

COLLABORATIVE PROCESS LEARNING ON THE SHOP-FLOOR FROM THE PERSPECTIVES OF LEAN MANAGEMENT

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Abstract:

Today the implementation of lean management principles is spreading from the pure manufacturing facilities into additional supporting areas, without which also manufacturing system cannot function well. One such area is the knowledge management, important for acquiring and disseminating knowledge across manufacturing facility so that also the manufacturing system could be effectively run. On the knowledge management discipline many articles and books have been published. However, the focus of this paper is to provide some additional insight into this discipline from the viewpoint of lean management, and thus to broaden the understanding of the knowledge management concept. The main ideas about knowledge management taken from lean management perspective relate to the ways of how knowledge can be acquired and shared through collaborative process learning, the relationship between knowledge and learning, how we can define knowledge worker in contemporary offices, and finally how we can implement the acquired knowledge in the processes and workplaces. The paper introduces a case study indicating that lean initiative supported by a company's management combined with deep trust and respect for the human aspect has the ability to motivate knowledge sharing and willingness to deploy collaborative learning at all organizational levels. The article tackles the issue of trust in employees and their motivation and engagement as one of the factors predetermining success of collaborative process learning.

Keywords: collaborative learning, process learning, lean management, knowledge management, acquiring and sharing the knowledge.

1. INTRODUCTION

Many of us have been educated via formal education, and many of us continue to learn throughout our personal and work life. We've read many books and articles on different disciplines and dimensions of learning and the discipline that we study as part of our profession. We have been participating on different seminars, lectures and workshops devoted to the area as they apply specifically to our professional practice.

The need of the learning is highlighted by concepts, among them also by lean management initiative. Lean practitioners already know that lean management practice is all about learning: at the individual level, at the process level, at the organizational level. Lean practitioners know that no lean management effort will succeed on the operational (technical) side without success on the social side of the business system – the dimension that people are working and learning together (Shook, 2012).

It's not easy to learn as an individual, but it's even harder working and learning together as a group, with deadlines looming, problems all around, and a high requirement for knowing the right answers to problems and tasks.

It's a challenge to do this, and that's why lean management initiative (the ultimate social-technical system, where the technical system are lean tools and methods and the social system are the people developing operating processes) respond to this challenge with specific tools and methods for lean learning (Shook, 2012). There are a handful of core lean management practices whose purpose is to serve as a means to enable effective learning, notably: Standardized Work, Kata, Strategy Alignment (hoshin kanri), 8D methodology, and the A3 process. Each is a PDCA based learning cycle that enables us to learn faster and deeper.

All these practices encompass the collaborative process learning method that enables us to achieve learning and alignment among the members of the organization. There is probably no better way to learn than to gather together as a group of engaged people on the process level and to share the experience and to become effective owners of our own problems and countermeasures.

What we so far know about the “Collaborative Process Learning” and its application to lean management practice is the theme of this paper. The focus of the paper is on providing the contemporary knowledge about the collaborative process learning supplemented with the real example. The aim of the paper is to bring additional knowledge into the field of knowledge management, to provide contribution to this management discipline from the perspectives of lean management that focuses on the knowledge acquisition and learning directly on the shop-floor through collaborative process learning.

As a methodology approach to elaborating on this paper, first, the relevant theoretical and practitioner literature is reviewed. However, lean researches often the explanation of key ideas of some topic – in this paper the collaborative process learning – validate through case studies of successful applications in the real settings. Therefore, to test theoretical findings we have used case research methodology according to Yin (2003) based on the data acquired through a semi-structured interview as a basic instrument in a large service corporation situated in the US.

2. COLLABORATIVE PROCESS LEARNING

There are many articles and authors who relate the term collaborative learning with classroom teaching or educational system (Nielsen, 2008; Thomchik, 1997; ...). From this perspective comes the definitions of collaborative learning as a broad term meaning joint intellectual effort by students or by students and teachers together (Smith & McGregor, 1992) or as a learning situation during which students actively contribute to the attainment of a mutual learning goal and try to share the effort to reach this goal (Teasley & Roschelle, 1993) or a modern version of definition is that a Collaborative learning is a term denoting a multiplicity of educational approaches that stimulate learners to work closely together in joint intellectual efforts (Kanev & Kimura & Orr, 2008). As these authors suggest, collaborative learning is pertinent to situations where a joint solution to a problem is built synchronously and interactively, which implies discussions between the collaborating parties in the process of task engagement.

