller, than*

*what we originally needed, and some others were largely larger… that was obviously because of the layout of the design… then it wasn't workable for some of us… you know… because it made some spaces smaller… it was always lower than our minimum requirements, so… you know, like, Ok! Some aspects we can give up, but someone has got to teach in that area, and got extra amount of students, we got extra amount of facilities… we can't worker in a smaller space, it is just impossible, so… for us than, to go back and then argue with them… That is where we are now… in the situation, so…" "… it was very comprehensive because than all could understand… It was just bad how that was interpreted in the final design…" (pg. 06)*

Moreover, she felt that, besides the fact the Building Design proposal was '*very comprehensive because then all could understand*', the *Project Brief*, as the Client Team conception of Changing Actions, was '***badly interpreted in the final design***' by the Consultancy Team: some spaces were smaller, than the what we originally needed; some others were largely larger (obviously because of the layout of the design); and others were it wasn't workable for some of us (functionality) – smaller spaces were lower than the minimum requirements. So, for the Staff Member there was a lack of opportunity to provide proper ***feedback,*** and engage in conversations to explain the ***Project Brief***:

*Researcher: Yes! But what it was this kind of information on the brief?*

*Staff Member: It was only the size…*

*Researcher: I mean this kind of adjacency or even…*

*Staff Member: No, it wasn't… but that is why I said… you know… if you put to many stipulations in it… you might just design it for yourself. So did put only the minimum adjacency requirements in that, but then when you see the plans… because obviously you have got to put the max and minimum, you give some flexibility for them, but if you put us there right next to some heavy plans, which is not workable…  (pg. 07)*

Part of the Project Brief was conceived in terms of spatial requirements (i.e. room size – Figure 78). In this case, aspects of the Building Design, as room adjacency, were only suggested in general terms, but not specified. According to the Staff Member, it was not the case to specify that in the Project Brief, but actually that should emerge from the natural development of the Building Project activity, through the interactions between the Consultancy Team and the Client Team.

| | Existing | | | | | |
|---|---|---|---|---|---|---|
| | Facility | Existing Room No. | Notes | Min M2 | Max M2 | Max Capacity (estimated) |
| Make Spaces | Assembly & Workshops | QSB/07 | Combine all areas into one large assembly workshop and maker space for the school | 250 | | 20-40 |
| | | T2/02c | | | | |
| | Spray booth | QSB/04 | | | | |
| | Spray booth comprerssor | QSB04a | | | | |
| | Laser Cutting | QSB07a | Combine all areas to create laser cutting facility | 65 | | 5 to 10 |
| | | QSB/07 | | | | |
| | | T1/13a | | | | |
| | | | | 315 | | |
| Digital Design realisation & Photogrphy | Digital Print | T1/11 | Combine area to create a digitally printed output/technology centre | 185 | | 20-30 |
| | 3D print | QSB/03 | | | | |
| | Heat transfer DyeSub & Digital fabric | n/a | | | | |
| | Photostudios | T1/03 | Create larger photographic studio space. Dropin studios for quick access | 227 | | 20-40 |
| | | T1/10 | | | | |
| | Equipment loans | As above | | | | |
| | | | | 412 | | |
| Fabric Production | Knit/Weave | T2/04 | Rationalise | 190 | | 20 |
| | Print/Dye | T2/03 | Rationalise | 300 | | 60 |
| | | T2/02 | | | | |
| | | T2/02a | | | | |
| | Fashion Construction | CAA1/01 | Rationalise & combine | 700 | | 190-265 |
| | Costume Construction | T2/04f | | | | |
| | Costume Spray & Dye | NA | | | | |
| | Fitting Rooms | N/A | | | | |
| | Embroidery | T1/13 | | | | |
| | | | | 1000 | | |
| School Services | IT/Infrastructure/Deployment | T1/11 | Create Infrastructure resource | 30 | | 4 |
| | | T2/04E | | | | |
| | | QSG/05a | | | | |
| | Materials Store | na | Covering C/Art, Textiles, laser materials etc | 30 | | 2 |
| Specialist Services & Facilities | Motion Capture (Phidias Lab?) | na | New resource | 40 | | 3 |
| | High Performance Visualisation (Phidias Lab?) | na | New Resource | 150 | | 50 |
| | | | | 1947 | 0 | |

**Figure 78: Fragment of the Project Brief – Schedule of Accommodations**

Interestingly, when the Staff Member was asked to describe what she considered to be the key features of the current conception of the Building Design that was presented by the Consultancy Team, she started to describe the main concepts that were conceived and included in the Project Brief document, but she did not actually refer to any specific spatial feature conceived in the Building Design proposal:

*Researcher: "What do you think are the key elements of the current Design Proposal?*

*Staff Member: I think it is a lot (inaudible: mixture or initiative) into interdisciplinary working, so it is not like in silos, and separated… we can share a lot of resources, like the CAD suites… a lot of them, for example, will be utilised throughout the "Academic Day" (more efficiency) …I would say we can be working together and sharing them… also bringing disciplines together that perhaps would… You know… working together… so you get like… for example… like the Interior Designers is with Textiles… Yeah! So people can actually work and share facilities, and actually*

*share creativity… …and be exposed… I think that just be in a vibrant place that you realise it is exciting… because if you come to a place like for example… "C" Building or anything like that… it could be a School of anything… there is no creativity… there no Buzz about a place of… I think it create that kind of environment where you can share facility, share ideas, across disciplines and just be in a really exciting place that is busy all the time… You know is very student focused and… you can actually see a bit more what is possible and share that creativity… "(pg. 02)*

According to Staff Member, at that point of the Building Project, there were still aspects of the Building Design that **were not completely understood or agreed** among Client Team, especially, represented by the *User Group*, and Consultancy Team:

*"Because, we still don't know where are we in the Stage of the final plan etc… There is like silly things that were… like pods of kitchens in open plan spaces that are probably interfering into teaching and acoustic, etc… So a lot of that, that I feel that a lot staff, or people in that team felt that… You know… We can feedback but no one was actually listening or… how much all this… the internal… because it seems to me to be pretty much an External Fixed, no one touches the external… Which is just fine, I don't have an issue with that, but certainly it need to in workable spaces, it seems to be very restrictive and there was a lot of frustration… " (pg. 03)*

**Misunderstandings** emerging between the conception of changing action, as the School Operational Project, and the proposed Building Design, seemed to have affected the Staff Members the perception of performance and interdependency, as well as, how individuals have been conceiving their own interactions at this instance of the Building Project activity. For the Staff Member, these misunderstandings were directly linked to the way the ***Engagement*** was conceived: *"we can feedback, but no one was actually listening…"*.

According to **the Dean**, the Operational Panel had chosen to limit the engagement of the Staff Members the Building Project activity, while the competition was still in place, because of the *Time* restrictions:

*"Because of the competitive nature of it, we had five teams. So it was impossible to have five sets of people, including students, staff and others working on the same design, because we would spend more time trying to articulate Conceptually Design as opposed to Doing the Design..." (pg. 03)*

It may be argued that the Staff Member and other Users were not aware of this justification, and didn't completely agreed with that.

So, the Dean described that, at the end of ***Stage 1 of the Project Programme***, the Operational Team was expecting the *Submission* (it was a competition, the use of the word "submission" tells a lot of the nature of the interaction it is being described) of what they called ***Initial Design***:

> *"...and then at that point was selected five, which started doing the initial design... and basically as part of Stage 1, it was for them to submit a design, not a detailed one, but detailed enough to persuade us that we have a feeling of what we are gonna get, but also they have to commit on the finances... "(pg. 03)*

At this point, Operational Panel expected that the Consultancy Teams would read, understand and respond to the *Project Brief* with a conception of Changing Action and Resources to the School Operational Project objectivated in the conception of a Building Design. However, when the Consultancy Teams submitted their proposals at *Stage 1*, the Dean indicated that:

> *"...So the design, first we've asked the Consultancy Teams to respond to our brief... to come back and say this is what we have understand, this is how we read the design... that is the narrative around the design and so on... and they were all very different... very, very different... and in the end... although they went through it...we were not a hundred per cent happy with any of them... I thought this was the first this happened in this university..." (pg. 03)*

> *"...we didn't feel that any of them was appropriate... it was bold enough... it was adventures enough... it was a game changer for the university...we didn't want another building like any other one... and we felt at that point maybe they understood the brief wrongly, maybe they were too conservative in the proposals they were putting forward..." (pg. 02)*

> *"...So there were things like... (let me think about some specific examples) ... ...there things like the "SOPHIES Lab", which is one specific area where they had it distributed across the building..." (pg. 04)*

At the end of *Stage 1*, the Dean's overall perception of development was that any of the proposals presented was appropriate. According to the Dean, there seemed to have been certain **misunderstandings** from the Consultancy Teams:

> *"Some of them were not bold enough and they haven't really cut under the skin what it means to be a student of this university..." (pg. 03)*

In the Dean's perspective, part of these misunderstandings came from the Consultancy Teams' conception and perception of the general purpose of the Building Project Activity, as according to him:

*"...So my particular concern was that they were running (or rallying) this project as construction project, as opposed to developing a building that would allow us to deliver a service to our students." (pg. 03)*

This seems to indicate that on the Dean's view the Consultancy Team was not concerned in conceiving a specific Building Design proposal emerging from and throughout the socio-construction of the conception of Changing Action based project participants' mutual intelligibility and agreement on shared objects, like the Project Brief. Rather they were conceiving a set of spaces the would comply with the spatial requirements stipulated on the Project Brief. In that sense, Client and Consultancy Team did not shared purposes, and even worst the Client felt that they were **contradictory**.

