

# **BARRIERS TO A CONTINUOUS LEARNING PROCESS IN CONSTRUCTION**

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## **ABSTRACT**

In a paper to IGLC in 2010 the researchers claim that Nonaka's model of knowledge creation may apply in the construction industry. Notably, there is an interdisciplinary and continuous dialogue between explicit and tacit knowledge taking place at the construction site. Based on empirical evidence, it is argued that the Last Planner System of production control (LPS) may stimulate such continuous learning, by facilitating opportunities for a continuous exchange between tacit and explicit knowledge. However, certain premises were found to exist, to enable learning within construction projects using LPS.

In a more recent IGLC paper (2012), it was concluded that when implementing the Last Planner System as a systematic framework for planning purposes, challenges were faced in terms of adaptation to longer planning horizons, transition to new meeting structures and letting go of a traditional approach to planning. Other noted challenges were involvement and relational issues. Further it was concluded that crucial drivers for future use of the planning methodology were key personnel to direct development processes, top management engagement, practical and theoretical knowledge of collaborative planning, and project support.

This paper builds on findings and conclusions of the two papers, and discusses obstacles and barriers for learning in the construction industry and how these may be overcome.

## **KEYWORDS**

Learning, last planner, humanistic change patterns, barriers.

## **INTRODUCTION**

In previous studies the authors have found that knowledge development as postulated by Nonaka (1995) do occur also on construction sites. Further, by introducing the Last Planner system (LPS) for production control (Ballard, 2000) as a framework for collaborative planning, challenges have been detected in terms of adopting longer planning horizons, transition to new meeting structures and giving up on traditional planning. Traditional planning entails that trades to a lesser extent have been involved in collaborative planning, and rather that each discipline have planned their activities in isolation. Other noted challenges have been reported in terms of involvement and relational aspects. We concluded in our previous research that critical factors for

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future use of LPS as a planning methodology were key personnel to lead and support the transition process, top management commitment, and practical and theoretical knowledge of collaborative planning, as well as project support.

In this paper we bring in theory on barriers to learning and discuss our earlier findings in light of this theoretical perspective. We ask: How can barriers faced in the construction industry in terms of learning and change, be understood using theoretical perspectives and concepts of organisational change? And how may such barriers be overcome?

## **THEORETICAL BACKGROUND**

Previously we have argued that implementing the last planner system may be a driver for knowledge creation (Skinnarland and Yndesdal, 2010). Such an approach to organisational learning largely represents a humanistic change strategy. A characteristic of humanistic change strategies is a wish to change behaviour by learning and by adaptation. It is an open social system, wherein actors together find and agree on solutions through reflection and learning. The tools to implement change are socialisation and practising, and training in groups. A challenge faced in this type of change strategy may be a difficulty in bringing new knowledge into everyday situations, and in establishing lasting behavioural changes (Borum, 1995).

A repeated situation from the construction industry may serve as an example of such challenges. When a construction project is handing over its finished product, the team of collaborators is replaced with new constellations of teams, as a new construction project kicks off on a new site. The new project kicks off, and goes through three phases of (a) initiation, (b) reinforcement period, and (c) behavioural effect as described by Skinnarland and Yndesdal (2010). Going through the three phases may internalise the new knowledge acquired during the execution of the construction project (Nonaka and Takeuchi, 1995).

## **THEORY ON BARRIERS**

Oxford Dictionaries defines barriers<sup>1</sup> as an obstacle that creates a problem, e.g. lack of common experiences or different cultures, which may or may not be conscious. Resistance is defined by the same source<sup>2</sup> as an opposition or reluctance to change, i.e. as anyone's reaction of trying to prevent a change from being implemented.

