REVEALING CULTURES AND SUB-CULTURES DURING THE IMPLEMENTATION OF LEAN CONSTRUCTION

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ABSTRACT

Over the last decade the construction business has been subject to increased pressure to change its production systems towards more efficient and effective methods. Movements advocating lean construction and other initiatives based on improving production and cooperation have gained momentum, allied with broad support for closer and less rigid working relationships. This is set against dominating subcultures anchored within individual trades and professions that appear to constitute a barrier to the adoption of process-orientated forms of cooperation.

Observation and analysis of the implementation of a lean process model on a large construction project in Denmark helps to illustrate the disparity between intention, current norms and culture. Despite broad understanding, and support, of the new production and cooperation principles, the members of the project organisation failed to make full use of the techniques: this appeared to be the result of a mismatch between intentions and interpretation of the procedures. The ethnographic research used was useful in identifying some of the softer issues in relation to the implementation of lean tools and methods. Questions concerning how process innovations are introduced and facilitated as well as some reflections on cultural norms and their position in the 'lean' debate are also discussed in the paper.

KEY WORDS

Communication, cooperation, culture and subculture, lean construction, social systems, process facilitation.

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INTRODUCTION

Culture in general, and organisational culture in particular, is subject to much attention in management literature. This is not surprising as culture is vital for the human being's interpretation of meaning in relation to work and social processes of all kinds. Introducing new process-orientated lean construction principles is much more than just a matter of revised procedures but to a great extent a question of interpretation within existing culture(s).

This paper first introduces organisational characteristics of construction and discusses these in relation to theory and studies of organisational culture. Thereupon culture related impacts of lean construction implementation are highlighted through an introduction to a case study from Denmark. Finally results are discussed in the perspective of applying process-orientated management innovation to construction.

THE CONSTRUCTION CONTEXT

When studying and discussing cultures in construction it is important to understand the context in which those cultures may be displayed. Two issues are central for understanding this context: the peculiarities of construction including the sector's project organisation and the historical development of construction.

A large building is by nature typically a 'one-of-a-kind' product of considerable proportions and complexity and the overall *projects* are basically individual. The assembly process is subject to rigid ties concerning the high amount of tasks with mutual interdependence and often bound to sequential execution.

Construction project organisations have, for a long time, been considered a barrier to efficient project management. This is reflected in various evaluation initiatives (e.g. Egan 1998). A project organisation is temporary and composed for a particular project only. Individual tasks and subtasks are subcontracted to different companies each responsible only for own technical assignments. Thus different roles and responsibilities are reflected in different objectives. This often leads to unfortunate situations where only client and project management have a direct interest in the overall project performance (Emmitt 1999, Tavistock 1966). Consequently we often witness pronounced sub-optimisation and other forms of opportunism within the project organisations (Bosch & Philips 2003), a phenomenon highlighted by the Tavistock Institute in 1966 (Tavistock 1966).

ORGANISATION BY TRADE AND PROFESSION

For centuries different trades were organised in guilds (suspended in Denmark in 1857), unions and/or closed societies. This was characteristic for the construction sector in Denmark and several other countries. Trade companies were small and operated independently as they offered the services of their profession to shifting clients. In this respect little has changed. The vast majority of subcontractors are specialised in one trade discipline reflecting assignments typically tendered. This specialisation and professional diversity has led to increased fragmentation and problems with communication between specialists (Emmitt & Gorse 2003).

Over the years building projects have become gradually more complex in terms of size, technology and organisation. Until World War II the physical construction work was subcontracted to typically around seven subcontractors each representing a classic trade. Permanent cooperation partnerships were common. In Denmark it is nowadays not uncommon operating with 30-50 subcontractors of which many have specialised in recently introduced disciplines of e.g. HVAC, IT network installations etc. The extent of subcontracting does however varies considerably from country to country (Bosch & Philips 2003). Permanent partnerships are exceptions and usually of limited extend as subject to unstable demand and rigid public regulation prescribing subcontracting through procedures of competitive tendering.

Workers and unions typically oppose the idea of multi-skilled workers and many also multidisciplinary gangs. One reason for this attitude is to be found in political interests of protecting privileges and sectional interests. These positions (reflected also in the educational structures) support the individual's strong identification with his/her profession (Hancock 2000) rather than with the construction work at large.