According the Dean, the Operational Team, which was responsible to assess the technical aspects of Building Design proposals thought that they were good enough:

*"...So, technically it was OK, but when you ask questions about how the students work in the space...You know... "where do you see the students circulating?"... not in terms of circulation spaces... but how would they circulate... What would a daily like... How would a lecturer deliver a lecture?... You know... there was very little understanding of that... Maybe I am being unfair, but there wasn't enough understanding to make me convinced that they really thought about what we mean about the brief." (pg. 03)*

However, *general functional aspects* were under evaluated by the Dean, and then later by Staff Members. According to the Dean, this was sign of *'little understanding'* by the Consultancy Team. So, in this case, both the Dean and Staff Members felt that the Consultancy Team had difficulties in understanding the Brief. Both seemed to imply that the Consultancy Team could get fully understanding of the Client's conception of Changing Action and Resources from the reading and interpretation of the Project Brief. In this case, they didn't seem to realise the how limited *Engagement Template,* may had affect the dialogue between both parties that address these misunderstandings.

One example of these **misunderstandings**, was related to the **'open plan' concept**. For the Dean, the Consultancy Team went for an *'easy option'*:

*Researcher: "Do you think that this a Concept that the architects... the (Consultancy) Team grasp?"*

*The Dean: "They did!... But they went for the "easy option"... What they said was: "Everything is open plan, so anybody can walk anywhere and that is how you have interdisciplinarity"*

*...which is true, however you still need to deliver a studio, you still need to have security, you still need to have acoustics, you still need to have all of that... and that in the end is what is taken us more time..."*

In the Dean's comment above it was possible see where his appreciative system might be different from Consultancy Team. His comments function as a breakdown, and it was possible to see that he understood that the Consultancy Team envisioned the *'open plan'* scheme as a way to objectivate *interdisciplinarity* by allowing people to *walk* anywhere in the building. However, that **objectivation might be in contradiction** (i.e. incompatible) with other functional aspects as: *studio deliver, security, acoustic.* Moreover, the emergence of these misunderstandings, and the resulting lack of functionality of the Building Design proposals, led to them to reconceive resource (i.e. Time) in the activity.

**Objectivation: *Building Design proposal (2) - Second Evaluation (Further Submission)***

The previous session showed how at the end of this Stage 1, the Dean and the Staff Member were not satisfied with the Building Design proposals. That led to an extension of the Stage 1 and a compression of the following stages on the *Project* Programme. In this case, Consultancy Teams had a chance to reconceive their Building Design proposal and resubmit that to the Client. According the new Building Design proposals presented changes:

> *"It moved from a completely open plan, to having some areas...we acoustic isolated, so for example the Post Graduate Researchers... that is a big concern across the university, every PGR space... we have to move it out away from where it was originally and put it somewhere else, so we could acoustically secure... So, those are the choices that we had to make it afterwards... and that is because we had really strong feedback as part of the meeting... ...So we change Photography completely... we change the PGR space completely... we reshaped the whole Admin to the new building, because... ...it wasn't obvious where the Admin Support is gonna go. So the people and the students rely most for Programme Support... You know asking questions about Courses, Time tabling... You know... all that was no where to be seen, it was just go be a small room of four people... So we had to make a lot of changes... But I think in the end the Final Design that I signed off... It was good... So I was very happy..." (pg.08)*

According to the Dean, these changes came after the *New Engagement Template* was put in place, with Staff members getting involved through the **User Group** that was assembled after the initial evaluation, by the Dean. So, in his view the *User Group* was able to give '*really strong feedback as part of the meeting'*.

**Objectivation:** *User Group 1 – New Engagement Template and "Formal" Feedbacks*

As it was mentioned before, according to the Dean, during Stage 1 the engagement between the Client and Consultancy Team was limited by the rules established in the procurement, aiming for a fair competition. So, in order to change the Engagement Template and provide more support to the assessment and feedback of the Client over the conception of Building Design presented by the Consultancy Team, the Dean assembled, a *User Group*:

> *"Yes! With five companies… But then I establish a group within the School… representatives from every department, from the technical team, from the research team…and we met together… and I used to communicate with them not designs but in general what are the things that they would like to see... so I was able to communicate some of their views… But I had to be able to communicate all their views without being able to show them any designs… I mean it was a quite bizarre situation… So that was quite challenging... and then in the end we had the meeting, we didn't like any of them to be approved…" (pg. 04 and 05).*

It seemed that, for the Dean, the challenge on these interactions was to have conversations about ideas and needs without showing the group any design. In his view, that was *"a quite bizarre situation"* – what might indicate that it did not make much no sense for him to do that. So, the Dean indicated to the Operational Panel the need to change their conception of *Engagement Template*, and adjust the Client's conception of resources, to include more *time* and *money* that would have be invested in the Building Project activity.

At this point, they conceived an additional Stage to the Building Project activity (Stage 1+), as an *"extension of Stage 1"*. The Dean described that, from the initial five competitors, only two decided to move into this extension period. Then, half way through one of them dropped off. So, at this point, when there was only one competitor left in the competition, the Operational Panel, changed its conception of *Engagement* in the activity, and allowed the User Group *'to work closely'* with the Consultancy Team. The Operational Panel, then set a series of events, called *Engagement Meeting*, between the Consultancy Team and the User Group:

> *"Yes! It was the extension of Stage 1, and half way after the extension that is when one of the partners dropped… So than we were left with one Consultancy Team, which than we started to work closely, but was at that point that we said: "Now is time that we can engage the user group", which was the meeting that you attended (29 March 2017 – Engagement meeting)… which was interesting in many ways and it was quite problematic in another… because we spent so many time in trying to locate things and put them in places, so on… and of course, when some comes a fresh, in particular people that are involved in architecture, you know… and they say: "why is*

*that here? Or would you like in a little bit like this and little bit like that? And what about those issues?... And then, although it was positive, there were too many new requirements that were coming in, which made the process really problematic." (pg. 06)*

According to the Dean's comments above, this interaction was *'interesting'* and *'problematic'* at the same time. For him, the problem seemed to have been that the Consultancy Team and Operational Panel were already working in that conception, and when these new individuals, the User Group, came to interact. This seemed to have sparkled a big **breakdown,** in the activity, when the User Group questioned the current state of Building Design proposal: *"Why is that here?... What about those issues?"*. The Dean recognised that these were valid conversations, but there were "***too many new requirements***" for that stage, which could affect, and may not be coherent with, the Client's **conception resource** (i.e. the Time and Money available for the Building Project).

*"Because, then we want to communicate out with the Consultancy Team, but without going back and communicating all of those issues it would be too much. And they might even left the project and say: "Look, we have been working on this for seven (7) months now, this is almost starting all over again... ...So we had to be very careful about, what feedback would give them, how we present the feedback that were saying and so on... ...which we did again... So I met twice again with them, we looked at different designs since and so on..."(pg. 06)*

So, for the Dean, this "new" conception of the *Engagement* in the project activity, was deeply affecting the conception of resource in the task, especially, from the point of view of the Consultancy Team. In the Dean's perspective, there was a risk, that these changes would trigger a negative conception of resource by the Consultancy Team. This led, the Operational Panel to restrict the feedbacks provided by the Staff Members through the User Group. The Estates Department was in charge of the Operational Panel, and consequently it tried to control the overall Building Project activity. According to the Dean:

*"The School didn't decide that... They (Estates Department) felt it better if they control the process from the Estates (Department)... So than we can insure that we don't divulge any confidential information from one group to the next... because at that point they can sue us... So if we were to say "Can you make your design like the previous contractor did?" ...You know because of these are peers and these are different groups... So we couldn't really in any shape or form say "we like this in another contractor and we want it here"... and that was a difficult at the beginning because every design has pluses and minuses, but we couldn't be very specific..." (Pg. 04)*

So, that represented a difficulty at the beginning of the project activity. As the Dean described above, in way the they couldn't be very specific on these feedbacks, which by consequence, put a lot of importance and pressure in the Project Brief, as the Client's objectivation of the conception of changing actions. Consequently, interactions between the Client and Consultancy Teams were tricky:

> "...of course the way that I was briefed by the "our" (heart) team in here was never say "a 100% sure you like it"... but if you don't like something you can say it... because the way the contractors work is if you say you like than we live it in... and then if I say "well I don't like it" and they will say "well you liked before, so why don't you like it now?"...so from their risk of thus... they are trying to eliminate the risk... so from their perspective if I say "hum...I really like that one" they will tick that off and say we are living it and let's move on to something else (How about the interdependences on design decisions?) ...So when they were presenting the views of the "Phydias Lab" as being a distributed lab, so the three spaces within would be in different parts of the building... I couldn't really say "No, that is not how it is!" but I couldn't support it either... So maybe it was a lack of understanding of my part, maybe it was a too strict rule by our lawyers to say: "don't commit to anything" ...because actually contractors are pealing after that for our decisions are quite normal in the sector... So if they present something and I say "I don't like it" than they say "Well, you liked before... You are liable... I worked on this"... So you need to pay... You know what I mean?..." (pg. 04)

For example, this *Engagement Template* limited the feedback the Dean could give on the way the *SOPHIES Lab* was objectivated on the Consultancy Team proposal. Thus, emergent misunderstandings could not be dealt. According to the Dean, the Operational Team backed by the University's lawyers, prohibited these feedback, because they argued that in these procurement template, the Client is liable to comments made to the Consultancy Teams.