## **Unlearning the old knowledge is difficult and crucial to organisational learning**

Probst and Büchel (1997) address the question of why organisational learning does not take place more often. They find that organisations appear to oppose change on the grounds that success with a particular strategy or procedure “confirm the validity” of using the same strategy also in the future. Necessary unlearning of the old knowledge thus becomes difficult. Unlearning is the process of discarding obsolete and misleading knowledge (Hedberg, 1981). According to Hedberg, this means that organisations, that want to implement change, need to consider its internal existing knowledge as an enemy. Argyris (1985) holds that success strengthens the existing

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<sup>1</sup> <http://www.oxforddictionaries.com/definition/english/barrier>

<sup>2</sup> <http://www.oxforddictionaries.com/definition/english-thesaurus/resistance?q=resistance>

knowledge and inhibits a process of unlearning. Following Hedberg, unlearning takes place as a series of “small death” at the micro level, as structures and mindset are slowly removed to make room for new. The process of unlearning is characterized by changes in knowledge structures, like cognitive paths. The cognitive paths are dissolved either when old events yield new outcome, or when the event itself is perceived differently. In the first case the connection between the event and the result is not working anymore. An example from construction may be a statement made by a participant in a construction planning meeting: “it is useless to plan six weeks ahead because there will be so many changes until then anyway!” Such a statement may no longer receive the expected reaction from other meeting participants (e.g. lack of affirmative nods), since, on the contrary, several of the participants may have experienced that planning a few weeks ahead, in fact will result in less changes as they approach execution. Another example is that when home buyers’ attitudes towards energy and environmental concerns changes, the market for low energy efficient houses will be less competitive even if the price in itself would suggest otherwise. Existing theories and norms are then discarded. In the latter example, the change in perception causes the connection between the event and the results not to work anymore. This is the case when e.g. a new perception that more and regular planning meeting may lead to lower overall costs, breaks with the previous perception that increased administrative costs lead to a more expensive project.

Organisational change is often triggered by decreasing turnover, increased costs, public criticism or new management. On the construction site there are several different organisations (subcontractors) in various situations that spend time working on the site to perform together. Turnover, cost development and management stability will vary within these subcontractor organisations. We argue in this paper, that it is the workers from the different subcontractors present on the construction sites who first and foremost benefit from the changes. They feel both the consequences of poor planning, and the effects of good planning.

### **Organisational defensive patterns**

Organisational defensive patterns in terms of skilled incompetence, defensive routines, or “fancy footwork” exist according to Probst and Büchel (1997) in one form or another in all organisations and are main barriers to organisational learning. Other barriers include norms, privileges and taboo and disorder/disturbances in information sharing.

From early childhood we learn how to react to painful or threatening situations so that we do not lose control of the situation. Such behaviour is translated into theories about how to cope in our daily lives. According to Argyris (1990) humans dislike losing control of their actions and like to receive praise when they have done something good. Most people thus refer to theory which means that they keep control of the situation. To cope, people sometimes have to lie, distort, omit or make up things. This is termed skilled incompetence (Argyris, 1990). Skilled incompetence results from unproductive and unconscious steps of a process. The process usually takes no more than a fraction of a second, thus usually making the action unconscious and difficult to control. Since skilled incompetence is part of our daily behaviour, it becomes an organisational norm. It is therefore considered as rational.

Defensive routines lead to errors being made towards individuals and groups. Mistakes are being done and are being ignored. These mechanisms limit the

likelihood that existing structures can be broken down. One example is how finishing an activity on the construction site is actually *defined* by the responsible team. If the concrete contractor in the past would finish up and leave the area to the carpenter without clearing out his waste and brush the floors etc., then they would consider such behaviour as saving a few hours' worth of salaries on the project, and thus legitimate their behaviour based on rationality. Such behaviour is found although it causes increased costs to the carpenters, which is the next discipline in, as they have to start their job with clearing the area after the team of concrete workers.

"Fancy footwork" (Argyris 1990) are defence mechanisms intended to lessen suspicions or to blame someone else. This leads to denial and the actors does not realise their own self-contradictions. The purpose is to defend themselves against criticism. Together, organisational defence routines, skilled incompetence and fancy footwork according to Argyris and Schön (1978) are signs of diseases leading to high costs and waste of human resources.