People are continuously moving from one project to another, work is done at various locations and construction workers often have little contact with the firms employing them. Employment is often insecure and workers generally display a high degree of mobility, shifting between different firms or gangs, dependent on where contracts for work has been obtained. "A study of Danish construction workers' mobility in the year 1993-1994 showed that 40% had moved to different employers during the twelve month period (BAT 1997).

In the construction sector many consider it conventional wisdom that strong subcultures are found within the different trades and that these are bound to profession and not individual firms, an assumption supported in research by Hancock (2000).

HIERARCHY AND SUB-ORGANISATIONS

Another characteristic of the construction profession is the extensive hierarchy of the typical project organisation where not only different organisational "layers" but also company boarders (and affiliated individual interests) contribute to a pronounced fragmentation of the production process (Emmitt & Gorse 2003). Cooperation is to take place as described in the official organisation charts. Nevertheless cooperation and communication follow systems and patterns very different from the ordinary channels of command (Hill 1995).

A classic study exposed no less than five de facto sub-organisations within the individual projects (Tavistock 1966):

a) *A system of operations*; largely represented by the formal project management of the main contractor, designers and client representatives to execute the project in accordance with the project material.

b) *A system of resource controllers*; the system organising production resources, represented by the subcontractors' own management of labour, material etc.

c) *A system of formal controls (directive functions)*; the hierarchal structure through which tasks and operations are directed and divided between teams and gangs, typically coordinated by foremen and clerks of work.

d) *A system of informal controls (adaptive functions)*; the system in which everyday practical matters are negotiated and dealt with outside the procedures of formal systems.

e) *A system of social and personal relations*; the structures of interpersonal relations crucial for interaction, cooperation and hence to project performance.

Research by Hill (1995), Pietroforte (1997) and Wild (2002) found formal project information and communication incomplete why informal communication paths are crucial to project completion. To temporary organisations, the lack of an efficient formal communication network is highly problematic since social and interpersonal relations need to be (re-)established at every project. The combination of a newly put together temporary organisation without de facto functioning formal procedures and a large complex one-of-a-kind project is likely to cause considerable problems to coordination and control over the production process.

DEFINITIONS: SOCIAL SYSTEMS VS. CULTURE AND SUBCULTURES

On the basis of the fragmented organisational reality, construction can be considered a social process (Hill 1995).

A social system, as defined and approached by Tavistock (1966), is: *"a group of people systematically sharing control of a common process"*.

Following this definition many different assignments, tasks and actions are dealt with in what can be seen as different and situation-related social sub-systems.

When approaching cultural phenomena it is important to define what we understand by the term "culture" which is often used in various ways implying very different meaning. Organisational researchers, e.g. Kunda (1992) and Alvesson (2001), often cite Geertz (1973) for defining organisational culture as: *"the shared rules governing cognitive and affective aspects of membership in an organisation, and the means whereby they are expressed."*

It is important to distinguish between culture and social structures. *Culture* refers to kinds of common mentality of shared ideas, conceptions, meaning and symbols. *Social structures* refer to systems of action as deriving from social relations and interaction (Alvesson 2001, 2000).

As such culture is not a tangible phenomenon to be found and deduced from individual persons. Culture only exists *between* persons (Alvesson 2001, 2000), and cannot be studied in its pure form independent from the context in which it is manifested.

Many other factors influence the norms and behaviour displayed. The kind of work, organisation, various interests and the individual member's age, sex, education etc. are probably more important for the norms exhibited than the influence of culture (Alvesson 2001). A point emphasising that a construction project organisation in a wider sense only forms a sub-organisation within the sector, which again forms a sub-organisation within society. Organisational culture stem from many external factors of which several originate in the surrounding society at large (Hancock 2000) rather than in e.g. charismatic leadership (Alvesson 2001). This questions if managers at all are in position to affect the culture in companies working as construction contractors. Generally speaking Alvesson (2001) warns against overestimating managers' ability to consciously shape, control and change culture

within the companies they run. A view differing radically from much popular management literature ascribing top managers extensive opportunity to radically reengineer existing organisational culture (e.g. Kotter 1996). Opposite to the conception of culture as something belonging to and existing within the organisation, Smircich (1983), Alvesson (2001, 2000) and Eisenberg & Riley (2001) introduce an approach through which culture is seen as a root metaphor for "organisation".

A PARTICULAR CONSTRUCTION CULTURE(?)