**Objectivation: *The Dean's Feedback Strategy (Client)* for *Mutual Intelligibility: Breakdown***

Thus, considering these limitations of the *Engagement Template*, during his involvement in the *Engagement Meetings,* the Dean seemed to have adopted a strategy to support his conversations with the Consultancy Teams, in a way that he could construct mutual intelligibility around conceptions the conceptions of Changing Actions with the Consultancy Team. In this conversations, the Dean addressed concepts like, an *'award winning building'*, and wen around asking the Architects: "*Do you think that building can win an award? And Why?*":

> "...And then, we challenge every competitor... we said "It need to be more 'Bold'" ... you know... "we need to have a building... not just a good building and not just another building"

*… …so my brief to them was "I wanna building that I will be winning awards"… so, every time when I get to meet with them I asked: "Do you think that building can win an award? And why?" … and if they couldn't answer it, than it wasn't good enough… and also one of the… if you like a proxy for understanding if they were serious enough, I used to challenge the architects, and if they used to agree with me, you can tell there wasn't a well thought out position… but later on, in particular with the final design, the architect used to say "No, I don't agree with you… this is how you read the building… that is the language of the building"… you get to the point that we think they really thought about the building itself, the design and everything else… So there were different strategies of really understanding that…" (pg. 05)*

According to the Dean, the Architects' answer would lead them to reflect and discuss about their own understanding of that concept, and how that is objectivated or not on their Building Design proposal. That created "***a proxy of understanding***" (in a way that he measured if they achieved shared understanding) for the Dean. Then, if the Consultancy Team, just agreed with him, it was an indication that they didn't thought it through, but if they could argue and eventually disagreed, based on specific reasons, explaining the way they interpreted differently such concept. That was the Dean's strategy to building mutual intelligibility at this instance of the Building Project activity.

In the other hand, both Client and Consultancy Team seemed to have agreed on objectivation of the *Structural Scheme* very early:

*"so… mmm…very quickly they moved away from a concrete structure to a steel and concrete structure because is quick to put up, because of the time scales were quite tidy, so we found the concrete structure would take it too long and is more expensive anyway, but… so that was one of the first decisions that were made. (pg. 05)."*

In a way that, by the Dean's comments above, both teams realised that the conception of resource, in terms of *Time* and *Money*, was a limiting factor, for the conception of the Structural Scheme, and both teams easily agreed that a solely concrete structure was not possible within the *Project Programme*. Then, they conceived that a mixed of steel and concrete structure would fit into the '*quite tidy*' time scale and budget of the project.

In another example, it was possible to notice how the Dean was aware of the interdependency among different Building Design aspects:

*"I think we did that… Although the problem was that we kept on changing our mind… so part of this was our fault… So it was about… What was critical for them was identify where the mechanical and electrical services… and the isolation spaces would be… and I was quite*

*adamant that we wanted natural ventilation in the building… (A) because I hate stuff like that, because there is no fresh air… nothing… then I was asking for opening windows in the majority of the areas… and that of course has a lot of challenges… the smaller the space you have, the harder is to regulate it… So their design immediately wanted to be more open plan, more open spaces… So you can get natural ventilation working properly… So if I started closing all the spaces, the whole strategy around natural ventilation wouldn't have worked. …So that was one of the biggest challenges at the beginning..." (Pg. 08)*

In this case, the way the Dean objectivated '*natural ventilation*' as a concept, showed how his conception was **exposed within the interaction** with the Consultancy Team (i.e., **Breakdown**). The words the Dean used to objectivate that concept carried embedded on it a set of values (i.e. appreciative system), justifying his intention. Along with this objectivation, it was possible to see how the Dean understood that such conception was interdependent with another aspects of the Building Design (i.e. *open plan spaces*), and eventually, how the re-conception of them would have affected the overall conception of Building Design.

It seemed that the Dean had to construct similar dialogue, and engage in **breakdown interactions** to achieve mutual intelligibility on another the aspect of the conception of the Building Design, the '*double height and one and half height' ceiling:*

*"…Because one of the big issues I had to fight was a double height and the one a half heights for the building… …because they said if you reduce the amount of single height, we can have an extra floor… so you can have 7,500 m2… …But I said to them, one the criteria is to get more students applying and the other one was to have more inspiring spaces… and I said to them: "I can't see any scenario, that you can create an inspiring space… on a floor, which is only a single height that cut across 20 or 30m… all it is, it is an office space……and also I said: "You are not gonna get good air circulation, which is a big problem… You are not gonna get a lot of natural light,, which is a big problem"… You know all of those things… So I insist of that… and that was a very difficult point to argue… because I get the Vice-Chancellor telling me that: "I get to save money in here, DEAN"…and me having to persuade him that the perception of the space will be enough to guarantee that the students would get a better experience, which is a soft stuff… it is something you can't touch… So that was a big challenge… even at to the last minute this a big, big challenge…" (pg. 09 and 10).*

From the Dean's comment above, it was possible to say that, the Consultancy Team was arguing that if they went for "single height", they could have an extra floor, which suggest that they might had a **different conception of resource** (i.e. more space for the same money) at that point. Then, the Dean argued that not necessarily they need more space, but rather the

space should be more 'inspiring', so it could lead to the School having more students' applications. So, it seemed that there was a **misunderstanding** between the Dean's and the Consultancy Team's (supported by University's Board of Directors – part of the *Evaluation Panel*) conceptions about how they would get **'more students'**. This could be directly related to the socio-construction of their conception of *Growth* objectivated in the *Project Brief* and, eventually, relates to their conception of resource in the overall School Operational Project.

In this case, the Dean had to put effort in **persuading** its own team of the reasons why that should be their conception, which configured a **Breakdown interaction**. In order to do that, he try to express verbally the negative impact of the physical aspects of a 'single height' space: *"I can't see any scenario that you can create an inspiring space on a floor, which is only a singly height that cut across 20 or 30m…"; You are not gonna get good circulation, which is a big problem; You are not gonna get a lot of natural light, which is a big problem".* The Dean also used **a metaphor:** "*all it is, it is an office space…"* to help to build shared understanding, and reach mutual intelligibility on a *shared object.*

According to the Dean, that was a really difficult point to argue that *"the perception of space will be enough to guarantee that students would get a better experience"*, because in the other side, The Vice-Chancellor (in the Evaluation Panel), claiming that he could "*save money*" with the "*single height*" idea.

**Building mutual intelligibility and the dynamics of the socio-construction of collaboration**

The example of interaction above seemed to reveal that because of the subjectivity participants could easily lost track of the main purpose of the Building Project activity, and find themselves in emergent misunderstandings. In this case, some of the project participants (e.g. The Consultancy Team and some members of the Evaluation Panel) seemed to have focused more on the provision of a New Building and the resources applied to get it, and less in the overall purpose of supporting a change the School Operational Project activity by reconceiving its spatial features (i.e. University's facilities).

This is not to discuss if the conception of '*double height* ceiling' and other concepts, as part of the Building Design proposal, would be the best way to achieve the intended change in the School Operation Project activity, but it seems that how emergent misunderstandings around such objectivations were dealt in these interactions may had affected the socio-construction of the Building Project activity, leading to a **low perception of the development and dissatisfaction of the project** participants, **as a dynamic and socially constructed measure**

**of collaboration.** All these set of perceptions and conceptions are constantly repositioned in the individuals' interactions to collaborate in the activity.

*Objectivation: Feedback and Engagement*

For example, according to the Staff member, the general "feeling" in the *User Group*, was that there was a ***lack of engagement and care*** with them, in moving forward with the Building Project activity. For her, there was no follow up in the feedback they gave to the Consultancy Team. So, the User Group did not know how these feedbacks changed the conception of the Building Design proposal:

> *"… the next process on that we have lack that engagement and care into moving forward… Cause I know we talked about somethings like essential adjacencies in some areas where you have to be next one near… hum… but we have not had that deep discussion since the design evolved… all I know now, for example, our PGR room changed and have moved to a different location, I don't know if all the other spaces changed for a different location, I don't know if we are next to a very noisy… You know… I assume not, because where is it located, but…  It would be nice to have that evolution in site and the plans, and ongoing discussions again…" (pg. 06 and 07)*

The Staff Member argued that they were "informed" that there were some changes, but they did not know the full content of them. This may have led some of these participants to build wrong assumptions about the Building Design proposal, which, eventually became source of misunderstandings among both teams. Moreover, the fact that Staff Member felt that they weren't been listened seemed to have led them (the User Group) to decrease their perception of performance in regards to the Consultancy Team in the project activity, and, consequently, for them to reposition their perception of interdependency, in which they felt that they were not "seen" as relevant for the Consultancy Team.

