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Koskela, Lauri, Howell, G. and Lichtig, W.

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Contracts and production *

L. Koskela¹, G. Howell² and W. Lichtig³

¹ *School of Construction and Property Management, University of Salford*

² *Lean Construction Institute*

³ *McDonough, Holland & Allen, P.C*

E-mail: l.j.koskela@salford.ac.uk

Abstract: It is argued that a change in the prevailing theory of production is also influencing how contracts, especially in construction, are being conceived. It is contended that the theoretical shift in question, both in production and contracting, concerns the metaphysical presuppositions of respective theories. This claim is further justified through a critical analysis of how risks and collaboration between parties are considered in conventional contracting.

Keywords: Contract, production, theory, risk

Introduction

It is well-known that in many countries, the construction industry is not viewed to provide adequate service to its customers. This situation has led to a broad search of novel operating methods, covering, for example, contractual strategies and production management models. However, it has turned out that renewed contractual strategies, even if marginally superior, often do not provide the benefits wished. Correspondingly, it has been realized that renewal of production management often collides with the conventional contractual strategies in use.

Here, it is contended that the current change in how production (broadly viewed, i.e. design included) is understood is – and has been - leading to a reconsideration of contractual arrangements. A fundamental explanation of this impact, which, at the root, is related to the coherence of metaphysical presuppositions in the theories of production and contract, is offered. This explanation is further illustrated through two issues which in conventional contracting have proved to be problematical: risk and collaboration between contract parties. Further illustration is given of the search for coherence between contracting and production management in the form of a practical case.

1. Changing theory of production management and contractual arrangements

The conventional theory and practice has considered production as transformation of inputs to outputs, intermediate or finished products (Koskela 2000). The total transformation can be decomposed into smaller transformations, until such tasks are encountered that can be assigned to employees or subcontractors. The total cost of transformation can be minimized by minimizing the cost of each decomposed part of it.

However, this transformation theory has increasingly been challenged by two other theories (Koskela 2000). The flow theory focuses on what happens in the time line. It emerges that

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there are two sorts of activities in production: transformations but also non-transformation stages, which are called waste. The elimination of waste is the primary prescription. The Toyota Production System and its derivatives are based on this theory. In turn, the value generation theory focuses on the process starting from customer requirements and ending at the fulfillment of those requirements through a product or service. The realization of the best possible value is the prescription of this theory. The quality movement has been based on this theory.

In practice, the methods based, mostly implicitly, on the flow theory and the value generation theory have proved to be superior in comparison to conventional methods based on the transformation theory. However, the switch to these new theories has been relatively slow.

One possible explanation for the slow uptake of the new theories is related to the difficulty of conceiving and overcoming the metaphysical difference between old and new theory (Koskela & Kagioglou 2005, Rooke & al. 2006). The transformation theory is based on thing metaphysics, which sees the world consisting of atemporal, discrete things. In practice, this is reflected in the view that production is a sequential execution of independent tasks. Instead, the flow theory and the value generation theory are based on process metaphysics, which conceives the world as consisting of temporal, indivisible processes. In practical terms, this is mirrored in the view that the best results, regarding both waste and value, are achieved through collaboration across tasks, as they are held as being interdependent.

The production theories are silent on how production is initiated or maintained and how the different inputs to production are acquired. Instead, these aspects are addressed, for example, by the theory of firm and the theory of contracting. Here, the focus is on contracting.

The conventional theory of contracting sees a contract as focusing on a bargain (Cheshire et al. 1996), i.e. a transaction. However, Macneil (1974) interestingly questions this view:

A transaction is an event sensibly viewable separately from events preceding and following it, indeed from other events accompanying it temporally – one engaging only small segments of the total personal beings of the participants. Only this separability permits such a clean and clear definition of contract [...]

But is the world of contract a world of discrete transactions so defined? Or is it a world of relation, an ongoing dynamic state, no segment of which – past, present, or future – can sensibly be viewed independently from other segment. Is it a world entirely of segmented personal engagements, or is it one tending to engage many aspects of the total personal beings of participants?

Based on his critical examination of transactional contracting, Macneil (1974) defines and expands the concept of relational contracting. The dividing line between these two forms of contracting is whether the contract is viewed referring to an independent event or to an ongoing relation. It is easy to note that transactional contracting, as defined by Macneil, is based on thing metaphysics, whereas relational contracting is based on process metaphysics.

Thus, transactional contracting is metaphysically coherent with conventional production theory, and of course has been part and parcel of conventional production practice. However, this coherence cannot rectify the idealization errors of both the transformation and the transaction concept, which in practical application generically cause counterproductive results (Koskela 2000, Koskela & Kagioglou 2005). In a nutshell, purchasing is an inappropriate

conceptualization of the contracting process, which in construction is rather dedicated to the design, formation and operation of the production system (Koskela & Ballard 2006).

In turn, relational contracting seems to be metaphysically coherent with new production methods based on the flow and value generation theories. That relational contracting supports such methods in practice is increasingly accepted (Ballard & Howell 2005, Cullen et al. 2005, Colledge 2005, Owen & Howell 2005).