### **Norms, privileges and taboo as barriers to learning**

Probst and Büchel (1997), hold that all organisations execute their particular characteristic behaviour. Since behaviour patterns are shared by many, these are difficult to change. Strong organisational cultures are taken for granted by those who are part of the culture. Components of change are not isolated islands, but are encapsulated in a whole. Norms, loss of privileges and taboos prevents learning.

Processes take place in which individuals and organisations consciously and actively resist learning through reluctance to give up on privileges. These norms are often valid for a large group of people and are therefore difficult to change. New thinking is met with scepticism, such as "we have tried this also in the past" and "it's not going to work". An example might be a construction manager who discovers a poor design solution presented by the owners' consultant. Rather than to offer a new proposal which he knows will be both easier to build and will work better for the client, he'll only notify the client that the solution is deficient. The main reason is that he doubts that the owner consultant will take responsibility for the solution he proposes. This may result in production down time for which the construction company lose money, and in a less optimal solution than necessary for the owner. Taboo is a form of resistance because morals and habits are extremely difficult to change. They are indisputable. An example may be the attitudes that consultants, contractors and owners have towards each other.

### **Information disorders as a barrier to learning**

According to Pautzke (1989) organisational learning is limited by disorders in information handling within the organisation. Hierarchy, specialization or centralization may hinder members of an organisation to access necessary information to perform their tasks. It may also be a question of capacity, priorities and poor practices. Several types of information obstacles exist. One is structural disorders of information (information being blocked or distorted because of hierarchy, specialization or centralization. Decision makers may then lack the information they need. The second type is doctrinal information disorders (a doctrine, a motto or slogan etc.) gives a wrong picture of the organisation. This may result in that some types of information is being favoured and that decision makers does not receive enough information to see the whole picture). The last type is psychological

information disorders. Individuals prefer harmony, and facts that may destroy harmony may be put a lid over.

## METHODOLOGICAL CONSIDERATIONS

This paper builds on findings and conclusions reported in previous papers to IGLC (Skinnarland and Yndesdal, 2010, 2012). The empirical basis was research into lean implementation processes and DBA research project carried out at Heriot Watt University in Scotland. Qualitative case studies in Norwegian construction pilot projects were conducted in a phenomenological framework using an explorative approach to achieve an increased understanding of processes of developing collaboration within a construction project.

Data on which the 2010 paper was based was collected from 36 one-on-one semi-structured interviews with project managers, foremen and supervisors, as well as observation in planning meetings at different managerial levels in the cases studied. In the 2012 paper to IGLC a total of 24 unique construction projects were represented in the data. All projects were within a large family-owned Norwegian construction company, ranging from short-term rehabilitation work to large scale construction projects. Altogether, 34 project managers and foremen participated in the study which took place in the fall of 2011.

Findings and conclusions from the previous empirically based research projects are discussed in this paper in light of various approaches to understanding barriers to learning. It is assumed that knowledge of inherent barriers to unlearning and learning may enlighten our understanding of the mechanisms that have to be tackled in order for change to occur. Below we will link the theoretical framework which has been accounted for above, to observed barriers to learning.

## DISCUSSION

In this section we will discuss obstacles and barriers for learning in the construction industry and how these may be overcome.

Planned change involves a certain interpretation of the past, a certain perception of the present, and an assessment of the future. Various backgrounds and uncertainties as to how change may affect each individual make individuals interpret change differently. Our experience in terms of success or failure in the past is crucial to our attitude towards change, and Argyris (1985) states that what we have succeeded in doing earlier prevents unlearning.

The balance between acquiring new knowledge and unlearning old knowledge affects whether changes are successful (Argyris and Schön, 1978). Unlearning occurs when there are changes in the knowledge structures, when connections between events and outcomes are broken, and we start to ask "why" - questions, and not just "how", i.e. double loop learning<sup>1</sup> (see Skinnarland and Yndesdal, 2012, for more on double loop learning).