In her own words, it seemed that for the Consultancy Team to take into consideration such feedbacks at that point was problematic because how that would affect their perception of resource (i.e. time and money:

> *"…and certainly the last (inaudible) where we did have… I did very strong felt that we weren't listened… to be quite frank! Nobody took notes… The architects and the contractors were like: "I can't afford that… I can't do that… I can't do that"… and every suggestion that we made was quite thrown back as… "Yeah, we need to feedback… Yeah, you write the comments down and*

*go back to us"… So, it was pretty much it… "This is it, and that is what you have it"… and You know it…  It wasn't a collaborative process…and obviously" (pg. 04)*

Thus, the Staff Member general feeling at the end of this interaction was that "***it wasn't a collaborative process…".*** In her view, the interaction involving the Consultancy Team's conception *"has been behind closed doors…"*, and some of the feedbacks have been ignored, and left without explanations why it was not considered. Eventually, that led to the *User Group* (Staff members) looking at the ***plans and documentation*** (without the presence of the Consultancy Team): and identifying what they saw as:

> *"…and I obviously I have seen it evolve in and out… well, I haven't been involved in every meeting, but… A lot has been behind closed doors… also when we fed in requirements I have late found that somethings have been ignored and then I had actually… and then when I looked at the plans or documentation later… because obviously it is a very complex building… I have actually expressed my views again and said: "how is that gonna be considered?"… and they have done an error, I found as all the architects have over looked that aspect, and I had to make sure that was back in… So that was really in terms of the role, basic requirements, I have not necessarily been involved in any design aspect… so I was just making sure that our needs and requirements are in…" (pg. 01)*

According to the Staff Member, she was playing her role and *"just making sure that our needs and requirements are in…."*. The interaction described be the Staff Member may reveal the natural **limitation of the *Project Brief*** in 'informing' all the aspects of the Client's conception of Changing Action. So, this seemed to have been a critical part of the interaction between Consultancy Team and User Group, in which **both parties struggled to build mutual intelligibility.**

The Staff Members dissatisfaction with the *Engagement Template* and *Building Design* proposal, even seemed to have led to the emergency of a **competing behaviour** within the User Group:

> *"Yeah! I think it was… some of it wasn't listen to that properly I believe… and, however, obviously I think sometimes you got to "shout louder" than the others so that my needs are happen to seem addressed…" "It was only through ongoing lobby that I did, afterwards, that space has changed…". (pg. 01)*

At this point, such emergent *competition* seemed to have aggravated the situation, making harder for the User Group to compromise and communicate their requirements and present a coherent front, as a cohesive group, in their interaction with the Consultancy Team:

> *"... It was only through ongoing lobby that I did, afterwards, that space has changed... But, like I said, somethings hasn't been, but not because... when we tried to feedback that, they were very hesitant... but, like I know some of my colleagues, for example, looking after COURSE A or the B... who complained about the noise and teaching spaces... and we were just told: "Ow, buy some more acoustics properties and... you know... in the surrounding areas" ...and we "Ow?"... I think until we felt confident of what that will be... You know... it is gonna be a better speaker systems... you know... it is not just getting fabrics on walls, it is about articulating that, and than how... we don't even know how the flooring is gonna be like... because when you got ladies walking in high shoes is up and down in the corridors, or you got spaces where the teaching and toilets are in the far corner and than people have to walk pass to you to go to the toilet, and is literally anybody, while you are actually teaching... It is a lot of this concerns still there... prevailing... and nobody seems to be addressing... it is just like that is it... And the kitchens are located not in the corners, but hide within the space in the middle of it... you know... a lot of the walk through... fly through videos... obviously, I know they are quite generic, but it is not how it should be... You know what I mean?... It is not given that impression of how it would work, because it is all computer desk everywhere... it is not like the spaces for teaching room that we wanted to see... well that is easy to understand, and it is just feel like we have not been really engaged that much at all..." (pg. 06)*

Thus, these negotiations seem to be hampered by **misunderstanding** between the User Group and the Consultancy Team around the conception of Building Design proposal (e.g. "*we don't even know how the flooring is gonna be like...*" "*Is this worse than we had... We don't know... I hate this, but...*".). According to the Staff Member, the walk-through videos may have misled and confused Staff Members in understanding about how building would work, because it was too generic (e.g. *"it is not like the spaces for teaching room that we wanted to see..."*).

Thus, the Staff Member's impression of how *Engagement* and *Feedback* was objectivated was that, it was very '*restrictive and there was a lot of frustration*', which seemed to have led to an overall **negative measure of collaboration, mostly due to a lack of shared understanding**:

> *"We can feedback but no one was actually listening or... how much all this... the internal... because it seems to me to be pretty much an External Fixed, no one touches the external... Which is just fine, I don't have an issue with that, but certainly it need to in workable spaces, it seems to be very restrictive and there was a lot of frustration... and I think it could be a more*

*collaborative process, or at least make the clients understands that you can't... Why somethings can't do it... You know ...a lot of things have been said that is "down to money, down to money"... ...Well, there is no point to spend extra amount of money on a building when is not fit for purpose... In the end, I think some of us was getting a bit concerned in going teaching in open plan spaces and noise issues etc etc... So, it is a bit of concern because I think... it is just not necessarily my space... because obviously, my issues have been resolved... but I can understand that some of my colleagues are still very apprehensive about it... how these spaces would be..."*
*(pg. 03)*

## Moving to next instance of the Building Project Activity *(Perception of Development)*

**Objectivation:** *Tender Settlement - Assessing the Building Design within the Consultancy Team*

For the Design Manager (Contractor), success (i.e. development) at this instance of Building Project activity was concerned with making sure that the overall conception of Changing Action, objectivated in the Building Design proposed was buildable within the Cost Plan (considering the amount of money that they are willing to spend on Construction, a part of the amount they wanted as *Profit*) and within the expected Time (according to the *Project Programme*):

*"Yeah! So, really what I am looking for is... making sure that is Buildable, making sure that is within the Cost Plan, and making sure that is built within the Time. ...So in terms of actual appearance of it, to be quite honest with you, I am not overly bothered... You know.. I'll build what I have been told to build in the day... but I've got to make sure... you know, I have got people above me saying: "Make sure it is for the right budget, make sure it can be built in time, and that is buildable"... So is that what I am really focusing on... So, if I am reviewing drawings, I am not thinking if it does look pretty, I am think does it fit in the cost plan?... "(pg. 03)*

In the fragment above, the Design Manager (Contractor) indicated that he was not particularly concerned with the *"appearance"* of the Building Design. This seemed to be an indication of the Contractor's lack of engagement in trying to understand the overall purpose of the Building Project activity, as a support to change the School Operational Project. For the Contractor, it seemed that, their only purpose in the project activity was *to build* something:

*"Yes! What I am looking for is any of the individual elements can be constructed... So I am looking into where we can get any off-site type of activities into the scheme... So, where we can do it go for pre-cast... and obviously I got look at sub-structure... and so, making sure that the sub-structure complies with the ground conditions... and it is pretty much it, really... I mean, in*

*terms of the actual functionality of the building, I am not really gonna comment on whether it can meet the employers' requirements, but I will make sure, well, that the Architect has engaged with the client and that these Layouts have been reviewed with the client, and the client is ultimately happy with them... Cause the last thing we wanna do is to submit something and then the Clients comeback in say: "That doesn't give us what we want!" (pg. 03)*

Thus, at this point, the Design Manager (Contractor), as the leader of the Consultancy Team, was specifically concerned with making sure that: The Architect had engaged with the Client; The conception of the Building Design had been reviewed by the Client; and The client was ultimately happy with them. However, it could be said that it was difficult for him to assure that, since he was not deeply concerned in understanding in depth the Client conception of Changing Action, as they were relying that the Architect has done that for the Consultancy Team. Interestingly, this seemed to be the rational embedded in the Organisational Template of the Contractor Company. According to the Design Manager (Contractor):

*"It is always a balance... you know... When we have to do what is called "The Tender Settlement", where we have to present this to our Board of Directors, and you know... to be honest with you, they do not bother to how pretty it looks or whether give the clients what they want... All they wanna know is: "Are we are gonna lose money?" ...And we got a good grilling (i.e. questioning) saying: "Have you looked at this? Have you looked at that? Who is doing this? Who is doing that?" ...And if they are not confident that it has been addressed properly they will not sign it off... and we won't be able to submit a price... So, that is really where we are..." (pg. 04)*

So, in order to approve the *Tender Settlement*, individuals at a high-level in the Contractor Organisation had interrogated (**Breakdown**) the Design Manager and other members of the Contractor Organisation involved in the Building Project activity, about their overall perceptions and conceptions in the project. However, this questioning and further discussion seemed to have been framed by the appreciative system of those high-level individuals' appreciative system, which focused on the fact that the Building Project activity should be profitable. This rationale of the Contractor Organisational Template seemed to have affected the way the Design Manager (Contractor) interacted in the project:

*"So is that what I am really focusing on... So, if I am reviewing drawings, I am not thinking if does look pretty, I am thinking if it does fit in the cost plan...".*

Thus, for the Design Manager (Contractor) the perception of development, or success, at this instance of the Building Project activity, was objectivated by the ***Tender Settlement*****,** which

was presented to the Contractor Company Board of Directors. The *Tender Settlement* was a price figure, submitted at the end of this Stage 1+ of the Project Programme, committed with the Building Design proposal. In this case, it represented the Consultancy Team commitment between the conception of Changing Action and the Conception of Resource (aligning *Money* and *Time)*, necessary to conduct the following instance of the Building Project activity: *Building Project Realisation* (including Planning Approval, Pre-Construction and Construction).

It important to mention that, at certain point in the interview, the Design Manager (Contractor) also mentioned that another important purpose for them in the Building Project activity, was to build '*reputation*' and establish '*repeated business*':

> Researcher: *"So in your perspective, and also considering your role, what is the purpose of this project? What do you expect to get from this?"*

> Design Manager (Contractor): *"I should make some money! (Laughter) ...That is the bottom line... Honestly! That is... obviously, it is all about reputation, we are looking for repeated business... so it is not just about making a profit, we've got to maintain a relationship with the client... we've gotta deliver a good product... otherwise, we are ain't not gonna get any future work, are we?... (inaudible)... we won't get any more work... We want to deliver on time... we want you guys to get what you want... So we wanna make sure that we meet the Brief, cause that is all part of delivering the thing on time..."* (pg. 05)

Interestingly, this seemed to expand in the 'original' idea of purpose and development (success) suggest held by the Contractor Organisation.