Of cultural differences between other industries and construction Hancock (2000) identifies the following examples as characteristic for construction: A culture of *conflict*, a culture of *fragmentation*, a culture of *labour mobility*, a culture of *subcontracting*, a culture of *crisis management* and a *masculine culture*. This indicates that the phenomena revealed by Tavistock (1966) today still haunt construction sites in Denmark (Bosch & Philips 2003) and the UK (e.g. Egan 1998).

CONTROL AND COOPERATION – THE ACHILLES' HEEL OF CONSTRUCTION

As mentioned above, construction projects experience considerate problems concerning cooperation between the parties involved. Tavistock (1966) states that; *"a social system in which relationships are based on mutual interdependence, and where contributions to the common task are based on sequential finality, does not seem suited effectively to control a process characterised by the interdependence of its operations, fraught with uncertainty and requiring carefully phased decisions and continuous application of all control functions." (p. 45).*

The Tavistock report argues that formal systems of mechanistic control fail due to reasons deriving from structures and cooperation forms inappropriate for the nature of building projects. The system of informal control and management *tends to produce a climate of endemic crisis (Tavistock 1966: p. 50).*

Based on the displayed behavioural norms the survey thus concludes on the personality of the individual builder. Alvesson (2001, 2000) advises caution towards the drawing of such parallels.

Tavistock (1966) continues to describe the system of social and personal relations: *"(...) inappropriate formal control system, coupled with an adaptive but non-responsible informal system, inevitably produces personal and group stresses and problems for all concerned. (...) it is in the later stages of the project (when effectiveness of the process control procedures are nearing their confrontation with the realities of time, cost, and quality of product) that these stresses begin to be felt." (Tavistock 1966: p. 50).*

These statements appear contradicting. If accepting the argument of the builder's "crisis type of personality" as observed in the survey concerned, it must be questioned how this is to be interpreted in terms of causes for the behaviour exhibited. Are builders less easy to get on with than other people or does the behaviour displayed at construction sites derive from particular institutionalised circumstances present there? In other words; does the "crisis type of personality" derive from a socialisation process as taking place in a construction context? Or is the behaviour (as implicitly suggested in the survey) a result of the individual's nature

and a socialisation process taking place in the surrounding society and brought to site along with the builder? Finally it leaves the question of *how* this behaviour is perceived in the culture of where it is displayed.

The latter of the above quotations states that behaviour is forced upon individuals through certain roles. Implicitly this suggests that conversational identities are developed at construction projects. Whether what is described "crisis type of personality" really was what had been observed is hence a question left unanswered.

AMBIGUITY AND SENSE-MAKING

Aspects of organisational culture and how it is displayed are usually marked by ambiguity (Alvesson 2001, 2000; Martin & Meyerson, 1988), which may be what we here see reflected in the Tavistock survey. Behaviour, norms and cultural artefacts do not necessarily reflect rationality in relation to the context in which they are displayed. Tavistock (1966) describes conflict-ridden meetings set to solve problems that the study concluded often derived from the different parties being left no choice but to schedule work with unrealistic possibilities for successful completion. Kärreman & Alvesson (2001) discuss an example from a newspaper's editorial evaluation meeting where little importance is ascribed the actual agenda and the matters discussed. Rather the evaluation meeting serves for internally constructing a common identity of the "newsmakers". In this article they cite Schwartzman (1987) for pointing out that meetings are typically used to make sense of problems, crisis, and decisional choices, rather than to resolve them. Meetings are thus seen as "sense-making devices". If this is true for construction meetings, it supports the conclusions of (Tavistock 1966), Hill (1995) and Pietroforte (1997) arguing that essential coordination activities are executed outside the formal systems.

HAVE THINGS IMPROVED?

When the Tavistock survey was published almost 40 years ago it widened the understanding of the complex bounds between work, technology, organisation and social issues in construction. But despite the many years of awareness, little indicates basic improvement concerning cooperation and coordination: on the contrary it seems that problems have compounded with the increasing complexity of modern building (Bosch & Philips 2003).

Proponents of thorough IT-application as a universal solution to communication related problems have exerted influence also in construction and over the last decade large IT-investments are made. But in terms of improved coordination and productivity they "don't seem to work" (Egan 1998). This supports the argument that communication and control is exercised outside the formal ordinary channels of command as typically approached by IT-tools applied.