The broad conclusion of this brief analysis into fundamental presuppositions of contracting and production is thus: The shift towards new theory of production is associated to a shift towards relational contracting. To further justify this argument, two central and interrelated issues in contracting, risk and (aversion to) collaboration, are considered.

2. Risk and collaboration in conventional contracting

The traditional contract essentially defines the two sides of a transaction: the deliverable and the compensation. In construction, the ultimate deliverable typically is described either through drawings and specifications or requirements, while compensation is monetary. Thus, both sides are predetermined as fixed things. From this outset, there are two derivative issues that play a major part in the formulation and implementation of conventional contracts: risks, and independence of the contractor.

In conventional contracting, the allocation of contractual risk to different parties is seen to be of central importance (Murdoch & Hughes 1996, Cox & Thompson 2006). Risk is usually understood as exposure to a proposition of which one is uncertain (Holton 2004). There are thus two essential components: exposure and uncertainty. It has to be noted that the very procedure of predetermining the price, i.e. proposition, creates the risk, as the future is genuinely open and uncertain when the price is set.

The conventional (construction) contract defines the delivery of the completed building (or other facility) at a given date as the one side of the transaction. The question is not about an employment contract, based on which the employer (owner) could give daily directives to the contractor. Rather, the underlying idea is that the contractor is just responsible for achieving the deliverable at the given date, without interference from the owner during the process. Thus, conventional contracting implies great independence for the contractor, and thus aversion to collaboration.

In the following, both issues, risk and aversion to collaboration, are critically analyzed.

2.1 Risk

2.1.1 The understanding of the origination of risk is too simplistic

The underlying assumption in contractual risk allocation is that we are able to identify the risks, analyze them for their likely occurrence and severity, and respond to them (Murdoch & Hughes 1996). Indeed, there are risk causes that are straightforward, such as ground or weather conditions. In such cases, it may be possible to reliably estimate the occurrence.

However, there are unfortunate events which have a complicated process of emergence, due to many contributory causes, which may be related to acts or omissions of several different parties. Such cases are uncovered especially in accident investigations (Dekker 2005) or in claim cases where the parties are unable to solve problems and resolve disputes within the commercial contract. These cases indicate that the process of production (as well as design) evolves in a network of mutually communicating and interacting agents (or more widely: work stations), connected through material flows. Here, even seemingly small problems of communication or modest variability of material flows may accumulate to cause drastic problems or substantial delays at the project level, or, as in the case of construction, systemic productivity losses, and other problems, at the day-to-day level. Thus, failures can not necessarily be explained through malfunctioning of individual parts of the production system, but rather through the properties of the web of dynamic, evolving relationships. This is cogently formulated by an experienced project manager (Bevan 2005): “Setting aside the elements, are we our own main real risk?”

Unfortunately, the way risks are allocated in traditional contracts to different contract parties does not help in responding to this kind of emerging risks. Worse, these contracts establish “rules of the game” that reduce emphasis on solving problems at the project level or producing predictable material flows within the organizations. In this way, traditional contracts increase project risk.

2.1.2 The notion of risk ignores frequent adverse events that are predictable at the aggregate level

The term risk is used for referring to a finite amount of deviations from the baseline, having significant costs impacts. Are all risks covered by this common usage?

Obviously, taking lead from Pareto’s law, we could claim that in this way, the “significant few” risks are addressed, leaving the “trivial many” aside. However, this can be challenged. Risks hit a project at many different levels. There are risks threatening the viability of the whole project. But there are also risks at the task level. Evidence for this is given when we look at the weekly plan on a site. In a normal situation, only half of the tasks or so get done during the week as planned (Ballard 1997). That cost-adding risks realize in a big share of tasks is well-documented fact. However, these daily mishaps are not conceived as risks because at the aggregate, contractual level, their cost impact is roughly predictable, and it is included in the cost baseline. The many studies into waste – as unnecessary activities or events have traditionally been called in operations management - in construction have indicated that the order of magnitude of the relative amount of waste in construction is 50 %. However, the pre-occupation with the big risks tends to leave the significant total contribution of small local failures, but overall present risks out of focus.

2.1.3 The focus merely on risk is misplaced

Avoiding risks requires an effort to prevent bad things from happening in relation to the baseline. That good things happen is the implicit assumption, actually the very baseline, represented by the description of the deliverable (or agreed price). Even if we would argue that we can reach the baseline by avoiding all bad things, it is an open question whether we

can exceed the baseline just by avoiding bad things. Here, a glance to other areas of knowledge is illuminating.

The philosopher Hintikka (1989) argues that in a historical analysis, both ethics and logic have similarly drifted from the original Greek understanding of their subject matter. In the ancient Greek thinking, ethics (or moral theory) concerned the achievement of moral excellence, through various virtues. These virtues covered courage, moderation and justice (Parry 2004). However, the Victorian times saw a redefinition of ethics. According to the new understanding, a virtuous person is he who merely avoids moral errors. Similarly, logic was originally established by Aristotle as the art of interrogative reasoning. However, the advent of modern logic meant that the idea of the art of reasoning was forgotten and logic was redefined as the art of avoiding logical errors.

