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Implementing of Lean – challenges and lessons learned

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Abstract

This paper has investigated how to implement Lean in a way the organization can benefit from and improve efficiency in business processes. The study explains effects, experiences and prerequisites for successful implementation in a larger pilot consisting of nine smaller cases in the Norwegian Transmission line Operator, Statnett SF. Some Lean approaches being principles, methods and tool were tested out and customized to business processes. All groups were supported by professional facilitators on a regular basis. The outcome demonstrated that the approaches used improved efficiency and had beneficial effects on culture for continuous improvements but required certain conditions in order to succeed. Among useful effects were 5000' Euros and an organization with a stronger ability to make useful changes.

Keywords: Lean, Implementation, Continuous improvement, Change management.

1. Introduction

Lean management is a methodology that was born from Just-In-Time and the Toyota Production System (TPS). On part of the literature considers Lean management as philosophy that follows five principles (value, value stream, flow, pull, and perfection) to eliminate all sources of waste (or muda) from the production processes while a second stream

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of the literature translates the lean philosophy using a more concrete perspective. In this stream is Lean management interpreted as a managerial system that integrates specific practices and techniques to reduce internal and external process variability, also called mura, recognized as the principal source of production problems from a lean standpoint [4] The benefits of applying Lean in organizations are proven by many in terms of time, cost and quality. [1], [2], but focusing on the implementation of Lean nearly two-thirds results in failure and less than one-fifth of those implemented have sustainable results [2]. Company survival is dependent upon their ability to systematically and continuously respond to changes for enhancing the value of their service or product, therefore value adding processes are necessary to achieve this perfection; hence implementing Lean is becoming a core competency for sustainability of any type of organization [3]. Bortolotti et al [4] argues that there are two critical success factors for Lean implementation: the organizational culture (OC) and the adoption of soft practices (concern people and relations).
This paper has investigated how Statnett has completed a Lean pilot consisting of nine smaller cases (groups) during a two years period (2017-2018). The research questions that has guided this study was:

1. ***Will Lean-approaches increase efficiency and realization of gains in Statnett?***
2. ***Will the use of Lean-approaches create a culture of continuous improvement in Statnett?***

Based on the assumption that standardization will improve efficiency and performance, Statnett designed 144 business processes (2014-2017). Every process had a responsible team supposed to execute improvements. The Lean-pilot was initiated with the purpose to experience Lean-methods and hopefully develop tools for executing improvements continuously and this way retrieve the efficiency potential in and between processes. Table 1 gives a short introduction to the 9 smaller cases that was part of the pilot.

Table 1: Presentation of the nine cases in the Lean pilot project

CASE FOCUS & AIM	PROJECT TYPE	PERIOD	TEAM	METHODS TESTED
1. Decrease total hours used for registration of work hours	Support-process ICT department – Customer service	Mars – November 2017	3 + manager	Lean scoping VSM A3-analysis with tools Effect estimations
2. Shortening timeline for the journaling of public papers	Support-process ICT department - Joint services	August - November 2017	3 + manager	Lean scoping VSM A3-analysis with tools Effect estimations
3. Maintenance process: efficient following up of improvements	Core process	January - October 2018	6 + manager	Lean scoping Prioritization Kanban board
4. Gain knowledge of how to do improvements in Projecting power lines (process)	Core process	February – June 2018	3	Lean scoping A3-analysis with tools Effect estimations
5. Save time/cost in face 1 BA-project Leirdøla	Face 2 in the Leadership process of projects	April – October 2018	4	Lean scoping A3-analysis with tools Effect estimations
6. Save time/ cost in face 1 BA-project Karmøy	Face 2 in the Leadership process of projects	May – November 2018	5	Lean scoping A3-analysis with tools Effect estimations
7. Increase efficiency of the project process (the generic one**)**	Leadership-process	June November 2018	4	Lean scoping A3-analysis with tools Effect estimations
8. Improve the use of the design process (generic for all processes)	Support-process The process-team of the generic process	May September 2018	5	Lean scoping A3-training
9. Lean-network follow up of ICT-pilots	Follow up the actions completing the first pilots & generate more	June – October 2018	5	Lean scoping A3-analysis with tools

