LEAN KNOWLEDGE MANAGEMENT: THE PROBLEM OF VALUE

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ABSTRACT

Lean knowledge management is defined here as: getting the right information, in the right form, to the right people at the right time. This definition highlights series of practical problems for knowledge management in the built environment which, in turn, have implications for lean theory.

In the terms of TFV theory, the problems that arise from getting information to the right people at the right time are essentially flow (F) issues, but those that are concerned with defining the right information and the form in which it is to be delivered are more concerned with value (V). Here, we focus primarily on the problem of defining right information.

A distinction is made between sociological 'values' and economic 'value', showing how both relate to production theory. In the course of benefits capture and realisation, both values and value are negotiated between project participants and other stakeholders. It is argued that these processes are best conceived as conversations and that this is implied in the basic formulation of V theory.

The notion of objectivity and its significance for these values/value negotiations is examined. The problem of benefits realisation is considered and a set of hypotheses are generated regarding the nature of an effective benefits realization management process.

KEY WORDS

Knowledge management, Value, Values, TFV, Benefits realisation

INTRODUCTION

Womack & Jones (2005) have suggested that lean thinking should be extended to the analysis of consumption. Lean Construction has long had a conceptual basis for such a move in the form of V theory (Koskela 2000). Here, we examine and extend this basis as the foundation a benefits realization management process (BRMP). In a BRMP, benefits equate directly with value, the purpose of this management process being to identify and ensure delivery of the benefits which will accrue from a project (Sapountzis *et al* 2008a). Thus, a BRMP is designed to address a series of problems that can arise on projects, including: to identify customer needs correctly; to optimize design to deliver best value to the customer; to deliver a finished product that

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conforms to the optimum design; to evaluate the process and finished product and to use the evaluation as a basis for future improvement. Currently, there are several more or less well developed initiatives to develop coherent BRMPs in construction, including under the auspices of the Australian Alliancing model (Ross 1999) and within the British health sector (Harris *et al* 2008). It is not the intention of this paper to review such initiatives, but rather to extend the theoretical basis for them.

The aim of benefits realisation in the built environment is a broad one: to rationalise the whole process of conceiving, designing and delivering optimal solutions for customers. However, most of the BRMP can be conceived of in terms of knowledge management (KM).

First, design (and particularly requirements capture) is central to the BRMP, since this is the process in which benefits are defined and turned into requirements. Design is knowledge work and as such is closely related to KM. It is possible to categorise designers activities as either using, creating, preserving, or communicating knowledge. These are all KM, or KM supported functions: preserving and communicating knowledge are KM functions; use and creation of knowledge are KM supported. The management of knowledge creation, arguably the central problematic of design management, has been an issue in KM for some time (Nonake & Takeuchi 1995). The analysis presented here does not extend to the main design process itself, for our present purposes the central process is an interactive one in which customer aspirations and knowledge are communicated and used to conceive, first benefits and ultimately design specifications. Such a process can readily be conceived of as a conversation (Slivon *et al* 2010).

Second, a BRMP is concerned with ensuring that the knowledge generated through the design process (i.e. the design, the design rationale, and the intended benefits that underlie the rationale) governs the production phase. KM processes involved here include the clear communication of design, adequate monitoring and feedback (information gathering and communication). In addition, effective production control requires incentive flow-through (Siriwardena *et al* 2006). Although the design of incentives is not a KM issue, their clear communication to those who are expected to respond to them is.

Third, continual evaluation and feedback is crucial to an effective BRMP.

Here, we define lean knowledge management as: getting the right information, in the right form, to the right people at the right time. This definition highlights the practical problems of knowledge management indicated by our analysis of BRMP above. It also calls for a clarification and extension of lean theory. In terms of TFV theory, the problems that arise from getting information to the right people at the right time are essentially flow (F) issues, but those that are concerned with defining the right information and the form in which it is to be delivered are more concerned with value (V). Here, we focus primarily on the problem of defining right information.

In what follows, we begin with an examination of the concept of value itself, reviewing previous work on the topic within the Lean Construction community and suggesting some additional clarification and extension. A philosophical and sociological basis is developed for examining the way that inter-subjective understanding of value is achieved in the design process. It is suggested that the unique adequacy (UA) requirement provides suitable criteria for inter-subjective understanding (Rooke *et al* 2009).

