

ORGANIZATIONAL LEARNING IN CLOUD AND LEAN TRANSFORMATION

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Abstract

Today, the cloud phenomenon is challenging companies' product and service development and also their business and revenue models. Many companies are in the middle of a fundamental change – transformation – in order to benefit from the opportunities that the cloud offers. At the same time, interest in lean thinking has grown in industries and research communities. Lean paradigm is assessed as a potential means to help companies pursue efficiency and better organizational performance. This paper discusses cloud and lean transformation in a large Information and Communication Technology (ICT) company, which has risen to the challenge of the cloud. This paper studies how organizational learning, which is a corner stone of lean thinking, relates to an organization's transformation. This paper proposes a revised transformation framework with the new aspect of organizational learning.

Keywords: Cloud, Lean, Organizational learning.

1 Introduction

“Cloud” is today's buzz word without a clear definition [1]. However, a proposal for it is given [1]: clouds are a large pool of easily usable and accessible resources, which can be dynamically re-configured. Currently, many business applications are moving to the cloud and the next decade promises new ways to collaborate everywhere through mobile devices. In this paper, we consider that the cloud has an impact also on the areas of businesses and brings changes to the external business environment. These changes will present both opportunities and threats, which companies must recognize and be prepared for. Thus, many companies are starting a transformation in order to benefit from the opportunities and to respond to the challenges of the cloud.

Lean thinking (e.g. [2]), which aims at creating value for customers in parallel with eliminating waste, has been introduced in several industries and today it is adopted also in software development [3], [4]. Lean thinking is anticipated to help companies in the current business challenges. Nevertheless, adopting lean thinking in an enterprise is a big change and

requires even years to be completed [2], [5], and [6]. Organizational learning is one of the corner stones of lean thinking [3], [4], [7], [8], as well it is an essential element in organizational transformation and it has to be integrated into existing business processes [9]. Literature of organizational learning lists three types of organizational learning: single-loop, double-loop, and triple-loop learning (e.g. [10], [11]). Further, the three loops of learning are linked to levels of an organization: individuals, teams, and enterprise [10].

In the context of this research, the cloud is the driver that forces companies to respond to its challenges; in other words, companies start *cloud transformation*. Lean thinking is a powerful means to contribute in the change; that is, companies conduct *lean transformation*. Cloud and lean transformations are major things for companies in order to maintain or gain competitive advantage. The whole organization must be involved in the exercise, which promotes organizational learning. According to [10] effective leadership, strategic positioning, and organizational goals and objectives are crucial factors in facilitating organizational learning, but time factor shall be considered as such initiatives can only take effect after a period of time. Moreover, organizational efforts need to be integrative; all forms of learning should be integrated into the work processes [10].

The case company is a large Information and Communication Technology (ICT) company, where cloud transformation is all-embracing initiative. At the same time with the transformation, the company started to actively map and analyze its existing operations from the viewpoint of the cloud. One of the services that was seen to have very good potential to be full blown cloud service, was one of the company's sustainability related service. The team's attempt is to adopt lean way of working in their cloud-based service development. This research views organizational learning in the context of cloud and lean transformation from organizational, team and individual level. The research question of this paper is: *How does organizational learning relate to an organization's transformation?*

The purpose of this paper is to emphasize the importance of organizational learning in cloud and lean transformation. Factors that influence organizational learning are described based on interviews. This study utilizes theories of organizational learning [12], [13]. Yeo's [10] framework of organizational learning and Rouse's [17] transformation framework create the foundation for this study. Further, definitions and views of the lean paradigm [2], [3], [4] are included in the theoretical basis of this research. This study utilizes the principles of a case study [14], which is a suitable research approach for the overall study in which the researchers act as investigators rather than participants and where the goal is to investigate a contemporary phenomenon in a real-life context.

2 Theoretical Basis

2.1 Cloud as Driver for Transformation, Lean Intertwined in Transformation

“Cloud” and “lean” are contemporary paradigms. In this paper, we do not speak only about cloud computing, but a cloud phenomenon that has an impact also on areas of businesses and brings changes to the external business environment. These changes will present both opportunities and threats, with some possessing the potential to radically alter how an ICT company conducts its business.

The capability of an organization to benefit from the cloud is dependent on its ability to adapt the entire organization to the change. Lean thinking is seen as a key approach which proactively responds to the issues and opportunities of the cloud. The roots of lean paradigm

go back far in the past (e.g. [8]), but just at the end of 1990s Womack and Jones [2] widened the scope of lean thinking from lean manufacturing to lean enterprise. They presented the lean thinking principles (identify value, map the value stream, create flow, establish pull, and seek perfection), which were further developed to *lean enterprise* principles [7].