2. Theoretical background – lean as tool for improving value in projects

The focus on *quality* was the driving force to create a *culture of continuous improvement* in Lean production at Toyota: quality-focus would increase efficiency and productivity, decrease costs, and in turn, allow the company to lower prices, attract a higher market share, increase profits, and improve customer satisfaction [5]. This Lean project focused on *efficiency, that can be* defined as "The comparison of what is actually produced or performed with what can be achieved with the same consumption of resources (money, time, labor, etc.)". "*Effective*" is the degree to which objectives are achieved and the extent to which targeted problems are solved. In contrast to efficiency, effectiveness is determined without reference to costs and, whereas *efficiency* means "doing the thing right," effectiveness means "doing the right thing." [6]. A project success is determined by evaluating the results of the project performance goals and the satisfactions of the project partner's, owners and/or end-user. Criteria like cost, time and quality are indication of success project, but do not by themselves provide a proper picture of the performance of the project [7].
There are eight types of waste which are commonly agreed on by researchers: Transportation, Inventory, Motion, Waiting, Over-Production, Over-Processing, Defects, Skills Misuse [19]. Many researcher's emphasis the importance of the use of appropriate performance measurement systems, which can give early warnings and identify problems before they occur, to support the successful implementation of lean construction [20]. To fulfill owners' and users' objectives is fundamental in creating value through a project. The concept "value" has gained a common ground in the focus on the customers and users. Knowledge about what creates value applied into a management framework will enable higher value creation. Value management can be defined as a structured, systematic and analytical process that seeks to achieve value for money by providing necessary functions at the lowest cost with required quality and performance. A model for value creation performs a systematic approach to prioritizing, measuring and monitoring the fulfillment of these requirements throughout the project and even after the project [7].

2.1. Lean – as a change strategy

Lean has been a change strategy for *improvement and rationalization* since Toyota in the 1970ies applied Lean production attaining goals for productivity and quality no one else in the car industry ever had done before [8]. Lean has survived since then and is spread to different industries over time [9]. Lean started as a production philosophy focusing on reduction of waste of any kind, without compromising on quality or on-time delivery, keeping the costs down [10]. Lean was based on the principles: Cooperation, Communication, Effective use of resources and elimination of waste and Continuous Improvement. Lean is a practice of Just-In-Time, standardizing and continuous improvement, and focus on the practical principles: specify and increase customer value, and create flow of activities by reducing waste as a prerequisite for creating best practices. To ensure long term competitiveness the ability to integrate the value stream of production with the value stream of organizations knowledge and capability to learn is crucial [8]. The pilot made no conscious choice a particular "Lean-school", but retrospective it seems to be a mix of Lean production (with the principles described above) and Lean management (LM): *a managerial approach for improving processes based on a complex system of interrelated socio-technical practices consisting of both soft practices (concern people and relations), and hard practices refer to LM technical and analytical tools. Soft practices are crucial for achieving superior performance through LM and sustaining the performance in the long term [4]*. The basis conditions to ensure organizational learning is to have time for learning, strong motivation for the learning and a will to learn from others [11]. A successful Lean organization depends on its people, both the management and the workforce [12]. There is yet no general accepted definition of Lean, but four perspectives define Lean at different abstraction levels [9]: an organizational trend, a management philosophy based on values, a set of principles, a set of operational practices [8]. Successful implementation presupposes defining Lean at the right level of use – we need to understand why we are doing Lean before knowing what to do: do not define Lean only as a practical toolbox while that will give a narrow area of use, and not to general because then it is not easy to use Lean [9].

2.2. Implementation of Lean, continuous improvement - a change process

Two out of three programs implementing continuous improvement fail. All though Lean methods are proved effective, implementation in practice is not easy and gives no guaranties for success. Resistance among employees and obstacles constituted by the complexity of opposites, processes, conflicts, cultures and humans can slow down or stop implementation [8]. Resistance to change is claimed to be the biggest obstacles stopping projects from reaching their

goals and often comes when we fail to handle the people properly [13]. Worley and Doolen [1] argues that many factors affect the success of a Lean implementation, but different researchers seem to agree on that commitment by top management is vital for success in any change program. If management fails to embrace the implementation it may sabotage the effort. Management must be visibly connected to the project and participate in the Lean events. Communication is also an important success factor [1].