For the Architect, the perception of development (success) at this instance of the Building Project activity, was constructed based on a sense of accomplishment in conceiving Changing Actions, as a Building Design proposal that was '*fully coordinated*':

> *"...you need to full commitment of everyone to do a Fully Coordinated Scheme..."* (pg. 16)

This seemed to involve a perception of success that the Consultancy Team was able to make their conceptions of changing actions and resource '*fully*' interdependent in the Building Project activity.

**Objectivation:** *Signing-off the Contracts*

While, for the Consultancy Team, the *Tender Settlement* was a way to objectivated the perception of development (i.e. success) by the end of this instance of the Building Project

activity, for the Client (i.e. the University) this perception was objectivated by the Dean *Signing-off the Contracts*. That meant that the Client approved the proposed *Tender Settlement*, including the Consultancy Team commitments with the agreed conception of changing action and resources, objectivated in terms of *Building Design* proposal. Thus, such approval, automatically, triggered the subsequent stage in the *Project Programme*: Stage 2, including tasks related to Planning Permission and further Design Development (i.e. RIBA Stage 3).

In this case, the '*Signing off*' interaction was conceived as part of the formal process envisioned within the procurement method, and indicated a contractual agreement accepting and "guarantying" the "transference" of resource (i.e. Money) from the University to the Contractor, as leader of the Consultancy Team. From the Dean's comments, it seemed that the enactment of this interaction it depended on the Client's satisfaction, as a positive perception of the result of the proposed changing action in promoting development for the School Operational Project:

> "*So the end of Stage 1 is: The client likes the design; The performance criteria can be met; and we can do it on budget. Ok?!... These are the three main issues.*" (pg. 03)

> "*...that I signed off all the designs... So that said: "I am now happy...I think that it represents a good building" ... ...all the spaces that are need are covered... we had to move things outside the building...we had to limit the square meter...we had to invest an extra 2 million pounds from the school to get what we wanted..."* (pg. 06)

Thus, the Client's perception of development was constructed and repositioned through the activity, and it was dependent on the other perceptions and conceptions of the aspects affecting the collaborative interaction. At the end of Stage 1+ (after the extension conceded to the Consultancy Team), the Dean, indicated that he was happy and that "*it represents a good building*", because according to him "*all the spaces that are needed are covered*". One might say, that this not necessarily indicated that the functionality of these spaces were in the way they would wish the they were. According to the Dean:

> "*...at the end of this Stage (1+) **there was a lot of compromises** to be made, through discussions, which led them to reconceive their conception of changing action due to cost implications: "...and there were many choices I had to make... unfortunately some of them moving computer labs away, but I left everything in there that was student focused, cannot be replicated in another space, and that will allow interdisciplinary work to take place. (Compromising) ...And then I signed off those designs, and of course there was a lot of discussions about: "Well this is gonna cost you that amount of money, because of the changes*

*you made" …and at that point I left to the Estates Team. …And since then, I haven't really been engaged because there wasn't a lot to do… because the design… the initial design is finished… and the problem is we were running of this Stage (2) about six (6) months late in the process…"* (pg. 06).

At this point, the Dean fought to prioritise in the conception of the Building Design aspects that were student focused and could not be replicated in any existing building, because in his view "*that will allow interdisciplinary work to take place"*. The Dean also indicated that most of these negotiations with the Consultancy Team was led by the Estates Department without his participation.

An important measure of success of the project activity so far, could be noticed by the Dean's argument on how the proposed conception of the Building Design could support the changes envisioned for the School Operational Project:

> *"The only reason I was important in that process is because we tried to drive a cultural change as part of the building… So one of the aims and benefits of the new building is to allow interdisciplinary work and what I call in the brief **as a discipline agnostic area**… What discipline agnostic means? It means the building… it should not say this is COURSE A, or this is it… it is all about… all the students being engaged in utilising all spaces and being able to feed from each other… …So three or four years after the operation in the new building, our students should be far more competent that any other student that comes from another university, because it would have an appreciation of COURSE B when they work in COURSE C… it would be able to have an appreciation of COURSE D when they work in COURSE B… they would be able to be an appreciation of COURSE E when they work in COURSE A… So it is more about creating the spaces that they don't have the Label behind, necessarily…" (pg. 08)*

The above fragment shows how for the Dean and the main purpose of the Building Project activity, was to support the change in the School Operational Project, described as a '*cultural change*'. Interestingly, he seemed to have found in the **metaphor:** *'a discipline agnostic area'*, the best fit to objectivate this conception into a Building Design. Thus, in his further description (i.e. **breakdown**) he seemed to expect to achieve mutual intelligibility on this overall conception.

In the other hand, the Staff Member seemed to have a complete different perception of development on the activity at this point. It seemed that because of her dissatisfaction with the way engagement was objectivated at this instance of the activity, her evaluation of the overall conception of the Building Design was insufficient, and she was not sure if the proposed 'new

building' would address all the necessary changes envisioned for the School Operational Project:

> *"I think... I think... (Laughter) Positive outcome?... I think the only fact is that potentially we got a new building coming in this space ... a lot of the problems that we have the space issues or... you know we have got others... we got something to tell the students or to look forward to say: "Ok, when we got the new building?" ...because, you know, we fought before... and unfortunately, that is all we got... we can't do anything away... we gonna have to go elsewhere or... but at least I think for the next year or two, we got something to look forward to... and say... and perhaps everyone minds that this building can answer everyone problems... which I do only hope it generally does, but in some ways that has been (inaudible)... Some part of the people are OK with present problems, because they know that in the future that is gonna be addressed... and I think: Is this transition period we are trying to be happy? Or we will try to adjust these problems? ...But, I know what I will do... I will try to address this in the new building but... in these two years time we will know... Is this worst than we had... We don't know... I hate this, but... (pg. 08)*

## Interviewees general reflection on the Building Project Activity

### Challenges

For the Architect a '*big*' barrier in the activity was resource (i.e. Money and Time) affecting the "level of engagement" of the members of the Consultancy Team. According to him:

> *"I would say that barriers... probably have been... Cost has been a big one! You know... the fact that we have been struggling to... to permit all of the Consultants to fully engage to probe to... you know... We were supposed to be at RIBA Stage 3, and it is difficult to get there, because there are certain levels of information and everyone is up to deliver and commit time to... But the challenge is always... There is always the opportunity that the University might turn around and say: "No you have not. You have not got this job. Move on" ...and we: "What now? We've spent all this money and we've invested..." ...So, you got a very fine line to thread and is quite frustrating... and you kind of just get on with designing the Building, because of the way it has been procured..."*

It seemed that for Consultancy Team members there was always the risk of '*not getting this job...*". So, for him this was "*quite frustrating*", and the level of engagement of these members was minimal: "*you kind of just get on with designing the building, because of the way it has been procured...*". For the Architect, the procurement method seemed to have created an

imbalance in favour of the Client in the conception of resource among project participants, while they were still competitors:

> *"...and it is competitive... and it is such a long process... I think the process has been "drowned out"... it has been 12 months... it is too long... than it should have been... You know... It puts a lot of pressure and strain on the Design Team, but also the Contractor... they got to have people on the job 12 months... and the University can turn around to us tomorrow and say: "Well, I'm not bother doing this..." ...which we just got Planning Permission, so the chances are that it is not gonna happen, but... Yeah! I think... I think it is too long... Don't tell Tim... (laughter)... You know..." (pg. 15)*

Thus, for the Architect, the positive outcomes of this activity are mostly in favour of the Client:

> *"they get like five coordinated design on the table, which you know it gonna work, they know how much they are gonna cost...".*

In his view, that created an imbalance, in which *"the risk sits with the Contractor"*. In his view, *"when more work becomes available in the industry as whole, people will gonna have less appetite to get onto the competitive route. Because it is so much risk involved, and you might not get the job in the end..."*:

> *Well, the positive outcomes is that the University get a lot out of it... Because, they get like 5 Coordinated Designs on the table, which you know it gonna work, they know how much they are gonna cost... So they only can do with all these 5 schemes for the money, because the risks sit with the Contractor... So, "plus plus plus" for the University, because they just got 5 Designs on the table, they know they can afford, they choose the one they want... Yeah! So... You know... The risks, I guess... How people... I don't know how to (inaudible) ...people are gonna have always to do this way... Especially when more work becomes available in the industry as a whole... People will gonna have less appetite to get onto Competitive route. Because it is so much risk involved and you might not get the job in the end of it... (pg. 16)*

For the Design Manager (Contractor), the '*commercial side of things*' was also one of the biggest challenges:

> *"I think biggest ones have been the Commercial side of things and a bit of just geography as well..." (pg. 13)*

So, in order to diminish the risk, the Consultancy Team, as a temporary organisation in the project activity, worked to reach **compromise on their conception of resource**, in way that

all team members were "*happy*" with the commitment they made as group – as a sense of fairness among them:

> *Yeah! I think it has been slightly… What has made this one more difficult than most is that we had to take the Design that bit further before we were awarded the contract, it is more usual… Or at least it has been an advantage for the client, that they will pay for the Design… cause, we clearly have to pay the Consultant some money, because that make our "Bras" nervous… so, they sort of "cut down" the amount of pay to the Consultants to the minimum, which that means the Consultant were a bit of: "Well, I don't really wanna give you a full service…I am only giving you half the service…" …and that has been a challenge… …Where is it, if the Client had said: "Ok, we like your Design we'll pay you up front… which is where it is going now, cause we have got to Stage 4, they are gonna pay us to do that, which will "unlock" it… it should be a full cooperation from everybody going forward… but this has been a bit of challenge during Stage 3… (pg. 13)*

In this case, the Contractor agreed in paying the other consultants some money, and from the other side the consultants also "cut down" their fees at minimum. However, that also created a situation in which the Consultants were arguing: "*Well, I don't really wanna give you a full service… I am only giving you half service…*". Thus, for the Design Manager (Contractor) that could be seen as an imbalance in the "relationship" with the client, which eventually hampered collaboration within the Consultancy Team.