The lean thinking manifests itself like a philosophy, which needs to be seen as a journey and as a mind-set that governs how one looks at the business and processes (e.g. [6]). Applying lean principles in an organization most evidently needs a big, long-lasting change [2], [5]. The transformation needs both top-down and bottom-up approaches ([15], [16]), i.e. both strategy-oriented and operations-oriented approaches [17].

2.2 Transformation Framework

Enterprise transformation occurs in the external context of the economy and markets [17]. Enterprises have their internal strengths and weaknesses, but external threats and opportunities drive the change within this broader external context. Many fundamental changes address value from the perspective of customers. Value deficiencies are claimed to drive enterprise transformation initiatives, but the enterprise's work processes enable the transformation [17].

Conclusions from case studies of ways of transformation implemented are illustrated in Fig. 1 [17], where the *goal or ends* of transformation can range from cost efficiencies to fundamental changes in markets, the *approach or means* of transformation can range from upgrading people's skills to major changes in strategy, and the *scope* of transformation can range from work activities to the enterprise as a whole. The ends and means influence the scope of transformation. The costs and risks of transformation increase when moving farther from the center in Fig. 1. In the context of this research, Fig.1 can be interpreted as "cloud transformation framework".

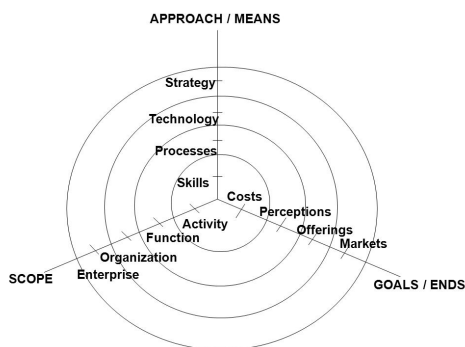


Figure 1. Transformation framework modified from [17].

2.3 Organizational Learning

The ultimate goal of lean transformation is to build learning culture [18]. Organizational learning deals with the ability of an organization to renew itself by changing its values, practices and processes [19]. Organizational learning is considered an essential element for an organization to create competitive advantage and it has to be integrated into existing business processes [9]. Difference between individual and organizational learning is in that individual learning in an organization may not represent organizational learning unless members of the organization act as learning agents [12]. In a learning process, an individual acquires

information, skills, attitudes, experiences and contacts, which leads to changes in workings [19]. Learning is defined [20] as the process of making an interpretation of the meaning of an experience, which guides subsequent understanding, appreciation and action. Kolb's learning cycle [13] includes phases of concrete experience, reflective observation, abstract conceptualization and active experimentation. In this cycle, one's understanding of the subject in question is increased through reflection, and subsequently he/she is capable to use that new knowledge. Thoughtful actions are divided to reflective and non-reflective actions; critical reflection involves critique of the presuppositions on which our beliefs have been built [20].

Levels of Learning. In an organization an individual is expected to follow defined processes and practices. This is called single-loop learning [12]; it occurs when errors are detected and corrected with no impact on present policies and goals (e.g. [10], [12]). This kind of learning is described [20] as instrumental learning, whose actions are thoughtful, but not necessarily reflective. Active interpretation can be a creative process and it is involved in a thoughtful action, but reflective interpretation is the process of correcting distortions in our reasoning and attitudes and it is involved in a reflective action [20]. Critical reflection can lead to a total change in perspective [20].

Learning through critical reflection is equivalent to double-loop learning [12]. Prerequisites of double-loop learning is questioning of the existing norms, beliefs and assumptions. In actual reflective thinking there must be seen some kind of criticism of thinkers' beliefs [21]. Schön [22] describes how an unexpected outcome gets our attention in the middle of the routine actions. This surprise leads to a consciousness of the factors in the situation and make us think critically about our thinking and the process which produced the pleasant or unpleasant outcome. At team level, reflective action gets more powerful via others' experiences.

When circumstances are favorable for double-loop learning, an organization can evolve into a learning organization; i.e. triple-loop learning, 'learning about learning' takes place. Triple-loop learning is about increasing the fullness and deepness of learning about the diversity of issues and dilemmas faced [23]. Triple-loop learning deals with the reflexive and integrative aspects of learning, and it takes into account organizational goals regarding the overall vision and purpose of the organization [10].

