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## Knowledge Management in Lean Production Systems

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### Abstract

The implementation of Lean Production Systems is more than redesigning some production processes. The most seminal change has to be made in people's knowledge. Otherwise, the changes will not be sustainable. Most implementation processes describe the sequence of necessary tasks but do not regard the integration of knowledge in the organization. Therefore, it is necessary to analyze how knowledge and knowledge flows can be described. The research showed that a multitude of different knowledge flows can occur during the implementation of Lean Production Systems and that a decentralized, role-specific approach can help to identify adequate methods of knowledge management.

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### 1. Introduction

Manufacturing enterprises are in an intensive competition in order to offer products with the best quality to reasonable costs and with a minimal lead time. Countless benchmarks are conducted by consulting firms and scientific facilities. Probably the most recognized benchmark was the International Motor Vehicle Program (IMVP) that was conducted by the Massachusetts Institute of Technology in the 1980s. The research revealed the superiority of Japanese manufacturing enterprises, especially Toyota. Furthermore, the authors described the basic principles of the so-called lean management. [1], [2] At the same time, the former Toyota engineer and founder of the Toyota Production System (TPS) Taiichi Ohno published his experiences from developing and improving processes at Toyota. [3] Thereby, the theoretical fundamentals of lean should have been widely spread.

Western enterprises started to implement some of the identified principles but did not achieve the expected results. It took years to find out that they had implemented isolated principles but failed to implement

an integrated system. Lean implementation turned out to be more than a common improvement project. Manufacturing enterprises then tried to implement holistic Lean Production Systems in order to achieve more sustainable results. Nevertheless, most LPS implementations still fall short of the expectations. Several authors identified that many companies focus on the visible elements of LPS like methods and tools and tend to change the layouts and processes of their production. However, the critical factors for the sustainable success of production systems are generally rather people-related than technology-related. [4], [5]

Five root causes for common barriers have been identified, that have to be adapted to the specific requirements of LPS implementation: Leadership, organizational culture, planning, organizational structure and LPS knowledge. [6] This paper focuses on the two aspects organizational structure and LPS knowledge. The field of implementation has already been focused by several authors [6], [5], [8], [9], [10] and their findings will be described in the next chapter. Based on these findings, approaches for the organizational structure and the knowledge management in LPS are shown. Both have a strong interrelation because knowledge has to be

transferred between different roles in the organization. These roles depend on the specific organizational structure of the LPS implementation. The other two root causes, organizational culture and leadership, also have strong interrelations and are subject of other research activities. [11], [12]

## 2. Implementation of Lean Production Systems

### 2.1. Implementation process

The transition to lean might be one of the most challenging changes manufacturing enterprises are facing these days. The implementation of a Lean Production System marks a fundamental transition of the enterprise's principles, methods and tools. This change affects each employee in every position. [5]

In the following, the implementation process according to [6] and [8] will be explained. It names four major phases of implementation. The process starts with centrally controlled tasks in the first phase but is more decentralized with every phase. The initial step of the process describes the awareness of management that an LPS would contribute to the enterprise's long-term and sustainable development. The second step is the lean assessment and strategic planning. The whole enterprise with its stakeholders, strategic objectives as well as the business processes and methods are analyzed. In the conceptual design of the Lean Production System, a central steering committee is installed in order to monitor and control the implementation process. The last step of the basic planning phase deals with the master planning of LPS implementation.

The second phase is already rather decentralized and begins with organizational changes regarding the LPS implementation. After the central organizational structures have been installed in the first phase, the local structure follows in this step. The sixth step deals with the detailed planning of implementation. The detailed plans are necessary to consider local conditions.

The third phase is completely decentralized and takes place in the departments of the enterprise. Often, the phase starts with a pilot implementation. Based on these important experiences, the entire LPS rollout starts. At the beginning, the rollout is often supported by central staff units and external LPS experts but it should successively get more and more decentralized. The responsibility for process improvement should be slowly delegated to the shop floor level.

The last phase of LPS implementation is the daily operation and continuous improvement. This ongoing phase includes the maintenance and the continuous improvement of the designed processes. In this last step, improvement activities should be delegated to the shop floor level. Of course, management still has to foster

change and innovative concepts but the daily improvement should be carried out on the shop floor.

### 2.2. Knowledge in LPS implementation

Moving physical parts in production like materials, machines and work places is only the visible part of LPS implementation. Many enterprises fail to implement their Lean Production System sustainably because they see their shop floor as a pure technical system. This perception is caused by a Tayloristic imprint, which many enterprises still have. [15] In Taylor's scientific management, knowledge and labor was strictly separated. Workers were obligated to execute the processes that management had designed. In such a system, the decentralized and worker-based continuous improvement cannot work out. In order to implement an LPS successfully, this separation has to be discarded. A sustainable adaption in daily operations can only be achieved, when the information about principles, methods and tools of the LPS is deeply understood in all relevant areas, especially by all shop floor workers.

An LPS implementation implicates the distribution of information and thereby the identification, acquisition, development, transfer, application and preservation of knowledge. Therefore, the provision of knowledge is crucial in LPS implementation but most implementation processes lack a systematic description of the flow of knowledge during implementation. [16]

Due to the special importance of knowledge in sustainable LPS implementation, the following chapter deals with the basics on knowledge management.

## 3. Knowledge Management

### 3.1. Terms and definitions

Davenport defines knowledge as "a fluid mixture of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information". In addition, Davenport states that knowledge belongs to the knower, whereas in a company, knowledge can be embedded in documents as well as in the organization. [17]

From this definition can be derived, that knowledge depends on the person who owns it. Moreover, knowledge can either be written down as well as implemented in the organizational structure. Gensicke defines knowledge as "based on information that is interpreted in the context of the recipient's experiences and expectations. Knowledge is a prerequisite for purposeful action". [18]

Consequently, for structuring and organizing the knowledge of an enterprise, it is important to implement

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