Moreover, for the Design Manager (Contractor), another challenge on the activity was the "*limited dialogue*" with the Client's Team, that "*had to be through a formal communication channel*", the University's Web System, where they had to put "*everything*" through. According to him, they would prefer to have established face-to-face discussions from the beginning:

> "*Yeah! I am mean… that is a good point actually, because that has been an issue here we have to… we had limited dialogue…it has to be through a formal communication channel, that is this "intern" thing that the University use, so you gotta go and put everything through it… you can't just go and sit down with the Man and say: "Right, tell us face-to-face" … …Although we had other few face-to-face discussions with the guys who currently seats on the arts block (probably referring to the Dean) …"*

For the Staff member, *Money* and *Time* could be traditionally considered "*limiting factors*" in the activity. However, she argued that in relation to *Money*, seen as resource the Consultancy Team "*can be creative within that budget*".

*"The limitations… obviously, time and the limiting factor of money… but, you know… I don't think money is completely limiting factor, because obviously you know the students… because if you set up a budget, you can be creative within that budget… So, I don't think money is the only limiting factor, but the time constraints have been key…" (pg. 08)*

Overall, in her opinion the biggest limitation was the University, as a Client *"ability to work with the Professional Team and the Collaborative Process…"*, mostly *"due to the form of engagement"*:

*"…and also our ability to work with… the Professional team and the Collaborative Process that is where I think is critical, cause like I said, we got to put forward the ideas, we got very educated staff members, who got extremely educated students that could have feed into this process a lot more creatively…and it is just not achieved… If you look at the Oastler Building and a lot of people can see a lot of flaws in that already, and it has not only been fully used yet… It looks great from the outside, but inside functionally isn't working correctly and… you know… only time will tell, but obviously, there are a lot of concerns… you know… The last thing we wanted to do is to be in the same position that, when we open our building… and I think that is basically due to the form of engagement…" (pg. 08)*

For the Dean, the main challenge was to build a shared understanding about the *Project Template* (i.e. *Competitive Dialogue* as a procurement method):

*"…But I think the main challenge is… …in the process up until now is being on the one hand an understanding of what that process actually is… so Competitive Dialogue and what is it involve…"*

Another challenge for him, was to have "*an appreciation of how finalised a design is at the end of Stage 1 and Stage 2*":

*"Another challenge was an appreciation of how finalised a design is at the end of Stage 1 and Stage 2… So although in the discussions… You know… you get to the point you say: "Yeah! We can look at later in the Detailed Design… We can look at that… we can look at that… In reality you fixing a lot of you decisions in Stage 1 (That can related to "freezing" and establishing interdependencies on the collective interactions) …because than, it is at that point when the Consult Team says: "I can build this building at 28 million pounds"… But than if you start to say: "Can we look at this now?" "Oh, that is a variation!" "That is a change we didn't take that into account"…You say: "Well, you said we are gonna look at the Detail Design later on…" "Yeah! But we didn't anticipate that"… …So the whole process after that becomes problematic, to be honest" (pg. 07)*

According to him, *"in the discussion… you know…"*, but this may indicate that it started as a **misunderstanding** about what is (value systems) or what to expect from Stage 1 and 2 of design. This misunderstanding, seemed to have led to inconsistency in the conversations and reactions between Client and the Consultancy Team, which, consequently, led to postponement of certain decisions, according to the Dean: "*Yeah! We can look at later in the Detailed Design…*".

The challenge was that, in fact "*you are fixing a lot of decisions in Stage 1*", which **freeze some aspects of the conception of the Building Design proposal**. So, this had a lot of importance in this kind of procurement method, because a Building Design conception presented at one stage was bounded to a conception of resource (i.e. the cost and time to build it). Consequently, eventual "evolutions", as things that were left to be resolved later, could be seen as "*variation*" and not be accepted because they could not be committed within that same conception of resource (i.e. cost and time). So, that created a dilemma, **due to misunderstanding about the concept of design completion at each stage.**

**Most engaging activity**

For the Architect, the most engaging interactions within the Consultancy Team were the visits they did to previous buildings together, the *Roadshow* events, and the use of 3D models on the *Design Team Meetings*:

> *"Yeah! Ok! Well… I mean… Probably, site visits… you know… Actually going out to visit previous buildings together. That is one that certainly got everybody "fired up", excited, and interested and talking cause you could see it… and certainly… I said earlier, the big one was the 3D models, cause you can keep coming with 2D plans on the table, but since you bring up the model in the screen and start showing everybody the Design, and that definitively engage everybody… and just raised for talk and their being there… working in 3 dimensional…" (pg. 15)*

**Potential Improvements**

For the Architect, a potential improvement in the Building Project activity would be to consider more *Time* to conceive the Building Design proposal at Stage 1 and 2, considering the level of commitment of everyone:

> *"The only thing… I think we were probably pushed too hard to develop the Scheme to a resolved and coordinated level too soon… and I think it takes longer to… to… and you need to full*

*commitment of everyone to do a Fully Coordinated Scheme… it just don't feel like it … Because as I mentioned before it is very difficult to Bid these projects…" (pg. 16)*

For the Staff Member, an improvement needed would be an enhancement on the engagement of the users of building with the Consultancy Team:

*"I think is just regular engagement differently…with the users of the building, which is critical… you know, like… meeting the Architect Team or just been in regular involvement" (pg. 08)*

Similarly, the Dean indicated that ideally they should have involved the users (i.e. "*I mean the staff that understand the students and how they operate in that space, but also they deliver studio*") earlier in the engagement activity with the Consultancy Team:

*"…So I think from my perspective… I think…I think that they should have… we should have the end users involved… by the end users I mean the staff that understand the students and how they operate in that space, but also they deliver studio… …So I think they should have been involved, more than me in some ways…in that…" (pg. 08)*

**Definition of Collaboration**

For the Architect, *Collaboration* would be the result of everybody working together in the same place and being able to speak to each other:

*"Collaboration, is the result of… …All consultants and all contractors within the Team, so everybody in the Team…All "singing" for the same (inaudible 1:01:15) always. So, if everybody was able to sit in one office, that would "ultimate" in the collaboration, because everybody would be talking to each other… you almost got a… and we had that instances where we have done that… For example, I was in one of the Projects that I set in Manchester City Football Stadium, for Rafael Vinoli, which was in the Training Academy. What he did there was… They took us all, they got an office… and they took the Architects, the Engineers, Structural Engineers, Mechanical Engineers… Everybody sat in one office and worked on that job… So you are in this office, for example, and someone is working on a Team on a Project, so you might even move desks… So you are five people, we are all sitting next to each other to collaborate… Where is that was ideal, because those five: Architect, Structural Engineer, MEP… Everyone was sitting around together and that just really did facilitate… fantastic opportunity to collaborate, because everybody is talking to each other. You don't have to send it through emails and wait replies, and they have misinterpreted what you meant. But you can… you rather just say: Can you look at this on the screen?" "You cannot do that" or…You take a screen shoot and send it on your email, and then you hold a day… you know… The best to collaborate is to everyone to sit together, and*

*just work... just "brainstorming" working all the time... that is... I think that would be the ultimate..." (pg. 17)*

According to the Architect, in order to be able to create this environment the "*job needs to be big enough to facilitate that*". This seemed to suggest that, because of the temporary nature of construction projects, the organisational template of construction and architectural companies, how they tend to objectivate their conception of resource (e.g. people and time) in these activities, are difficult to adapted to this collaborative context:

*"That is why... It cost money to do it! But to really be able get the office and put everyone in one place... but you also got to have those people... You know... The job need to be big enough to facilitate that... cause people that you got in that office, can only be working in that one job. Where what you got often are smaller jobs, not necessarily like this one...but smaller ones, you might be working in two or three smaller ones also... You would have to have two days in that office and two days in that one..." (pg. 17)*

The Design Manager (Contractor), also understood *collaboration* as "**working together as a team**", so "*everybody understands what everybody else's priorities are...*":

*For me? It is purely about working together as a team, isn't it? Making sure everybody understands what everybody else's priorities are, if you like, so that we can work together successfully. You've got to make sure that all of the participants know exactly what and each of them are doing it, and what their goals are... and that is not just the Design Team, that is Us... and to some extent it is the Client as well... Cause, I think the most successful projects start with a good Brief and the Client knowing what he wants... some of the least successful jobs I had worked on they all got a common theme and that is where the Brief haven't been particularly well defined, and you... The Client knows what he doesn't want, but he doesn't know what he wants... (pg. 15)*

Also, for him "*successful projects start with a good Brief and the Client knowing what he wants...*", which seems to indicate that he believes that "everything" necessary to conceive the changing action (design proposal) can be determined and described through the Brief (object). Moreover, there seems to be a tendency of the Design Manager (Contractor) to put the responsibility (for the lack of success in the others – in this case the client in producing the brief).

