Learning capability in construction projects: from the learning organisation to the learning project

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Abstract

Effective learning is a crucial element in any management system. In the construction industry, the lack of feedback and knowledge transfer is mentioned as one of the core challenges for delivering sustainable buildings. Another challenge is developing individuals working in the projects and transferring knowledge between projects. It is generally recognised that learning take place in construction projects, nevertheless most research examines the concept of learning either from a company perspective, i.e. how learning can be integrated in the company’s management system, or by focusing on learning within specific professions. This paper aims at filling a gap in the organisational learning literature by introducing the concept of learning capability in construction projects. The influence of contract form, organisation, culture, knowledge, leadership etc is discussed, including how it is integrated in the project management system. The paper is based on a literature review of the concepts of learning theories and characteristics of construction projects. It argues that more research is needed to identify how construction projects should be organised and managed to increase the individual learning as well as the organisational learning.

Keywords

Construction project, learning capability, organisational boundaries, organisational learning

1 Introduction

Construction industry has the image of being an old-fashioned, slowly changing industry that cherishes outdated methods and working styles. The fear of possible consequences strongly limits the experimentation with new materials, contract forms and working styles. There is a clear opinion that the construction industry has to overcome outdated traditions by speeding up and improving the learning processes.
Internal and external environmental factors influencing construction projects are dynamically changing and unstable. Effects of changes during the construction project time are highly unpredictable and can have significant effects on the organisation as well as on the project outcome (McGill and Slocum, 1993; Kululanga et al., 1999; Love et al., 2002). Additionally, outdated working and communication styles as well as slow adoption to new medias and working tools strengthen the perception of an old-fashioned and unattractive industry. This leads to difficulties in attracting qualified and highly motivated employees (Gomar et al., 2002).

The project structure, with clearly separated phases, tight timeframes and high fragmentation characterise construction projects. These characteristics create organisational boundaries, limiting the flow of information and heavily influence the communication, which in turn leads to a reinvention of already known solutions. Errors, rework, inadequate methods and traditional but not value-adding activities lead to high avoidable cost and low profit margins. Overcoming those roadblocks by improving knowledge, cooperation and communication can offer excellent opportunities to increase the attractiveness and profitability of the industry.

This paper introduces the concept of organisational learning capability in order to understand existing and absent learning processes in construction projects. The aim is to provide an overview of organisational learning in construction projects and to identify relevant areas for further research.

2 Theories of learning

In the past few years the literature about learning has grown rapidly as an answer to challenges caused by an always faster changing environment. According to Yeung et al. (1999, p21) the roots of “learning organisations” can be followed back to the early 1900s to Frederick Taylor, who argued that when management standards were articulated and measured, it is possible to transfer this learning to other employees and improve the organisations efficiency. More recently, Argyris and Schön (1996, p180) divided the literature on organisational learning into two categories: the principally sceptical scholarly literature of Organisational Learning and the practice-oriented, prescriptive literature of the Learning Organisation.

2.1 Organisational learning

Argyris and Schön (1996, p188) argue that “the literature on organisational learning is intentionally distant from practice, nonprescriptive, and value-neutral”. Cook and Yanow (1993) describe organisational learning as a category of activity that can only be conducted by a group and not by an individual: “In this respect, organisational learning, as we use the term, refers to the capacity of an organisation to learn how to do what it does, where what it learns is possessed not by individual members of the organisation but by the aggregate itself. That is when a group acquires the know-how associated with its ability to carry out its collective activities, that constitutes organisational learning” (Cook and Yanow, 1993, p438). Yeung et al. (1999, p28) consider learning to be organisational when ideas and knowledge generated by individuals within the organisation are shared across organisational boundaries of space, time and hierarchy. These kinds of organisational boundaries characterise construction.
2.2 Learning organisation