The principles of value generation (Koskela 2000) are reviewed and extended and the corresponding KM processes are identified. It is argued that three of these (requirements capture, design and evaluation) are concerned with the definition of

economic value and that these are best seen as a continuous learning and improvement cycle.

We hypothesise that an effective BRMP will include all the elements of this extended V theory and this hypothesis is broken down into a series of more specific sub-hypotheses, which have already found some confirmation in the benefits realisation literature.

VALUE

Value has been analysed previously by Emmitt *et al* (2005) who identify the following characteristics.

5. Value can be categorised as external or internal:
    5. external customer value is the ultimate objective of the project, it can be categorised as either,
        a. process value, derived from the customer's experience of the design and construction process,
        b. or product value, deriving from the characteristics of the finished building itself,
    6. internal value is the value created for participants in the project delivery team.
6. The perception of value is subjective.
7. Values change over time.

They also observe that the customer in any particular case may represent a complex of stakeholders and that interests from the wider neighbourhood may also impact on our conception of value.

Thyssen, *et al* (2010) add the following observations:

5. value can be distinguished from 'values', which refers to principles and ideals;
6. notwithstanding its subjective nature, value can sometimes be subject to objective measurement, though this measurement often depends on context;
7. the durability of a valuation depends upon the number of people who agree on it and the correctness of their assumptions;
8. value can be instrumental;
9. it can be perceived in physical objects, activities, or abstract concepts.

Finally, they note that mathematical definitions of value, such as those suggested by Thomson *et al* (2003), are simplistic and nonsensical.

The use phase of the built facility remains unexplored in these papers and the concept of external value used in the value management model consists of a "standard value agenda [of] beauty, utility, durability, harmony with surroundings, environmental issues, and buildability" (Thyssen *et al* 2010:23). Siriwardena *et al* (2008) have explored the way stakeholder roles change over the built environment life-cycle, an analysis inspired by a shift in focus from the simple provision of built facilities to a situation where companies provide not only the building, but services to the building. Two consequences of this are that: the ease with which a building can be serviced becomes a further source of value (though there may be some doubt as to whether this can be considered internal or external value); the emphasis on through-life management brings the demolition phase into focus.

The management of internal value also remains under-theorised, though the Language Action Perspective offers a promising way forward (Howell *et al* 2004; Slivon *et al* 2010).

Philosophical problems related to the subjectivity and durability of value are treated at some length without a clear resolution in Thyssen *et al* (2010), but the

practical solution is already presented in the earlier paper (Emmitt *et al* 2005). This consists of a workshop approach which enables durable values to be established through discussion. It only remains to provide the philosophical basis for this approach. Such a basis can be found in Schutz's (1967) theory of intersubjective understanding. Beginning from the fact that individuals are continually engaged in meaningful lived experience, a component of which is an assumed reciprocity of perspectives with other human beings, Schutz shows how the objectivity of an experience is established through a process of social interaction.

SOCIOLOGICAL VALUES AND ECONOMIC VALUE

Although Thyssen *et al* (2010) distinguish between value and values, they do not pursue this distinction in a systematic manner, in addition, the similarity of the two terms leads to some ambiguity in their discussion. We propose therefore, that the distinction should be between sociological values and economic value. The former represent "culturally defined standards by which people assess desirability, goodness and beauty, and which serve as broad guidelines for living" (Marcionis 2001). Situating the definition of sociological values within the context of culture in this way has the advantage of stressing their inter-subjective nature. Culture cannot be understood in terms of a logical dichotomy of objectivity and subjectivity; its intersubjective nature is further explored in the next section.

Economic value is a narrower concept, being a standard by which we asses goods and services for the purposes of exchange. 'Economic value' has two meanings, being either exchange value, or utility value (Smith 1976). Exchange value (or price) is simply the value of goods or services for which a good or service can be exchanged. It is, by its nature, automatically quantified in any market system that uses money as a means of exchange. A notion of utility is necessary in order to explain why exchange takes place in the first place, but the relationship between utility value and exchange value proved problematic for many years, until it was realised that it is marginal utility (the value of having one more than you have now) that determines price (Lipsey 1975).