On the other hand, collaborative process learning, as it is understood in lean management initiative, goes beyond the classroom presentations, vastly proliferated in the contemporary employee training and educating. It uses an experiential approach to provide first-hand experience and help managers learn to create the environment for effective and comprehensive problem solving by conducting a series of rapid Plan-Do-Check-Adjust (PDCA) cycles (Shook, 2012).

The skills of collaborative learning are essential to mastering improvement tools and methodologies. However, to sustain the lean organization's continuous improvement efforts, managers need to not only support the deployment of lean tools and methods but also the supporting management systems. This means the need to create an environment for effective and comprehensive problem-solving at the process levels of the organization, and create the behavior that supports this open problem-solving environment.

Collaborative process learning helps to make the thinking patterns that form the foundation of an open problem-solving environment and drive lean managers' behaviors. It creates a new look that lean managers can use to address and change these thinking patterns and support a lean transformation. It helps to develop experiments that will create a new problem-solving culture.

These thinking patterns and behaviors cannot be learned without real practice; managers and employees must go together through their own Plan-Do-Check-Adjust (PDCA) learning cycles of experimentation to understand the basic underlying drivers of the existing process performance and develop a new tailor-made process performance.

By nature, lean management is highly collaborative. Without collaboration, lean efforts fail before they have a chance to make a difference. Whatever lean principle or tool you use – value-stream mapping, the A3, 5S, 5Why – lean is about gathering all of the people in the organization who actually perform the work to grasp the situation at hand, better understand the processes involved, and begin solving problems together to create better conditions (LEI, 2012). This understanding of collaboration is at the heart of collaborative process learning. The role of the lean manager goes beyond making executive decisions; it is to promote a deeper, more critical level of thinking in employees. Lean managers and employees work together to see problems more clearly and continuously improve the process performance by

eliminating these problems. Lean managers act as co-learners, engaging people in asking the right questions and working to answer them together.

So what is the summary of the main characteristics of collaborative process learning? Here are some of the main points (LEI, 2012):

- It is about learning-by-doing, a practical, non-theoretical way of learning that happens at the gemba – actual workplace – with colleagues inside and outside the company to accelerate learning and the overall lean transformation. Learning-by-doing develops people who have deep direct experience (not tacit knowledge) in applying lean management tools and adopting lean management behaviors so that improvements that are put in place, stay in place.
- It structures gemba visits around a specific theme such as strategy deployment (hoshin kanri) to ensure that gemba walks are not empty tours. Learning at gemba goes in two directions: from management to workers and back to management as visitors asking questions and offering constructive feedback.
- It develops better lean leaders by creating a path for continuously exchanging ideas with both workers and executives who are confronting the same challenges you face.
- It brings together insights and resources from collaborative partners about how to implement new behaviors such as leader standardized work so we build sustainable capability in people.
- It gains the yield from the knowledge gained by learning group sub-networks pursuing tightly focused special interest topics.

2.1. Collaborative Process Learning and Knowledge

Knowledge is gathered when we work on improving a process or situation. If we do not attempt to improve we do not examine what we are doing and what we can improve. Knowledge is gained through critical analysis of the current situation (Goldsby & Martichenko, 2005). When we try to improve the process, we are seeking for knowledge as the best practices and these best practices are usually represented in the form of standardized work.

Lots of training programs begin and end with seminars. But just participating in a seminar doesn't give a real understanding of anything. To gain a real understanding, you need to take what you've heard in a seminar, put it into practice in your own workplace, and show your boss how it can generate results (Shimokawa & Fujimoto, 2009).

Learning depends on doing in the workplace, undergoing a follow-up check by your superiors, and determining what action is necessary to make things work better. Only then have you really learned what you heard or saw in the seminar (Shimokawa & Fujimoto, 2009).

Anyone can gain knowledge through for example study of the books. But only someone who actually uses this knowledge can really understand how it works. The real knowledge didn't arise from textbook learning. It arose from practical experience in the workplace, and the best way to learn is to use it through collaborative process learning.

Knowledge creation occurs when new knowledge is developed or when existing knowledge is replaced by tacit or explicit knowledge originating from the organization (Gonzales-Rivas & Larsson, 2011). Explicit knowledge can be expressed, formalized, and shared through

manuals; tacit knowledge is not so easily expressible and cannot be formalized, such as insights, feelings and knack.