Organizational Learning Framework. Learning in an organization takes place in three levels: individuals, teams and organization, and these three levels are linked to the three learning loops [10] (Fig.1). Single-loop and double-loop learning can take place at the individual and team level rather than the organizational level, and triple-loop learning deals with organizational goals, the overall vision and purpose of the organization.

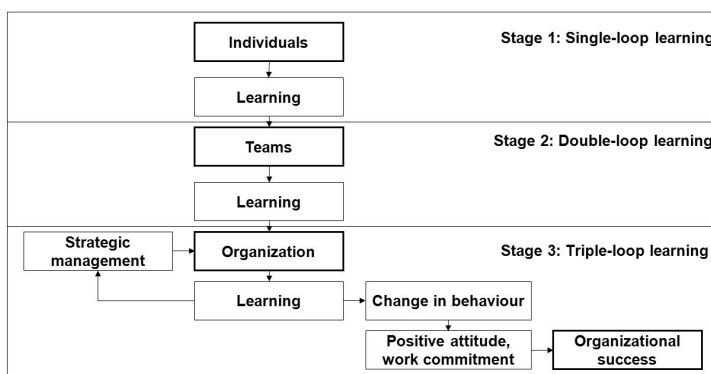


Figure 2. Organizational learning framework (modified from Yeo [10]).

3 Research Design

3.1 Case Company and Case Unit

Tieto is a leading IT service company in Northern Europe providing IT and product engineering services employing about 18000 employees. Tieto aims to productize services and offerings. Tieto sees sustainability of an integral element in IT services business including internal operations, offerings or data centres.

In this study, the focus is on Sustainability Intelligence team (SI team) that is a research and development (R&D) team originally assembled in 2005 for European Commission Sixth Framework Programme research project called Indisputable Key. In the Indisputable Key project the team researched the optimization of the wood-forestry supply chain using automatic identification [24]. In the project the main method of automatic identification was Radio Frequency Identification (RFID).

SI team worked as a research project and thus had liberty to decide their ways of working. The team included a group of experts working as peers. The team experimented agile development methodologies which consequently led to self-organization. The focus of work was to gather and categorize the requirements of the project, to define the scope of the project and to implement the traceability platform. Project was finalized in start of 2009 after which the team continued to develop the service by generalizing it also for other industries. In the organizational structure the team moved to a horizontal business line – Business Intelligence – to serve the vertical target industries of Tieto.

SI team made a strategic choice to enter Cloud Software Program with a new theme ‘Cloud of Things’. Target was to create a proof-of-concept service aiming at providing item level product information for consumers. The service collects and shares lifecycle information of products. The service can be used to create a reliable system for measuring the environmental impact of a single product and to present this information to customers. The information enables consumers to make more educated purchasing decisions. To catch consumers’ attention, new methods to offer the product information to consumers are researched in this program, for example, a mobile application using augmented reality [25].

Parallel to the development work in Cloud Software Program the team started to use the Application Lifecycle Management (ALM) system called “MSF Agile” which includes process rules to control the development process. After the process model was implemented and in use, SI team was able to see the status of the project and the connection between the tasks and the source code. During the program the team used Value Stream Mapping (VSM) (e.g. [26]) workshops to rationalize their development process. In the workshops the steps and information flows of development process were identified, and delays between the processes were analyzed. As a result the reasons for the delays were identified and the new version of the development process was defined.

The new version of MSF Agile process template using Scrum method was taken into use. A few sprints were tried out, but many ad hoc tasks distracted sprints. Next step forward was to integrate Kanban with Scrum, referred as Scrumban, in which both methods are used in parallel. The defined R&D tasks are handled with Scrum and ad hoc cases are processed with Kanban. Further, the team agreed that one day of the week is reserved for Kanban tasks and four days for Scrum tasks. Experiences about Scrumban are good and it has improved the team’s efficiency.

3.2 Research Method

This study follows the principles of a case study [14]. The case study method is a suitable research approach for the overall study in which the researchers act as investigators rather than participants [27] and where the goal is to investigate a contemporary phenomenon in a real-life context. The case study is descriptive and interpretative by nature [28] and its approach is beneficial also in researches, where control over the behavior is not possible, as the research data are collected through observation in an unmodified setting [14].