The concepts of exchange value and marginal utility value are quantitative measures useful for studying the distribution of scarce resources. However, they are of limited use to production science, where problems of value demand a precise identification of utility value and its transformation first into design and ultimately into the delivery of the required product or service. It has been pointed out that this is a radically different way of thinking about projects than the narrow economic one that currently dominates in construction (Koskela & Ballard 2006). It requires a conception of economic value that is:

- based on utility, so that it can capture user needs;
- qualitative as well as quantitative, so that it can inform design and production.

This is the conception of value that lies at the heart of Shewart's (1931) approach to production management.

Economic value is one kind of sociological value, but there are others. A key point is that sociological values determine not just the economic value of a product, but the nature of the means by which the product can be produced (Parsons 1968). Some of the obstacles to lean construction that established construction industry values can present have been explored by Rooke *et al* (2003, 2004).

INTERSUBJECTIVITY

Difficulties arise from the attempt to decide whether values are objective or subjective. How, for instance, can value exist in objects, if value itself is subjective?6 Sharrock & Anderson (1991) point out that arguments about objectivity and subjectivity often fail to progress, due to the ambiguous nature of the distinctions that are being drawn. This ambiguity is evident in Thyssen *et al*'s (2010) treatment and we have suggested that the notion of intersubjectivity is therefore preferable to the hard objective-subjective dichotomy. In this conception, 'objective' and 'subjective', rather than being mutually exclusive categories, are more like points on a continuum in which objectivity is socially established from the stream of our perceptions.

Greiffenhagen & Sharrock (2008:77) note that the hard dichotomy is based on the assumption that "the properties that an object possesses 'objectively' and the properties of the object 'subjectively' perceived are discontinuous." They argue that this dualism stands in the way of "a more scrupulous portrayal of experience, including the 'objective' features *inherent* in experience (Greiffenhagen & Sharrock 2008:77). Schutz (1972:11) observers, that the perceived world "is not my private world, but an intersubjective one [...] my knowledge of it is not my private affair but from the outset intersubjective or socialised." This intersubjectivity is the process in which "we organise our social and organisational worlds so that we can find them understandable, meaningful, significant in the standard, patterned, institutionalised and hence shared ways that we do" (Anderson & Sharrock 1993:158). The products of this organization (and indeed, the organizational process itself) are cultural objectifications, which can be treated as having objective meaning (Schutz 1967). This approach "allows us to begin treating perception as an intersubjective, public, socially organised accomplishment rather than a subjective, private, internal process" (Anderson & Sharrock 1993:149). It is an approach that treats (many of) our perceptions of the world as objective, without neglecting the importance of subjectivity. Rather than treating objectivity and subjectivity as dichotomous concepts, it emphasises their interdependence as aspects of social processes of communication (Greiffenhagen & Sharrock 2008). This is true of our perceptions of both organizations and physical artefacts (Schutz 1967; Rooke *et al* 2010).

UNIQUE ADEQUACY

The notion of intersubjectivity requires different truth criteria than that of objectivity. Such criteria are supplied in the Unique Adequacy (UA) Requirement of Methods (Garfinkel 2002). UA has two forms, the strong and weak requirements. The weak requirement stipulates that the author of a research report should have an everyday practical competence in the setting reported; the strong requirement restricts the analytical devices used in the report to those already present in the setting. Strong UA is negative in effect, refusing the use of theory to inform fieldwork. (Rooke *et al* 2009). The utility of these criteria can be seen, for instance, in the recommendation that designers should be familiar with the practices of users (Norman 1998; Kelley 2001)

LEAN KNOWLEDGE MANAGEMENT

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6 We thank one of our anonymous reviewers for providing this question.

problems that arise from getting information to the right people at the right time are , to some extent, flow (F) issues, but those that are concerned with defining the right information and the form in which it is to be delivered are more concerned with value (V). This paper is focused primarily on the V theory problem of defining right information.

Koskela (2000:79-81, slightly re-ordered here) identifies five principles of value generation, to ensure:

5. "that all customer requirements, both explicit and latent, have been captured";
6. "that customer requirements have a bearing on all deliverables for all roles of the customer";
7. "the capability of the production system to produce products as required"
8. "that relevant customer requirements are available in all phases of production, and that they are not lost when progressively transformed into design solutions, production plans and products";
9. "by measurement that value is generated for the customer".