For the Staff member, collaboration is considered "**good communication**". In her view, collaboration is achieved by participants "*being aware and up to date is critical...*":

> *"I think is good communication. I think that is successful… and when I mean communication, it is not just be like physically, it could be virtually, but… it just being made aware and up to date is critical… because, it is like I said… If certain decisions have to be made and people are not going to be happy about, we got all to accept that is compromise in a non-ideal solution, but if we are constantly made aware of this changes and why they occurred… …you kind of accept it and buy it… so, you know what you gonna expect… so why you… So, like I said, it is about accepting that final building, when you know the reasons behind or why things have been restricted… I mean, it is just not knowing, you can't see a solution, you can't get involved or you can't have the say also… That is when it becomes a very difficult process and become worried about the future…" (pg. 09)*

So, "*we got all to accept that decisions are not going to make everyone happy, and they need to compromise in a non-ideal solution…*" "*but, if we are constantly aware of these changes and why they occurred, you kind of accept it and buy it…*". "*When you know the reasons behind or why things have been restricted…*". This is very close to a notion of **mutual intelligibility**. This concept, seems also to be "framed" by her general impression of the activity, and her dissatisfaction with the Consultancy Team.

# Appendix 5:
# A very brief context of the philosophical stands in the nature of collective actions

As mentioned before, previous work already suggested that current organisational models applied in construction project management, which include design disciplines too, have been influence by metaphysical standpoints originated in the philosophy of the Ancient Greece (Koskela and Kagioglou, 2006a; Koskela et al., 2017). These researches have explored the dominant presence of a dualist ontological tradition on the philosophy of science based on the rationalism originated in Plato, and in the empiricist originated in Aristotle. Interestingly, there is no reference to Socrates and his philosophical orientation towards dialectics. In this section, it is presented an interpretation (based on fragments of *The Philosophy Book*, from Buckingham et al., 2011) on how these ontological traditions, including Socrates dialectics, emerged to configure the foundations of the suggested three metaphors of collaboration.



**Figure 79: The three ontological and epistemological traditions**

## Socrates and the Dialectics

Socrates was Plato's master and is considered to be one of the founders of the western philosophy, in Ancient Greece. He believed that the central concern of philosophy is an investigation about life, which should be brought by questioning our deepest beliefs. In this way, Socrates suggest a process in which we question the meanings of fundamental concepts that we use every day, but we never think about it, consequently revealing their real meaning and our own knowledge (or ignorance).

Appendix 5: A very brief context of the philosophical stands in the nature of collective actions

This has been called the Socratic Method, or Dialectics, because its conducted as a dialogue between opposed views. This simple system of questioning would bring to light assumption, that most of time were false, that serve as basis for a supposed knowledge. In order to conduct such questioning, Socrates assumed the point of view of someone that did know nothing and simply made questions exposing contradictions and gaps in the presented arguments, that would lead to insights and agreement in a new set of conclusion.

According to Socrates, in order to acquire knowledge about the world and ourselves it is necessary to understand the limits of our own ignorance and remove preconceived ideas. Only by doing so, it would be possible to find truth.

Maybe the point of comparison between Plato and Aristotle ideas with Socrates' dialectics would be the concern of the first two with the search for a "fundamental rule or form apprehension" of the nature that eventually led to a dualistic frame of Deterministic approaches. It seems that Socrates' philosophy implies that there is no "need, advantage, or even sense, in working towards this distinction, while the context of knowledge is always situated in actions through dialogue, which implies a Non-Determinist approach.

For example, the proposition of the syllogism as an innate rational method, position Aristotle no so far from the rationalist tradition. It could be argued that, is at this point that the *individualist* essence of the process of acquiring knowledge that is implied in the rationalist and empiricist tradition will find contradictions with the *collective nature* of dialectics in the Socratic Method. In some sense, it could be said that while Plato and Aristotle seem to "provide" a way to find and interpret such order in the world, Socrates seem to suggest that such "order" is just valuable as way to express conceptions and it is useful in conveying meaning in society to support collective actions. Maybe he is not so clear in that. But can we imply that? Why the others took such different direction on philosophy? More importantly, these traditional systems of inquiry seem to establish three foundations for subsequent development and emergency of the metaphors of collaboration.

## Hegel and the 2nd age of Dialectics (Metaphysics)

The German philosopher George Hegel lived during the late 18th century and his central idea was that all the phenomena, from consciousness to political institutions, are aspects of a unique spirit ('mind' and 'idea', for him) that reintegrate these aspects in itself through the pass of

Appendix 5: A very brief context of the philosophical stands in the nature of collective actions

time. This process of reintegration is what he calls dialectics, and what we as aspects of this spirit understand as history.

He argues that language, for example, is something that we learn and change as we use it, and the same is true for science and social institutions. Therefore, human beings never start their existence from nothing, rather always within some kind of context, which sometimes changes completely within the same generation. However, some things seem not to immediately historical or subject to change. One of these things is the consciousness, which is plausible to affirm that the structures of thought are not historical and have always been the same for everyone. This clearly represents the beliefs of Kant presented earlier. According to Kant, the basic process of reasoning and basic structures of consciousness are independent of any historical influence or development. In Kant's argument, everything we can know is the world as it reveals itself through the structure of a priori concepts, as what he calls 'phenomenic' world.

Hegel believed that what exist is what becomes manifest in consciousness – as something sensed or thought. For him, Kant's notion of the 'world in itself' was an abstraction empty and meaningless, which is based on excessive assumptions about the nature and the origin the concepts a priori. Hegel observed that Kant supposed that there is no relationship between these concepts. Kant suggested that these concepts, as categories, are logically distinct, in other words, they cannot be derivate from one another. What Hegel realised is that, in fact, they are '*dialectics*', which means, they are always subject to change. While in Kant's idea there is an immutable structure of experience, Hegel believed that as well as the world that we experience our own structure of experience is subject to change too. Therefore, consciousness is not only something that we are aware about, but rather part of an evolution process, a dialectics process.

This may help to explain the existence and the role of distinct metaphysical models, namely *rationalist* and *empiricist*, which have been function as kind of interpretative structure or system of inquiry (i.e. conceptual framework) by which one can make sense of the world. It could be said that this is present and has 'evolved' in terms of metaphors because it implies its existence on socio-historical interaction.

By stating that the structures of thought are dialectics, Hegel suggest that they are not distinct or irreducible, as proposed by Kant, but in fact they emerge from broader notions brought by a movement of auto contradiction and resolution. According to Hegel, every notion, or 'thesis', contain inside itself a contradiction, or 'antithesis', which can only be resolved by the

3

Appendix 5: A very brief context of the philosophical stands in the nature of collective actions

emergence of a newer and richer notion, called 'synthesis', coming from the own original notion. As consequence of this process, when one become aware of the synthesis, one perceive that what was previously considered as contradiction in the thesis was only apparent, caused by some limitation in the way one understood the original notion.

For Hegel these dialectical developments are not only interesting facts of logic, but they are real developments and can be observed in action in history. It could be argued that, this recognition of the 'historical' validity of dialectics may be what suggest a connection between Hegel's ideas with the foundations of Pragmatism, and the role of 'general concepts' as structures of social consciousness.

Interestingly, in his first great work, *Phenomenology of Spirit* (1807), Hegel provide an explanation of the dialectic development of these forms of consciousness. The author mapped the kinds of consciousness an individual can have and gradually advanced until **collective forms of consciousness** (i.e. social institutions). He tried to demonstrate that those types of consciousness are externalised in historical periods or particular events – like the French revolution.

Therefore, Hegel conclude that there is nothing about human beings that is has not a historical character. More importantly, as a **dialectic process, it must somehow contain in some sense a particular sense of direction as well as a purpose**. Hegel call this purpose the 'absolute spirit', in which a future stage of consciousness does not belong to individuals, but reality as a whole. Hegel's explanation about this progression start with a consciousness that first think of itself as individual thing among other individuals, as occupying a separate place of mater or natural world. However, posterior stages of consciousness do not belong to individuals, but social or political groups – in a way that dialectics continues developing till a point it reaches the 'absolute spirit'.

In the end, Hegel affirms that the dominant philosophical view stating two types of entities in the world (things that exist in the physical world and thoughts about these things) is wrong. For him, this is just an apparent distinction, which is overcome when we realise that only exist one reality, that one of the 'spirit', which knows and reflect about itself, and it is the thinking as well as the thing that is thought.

## The Pragmatism and the argument to question metaphysical traditions

The Pragmatism started by the end of the 19th century with Charles Sanders Pierce, which was deeply sceptical about the metaphysical ideas, like the one that state the existence of a real world beyond the world that we sense. Peirce believed that the meaning of a concept, like 'diamond' or 'gold' is derivate of the object of from the quality related to these concepts and the effects that it has over our senses. In this sense, Peirce propose the pragmatism maximum that the meaning of a concept is a sensorial effect of its object, which leads to a conclusion that 'truth' is description of reality that works best for us.

Indicate how this may be influenced by Dialectics. As well as, Hegel and his dialectic theory, Peirce tried to demonstrate that the majority of debate around philosophy and science has no sense. Since the effects of these debates on our senses can never be specified, on in other words determined, the debates will be mostly about words, and not about reality. A fundamental consequence of this theory is that one cannot **acquire knowledge** only through observation, but rather doing, and one can only count on this knowledge when it is useful, in the sense that it properly explained things to us. When this knowledge does not fit its purpose or better explanations made it obsolete, the knowledge is substituted.

This argument will support a complete different stand and volatile idea about knowledge and understanding, which is much more related to the ideas of thesis and antithesis presented in Hegel's dialectic method. More importantly, this idea suggests that knowledge, as a explanative tool, is different from facts.

The *Pragmatism*, as proposed by William James (1907), rejected the rationalist tradition that a changing world is somehow unreal, because in the pragmatic perspective the world, as reality, is still evolving, since truth is constantly becoming existent. This also took them to question the idea that this 'flow' of reality is susceptible to empirical analysis, because since there is this continuous flow, the act of observing will affect the analytic truth. This argument for example support the contextual and historic notion on our socio-construction of 'reality', which is embedded in language and other artefacts.