Rolfsen [8] understand implementation as instrumental or institutional. The *instrumental* perspective says that a new practice will increase efficiency, capabilities, production and working conditions if the organization follow a set of rules for implementation. When this fail, we need the *institutional* understanding in order to understand the cultural and normative factors that impact the process, while different social contexts makes it difficult to operate from an instrumental understanding. Rather we need to translate the new practices into the specific organization and local needs in order to give value. The translation of Lean-principles and methods into words that give meaning for the organization is crucial in order to succeed with the way we will translate and use Lean in practice [8]. Rolfsen [8] state five main learning points on how organizations successfully can implement Lean and underlines that Lean firstly must be understood in a social and institutional context starting out with understanding oneself as a company in order to implement Lean: (1)Translation of general Lean in a way that employees can actively own the concept, get interested and committed to do improvements in this way. Then Lean can become recognized and institutionalize as the way to operate (2) Lean must be perceives as useful and sensible to use in order to become accepted for having a practical legitimacy (not an empty concept without meaning) (3) When trying to change work practices it is usual to meet resistance, but if the change process facilitates dialog there are better chances to succeed with change (a) A clear top management is important and in a way that offers active involvement in daily continuous improvement as well as request results (b) Employee participation while those will be the practical users of Lean and also on a general basis to get support for the changes and ensure that Lean will have a content that fits to the culture (4) Training programs for employees and managers in continuous improvement will strengthen the legitimacy if perceives as sensible (5) Continuous improvement calls for a systematic work over time, step by step and long term. Sundar et al [3] argues that successful implementation depends on both intrinsic factors (commitment, belief) and external factors (lean work method, communication) which affect the success of Lean implementation from *workers' point of view* and suggest that the possibility of the Lean transformation success, is on the hands of employees' commitment levels, beliefs, communication and work methods.

2.3. Culture and change

Implementing Lean-methods as something new to the culture can be a difficult challenge since there is a need to convince managers and employees to think and act in ways that are foreign to them. Employees may resist the tools of Lean or may experience difficult thinking in new terms such as customer value and waste [1]. Many companies fail in the first phase of change because they underestimate how hard it can be to drive people out of their comfort zones, they lack patience with the "preliminary" or the executives are not change champions. It is necessary to understand the nature and mechanisms of organizational change in order to make change possible [14] [15]. Culture can be described as "the learned beliefs, values, rules, norms, symbols, and traditions that are common to a group of people [16]. To change organizational culture there is a need to change the thoughts, behavior, habits and practices of every employee [8]. In order to move the organization to the wanted situation from the now, you need a model for what to do in order to manage the change process [13]. Change management can be defined as *modifying or transforming organizations* in order to maintain or improve organizational effectiveness [15]. Organizational change efforts often run into some form of human resistance. Resistance to change are often referred to as the main cause to change processes failing [17]. Hayes [15] describe John P. Kotter's eight failure of change, and underlines that leadership is claimed to be one of the most important factors in order to succeed with the change process: (1) Create motivation for change (2) Establish a strong guiding coalition with anchoring and ownership to take leadership of the work (3) Create a clear vision of where to go (goal) (4) Communicate actively as often as you can in every possible channel, especially managers (5) Get rid of all obstacles to ensure the vision (6) Establish short term goals on the long road to fulfilling the vision (7) Don't announce victory too fast, but only for the short term wins/results visible (8) Changes are settle in the culture firstly when the behavior has become "the way we do it here".

Kotter and Schlesinger [17] claim that having a limited approach to resistance of change can create serious problems. There are different ways in which individuals and groups can react to change. A correct assessment is often

not intuitively obvious and require careful thoughts. There are different strategies on how to handle resistance towards change being: training and information, involvement, support, negotiation and compromise, manipulation and cooperation, and as last the use of power and even hidden power. The strategy applied is decided by the resistance, its power and what the resistance is a sign of.

3. Method and Research Design – action research approach longitude study

This paper has investigated how to implement Lean and investigate how an organization can utilize and improve efficiency in business processes. It is a longitude study done in a large pilot with nine cases conducted 2017-2018. To answer the research questions an *action research approach with double loop learning was applied*. We applied triangulation and the combination of the qualitative and quantitative methods as described by [18] to answer the research questions, done mostly by the groups within the facilitated workshops or between workshops. Mixed methods were employed: literature review, continuous dialogue in groups, observation of practices and interviews before under and after the pilot. Qualitative data has been collected by document studies within the groups, semi-structured interviews, dialogues' and observations. Interviews have been done of all groups and the steering committee as well as group-leaders alone afterwards. To increase reliability facilitator and project manager was always present in the interviews and what they said put up on a white board to be accepted.

4. Results and findings

The pilot identified and tested a variety of Lean methods. 7 cases out of 9 has been completed and gave positive results. External Lean experts facilitated the groups as they demonstrated and trained the methods: Lean scoping, Value stream mapping (VSM), A3 analysis designed according to a PDCA-circle and including tools as priority charts, 5Xwhy and fishbone diagrams, and Kanban boards. Experiences coming from the two first cases in 2017 made us change the facilitators into someone more tuned into the factual needs of the organization, and the next 7 cases were more tailored to Statnett needs, since they adjusted their approach and pace step by step. A steering committee were organized from 2018 consisting of key stakeholders from the company in order to align results and learning as well as adjusting approached according to experiences and make decisions on the next step in the pilot. Pilot 8 and 9 was stopped and did not finish their work, and they are therefore not included in table 2.