Various data collection methods were applied as proposed in the case study method [14]. Semi-structured individual interviews and workshops were used as data collection methods. Six development team members and seven leadership team members were interviewed. The workshops with the development team (totally about ten members) were organized in order to introduce lean methods such as VSM (e.g. [26]) and to identify improvement ideas of the team's work processes. All data were collected during 2010 – 2011.

All data of 60-90 minutes interviews were tape recorded and transcribed. The data of the workshops were collected and documented and they were validated by the team members. The researcher's role was to facilitate lean methods and tools and to observe the development team in the transformation.

4 Research Findings

4.1 Findings from the Interviews of the Leadership Team Members

The theme of the leadership team interviews was how the company should prepare in order to utilize the opportunities and to cope with the threats created by the cloud. The leadership team recognizes that cloud transformation through lean paradigm will be a long lasting effort and the company's strategy, organizational structure and systems shall be aligned with the change. The leaders highlight the importance of the whole organization's participation and commitment to the change: competence structure, sufficient and right competences shall be in place, the whole staff readiness to the change is essential in order to success. They highlight that when transforming for cloud, also "competence transformation" shall take place. Finally, the leadership team members emphasize shared values of the company and say that the change will promote learning and change the thinking process.

4.2 Findings from the Workshops of the Development Team

Several workshops and meetings were conducted with the development team including one lean analysis workshop, several VSM (e.g. [26]) workshops, and several follow-up meetings in between. With lean analysis the current status of the team's all work processes and practices are viewed through lean principles in order to identify the most urgent improvement areas; lean analysis acts as a starting point for VSM workshops, where wasteful activities in processes are identified. Concrete actions for removing waste are planned, i.e. improvement plan is created. The execution of the improvement plan was followed in the follow-up meetings/workshops. VSM is not a session that is conducted only once, but several VSM sessions are needed as shown in Table 1. The researcher's role was to facilitate and monitor the team's work.

Table 1. Events included in the study during 2010-2011

Event	Process area
1 Lean analysis workshop	All relevant processes for the team in question
2 VSM workshop	Requirements management process
3 VSM follow-up workshop	Requirements management process
4 VSM follow-up workshop	Requirements management process
5 VSM workshop	Implementation process
6 VSM follow-up workshop	Requirements management and implementation process
7 VSM workshop	Sales process
8 VSM workshop	Sales process
9 VSM workshop	Tailoring Scrum and Kanban practices

The main result from the workshops was that the modified processes became more efficient as wastes were removed and the team could concentrate on essential issues, e.g. unnecessary delays were removed or significantly shortened. The team claim that they have benefited from the workshop results and the team considers VSM a useful method, which has helped the team to improve their processes. VSM makes the problematic points concrete and visible.

4.3 Findings from the Interviews of the Development Team Members

The interviews of the development team focused on their current work environment aiming to find out enablers and disablers for organizational learning. Generally, the interviewees describe the working environment very positively. The respondents argue that transferring competences between team members takes place all the time and that the team's way of working supports learning both at individual and team level. They appreciate that the company invests in this kind of spearhead project, which aims at creating innovative, new cloud services.

The team members list enablers for learning on individual and team level: own interest, possibility to try new things, learning from failures, good leadership, well defined roles, good team leader, organized tasks, agile method (Scrum), possibility to create new ways of working, and finding best practices in creating new innovative solutions. In addition to company level competence development plan, it is also possible to develop competences off one own's bat. They mention that the company's organizational structure, systems, policies and strategy support the team's work. They say that sufficient education creates the baseline for competences, but in a spearhead project it is possible to create new knowledge. Team members even think that their doings have impact on the way how the entire enterprise functions.

As disablers the interviewees mention inadequate resources and competences. Additionally, team members are allocated to parallel projects. Distributed development is still seen as an obstacle even though technical communication solutions are available. Finally, they argue that due to the nature of spearhead project, reassurance of the team's objectives, and also the team's absorption to the rest of the company is a challenge.

The interviewees argue that the team members' learning lead to the team's learning. Working atmosphere is permissive, which promotes learning, innovativeness and enterprise. Further, they discuss that the company values support learning. The team members interpret that the team's participation in this kind of research project is a testimony of the company's support for organizational learning.

5 Results

5.1 Reflecting Findings to Levels of Learning

By definition, single-loop learning means incremental learning or following the rules. In the case company rules, guidelines, and process descriptions exist, which was visible in the workshops conducted (ref. chapter 4.2). The case unit followed the processes and guidelines as far as they served the team best. In that sense, it can be argued that single-loop learning happened.