These pragmatic ideas took John Dewey to consider that the purpose of thinking is not one of producing a real picture of the world, but rather one that help us to act effectively within it. In this sense, Dewey believed that philosophical problem is not abstract question divorced from people lives. According to him, these problems exist because as humans are beings constantly

Appendix 5: A very brief context of the philosophical stands in the nature of collective actions

making sense in the world, fighting to decide how to better act in it. In these thoughts it is possible to recognise an influence some of the evolutionist ideas from Charles Darwin, and his *Origin of the Species* (1859), and a consequent tendency to consider human 'problems' as collective ones.

In his essay *Kant and philosophic method* (1884), Dewey further discuss the idea that we only think when we are confronted with problems. According to him, **we are organisms that will respond to a world subject to constant change and flow. Existence is a risk, or a game, and the world is fundamentally unstable.**

In this context, Dewey highlight the importance of understanding that we can never completely control the environment or, we can never change it to a point where it is possible to eliminate all the uncertainty. In the best case, we can change the freighting and uncertain nature of our world. Interestingly, this may be related to the concepts of resource and development present of the Social Systems metaphor. Consequently, Dewey considered that judgment over a philosophical theory should be about its utility and efficacy on solving problems in our lives, which in this case is exactly the kind of reflection that take this investigation over the role of metaphors.

## Relevant contemporary developments on Ontology and Epistemology

In this historical development of traditional ontological and epistemological positions, it is also important to highlight the work of four contemporary philosophers, namely, Ludwig Wittgenstein (1889-1951), Martin Heidegger (1889-1976), Hans-Georg Gadamer (1900-2002), and Jürgen Habermas (1929-). Especially, their discussions philosophy of language, will be fundamental to advance the argument on questioning the current assumptions on the nature of knowledge and understanding embedded in the metaphors of collaboration as well as the current paradigms of design.

Wittgenstein in his work *Tractatus Logico-philosophicus* (1921) addressed the same task of Kant before in his *Critique of Pure Reason* (1781). Wittgenstein was particularly concerned in exploring the limits of language, and consequently, the limits of all reasoning and knowledge. He did so because he suspected that great part of the discussion and philosophical disagreement is based on fundamental errors in the way we deal with reasoning and the way we discuss the world.

Appendix 5: A very brief context of the philosophical stands in the nature of collective actions

These ideas are based on the principle that language as well as the world are formally structured, and those structures can be decomposed in its component parts. Wittgenstein engaged in revealing these structures belonging to both language and world, then demonstrate the way they relate to each other. According to Wittgenstein, language 'picture' the world, in the same way that the elements represented in a map are related to each other, as well as they are in the location represented in the map. Wittgenstein understood that, what an image or representation shares with the thing that it represents is its logical form. Consequently, an image binds itself to reality as a pattern of measurement, representing the world. In this sense, they can be both true or false. This means that, in its logical form, language as it come about through this *ontological structures*, it can speak about the world picturing it in a way that it agrees with reality.

This is key for the proposed argument in this thesis in terms of the nature and role of metaphors as sensing artefacts produced through language. I shall say that maybe de major legacy from Wittgenstein philosophical ideas is the concern with the role of language as "logic mechanism" that "acts" formally in our understanding of the world, as sense making artefacts. This will have deep consequences in the way we build our assumptions of the role of language (representations) in collective actions.

Another important contribution to this argument can be found in Martin Heidegger's ontological discussion about *Phenomenology*. In his work, *Being and Time* (1927), he argues that previous philosophers had made ontological questions, but their approaches were too abstract and superficial. He thought that if we want to know what means to say that something existed, we need to examine the question from the perspective of those beings for which to be is a theme.

For Heidegger we simply discover that we exist in a world in progress, that exist before us, in a way that when we are born we are introduced to a particular historical environment, which is material and spiritual. What we do is to try to make sense of this world by engaging in many activities, for example to build a house to provide shelter. **By engaging in these projects, that consume time, we project ourselves literally towards different possible futures: we define our existence**. This is true with we assume a self-determinist nature of human existence, and consequently how important is that we are aware of these conditions affecting our everyday interactions.

Appendix 5: A very brief context of the philosophical stands in the nature of collective actions

One could even say that some of these ideas will have an important influence in the philosophy developed by Hans-Georg Gadamer (1900-2002) and his argument towards the role of interpretations, which is associated the branch of philosophy that study hall humans interpret the world, called *Hermeneutic*. Gadamer's ideas will support much of the arguments on this thesis about the dialectic nature of "knowledge" and understanding in collective actions of design.

Gadamer study philosophy under the supervision of Heidegger. In his work *Truth and Method* (1961), Gadamer explored the idea proposed by Heidegger that our interpretation of our existence evolves through a circular process of deepening our understanding, starting with what we already know, which Heidegger called the '*Hermeneutic circle*'. Gadamer went further to say that this understanding is always achieved through a particular perspective in a certain point in history. This corroborate with Hegel's assertion about historical feature of our thoughts. According to Gadamer, our prejudices and beliefs, the kind of questions we judge are worth doing and the kind of answers that will satisfies us, is all product of our history. In his ideas, one cannot stand outside of history and culture. Therefore, one can never reach an absolute objective perspective.

These ideas of "subjective" interpretation will present and further explored in the study of can correlate with the principles applied in the Activity Theory.

For Gadamer, even if it was possible to be free of all the prejudice, we would not be able to see things clearly, because without any determined system of interpretation (i.e. as ontological systems of inquiry like the rationalist or empiricist tradition), we would not be able to see anything. The emergent problem I shall say is that when this is systems are considered as the definitive truth, and more critically, the only possible way to see and understand the world. That is why the importance to recognise the existence and the value of the metaphor by which we make sense of our world. It seems to be the role of the "ontological systems" in metaphysics, in providing a determined system for interpretation of the world. The only mistake is in taking this for granted and not recognize their argumentative nature and the need to "question/reflection" upon their "value" as means to amplify our understanding and improve our actions (pragmatism), in social context. Consequently, we need to realize and be open to engage in dialogues of contradictions (dialectic).

Gadamer suggest that the process of understanding of our lives and of 'ourselves' is similar to a 'conversation with history', which approximate him from the perspective of dialectics

Appendix 5: A very brief context of the philosophical stands in the nature of collective actions

proposed by Socrates and Hegel. Through these linguistic interactions, in other words, dialogues, our prejudices and predispositions become clear, and consequently our understanding of the world reaches deeper and richer levels.

According to other German philosopher, Jürgen Habermas (1929-), modern society depends a lot on our capacity to criticise and think collectively about our own traditions. Reason is a central concern in our everyday communication, in which we continually ask for justification on our actions. In this sense, Habermas suggest the idea of 'communicative reasoning', because he believes that is not a matter about finding abstract truths in this dialogue, but the need to justify ourselves in these interactions. In his work, *The Theory of communicative action* (1985), Habermas conclude that there is a connection between 'communicative reasoning', and what he called 'public sphere'. In the public sphere, there is the opportunity to recognise that we have common interest with other private individuals, and consequently to question efficacy of existing social institutions.

Once more, this brings attention for the notion of "shared understanding", which we shall consider as an equivalent to "fusion of horizons" in Gadamer words, as a key condition in the development as evolution of collective interactions. In conclusion, it could be said that Dialectics afford a non-determinist alternative to the other perspectives on ontological philosophy. Consequently, it will allow the emergence of much more useful (in pragmatic terms) approaches to epistemology and inquiries in the context of collective development (human as social systems).

# References

Buckingham, W. (2011). The philosophy book. Dorling Kindersley Ltd.

Darwin, C. (2004). *On the origin of species, 1859*. Routledge.

Dewey, J. (1884). Kant and the philosophic method. *The Journal of Speculative Philosophy (1867-1893)*, *18*(2), 162.

Gadamer, H. G., Weinsheimer, J., & Marshall, D. G. (2004). *EPZ truth and method*. Bloomsbury Publishing USA.

Gadamer, H. G. (2008). *Philosophical hermeneutics*. Univ of California Press.

Habermas, J., McCarthy, T., & McCarthy, T. (1984). *The theory of communicative action* (Vol. 1, p. 308). Boston: Beacon press.

Hegel, G. W. F., & Inwood, M. (2018). *Hegel: The Phenomenology of Spirit*. Oxford University Press.

Heidegger, M. (2010). *Being and time*. (1927) Suny Press.

Appendix 5: A very brief context of the philosophical stands in the nature of collective actions

Kant, I. (1908). Critique of pure reason. 1781. *Modern Classical Philosophers, Cambridge, MA: Houghton Mifflin*, 370-456.

Koskela, L. J., & Kagioglou, M. (2006). On the metaphysics of management. In *Proceedings of the 14th Annual Conference of the International Group for Lean Construction* (pp. 1-13).

Koskela L., Pikas E., Niiranen J., Ferrantelli A. and Dave B. (2017). On Epistemology of Construction Engineering and Management. In: *LC3 2017 Volume II – Proceedings of the 25th Annual Conference of the International Group for Lean Construction* (IGLC), Walsh, K., Sacks, R., Brilakis, I. (eds.), Heraklion, Greece, pp. 169–176 DOI: https://doi.org/10.24928/2017/0336

James, W. (2000). *Pragmatism and other writings*. Penguin.

Wittgenstein, L. (2013). *Tractatus logico-philosophicus*. Routledge.