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<sup>1</sup> "In double-loop learning procedures and practices are questioned critically, this is radically different from single-loop learning where procedures and practices are rather operationalised than questioned" (Skinnarland and Yndesdal, 2012, referring to Argyris, C. and Schon, D. A. (1974). *Theory in practice: Increasing professional effectiveness*, San Francisco, CA, Jossey-Bass..

## **INTERDISCIPLINARY EXPERTISE AND INTEREST IN OTHERS**

Research (Skinnarland and Yndesdal, 2010) has revealed that to some extent there is a lack of interest in others' work and how other's work is related one's own. This results in a lack of commitment. Every new construction project is largely unique. The uniqueness of projects makes it difficult to fully understand the connectedness of interdisciplinary work, which means that a lack of interdisciplinary expertise to a greater or lesser degree is a challenge in every construction project. Technical solutions and choice of materials used also varies from project to project. This means that work processes and sequences of activities used in previous projects, cannot be automatically transferred to the next project. Thus, successful projects are therefore dependent on interdisciplinary expertise to secure an optimal interface between disciplines and activities. So, those who lack interest in how their own work is related to other's work may easily resort to theories of experience learned incompetence. This often happens automatically in order to retain control of the situation. This then suggests that individuals make unproductive steps which need to be challenged in order to be aware of and to be able to change their response pattern and behaviour.

When every new construction project constitutes a beginning from scratch, project participants may act to prevent themselves from revealing how little they know about the other trades. A defence pattern of fancy footwork may be set in motion, when one perceives to have limited knowledge of the others, which one does not want to reveal. Fancy footwork then feels safe.

A lack of interest in others' work may also stem from a difficulty to unlearn. If previous success was dependent on one's ability to limit responsibility according to contract, and, in shared enterprises, by sticking to contracts only, then spending time to get to know others, which is not written in the contract, is not considered worth spending time on. This line of thinking needs to be broken. And maybe there needs to be a contractual paragraph stating an expectation to devote time to others, e.g. in progression planning meetings. Thus, according to Probst and Büchel (1997), these project participants may oppose change since previous success with a narrow minded and strict reading of the contract as a strategy "confirm the validity" of their old behavior. This behaviour needs to be unlearned and cognitive paths need to be broken (Hedberg, 1981).

A solution may be to clearly state expectations already in contracts of shared enterprises, to comply with established meeting structures, the content of meetings, e.g. progression planning, whom are expected to meet, and so forth. In other words, lay the grounds for learning.

## **HOW ARE WE CHALLENGED AND WHO ARE CHALLENGED?**

In implementing LPS methodologies, the changes that most easily have been adhered to are daily conversations, collaboration and team supervisor meetings to plan for the next week. There has always been conversations and collaboration between the various contractors' team supervisors and between workers on the construction site. However, showing interest in other's work and the way they talk about and to each other have changed as a result of both kick-off meetings and weekly team supervisor meetings as part of the LPS structure (Skinnarland and Moen, 2010).

This type of change to a larger degree applies to those present on site full time, who discuss and collaborates, and who thus better understand the dependencies

between each trade and how work activities are related. The challenge described in the introduction section in terms of involvement and relations only to a limited extent applies to this group. Within these groups much information and knowledge is shared and challenged on a daily basis, see Nonaka's model below. Table 1 shows “a spiral model for creating organisational knowledge, a dynamic theory with a continuous dialogue between explicit and tacit knowledge. Organisational learning occurs in interaction between tacit and explicit knowledge, when individuals’ tacit knowledge is made available, tested and developed and turned into practical use.” (Skinnarland and Yndesdal, 2012, referring to Nonaka, 1994)