The learning organisation approach is more practical and action-orientated. It can be considered as a counterpart to the more theoretical approach of organisational learning. That being said, the learning organisation literature is not devoid of theory; it draws very heavily from ideas developed within organisational learning but it is selective on the grounds of utility (Esterby-Smith, 1999). Although this literature takes many forms, its underlying conception of a central idea is broadly shared. This ideal includes notions of organisational adaptability, flexibility, avoidance of stability traps, propensity to experiment, readiness to rethink means and ends, inquiry-orientation, realisation of human potential for learning in the service of organisational purposes, and creation of organisational settings as contexts for human development. Senge (1990) defines a learning organisation as an organisation that is continually expanding its capacity to create its future. For such an organisation it is not enough merely to survive.

2.3 Organisational learning capability

The term capability can be followed back to the early 1990’s where it was mainly used as a general concept for resources and skills or competencies (Teece et al. 1990; Leonard-Barton 1992). Organisational learning capability can be achieved, when an organisation learns from its experiences and has the ability to pass these lessons across different kinds of boundaries (Ashkenas et al. 1995). Yeung et al. (1999) narrows this definition by adding the necessity of impact: “An organisations fundamental learning capability represents its capacity to generate and generalise ideas with impact (change) across multiple organisational boundaries (learning) through specific management initiatives and practices (capability)” (Yeung et al. 1999, p59). They contend that learning capability is based on three building blocks: (1) Generation of ideas, (2) generalisation of ideas, and (3) identification of “learning disabilities”.

In addition, Yeung et al. (1999) argue that the base for organisational learning capability is strongly formed by the overall organisational culture and commitment of leadership. Further on competence, consequence, governance and capacity for change directly influence it. Competence ensures that the individual, the team and the organisation have the right competencies to learn, by right staffing, training and development of the employees. In addition, consequences have to encourage learning on all levels, while governance takes concern about the organisational structures. Capacity for change on the other hand estimates to which extent work processes encourage learning (Yeung et al., 1999). DiBella and Nevis (1996) state that there is not one way to establish organisational learning capability; rather the learning style has to fit its product, service and environment.

2.4 Forms of learning

During the 1970s Argyris and Schön established their theory about single and double loop learning. They define single loop learning as “instrumental learning that changes strategies of action or assumptions underlying strategies in ways that leave the values of a theory of action unchanged” (Argyris and Schön, 1996, p20). They mean that double loop learning is superior to single loop learning and argue that hardly any organisation achieves the statues of double loop learning. Organisational learning can be achieved by adapting concepts like dialog, system thinking or reflection. “The dialog is a structured method for intervention into ongoing workgroups which requires members to allow space for each other to speak,
to avoid evaluating the comments of each other, and to be willing to speak out on their own views” (Isaacs, 1993). According to Senge (1990) system thinking integrates the disciplines of personal mastery, mental models, shared vision, and team learning into one unit is essential for learning organisations. Reflection is a tool that Schön (1999) sees as necessary: “It consists in on-the spot surfacing, criticizing, restructuring, and testing of intuitive understandings of experienced phenomena; often it takes the form of a reflective conversation with the situation” (Schön 1999, p241).

Although the theory about learning has some shortcomings, like the missing of a general accepted concept (Fiol and Lyles, 1985) or the strong interest in designing one ultimate concept that enables learning (Senge, 1990), its most substantial benefit lies in the focus on the individual within its organisational context. Organisational learning capability is of high relevance for workforce intensive organisations such as the construction industry.

3 Learning in construction projects

The construction industry is, as all other industries, strongly shaped by its environment. Contract forms and process flows develop and change according to environmental demands and needs. People in the industry work in shorter projects with increased number of actors involved. Existing organisational boundaries are growing stronger and new boundaries arise.