Principle 5 requires some extension. First, if value is to be judged in terms of customer satisfaction, this is a difficult thing to measure. Qualitative description will be necessary in addition to any quantitative measures used, if the outputs are to be properly evaluated. Second, a distinction should be drawn between outputs and outcomes. Project outputs are theoretically under the direct control of the project management. However, customer value may best be conceived in terms of outcomes: the effects that these outputs have on the customers' life and/or business. As the through-life management work has shown, it is important to look far into the life-cycle of a building in order to appreciate its true value. Third, a key use of evaluation is as the basis for learning and improvement. Thus, the necessity of establishing a learning loop/improvement cycle should be emphasized.

All five principles require adequate knowledge management processes:

1. to adequately discover and define customer requirements;
2. to transform these into an optimum design;
3. to identify the required inputs for production;
4. to deliver knowledge of customer requirements to relevant parties throughout the production process;
5. to facilitate customer evaluation and production process learning cycles.

Information flows, analogous to product flows (getting information to the right people at the right time) can be traced throughout all five processes. However, preserving the integrity of the information is also a concern (right information in the right form). This might be usefully treated from the V perspective as a question of controlling variation (Shewart 1931). However, it is a question of communication which the LAP and other language based approaches are perhaps best equipped to address.

Process 3 can be seen as a T concern; a question of matching necessary inputs to required outputs.

Process 4 is requirements flow-down (Koskela 2000), but also requires incentive flow-down, in which participants in the production process are adequately motivated to meet the specifications (Siriwardena *et al* 2006). We will refer to this dual process as Benefits Flow.

Processes 1, 2 and 5 are concerned with the problem of defining economic value. The three processes involved can be seen as a learning cycle, in which:

(a) designers gain an understanding of customer requirements which is as near uniquely adequate as possible (requirements capture);

(b) a design science approach is adopted, in which requirements are transformed into specifications (design);
(c) the product is continually improved through an evaluation process that feeds back into design (evaluation).

BENEFITS REALIZATION

A Benefits Realization Management Process (BRMP) is a system for optimizing or maximizing the benefits from a project (Sapountzis *et al* 2008). Our hypothesis is that an effective BRMP will be one that embodies and operationalizes the concepts and principles outlined above. Some sub-hypotheses are generated, which are confirmed in the existing literature (see Sapountzis *et al* 2008a for full review):

- Expectations must be managed. Since the process of achieving objective value judgments is inter-subjective, it is influenced by the supplier as well as the customer. Designers and contractors must be careful not to generate unrealistic expectations which will lead to the customer being disappointed. (Bartlett 2006; Reiss *et al* 2006)
- Sociological values are a crucial concern, since organizational cultures can obstruct the realization of benefits (Bartlett 2006).
- Project and product longevity are also a threat to benefits realization, as perceptions may change over time, this needs to be addressed through expectations management (Bartlett 2006).
- The link between strategic aims and project outcomes is vulnerable to breakdown and must be monitored (Thorp 1998).
- A full analysis of potential stakeholder and the impact on them is necessary in order to resist the possibility of unintended outcomes (Thorp 1998; Newcombe 2003).
- Stakeholder interests will sometimes conflict, presenting difficulties for the determination of a value and requiring a sensitivity to and proactive management of power relations (Newcombe 2003; Kenrick 2004; Sapountzis *et al* 2008b).
- A full analysis of the personnel involved in benefit delivery is necessary, including time of involvement, activity and motivations (Thorp 1998; Rooke *et al* 2003)
- Timelines will be vulnerable to all the influences listed above (Thorp 1998).
- Successful benefits realisation requires that suppliers actively build dialogue and partnership with their customers (Harrison & St John 1996; Kenrick 2004; Ayuso *et al* 2006).

CONCLUSION

We have treated value as a problem for lean knowledge management and offered the following suggestions as extensions an clarifications of V theory.

- The concept of value should cover the whole life cycle of the built facility.
- Value is best understood as an intersubjective phenomenon.
- Understandings of value can be evaluated using the UA requirement.
- The purpose of projects is to generate economic value, but the specification, production and delivery of value are governed by sociological values.
- The concept of internal value requires further investigation, particularly with regard to its impact on benefits flow.

- Evaluation requires qualitative reporting.
- The long term outcomes, as well as the immediate outputs of the project, should be evaluated.
- Explicit methods for turning evaluation into improvement are necessary.

On the basis of this revised theory we have suggested a series of hypotheses regarding lean benefits realisation in the built environment. Support for these hypotheses can be found in the existing literature. It remains to test them in practice.

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