The activities described in Table 1 indicate that the team is continuously improving their processes and changing the underlying assumptions, which relates to double-loop learning. It also includes questioning and modification of existing norms, procedures, policies, and objectives [12]. In the workshops and meetings, the team members considered whether the prevailing rules, processes and practices worked for them or should they be changed. VSM is a method to execute double-loop learning.

Triple-loop learning addresses the question whether people really have the opportunity and competence to participate in making well-informed choices in the process of discussing and managing issues that concern them [11]. On one hand, the team members say that the team has the possibility to function as a spearhead project, which gives them the opportunity to create their own way of working. On the other hand, the leadership team members say that the strategy is being modified to better respond to the changes in the business environment and that the transformation is expected to create new spearhead projects to develop new cloud services. They continue that change in culture and behaviour is anticipated as well. All this leads to our claim that triple-loop learning is going on in the case company.

5.2 Reflecting Findings to Organizational Learning Framework

The previous chapter shows that all three learning loops are happening in the case company. Referring to the organizational learning framework (Fig. 2), the three stages of learning are linked to the three learning loops. The link between single-loop and double-loop learning is confirmed by one interviewee, who said that the team members' learning leads to the team's learning. One could argue that a way to move from single-loop learning to double-loop learning is to promote open dialog and (critical) reflection among team members.

The interviews of the leadership team members elicit information that the cloud and lean transformation is a welcome and pursued target in the company. They say that competence transformation is needed as well, which leads us to state that organizational learning is a target, and also happening all the time. The leadership team see that change in culture is needed. However, when referring to the Fig. 2, the clear link between stage 2 (double-loop learning) and stage 3 (triple-loop learning) seems vague, even though willingness of the development team and the leadership team to create or maintain the dialog is evident.

5.3 Reflecting Organizational Learning Framework to Transformation Framework

As said above and referring to Fig. 2, single-loop, double-loop and triple-loop learning take place on individual, team and organizational level. Further, the link between single and double-loop learning is strong, but the link between double and triple-loop learning needs strengthening in the case company. Concerning the research question "How does organizational learning relate to an organization's transformation?" we suggest combining the

transformation framework (Fig. 1) and organizational learning framework (Fig. 2) to a revised transformation framework (Fig. 3), which introduces *organizational learning* as a new dimension.

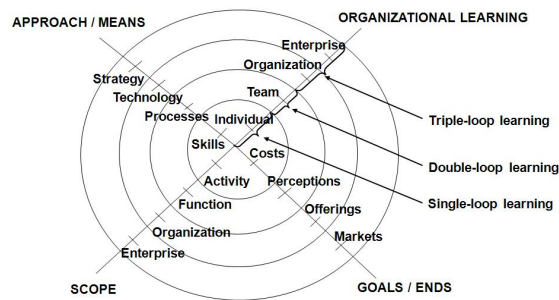


Figure 3. Revised transformation framework

The revised transformation framework highlights the importance of organizational learning as the new perspective in transformation. The revised framework illustrates the levels of learning in relation to the size or progress of the transformation; when a large company - like the case company - is transforming, it is necessary to align the whole company to the change and to acknowledge that the change will be a long-lasting effort. This also confirms the statement that organizational learning takes a long time (e.g. [10]). According to [10], strategic positioning of the organization and organizational goals and objectives shall be clearly set out, when directing organizational learning, which applies also for transformation and is visible in the framework as *the goals or ends* and *the approach or means* axes.

6 Conclusions and Future Work

The findings of this research confirm the organizational framework of Yeo [10] in the sense that the three learning loops are happening in the case company. Additionally, the link between single-loop and double-loop learning seems to be strong, but the link between double and triple-loop learning needs strengthening. As the answer to the research question we propose a revised transformation framework (Fig. 3), which was based on the transformation framework with aspects of *the goals or ends*, *the approach or means*, and *the scope* [10]. We complemented the framework with the perspective of *organizational learning*, which we argue to be an important aspect in a transformation, because it prepares the organization for the future at individual, team, and enterprise level.

The interviews of the leadership team provided background information of the case company's effort in cloud and lean transformation. They pronounce their commitment and support to the work of the development team in question. The interviewees of the development team say that they have learned as individuals and as a team and that their competences have increased. However, the dialog between the leadership team and the development team could be stronger.

The case company is just taking their early steps in the cloud and lean transformation. However, based on this research we claim that organizational learning is an important factor in the success of cloud and lean transformation. Yet, there is room for further studies.

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