Expansion of knowledge requires theory. Knowledge is expanded through revision and extension of theory based on systematic comparisons of predictions with observations. If predictions and observations agree, the theory gains credibility. If predictions and observations disagree, the variations (special and common) between the two are studied, and the theory is modified or abandoned. Expansion of knowledge (learning) continues thus forever (Gitlow, 2009).

3. CASE STUDY

This practical example will prove that any lean initiative accepted, supported or even driven by the top management combined with deep trust and respect for the human factor has the ability to motivate knowledge sharing and willingness to deploy collaborative process learning at the process level. Only the well-managed and correctly motivated system through collaborative process learning is capable of maintaining and advancing the organization's knowledge base.

Although both practical experience and academic sources offer a wide range of tools and instructions on successful implementation of change initiatives intended to drive performance of any organization, this case study turns attention to collaborative process learning, seen by the authors as one of the main sources of practical lean initiative. Although the circumstances are characteristic for the particular company, the outcomes may be generalized and well used for any company conducting its business in any sector.

This study looks into collaborative process learning within lean implementation in the aviation industry, particularly in the support services, generally referred to as Aircraft Maintenance, Repair and Overhaul (MRO). Since these services account for 15 to 18% of all costs incurred by the aircraft operators (Nagalla, 2011), they offer a great opportunity for the introduction of concepts aimed at the increase in process efficiency. The reason behind our decision to focus on this dynamically evolving industry is to prove importance of knowledge management from the perspective of lean management in purely non-manufacturing sector.

This paper introduces a reputable US-based general aviation airplane manufacturer, which operates a network of 9 brand services centers, 8 of them across the US and one in Europe. The subject of our analysis is a service center in the south of the US, founded as early as 1978, which performs inspection, maintenance and repair of small business jets. In reaction to deteriorated economic climate the center launched in 2005 the implementation of lean principles as a part of its quality improvement program following the orders of the parent company, which was actually the first one in the group to discover the benefits of being "lean" in terms of reduced costs and higher quality.

3.1. Current State Analysis

Back in 2005 the service centre faced the problems with a significant impact on satisfaction of customers and operating costs, which in fact were common for almost all companies in the industry: increasing volume of work, closely interconnected with the lifespan of the airplanes; long time necessary to complete an assignment right from its acceptance until completion and an inappropriate quality control system which would prevent delivery of defected job to a customer. Inside the company the problems manifested in absenteeism and fluctuation

exceeding standard industry levels, dissatisfaction of the customers and growing overhead costs. Despite widespread awareness, the existing problems had not been adequately assessed and examined from the point of their mutual interaction.

The very first step preceding the transformation launch was to introduce the center to the principles of lean. For the center's decision to implement lean management was based on the direct order, it was the parent company that assumed responsibility for spreading the knowledge on lean management across its business units, paying special attention to standardization of all transformation elements such as trainings, requirements and project tracking. The parent company set up a strategy to deploy a team consisting of external consultants and in-house lean experts ("Lean Black Belts") to present a success story in order familiarize leaders of the centre with the lean principles and their benefits. As a result, the service centre management embraced the newly introduced method and manifested its full support, which turned out to be so crucial in the upcoming implementation phases.

Another prerequisite for success was the general understanding of the lean concept among the employees. This goal was achieved through an intensive one-week lean training program. The employees acquired general knowledge on lean management and its operational side while being assured that the change would be positive not resulting in any lay-offs by the end of the day. One of the outcomes of that training was the formation of an implementation team, comprising the ordinary employees (airplane mechanics), supervisors, in-house lean experts and an observing external consultant. The team passed another three-week workshop aimed at process mapping methods and analysis of value from the customer's perspective. Visualization of the present state from the process perspective represents a shift from the assessment of traditional performance indicators and therefore the team members needed to grasp techniques and tools required to derive an optimum state and develop system thinking providing constructive solutions to existing problems. In next phases the responsibilities of the implementation team included creation of an action plan in collaboration with employees from all departments and supervision over its fulfillment. The implementation team clearly acted as a learning-by-doing steering unit setting up the right direction by processing suggestions of all.

Once the series of workshops was completed and everyone was well aware of what will the change require the time was high to launch implementation, teach the employees to cooperate, provide them with positive experience and motivate them in further efforts. The team decided to start with rapid implementation of 5S method to engage everyone in the organization. This method, focused on strengthening the interpersonal relationships, is a generally recommended starting point of any lean efforts as it makes the employees, who might not have been in direct contact before, to work together on achieving a common goal. The employees were asked to clean both the shop-floor and offices, remove all unwanted items, rearrange the remaining equipment so it is near at hand and develop a plan on how to maintain the new condition. The main goal was to streamline the material and information flow and through hands-on experience manifest the advantages of cooperation at work.