Table 1: Nonaka’s Knowledge Creation Model

	<b>Tacit knowledge</b>	<b>Explicit knowledge</b>
<b>Tacit knowledge</b>	<p><b>Socialisation</b> (By observing and imitating, in meetings and group discussions)</p>	<p><b>Externalisation</b> (Articulation of ideas, use of metaphors in dialogue)</p>
<b>Explicit knowledge</b>	<p><b>Internalisation</b> (Translating explicit knowledge to new practice)</p>	<p><b>Communication</b> (Combining new contexts and categories)</p>

Unproductive behaviour and distorted explanations to retain control which are used within these types of groups is challenged by the other members of the group, who are in the same context and who see and talk about the same dependencies.

The Nonaka knowledge creation model thus suggests vulnerability in terms of trades that are present on the building site for short periods only. They lack the opportunity to be acquainted, to receive more information than strictly necessary, to share knowledge and to challenge and be challenged. Among such participants, the barriers to learning may prevail.

Nonakas model may help to explain and even solve learning issues according to the barrier concepts featured above. Firstly, unlearning may take place by facilitating double loop learning. Participants may become conscious of how to treat old knowledge like an enemy. Also, by promoting a collaborative atmosphere built on trust and understanding, skilled incompetence may be reduced. By facilitating the transition process from tacit to explicit knowledge the fear of losing control of one’s actions (Argyris, 1990) may diminish.

Information overflow help challenge the status quo. Participants have their speciality knowledge, and others may be prevented from asking questions just by knowing too little to be able to ask questions. However, when they spend more time together on the project (Nonakas model above), they communicate, ask questions, and receive more information that is strictly needed. Their ability to ask more qualified questions is increased as a result, and the need for fancy footwork may be reduced.

Subcontractor project managers, however, mostly (at least in Norway) are in charge of several construction projects simultaneously, and only pay visits to the sites to attend scheduled meetings and inspections, then leave the site again. These project managers often do not develop the same relationships to the other disciplines' teams, nor do they receive the same overflow of information (Nonaka 1994), and nor are they involved in the other team's work to the same extent. The same holds for subcontractor workers who do work on the building site on an on-and-off basis. The two latter groups thus find themselves somewhat on the side of this dynamic development between tacit and explicit knowledge, with new combinations developed among the teams, giving these participants an expanded understanding of the construction process and in turn have their own theories challenged. This is in line with Pautzke (1989) who holds that disturbances in information sharing provide a deficient image which may provide resistance to unlearning. In line with Nonaka (1994), such a situation creates an obstacle to double loop learning.

An observation was made by the authors at the construction site where a plumbing contractor was one of the major contractors and had many interfaces with other disciplines. Their project manager was seldom at the construction site. He seldom demonstrated any interest in the interdependencies on site. In addition, the contractor changed site managers (foremen) quite often, having four different foremen on site in nine months. For the new foremen that came to the site, this situation created a challenge in terms of getting an overview of their own work. Even further, the many alterations and lack of project management interest resulted in limited discussions with other disciplines, and thus limited understanding of dependencies. The new foremen did not take part in the dynamic knowledge development taking place on site to the same extent as others. Not being part of the dynamic development between tacit and explicit knowledge on site was reflected in the foremen's behaviour in meetings as use of organisational defensive patterns (lying, distorting, make up things, blaming others) in order to retain control. This strategy led to reduced learning on site for all involved, and not only the plumber. The other disciplines did not expand their knowledge capacity either, in terms of dependencies towards plumbing.