In "*Makers from Mars, Designers from another Planet? Sub-Cultures in a Joined-up Industry*" Powell (2000) discusses the macho role of the builder vs. softer cooperation issues, in this case represented by the designers and a design culture. It is argued that disparate subcultures between construction designers and builders form a hindrance to effective cooperation throughout the supply chain. Similarly, Hancock (2000) draws attention to cultural factors that must be considered to severely challenge interdisciplinary cooperation.

Emmitt & Gorse (2003) suggests that one factor contributing to the problems of improving communication within construction projects is the relatively late application of the softer sociological sciences in construction management research.

A CASE STUDY

The cultural impacts on construction cooperation, as discussed above, can be illustrated by a case study from Denmark where a large design-build office project was monitored over seven months in 2002. The project was managed by a main contractor and around 30 different subcontractors worked simultaneously on site during hectic periods. This particular case was selected because the main contractor was regarded as leading the way in the implementation of lean construction, introducing a proprietary process management system (a management innovation). Lean construction principles and the Last Planner System (Ballard 1994) were applied at this project where the main contractor gave high priority to the cooperation between the parties involved. For using such planning tools good cooperation was regarded necessary since all subcontractors were to take active part in the reactive planning and contribute with feedback from the production.

A non-participant observation approach was adopted with the researcher observing and recording the implementation of the production system. Twenty-six interviews were conducted with participants at all levels in the contracting organisation's offices and construction site. These semi-structured interviews were designed to explore the perceptions of the individuals involved in the implementation process and were a useful tool in helping to validate the findings from the observations.

A NEW PRODUCTION CONCEPT

The new production concept was based on substituting the traditional *transformation*-orientated construction approach with a *flow*-orientated understanding (Koskela 2000).

Realising that a change towards better cooperation is needed on construction sites if efficiency is to be improved substantially, the new process-orientated procedures were supported through *process facilitation*. This was the task of a so-called *process facilitator* employed by the main contractor to support planning, coordination and cooperation on site. High-ranking managers of the main contractor put much effort into providing the process facilitator positions with high status and legitimacy.

Construction is a male dominated business (e.g. Hancock 2000, Clarke et al. 2004). However many women entered jobs as process facilitators. At many instances members of the main contractor's organisation stated that women are the best process facilitators because women's "human skills" are superior to men's. The most visible proponent of this view was an external consultant deeply involved in developing and implementing the new production concept. The consultant often publicly declared that all process facilitators ought to be women "because women can handle difficult social processes where men fail".

However, no deeper analytical arguments were brought up for support of the assumption that women by nature are the best process facilitators. Rather it must be assumed that this belief reflects; a) recognition of the conflict-ridden masculine culture embedded in current practices, and b) traditional perceptions within the business (resulting directly from and

preserved by *group-thinking*) and as such taken for granted. According to Alvesson (2001) most jobs are *sex-(gender-)typed.* Jobs are perceived as either masculine or feminine and subject to common interpretation about whether naturally practiced by men or women. Much indicates that the process facilitator role got sex-typed as female. An issue discussed later in this paper.

When interviewed, female process facilitators expressed that the efforts of providing the facilitator role high status had not been successful. However, several found that the development was positive and noticed that some men were showing interest of working in this position.

The main contractor's management was conscious about wanting a change in culture regarding how the phenomenon *construction* was perceived by those involved. Similarly it wanted to change the norms of cooperation from a mistrustful, conflict intensive, behaviour towards a cooperation attitude, enabling the project organisation to spend resources solving problems rather than disputing about them. The managers responsible declared that they wanted to change the current macho norms and implement softer values in the organisational culture. The management was, in other words, seeking to practice so-called "culture engineering". An ambitious aim in a business where project organisations are temporary and fragmented in terms of the different firms and professions that constitute them. Kunda (1992) delivers an illustrative example of the difficulties of successful culture engineering exercises, questioning whether managers will be able to see through the results when attempting to make constructive use of identity building mechanisms.

INTERPRETATION IN THE PROJECT ORGANISATION - CONSTRUCTION OF MEANING

The case study revealed certain patterns of behaviour and organisational response to the new production concept. For understanding cultural issues of introducing this new paradigm the most interesting aspects are not displayed behaviour and participant response in itself. Rather the central issue is *how* these expressions can be comprehended in terms of the participants underlying cultural interpretation through which meaning is constructed (e.g. Alvesson 2001, 2000).