Based on everyday experience, it is clear that just by avoiding errors, moral or logical, we cannot achieve moral excellence or become sharp thinkers. The achievement of excellence requires also other principles and efforts than just the avoidance of errors. Analogically, it can be argued that for achieving excellence in project realization, more is needed than avoiding risks from happening, i.e. deviations from a predefined baseline. Unfortunately, conventional contracting, like modern ethics and logic, is not oriented towards enabling excellence.

It can also be noted that in any construction project, many significant improvements would be emergent, originating in the conversation among experts. Regarding design, such conversation has been called positive iteration by Ballard (2000).

2.1.4 Discussion on risk

The three fallacies related to risk were explained as separate, independent cases above. However, in all of them, the underlying cause is related to the metaphysical stand chosen:

- In the case of the origination of risk, the prevalent thing-based conceptualization allows the causes of risks being related to tasks and parties, but emergent risks, being process based, remain just invisible. These process-based risks arise when the commercial contract ignores the interdependent relationship of the parties and shapes communication systems so they serve to protect interests rather than solve problems.
- Regarding the ignorance of the frequent, small risks that are predictable at the contract level, the very nature of a transactional contract, with predetermined price (an abstract thing) leads the attention towards preventing deviation from the predicted costs, but no more.
- In view of the focus merely on risk, when both the price and the deliverable are predetermined (as things), the attention is directed away from improvements in either. Also, many significant improvements would be emergent, and thus beyond the purview of a thing-based conceptualization.

2.2 Aversion to collaboration

Why a contract should rather enable and support collaboration during the realization of contracted work than eliminate or hinder, has actually been answered above. Collaboration is simply needed for

- enabling good or excellent things to happen,

- preventing bad things from happening, and
- adjusting appropriately when they do.

Unfortunately, conventional contracting does not support such collaboration.

3. Example of new contractual arrangements stimulated by new production thinking

Already, leading clients are actively pursuing relational contracts that support waste minimization and value maximization, the intrinsic goals of new production theory. As one illustrative example, the development work of Sutter Health, a California not-for-profit healthcare provider, is briefly described, based on (Lichtig 2005a and 2005b).

Sutter Health has a construction programme of 5.5 billion US dollars to be completed by 2012. The organization has recently adopted the lean project delivery system for its construction programme. In this connection, it has also revised its commercial and contractual strategies to promote lean project delivery and to avoid constraining it. In outline, the new arrangements focus on

- Creating an integrated project team including the owner and all designers and constructors
- Creating a collaborative design environment emphasizing collective exploration of underlying requirements and possible solutions
- Joint management and ultimate sharing of financial risk
- Joint management of disputes
- Developing an incentive program that rewards overall value creation and waste reduction at the project level, rather than the individual company level.

The implementation of the new production and contract arrangements has included training, web based portal for sharing information and experiences, vendor forums, the establishment of a Lean Executive Leadership Group for industry executives participating in the programme, as well as the preparation of a new template of Integrated Agreement for Lean Project Delivery.

The crucial feature of this example is that the new contracting arrangements are advanced in coherence with wider endeavours for changing production management methods, rather than as an independent initiative. Transactional contracting for construction has caused companies to focus on individual performance without regard to the interdependent nature of their performance within the project system. This relational contract, however, focuses the attention of the project participants on these interdependencies – making them both visible and important. The contract calls for deliverables of the team's plans, developed collaboratively, to address major causes of waste in the flow of information, the development of designs that are constructible and within budget, and the reliability of the commitments made among the project performers. This impels the project team to have conversations about topics rarely considered across these boundaries.

It is also easy to see that there is a pursuit to avoid the pitfalls of conventional contracting, relating to aversion to collaboration and handling of risk. Thus, collaboration is enabled contractually (new template of Agreement), technologically (collaborative design environment, web portal, nD modeling) and socially (integrated project team). In addition, the owner is making a substantial financial investment in this preconstruction collaboration by

paying the expenses of the integrated project team. The incentive program, especially, is geared towards achieving excellence in project realization by rewarding the entire team based upon project-wide success in achieving performance metrics that exceed established metrics. Joint exposure to and management of financial risk contributes to collaborative mitigation of emergent risks. The production management system, which involves the use of the Last Planner System, aims at the mitigation of small but frequent risks to the smooth progress of daily and weekly work.

4. Conclusion

It has been contended that the current change of production theory influences contractual arrangements. Thus, any consideration of future contractual arrangements must cover this change of production theory. In such a consideration, especially significant seems the resonance and synergy between new production theory and relational contracting. In contrast, the implementation of new production theory seems to be hindered by transactional contracting, and symmetrically, the implementation of relational contracting will be constrained by the use of production methods based on the transformation theory.

Lastly, it is necessary to pinpoint that even if there is new theory both regarding production management and contracting, the practical ways of theory implementation in each relevant context are often still under exploration and experimentation.

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