3.1 The contract forms

Projects are organised in different contract forms. Total construction contract, general construction contract and shared construction contract as well as combinations of the three basic forms are widely used. The contract form is chosen according to the specific needs, because it strongly influences communication and decision-making. For example, there are normally no informal communication between designers and contractors in general construction contracts. Carlsson and Josephson (2001) indicate further, based on four case studies, that individuals learn more in total construction projects due to enhanced feedback and more time for reflection.

In the last few years, new contract forms have emerged, aiming to adapt to new customer demands. Examples of new contract forms are Private-Public Partnership and partnering: “A Public-Private Partnership is a partnership between public sector and private sector investors and businesses, for the purpose of fully undertaking the tasks of planning, designing, financing, constructing and/or operating a service otherwise provided by the state” (Leiringer, 2001). Partnering is a contract between two or more organisations to achieve a shared goal by using each other’s resources in an optimal way. Kadefors (2002) regards partnering as a means to overcome contractual boundaries and facilitate team working across such boundaries. Relation building, a shared goal, a system for problem and conflict solving and a system for following up and measuring progress are seen as the fundamental components for partnering. Therefore, trust is a major factor for learning over organisational boundaries (e.g. client-contractor). Kadefors (2002) argues that the contract form and the lowest price winning results in a behaviour where any participant in the process assumes to be cheated. Partnering and long-term agreements are seen as a solution to overcome the defensive behaviour of the participants. There are several elements in these new forms of contracts that enable for enhanced learning. Empirical studies indicate that partnering increases learning, probably due to improved communication
over organisational boundaries (Barlow and Jashapara, 1998; Josephson and Lindahl, 2002).

3.2 The construction process – communication and information

The construction process is traditionally divided into four principal phases: Idea and evaluation, design, production and utilisation. The boundaries between these phases are of different strength depending on the contract form. The phases follow one another, which means that almost new organisations are created for every new phase. Handing over the product from one phase to the next involves loss of knowledge as well as of information and skills (Spatz, 2000).

Communication is one of the most powerful enablers for sharing information for generalising ideas. Collectively, formal and informal processes for communicating ideas can be useful tools for sharing information across boundaries as long as they work toward the same business goal (Yeung et al., 1999).

Successful knowledge transfer is based on an understanding of one another; therefore a shared language is required in order to enable for effective communication. However, similar to the difficulties that arise when architects, structural engineers, and contractors are unable to communicate because of a lack of shared vocabulary, organisations cannot develop long-term plans when members are working from different definition bases. Reducing uncertainty and miscommunication require a common understanding and interpretation of foundational concepts (Chinowsky and Meredith, 2000).

Newcombe (1996) argues that communication, as a base for empowerment is most likely to be improved by enhanced relationships among team members, while formal techniques play a less important role. Huemer and Östergren (2000) argue that there exist only a few systematic approaches for sharing experience and even those that have been developed are rarely used. Another factor limiting the feedback process is time. Scott and Harris (1998) explain: “The majority of the learning appears to be unstructured, involving the collection of information, but failing to put it in good use. The corporate attitude seems to be that information gathering will only take place when there is time and money to allow it” (Scott and Harris, 1998, p124). Smaller companies may, Bang and Clausen (2001) argues, face even more challenges: “Learning mechanisms in the firms in terms if institutionalised (formalised) procedures for systematic knowledge accumulation are relatively uncommon. In small firms only the owner is normally engaged in daily, continuous collection of experiences and lessons learned” (Bang and Clausen, 2001, p205).

Sharp boarders and the lack of knowledge brokers are other problems limiting information transfer (Josephson and Lindahl, 2002; Spatz, 2000). Spatz (2000) argues for a need of cross-organisational and cross-functional project teams in order to reduce the loss of information when the product is handed over to the next phase: “When individuals from earlier phases are involved in later phases, skills are transferred, learning and knowledge are shared, and projects benefit by having committed, interested stakeholders contributing to project quality and improvement downstream. Team environments encourage and support high performance collaboration” (Spatz, 2000, pp100).