In the following some of the most conspicuous observations from the case study will be presented:

Action

Action carried strong symbolic value to participants on all organisational levels. Getting tasks and assignments done is often crucial to other parties. Builders know and understand that delays are sometimes unavoidable. Therefore informal judgement on other parties depends more on whether those have worked as hard as they could, rather than on whether work was finished on time. Focus is on getting work started and less on looking ahead. By statements as the following, participants described a weighty criteria of the social rewarding system on site: *"Better start on time, re-do work and finish delayed than start later and finish on time."*

Despite broad support and understanding of the new principles participants were reluctant to report on their own progress. At work planning meetings (though labelled "informal", set very much alike traditional formal progress meetings) participants slipped back into old

roles, focusing on avoiding responsibility at the expense of eliminating future obstacles Many expressed fear that reports provided the main contractor with camouflaged means of control, e.g. for use in case of later disputes. Being controlled usually meets discomfort and/or resistance from those controlled (Alvesson 2001), (Kunda 1992). However, as meetings closed and participants broke up, foremen were usually very active exploiting the situation of being gathered to coordinate various tasks. While the meeting was obviously subject to ritualism, communication was subsequently practiced in circles of smoking and chatting.

Generally foremen were far better at coordinating their upcoming assignments than clerks of work and contract managers who were not working full time on the site. The "part-time affiliation" weakened their integration in informal social systems and their look-ahead coordination was poor. Similar were their understanding of what certain specific tasks would involve. During meetings this group kept focusing on activities of past and near future (as already dealt with by foremen). And with a less developed system of social relations little, when any, coordination took place during breaks or when meetings had ended.

The paperwork implied in the new concept was not appreciated and especially foremen were very reluctant to fill in forms of any kind. Those activities were often referred to as "time wasted". Paperwork was not perceived as action.

Personal qualities

"Personal qualities" of people involved were often ascribed all kinds of project problems or successes. Participants noticed internal problems in the project management team. Project related problems were explained as deriving from this team's internal difficulties while little importance seemed to be paid to the fact that the project was technically very advanced and had started behind schedule for reasons out of hands of those involved. Few recognised that the project management team had just completed another large project with success, which was an important factor for the main contractor's choice of this particular team. When asked to explain the problematic development of the project, participants usually referred to the relatively minor constellation changes of the management team, taking the decisive importance of the individual for granted.

Despite the construction project's vulnerability to uncertainty and matters out of the hands of individuals, participants expressed a common belief that success or failure depend on key-persons more than on how work is done. References to "personal qualities" somewhere in the supply chain usually formed the starting point for analysis and explanation, even to technical problems occurring from combinations of causes connected to different areas of responsibility. This indicates deep-rooted "group thinking" as described by Alvesson (2001).

Considering that a project manager's influence on the production process itself is indirect (e.g. Howell & Koskela (2000)) and dependent on informal communication paths (Pietroforte 1997) it is remarkable how narrowly construction professionals were focusing on the individual manager rather than on *how* results are achieved. In many respects an irrational approach to reflecting on project management and processes, assumingly partly deriving from the Western culture's extreme focus on managers and their roles as described by Alvesson (2001).

The metaphor of "the culture as blinkers" (Alvesson 2001) may illustrate the cultural manifestation displayed through the emphasising of personal qualities and their assumed significance. Also the metaphor of "the culture as a frozen image of the world" may help understanding the importance ascribed this issue (e.g. Alvesson 2001).

Power

Power (and the manifestation of it) also appeared to form an artefact of great symbolic importance. Projects are fraught with conflicts and disputes (Tavistock 1966, Hancock 2000). Each project forms a frame for perpetual negotiation about getting preconditions for own responsibilities assigned priority and resources when re-planning is needed. Power was perceived as vital for successful performance in these situations. In the fragmented project organisation formal power (as according to hierarchal position) does not necessarily provide authority over sub-contractors and their employees who are responsible only for tasks as contractually specified. Authority follows he/she capable of making the work progress. Thus authority is strongly influenced by the situation in which it is applied. Therefore social relations set a scene for internal positioning in a system of asymmetric division of power and influence, widely determined by control of financial means.