Table 2 shows the overall result from seven out of nine cases

Case name	Initial needs	RQ 1 Improved efficiency & gains	RQ 2 Culture of continuous improvement	Estimated effect for the company
1.ICT - Customer service (process) (2017)	Reduce # work hours used for time registration in	Yes, partly good effect	• Good, practical and useful methods/ tools that helps to identify problems at an early stage - useful for questions of all sizes • The knowledge/skills increased motivation to execute continuous improvement • Increased focus on customer, service and quality • Increase awareness and focus improvement, all from everyday life to larger change processes • Methods not tailored but was wanted	Saved work hours (cost 328' NOK=41'E)
2.ICT - Public Journaling (process) (2017)	Increase data quality and reduce unnecessary use of time in the process	Yes, partly god effect		Saved work hours (in costs 626' NOK=78'E)
3.Maintainance (process)	Increased efficiency in following up tasks of improvements (and improve the common under-standing in the team by Kan-ban)	No measured effect in numbers of cost and time was actual	• Kanban board gave a practical and simple overview of cases, measurements and progress that made problems visible for all & we could easily prioritize and solve problem according to measurements • Increased awareness and common understanding in the team – all always informed of tasks and progress	*No measured effect in numbers of cost and time was actual*

4.Projecting Power Lines (process)	Learn how to do improvements (i.e. better overview of needs and actions, prioritization of actions)	Yes, very good effects	• Thorough, proper and useful analysis – that increased the ability to work methodically with improvements, prioritize actions according to time, capacity and effect • Increased smart use of resources as well as efficient meetings. • Crucial that tools tailored to our needs	Saved costs (900' NOK=113Euro) report (used < 90 to save 900' NOK/year) **ROI > 1/10**
5. Planning construction of Leirdøla power station (project phase1)	Save time and cost of budget (i.e. shortening of timelines)	Yes, very good effects	• Thorough, factual and useful analysis that gave better decisions with higher gains • Increased awareness in the whole team on what drives cost and time as well as a common overview of the challenges and the actions to take (easier to act) • Sot a lot done in a short while with high paybacks • Crucial that facilitator customize methods and ways to our challenges & viewpoints	Saved cost in phase 1 (Out of 7900' saved 1.700' NOK = 212' Euro) Reduction of **>21,5% of budget**
6.Planning construction of Karmøy power station (project phase1)	Save time and cost (i.e. simplifying process, specifying requirements, do tasks one time etc.)	Yes, very good effects	• An awakening of what drives cost and time of our projects • Increased overview and better prioritizations, planning, time allocation • Factual based analysis (not guesswork) • Improved team dynamics, common understanding, better discussions, more jointly taking responsibility etc. • Facilitation and tailoring methods crucial	Saved cost in phase 1 and 2 (14 000' NOK= 1750' Euro)
7.Efficiency of the generic project process	Increase efficiency in time and cost (i.e. simplify and reduce builder cost, phase 0 and 1- 10 project)	Yes, good effects	• Increased focus on the business (cost/ benefit) in order to succeed with change • The analysis and effect calculations give a better decision support • Improved understanding on how to work with improvements in processes	Saved cost in phase 0 and 1 (22 500' NOK=2812,5' Euro)

Lean methods were effective in seven of nine cases since they achieved their objectives. Lean increased efficiency since they produced and performed more with less money, time and effort. Hence, applying Lean created value for the owners of a project or a process. Feedbacks from the groups told that increased awareness on what created value for the user also improved their continuation of creating more value. We had examples of benefits of more than 10 times the time investment, and some even higher gains. Those cases that did not achieve results did not use the methods at all or not properly. Examples of un-skilled use of the methods occurred and showed that this easily creates a negative attitude towards Lean because methods and tools does not work properly, and the effects do not come.