#### **WHAT KIND OF LEARNING TAKES PLACE AND HOW TO TAKE IT FURTHER**

New knowledge that has been developed at the construction site by team supervisors, foremen and workers, and that has been internalised as a new practice, is tacit knowledge. Nonaka (1995) holds that an organisation to a limited degree can benefit from this kind of knowledge as long as it stays tacit. Although team supervisors and workers in multiple projects have developed new knowledge as Nonaka's model demonstrates, this knowledge still is difficult to communicate to their managers. For instance; conveying that expenses in terms of new forms of collaboration with more frequent meeting structures, i.e. more planned use of administrative hours, will be recouped in the form of less unproductive hours spent among the worker teams; or the interdisciplinary expertise has developed to such a degree, that fewer errors are made that needs to be corrected. The subcontractor project and general management may thus have a completely different perception of the reasons for money earned in a particular project. An attitude may thus prevail among project managers that increased administrative costs of attending meetings will not pay off. It may also be the case that subcontractor project management have doubts that collaborative

contracts are designed so that they will benefit, i.e. that contracts can possibly be founded on a creation of a win-win outcome.

This may constitute a structural disorder of information Pautzke (1989), i.e. that information is being blocked or distorted because of hierarchy.

Longer planning horizons has proven to be a challenge for many (Skinnarland, 2010 and Skinnarland and Moen, 2010). And those who according to LPS should be responsible for planning several weeks ahead are not usually on the site on a daily basis. Nor are they thus the ones who experience the benefits achieved from improved work flows and improved collaboration on the site. For subcontractor project managers who participate in lookahead meetings longer time may be needed for new knowledge to be internalised, as they receive less information and develop fewer relationships with other participants in the construction project. The risk of structural information interference Pautzke (1989) is usually extra critical since they lack the overflow of information they would normally receive if they were on site daily.

## **CONCLUSIONS**

We may thus argue that project participants with the least formal power are learning the most. Their new knowledge is tacit and therefore difficult for the organisation to take advantage of. A change strategy based on a humanistic change strategy alone, aimed to result in behavioural change from learning and adaptation, may therefore not be sufficient. It is therefore critical that key personnel manage and support the change process and that the change processes also receive necessary support from top management, so that new knowledge and altered structures go through the three phases of initiation, reinforcement and effect (Skinnarland and Yndesdal, 2010). This is when unlearning in the form of old events getting new "outcome" occurs (Hedberg, 1981).

There may be a tendency to view everything in the light of some win and others lose in terms of a change. What may be the rationale for such an attitude? And how may such a mindset be changed? A mindset of win/lose as regards change may be perceived as a threat. "What does this change really entail for me?" "Could it be that I take on more responsibility than I need to?" These are quotes that exemplify that change may be perceived as a win/lose situation. Other examples are perceptions about changed power and social relations. "Will I gain or lose?" To some, there may seem to always be a prospect of personal loss.

To create individual learning defence mechanisms needs to be reduced, and a climate for learning and development needs to be created, (with reference to our earlier example that team managers and workers who spend time on site on a daily basis learn more).

In addition, there is a need for a systematic approach so that groups, not just individuals, learn.

Double loop learning is the key to overcoming barriers and to achieve organisational learning, (Aryris and Schön, 1978). Double loop learning occurs only when individuals becomes aware of the underlying theories that govern our behaviour. Such awareness may be raised by discussing their behaviour openly with others. To achieve this there is a need to create a climate of trust and confidence, so that nobody is afraid of being attacked and criticized. In this way, these underlying theories are being tested, (Nonaka, 1994) and with reference to Skinnarland and Yndesdal (2012)

who find that the LPS framework on site is a good framework for continuous knowledge development.

This paper demonstrates that various underlying theories exist which contribute to govern project participants behaviour on the construction sites. These theories explain which mechanisms may create barriers for unlearning and learning to take place. We have discussed how differences in project participant presence and involvement on site may affect their ability to change their behaviour by learning and by adaptation. Awareness and knowledge of the mechanisms that create barriers for learning, and ultimately changed behaviour, is important in order to address many of the challenges faced by the construction industry.

### **FURTHER RESEARCH**

An interesting topic to study further would be barriers to learning among those project participants who are in charge of planning in a longer time horizon, i.e. project managers who's relationships to those present on site is limited and occasional. How can these become more involved so that they may take more part in the continuous knowledge development?

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