3.3 The construction worker

The construction companies are facing problems with recruiting new personnel, especially blue-collar workers. Reasons for this are the poor image of the industry and the lack of opportunities for training and career growth. Short employment durations
and frequent seasonal layoffs, but also the sensitivity to economic fluctuations lead to high fluctuation of experienced workers in construction (BRT, 1997; Liska, 1998).

Among different concepts that may be of help when dealing with this problem, Gomar et al. (2000) addresses multiskilling as a method to overcome the problem of frequent lay off and the thereby caused knowledge loss. Multiskilling also reduces the number of organisational boarders.

Overcoming traditional hierarchical structures and motivating subcontractors and workers through empowerment of the workforce as another approach is discussed by Newcombe (1996). He argues that empowering different parties can help to focus the whole organisation on one goal and in this way improve the financial outcome, due to a win-win situation, as well as the personal satisfaction. To successfully adhere to an empowerment strategy, self-confident leaders are needed and the workforce has to be capable to handle the higher responsibility.

In addition, inter-organisational teamwork can positively influence the project outcome as well as the members’ commitment and therefore it can be a method to keep eager workforce. “The potential benefits of using inter-organisational teamwork effectively in public design and build projects or total construction projects are not limited to the project itself. Project participants may gain a higher level of job satisfaction as well. Perhaps more important is that a positive relationship between job satisfaction and project performance is found” (Chan et al., 2001, p39). However the positive effects of teamwork are very likely to be cancelled by a rough climate that makes it impossible for team members to admit mistakes: “It is also questionable whether the teams are actually characterised by high tolerance. To facilitate learning and exchanges of experiences, the climate should be such that individuals are not afraid to make mistakes” (Anheim, 2002, p159).

However, it can be questioned if learning always creates positive effects in developing individual and organisational competencies. It may also strengthen wrong or inefficient routines. Gherardi (2000) examines a safety case where positive as well as negative learning occurred. New employees are often copying safety behaviour of established co-workers even in cases where they know their behaviour is risky. On the other hand, positive behaviour is taken over by organisations but their filtration time is much longer.

4 From the learning organisation to the learning project?

Most literature about organisational learning theory focuses on the organisation as a construct that is more or less stable over time. In most cases the focus is on a company while in other cases on a profession. However, construction projects differ from stable organisation in several aspects, which influence the learning capability.

4.1 Characteristics for project organisations

The timeframe for projects is normally short, while it is relatively long for companies and professions (Table 1). The turnover of personnel is high during the project process. In construction a new project normally means a new location for the final product. The fragmentation of the process, i.e. the number of activities and experts involved, is high. The information structure is complex. Finally, the project members work at many different places at a specific time, e.g. during design. Therefore, it is often argued that it is more complex to establish routines in project organisations than in companies and for professions. A main reason is of course that
the project members come from many different companies and belong to many different professions. Following that, learning capability in projects involves more aspects than learning capability in companies or in professions.

**Table 1: Principle characteristics for project organisations (temporary organisations), companies (permanent organisations) and professions.**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Temporary org.</th>
<th>Permanent org.</th>
<th>Profession</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timeframe</td>
<td>short</td>
<td>long</td>
<td>long</td>
</tr>
<tr>
<td>Turnover of personnel</td>
<td>high</td>
<td>low</td>
<td>periodic</td>
</tr>
<tr>
<td>Location of organisation</td>
<td>varying</td>
<td>fixed</td>
<td>fixed/varying</td>
</tr>
<tr>
<td>Fragmentation</td>
<td>high</td>
<td>low/high</td>
<td>low</td>
</tr>
<tr>
<td>Information infrastructure</td>
<td>complex</td>
<td>simple/complex</td>
<td>simple</td>
</tr>
<tr>
<td>Number of workplaces for the members at a specific moment</td>
<td>many</td>
<td>few/many</td>
<td>many</td>
</tr>
</tbody>
</table>

4.2 Organisational boundaries to overcome

We have seen that construction projects involve several organisational interfaces or organisational boundaries related to time, hierarchy, location and culture. These boundaries hinder design and production of sustainable buildings as well as establishing effective learning processes. For example, Josephson and Hammarlund (1999) found that the underlying causes of most errors occurring during production were related to four types of instability in project organisations: new vertical relations (e.g. between client and designer), new horizontal relations (e.g. between two subcontractors), project members joining the project organisation too late, key persons are exchanged. These instabilities create new boundaries or strengthen existing ones, which increase knowledge losses and limit the learning.