Power relations are very influential concerning the development of organisational culture (Alvesson 2001). Therefore structural aspects affecting issues of power cannot be approached independently from their cultural implications. This difficulty of introducing process facilitation is illustrated in the following example from an educational seminar where participants recurrently expressed uncertainty about how to relate to the process facilitator role: *"If the process facilitator isn't responsible for contractual matters and can't sign financially, how can we then trust him/her?"*

The metaphor of "culture as a regulator of profit/proceeds" (Alvesson 2001) may help provide an understanding of why a fragmented and temporary system of divergent interests and bargaining positions usually do not breaking down in practice. Even in conflicts with much to win and little to lose participants usually behave within certain norms experienced as natural, universal and everlasting.

DISCUSSION AND CONCLUDING COMMENTS

The case study highlighted the importance attributed individual persons at certain positions. Equivalent to the Western culture's traditional focus on the role of the strong individual (Alvesson 2001), builders appeared to value action, personal qualities and power. Meyer & Rowan (1977) suggest that such phenomena may be explained by the formal rules generating inconsistencies why the ability to coordinate things in violation of these become highly valued.

The study showed that construction professionals did not perceive the lean construction concept in the way intended by the main contractor's management. Cultural interpretations constituted a considerable impediment to process-orientated cooperation in an otherwise traditional project organisation. Conflicts were nourished by unpredictability and absence of interest and responsibility concerning the total project performance. Project participants showed reluctance to share information and plan ahead. In spite of good will and common interests in improved coordination, the participants slipped back into old roles. There were

indications that meeting situations were subject to ritualism and culturally interpreted as a scene for settling blame for current situation, not for planning ahead.

Process facilitation was not utilised as intended. Cooperation is traditionally conflict-ridden and formal procedures ignored. However observations supported conclusions of previous research by Tavistock (1966) that found that people cheated in carrying out formal roles, thus enabling informal collaboration. In other words; cooperation is currently taking place in informal social systems where culturally institutionalised norms are setting the scene for interaction. For the adoption of new process-orientated procedures it would appear to be crucial how these are culturally interpreted in the systems of social relations. Integrating the process facilitator role in the current situation thus requires that the role is, somehow, tangible in the informal systems of social relations.

With no formal power and control of individual tasks, a process facilitator can only obtain influence by virtue of the individual participants' belief in his/her "personal qualities" enabling him/her to have a say among other participants. Roles and professions characterised by action, firmness and insensitiveness – characteristic for roles traditionally found on construction sites – are typically seen as masculine (Alvesson 2001). In the masculine construction culture (Hancock 2000) it seems highly questionable whether heavy female sex-(gender-)typing of the facilitator role supports the process facilitator's integration in a male dominated project organisation.

The difficulties of implementing the new concept indicates a need for more comprehensive research investigating more thoroughly the existing construction paradigm in terms of process understanding and participants' identities in relation to roles and functions. Organisations innovating in essential structural ways bear considerable exposure to the cost of legitimacy when deviating from prescriptions of institutional myths (Meyer & Rowan 1977). Failure to effectively address such issues may present considerable risk to organisational implementation of lean construction.

The "lean opponent" Green (1999, 2000) criticises the lean construction research for omitting HRM issues and for assuming that principles originating from Japanese car manufacturing can be successfully transferred to a different cultural, organisational and structural context without further substantial adjustment. The case study indicated a need for further addressing these issues in terms of implementation.

With subcultures bound to trades and professions rather than individual organisations – more research is needed to explore whether an "isolated" process of paradigm shift can be carried through in individual companies exclusively, or if the construction sector at large will need to be addressed for promoting the process-orientated understanding of construction as approached by lean construction and similar concepts.

When considering the vast professional fragmentation of construction, socio-technical methods may prove themselves too shallow for reaching the depth necessary for research to provide a sufficient cultural understanding the object studied.

Before concluding on the course for approaching any radical change to organisational working methods of construction it may thus be necessary to investigate the contextual social and cultural implications of process-orientated construction cooperation through methods of anthropological research.

Findings of this paper are partly based on empirical material from a Danish project. It is therefore not appropriate to draw universal conclusions on cultural issues of lean construction implementation. When studying cultural differences between construction professionals in Denmark and the UK, Hancock (2000) found more pronounced variation between the architects, civil engineers and building surveyors as groups of professionals than what comes to nationality. It must be assumed that the cultural challenges of implementing lean construction as discussed in this paper cannot merely be ascribed as an isolated Danish phenomenon. More research and discussion of experiences from different implementation programs throughout the world will be necessary in order to identify cultural impediments of lean construction application and how these may be addressed in general.

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