The decision passed by the team members preferred testing the applicability of lean management on a single project before its expansion to all organizational levels for the concept still had to be adjusted to the company's needs in order to avoid any unexpected circumstances and associated costs. All activities of the service centre were divided into two groups: planned preventive maintenance (70%) and unexpected repairs (30%). Volume and

predictability represented the main two reasons for which the implementation team decided to test the lean management in the first phase at the planned maintenance services.

Using the value stream mapping method the team analyzed all standard operations representing the process of regular aircraft maintenance. In order to create a map, which would be capable of providing a real picture of the existing processes with all hidden encumbrances, the major communication aspects promoted were open discussion and knowledge sharing while recognizing the importance of every single contribution. Throughout the mapping stage the mechanics were encouraged to provide their input since they were the closest to the actual process having, thus, available the essential knowledge basis. They admitted being aware of a lot of waste (e.g. waiting, looking for needed tools, search for information) although they had not realize the amount of time it had taken (70%).

Two types of data were collected to analyze the existing processes: quantitative and qualitative. The qualitative data was obtained through independent surveys, interviews and participation in the processes in question. In this regard the so-called “chalk method” turned out to be very helpful, allowing an unbiased individual to observe the process from one spot on the shop-floor for a certain period of time. In addition, informal dialogues provided that type of qualitative information, which turned out to be necessary to comprehend existing working conditions and further provoked efforts to obtain quantitative data which would be otherwise neglected.

3.2. Lean MRO

Once the work processes were mapped the implementation team was expected to formulate the problems existing therein. As expected, the mechanics failed to agree on the first formulation of the major problems. While they were well aware of their partial work, they lacked understanding of the entire value stream at the workplace. The dilemma was solved by encouraging the employees to use their experience and knowledge to re-formulate the problems. The following problems were identified after several rounds of talks taking into consideration all available information.

Average time needed to complete a job was unreasonably long, ranging from 1 week for less complicated interventions up to several months in case a serious failure was detected. This variability made it impossible to provide a customer with an estimated maintenance duration or provided information remarkably varied from reality. The thorough analysis revealed reasons behind multiple delays in the process. The major one was inappropriate coordination of work. In the old system numerous teams from different shifts would work on a project depending on the decision of a supervisor who used to define priorities of the day and assign the tasks accordingly. This system of work on one hand made it close to impossible to find and repair all failures; the result was lower quality, responsibility for which was basically untraceable. On the other hand, instead of having control over the entire maintenance process, the employees worked on discontinuous tasks and this reflected in high frustration and turnover. Moreover, the lack of avionics experts did not allow including at least one in each work team and, thus, an ordinary team was not able to repair all defects independently. These problems hindered smooth flow of the process and their interaction contributed to deteriorating service quality, large number of complaints and increased operating costs generated by the failure demand.

Generally speaking if the lean management is to gain support across the entire organization starting at the most bottom levels, the used methods have to be simple, intuitive and straightforward so anyone is able to use them. Having this in mind the implementation team deployed simple analyzing techniques such as 5Why and Fishbone Diagrams to find the root causes of the identified problems, followed by identification of the value from the customer's perspective. Having all this information available, the future state map was created with the active participation of the affected employees.

While creating the future process map, the members of the implementation team were guided to rebuild the existing processes in such way to create the desired value and to contribute to the achievement of the corporate goals. In order to find out whether the activities performed on a daily basis did or did not create value, the workshop moderator encouraged discussion by asking questions "Do we need step?" or "Can we do without it?" At first the participants only answered the questions but soon enough they were proposing their own improvement solutions. The moderator had to be extremely careful not to suggest solutions himself but rather to initiate an open discussion instead. Although this brought about a slight delay in the future map creation, the real originators of the improvement ideas were the employees who were the most familiar with the work performed and that turned out to be one of the main criteria for success of the lean initiative.

Once the members of the implementation team reached an agreement on the future process map, it was presented to other employees in order to get their feedback. Some of them came up with new improvement suggestions and thus, after several adjustments the future map acquired its final form. An action plan defining partial tasks and pertaining deadlines was carried out. Thanks to their participation in the entire mapping process, the employees were, surprisingly, volunteering in assuming responsibility for the tasks to be performed.