Organisational boundaries related to time involve that sub-organisations and individuals not meet each other. Of that reason, knowledge and experience cannot be exchanged between project members. For example, thoughts not included in drawings cannot be explained to the contractors, information on critical activities cannot be transferred sufficiently and feedback cannot be given. Project members leaving the project early can cause a loss of valuable information whereas those coming late may not get a more elaborated understanding of earlier decisions as well as extra time for becoming familiar with the project is often needed.

Boundaries related to location also involve that sub-organisations and individuals not meet each other. A typical example is that designers work at their home offices and only meet now and then. However, in few larger projects special design offices have been organised. Another example is that the contractor has some managers on site and others at the main office. This splitting of location leads to difficulties in collecting, storing and distributing relevant information in a way that is accessible by most participants and can therefore limit the learning capability. To overcome this difficulty advanced information systems that are easily accessible from any location can be a solution.

Hierarchical boundaries imply that individuals at different organisational levels do not exchange sufficient knowledge and information. A typical example is that the contractors’ project manager does not understand the site managers’ need of support or that the site manager doesn’t ask for support.
There are also culture related boundaries between professions because of their different education and roles, for example between architects and contractors. A common concern is that professions tend to generalise the behaviour of other professions. For example, all architects are handled in the same way regardless their expertise, experiences and personality. In this way a professional behaviour is created that may hinder learning.

This fragmentation in different disciplines and the number of boarders make learning more complex but also more interesting to improve. It is a general opinion that the information flow through the construction process is underdeveloped and that feedback loops are almost non-existing. One improvement approach is to reduce or even completely overcome the boundaries by new organisation structures or improved communication between the different project members.

5 Conclusion

This paper is aimed at giving an overview of existing organisational learning theories with a focus on organisational learning capability and their appliance on research regarding construction projects organisations. It shows that great emphasis is laid on theoretical discussions and advices about how learning cultures are likely to appear and how they can be achieved by using specific techniques. On the other hand, much less research is paying attention on empirical studies about learning occurring in reality: “Research has concentrated on describing learning organisations and on individual customised implementations of organisational learning concepts and tools in a variety of organisational types” (Ford et al., 2000).

A concentration on single aspects of organisational learning capability or tools is noticeable, whereas a comprehensive view about the implications on the single person or on the organisation is fairly neglected. A viewpoint within or about one company is common, although it is against the nature of construction projects, which are characterised by cooperation of several companies and the involvement of numerous specialists. From a managerial view exists an interest to see the impact of investments in training or new communication infrastructure and their usefulness.

For achieving a comprehensive picture about how the learning situation in building projects really is, how existing theories and methods are applied, broader empirical studies are necessary in addition a generalisation of results found by applying case studies can be performed in this way. Another important factor is to widen the perspective by adding interacting partners in the learning process. Huemer and Östergren (2000) identify a general lack of systematic empirical studies, whereas numerous normative concepts, about what organisational learning should be, exist.

The research indicates that most hinder for learning are related to existing organisational boundaries. These boundaries may exist because the project organisation includes many companies and many professions. However, there seems to be no empirical studies aiming at identifying and analysing these boundaries in a broader sense. Such study should give a good overview of the learning capability in construction projects. The industry should get information on how to organise their projects for increased learning. Further, it should guide the creation of more focused studies on learning capability.
6 References


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