Lean methods are a process for value creation that when applied properly solve problems and increase efficiency. Lean was communicated and used as a method to reduce waste in terms of time, cost and increase customer value (quality) by creating a better flow of activities. We spend time to learn Lean and focused on communication, cooperation and learning within the groups as well as between groups. All participants became motivated to learn and to learn from others in the group. Groups reported their appreciation of new skills that made them become better problem solvers and cooperators. All in all this way of working with Lean boosted the groups motivation for continuous improvement. Piloting Lean was done in order to customize the methods to the organization (institutional). By spending time defining Lean on the right level of use as well as translating the methods to fit the organization, a tailormade Lean-version was build. Participants reported that the tailoring of methods to the groups issues was of major importance for success. While Lean work methods were communicated and understood in a way that made them useful (external factors), the methods became recognized since employee commitment and believed increased (intrinsic factors). Facilitation of the group dialog was crucial in order to learn and use method and was a prerequisite

for overcoming resistance. There was a weak top management support except the initiation and budget. For some time the only management involved was the group managers that were hands-on, motivated and applying Lean methods in practice, until the steering committee came in 2018 but was rather weak as a management support. The groups did the practical translation of Lean and asked for management support to execute the changes.

Groups started out with some resistance being in their comfort zones and waiting for the facilitators to demonstrate that Lean was useful. Handling resistance were carefully done within every group by the facilitation applying skills: information and explanation, training, involvement and support, compromising and cooperation. Motivation increased when we communicated the vison of Lean and participants understood goals and possible gains from Lean. The groups slowly overcame their own resistance and the changes came little by little, helped by facilitators meeting everyone where they were every moment. Changes called for patience from the facilitators, and it called for tailormade approach for every group and every employee involved.

If support from top management, we believe that less effort would be spent on searching for motivated groups and for pushing progression of results. There was no strong guiding coalition from the beginning and the one we established in 2018 did not get any additional support from top management. Every group had the responsibility to get rid of all obstacles to ensure their gains from Lean-analysis and actions. Groups were in charge of their own short-term goals and worked step by step in a continuous stream towards the targets of departments owning the process gains. Some of the cases announced their gains about practical outcome, and some not, but after the pilot we announce all victories to top management, and then top management gave the order to inform all executives groups in the organization about the effects and how to. We hope to see the changes settled in the culture not only as a new behavior in the case-groups but also "the way we do it here" in the whole organization.

5. Discussions and Concluding remarks

Statnett experienced many benefits of applying Lean, but it has also been challenges along the way. All in all, executing the pilot was definitely an useful strategy in terms of effects and in culture of continuous improvement. The gains from Lean was worthwhile the efforts all though “it takes money to make money”: Successful implementation of Lean requires investment of time in learning methods, analyzing data and fixing problems, but over time these improvements will pay off in increased efficiency in terms of cost, speed and quality in the organization. The pilot cases found that there is a big potential to increase efficiency, and some gains can be easily obtained since the examples of what is waste, is well known in the participants daily life, and the time invested in learning and executing the analysis is well payed off.

We learned that successful implementation of Lean requires customizing and tailoring of methods so that they fit the culture and the specific need in the groups. Lean methods must also be applied correctly in a structured way and with support from a professional facilitator in ordered to be utilized. A strong management support is a prerequisite for success, and that they prioritize time and resources for improvements as well as working hands-on in the groups. Management support was the most critical and at the same time the most demanding to achieve. Furthermore, people must be motivated and trained to solve problems with Lean-methods, and that strong motivation for improvements came from quickly gained results when using the tools in cooperation within the group. Facilitators must be able to tune into the organizational culture and tailor their approach and adjust to the group's different needs of over time. Applying only Lean-methods was not enough in order to tailor a proper way of working with the group: facilitators needed to be professionally trained with broad set of skill and methods.

Despite weak management support already from the start, seven of nine pilots succeeded getting results, and succeeded because of its workforce (people), results and the skilled facilitators. The weak management support made it a struggle all the way in terms of not getting support to find and follow up the cases as well as getting the pull nor push for results. Participants reported high satisfaction based on the gains of Lean-methods: (a) Practical methods easy to learn – especially if you spend time to understand all the first time and continue to you use it in several cases (b) Useful methods in detecting, analysing and measuring improvements, also especially useful in decisions since methods factually proved the business case (need) and the necessary actions based on facts and calculations of effects (c) Increased customer focus as the basis for making a better flow of activities to give increased quality of service. Once Lean is implemented groups will need to spend a certain amount of time to maintain the good work, skills and focus

over time until the new habits have become a culture of continuous improvement. The routine of becoming and being a culture of continuous improvement seems to call for patience since it takes time to train functional problem-solving teams and after that it is one small step after another that takes you towards the goal.

This study confirms previous research on what are the main challenges in implementing new process in large organization and it shows that Lean as concept is good, but to achieve successfully implementation the Lean Concepts must be adapted to the local firms needs and culture. We hope this study can inspire and be a contribution to the progress of research in this field.

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