Based on the conducted analysis, the implementation team came to a conclusion that improvement can be achieved through the rearrangement of the main process. The changes included creation of cross-trained teams of mechanics able to perform the entire service process without the need to ask specialists for help and design of a performance monitoring system, which would eliminate negative behavior at the workplace. Steps of the new process were standardized and documented securing, thus, consistency at work, speeding up the training of new colleagues and providing the knowledge on the best way to perform the work.

The referred changes also required a major shift in the corporate culture. Implementation of the technical side of lean management was quite easy but it took over a year to really make it the way the things were done in the company. The company soon found out that success of any lean initiative is directly dependent on the trust of employees and to guide the employees to do the things right just because they want to do it requires a real shift in their thinking. In the centre of attention there was the need to turn the traditionally vertically managed employees performing closely defined tasks into highly qualified and adequately cross-trained workforce existing within the supportive managing hierarchy, which would incorporate the responsibility and engagement elements into work. As the most competent individuals at the workplace they needed to accept control over the work processes. The way the change requirements are presented is an essential condition for their buy-in; every employee has to be offered a chance to review them or propose own countermeasures. This taught the company to take into account all opinions before passing any decision. Collected feedback revealed that delegation of certain powers to employees increased their trust in the centre's management,

eliminated negative behavior at the workplace and enhanced employee morale. Flexible work time following the actual work load helped the service centre managed to avoid any lay-offs.

Detailed preparation and active involvement of all employees were the two factors that secured overall buy-in. It is to be noted that implemented changes did not result in immediate increase in performance effectiveness. In fact the transition to a new system reflected in worsened performance indicators at first. The workplace in question got overwhelmed with chaos for some time. Nevertheless, as everyone was getting used to the new system, not only individual but also team performance went up rapidly. One of the biggest changes the employees had to face was the abolishment of specialized departments (structural repairs, avionics) and training in any technical skills needed. Sharing of the technical know-how, which resulted in creation of multi-functional teams able to deal with any problem, taught the employees to achieve higher goals than previously prescribed by rigid HR management system. A new position of a quality manager, assigned to the most experienced and motivated employee, is a guarantee of compliance with industry standards and every-day support.

After completion of the lean transformation, follow up was necessary to document the methods that proved or proved not to be helpful and any adjustments to be made in the future improvement projects. Success of the test project was followed by the expansion of lean principles to all projects of regular maintenance, unscheduled repairs and support services, while the implementation process complied with the test model: i) preparation and training; ii) process mapping; iii) future state map; iv) implementation and competence delegation; v) follow up and verification of used methods.

In order to achieve the status of a learning organization seeking for continuous improvement, the employees are encouraged to submit improvement suggestions, resulting from their deep knowledge of the work performed. Within one year after the lean initiative was commenced, the employees proposed 700 improvement suggestions. This and all the achievements referred to above clearly prove that the lean management was a great success for the company moving it forward on its path to excellence.

This case study proved that any lean initiative, enjoying strong support from the corporate management and ideally also external unbiased observers, requires trust and engagement of the employees closest to the actual processes as they are in possession of the real knowledge. With the right guidance they can be motivated to share such knowledge through collaborative critical analysis and hands-on experience in order to reveal existing problems and find appropriate solutions, improving, thus, their own workplace. Only the change supported from within the organization can be sustained for a long time while such support may be obtained through employee engagement and recognition of their value. Any company that does not understand that the workforce, an originator of all the knowledge essential for the company's existence, is its main asset, is predestined to fail with its lean efforts.

4. CONCLUSION

We need to avoid thinking that the present way of doing things is the best way. We cannot be satisfied with the current situation for a long time. We need to always try to change things. Everything new begins with trying something. Without that determination to try something new, all the knowledge is useless and current knowledge will eventually deteriorate.

We can master and accumulate knowledge through collaborative hands-on effort on the process level. We try things ourselves. If we fail, we learn why we failed and try something else. If we succeed, we learn why and how we succeeded. So learning only happens if we do things ourselves collaboratively through hands-on effort.

In conclusion, lean management concept prefers to focus on gathering experience, learning from it, and applying it to the problem at hand. Though expertise gained through experience and events or workshops is a part of lean approaches to improvement and learning, lean practice is neither an expert nor an event or workshop model. Lean management concept involves everyone, every day, all day.

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