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# COMPUTER ASSISTED LEAN PRODUCTION MANAGEMENT

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***Abstract:*** *The corporation's great challenge is their ability to adapt to competitive market dynamics, the continuous adaptation of their production systems and technologies by a performance management and leadership of human resources and leveraging the information technology advantages available for managers.*

***Keywords:*** *Lean manufacturing ,Computer integrated manufacturing, SAP supports*

## 1. INTRODUCTION

The transition to the ideas economy transforms the knowledge economy in the main source of power and the enterpris in a knowledge amplifier. Because of market systems and mechanisms imperfections it is needed to promote the economic intelligence management, the consistency provided by projects and common objectives, the quality of a primate from the relational skills, the cross flow of information. In the era of intelligent information, the manager must know how to add value by finding the way to performance. Currently the product market is characterised of unprecedented dynamism due to competition between producing firms mainly manifested globally on the one hand and, on the other hand, the trend of diversification, customization and frequent change of the types of products produced. In order to survive in such a market, companies must act quickly to improve the activities of production units, the human resources and economics management and to take in consideration new issues until recently were considered the side, such as limiting the environmental impact of industrial activity.

## 2. THE LEAN MANUFACTURING PRODUCTION

**2.1 Definition.** *Lean manufacturing is the systematic elimination of waste from all aspects of an organization's operations, where waste is viewed as any use or loss of resources that does not lead directly to creating the product or service a customer wants when they want it. In many industrial processes, such non-value added activity can comprise more than 90 percent of a factory's total activity*[1]. The *"lean manufacturing"* production system is based on the configuration shown in the figure1.

**2.2 Outcomes of Lean Manufacturing**

[1] *Source: Simon Caulkin. "Waste Not, Want Not," The Observer (September 2002).*


Figure 1. The "Lean Manufacturing" production system[2]

When companies implement several or all of these lean methods, several outcomes consistently result:

- Reduced *inventory* levels (raw material, work-in-progress, finished product) along with associated carrying costs and loss due to damage, spoilage, off-specification, etc;
- Decreased *material* usage (product inputs, including energy, water, metals, chemicals, etc.) by reducing material requirements and creating less material waste during manufacturing;
- Optimized *equipment* (capital equipment utilized for direct production and support purposes) using lower capital and resource-intensive machines to drive down costs;
- Reduced need for factory *facilities* (physical infrastructure primarily in the form of buildings and associated material demands) by driving down the space required for product production;
- Increased production *velocity* (the time required to process a product from initial raw material to delivery to a consumer) by eliminating process steps, movement, wait times, and downtime;
- Enhanced production *flexibility* (the ability to alter or reconfigure products and processes rapidly to adjust to customer needs and changingmarket circumstances) enabling the implementation of a pull production, just-in-time oriented system which lowers inventory and capital requirements.

**2.3 Changes in organizational culture after lean implementation**

Reduced *complexity* (complicated products and processes that increase opportunities for variation and error) by reducing the number of parts and material types in products, and by eliminating unnecessary process steps and equipment with unneeded features.At the same time, lean implementation consistently fosters changes in organizational culture that exhibit the following characteristics:

- A *continual improvement* culture focused on identifying and *eliminating waste* throughout the production process;
- *Employee involvement* in continual improvement and problem-solving;
- *Operations-based* focus of activity and involvement;
- A*metrics-driven* operational setting that emphasizes rapid performance feedback and leading indicators;
- *Supply chain investment* to improve enterprise-wide performance; and
- A *whole systems view and thinking* for optimizing performance.

**2.4 Methods and tools used by the organization.** There are numerous methods and tools that organizations use to implement lean production systems. Eight core lean methods are described briefly below. The methods include:

1. **Kaizen** Rapid Improvement Process
2. 5S
3. **T**otal **P**roductive **M**aintenance (TPM)
4. Cellular Manufacturing / One-piece Flow Production Systems
5. Just-in-time Production / Kanban
6. Six Sigma
7. Pre-Production Planning (3P)
8. Lean Enterprise Supplier Networks

Fundamentally, organizations implement lean to achieve the highest quality product or service at the lowest possible cost with maximum customer responsiveness. To accomplish this, they typically focus on three key goals:

[2] *Source: Lean Thinking. Womack and Jones, 1996*

- Reducing product or service production resource requirements in the form of capital and materials;
- Increasing manufacturing velocity and flexibility;
- Improving first time product quality.

## 3. COMPUTER INTEGRATED MANUFACTURING AND LEAN PRODUCTION

**3.1 Computer integrated manufacturing.** Computer integrated manufacturing is an automated version of the overall manufacturing process, where each function is replaced by a set of automated technologies. In addition, traditional mechanisms of integration of oral and written communication are replaced by digital technology. With CIM, the three main functions (Product Design and Manufacturing Process Planning and Production Monitoring, Production itself - are replaced by six functional areas:

1. Computer Aided Design;
2. Group Technology;
3. Systems Planning and Tracking Production;
4. Automated Material Handling;
5. Robotics;
6. Computer Assisted Manufacturing.

It can be said that information flow is a determining factor in characterizing the CIM concept. The quality, intensity and speed of information flow have crucial implications on the products. Information technologies are a complex of interconnected disciplines to form integrated enterprises, based on distributed database systems, unified and standardized.

**3.2 The CIM concept applied in production.**The necessary computing system for integrated production complex software / hardware / communications is capable, based on implemented algorithms, to achieve optimal manufacturing management in real time.

The CIM concept has mainly the next parts:

- **PP&C** - **P**lanning **P**roduction & **C**ontrol;
- **CAD** - **C**omputer **A**ided **D**esign;
- **CAE** - Computer Aided Engineering;
- **CAPP** - Computer Aided Process Planning;
- **CAM** - **C**omputer **A**ided **M**anufacturing;
- **CAP** - **C**omputer **A**ided **P**lanning;
- **CAQ** - **C**omputer **A**ided **Q**uality;
- **CAS** - **C**omputer **A**ided **S**ervice.

PP & C systems are designed to meet the following operational objectives:
- improve knowledge delivery dates;
- improving delivery of information (the information flow);
- reduce delivery times;
- reduction of inventory levels over time, while maintaining levels of availability in materials and components.

Computer Integrated manufacturing system (CIM) is the system in which the processes are headed (partial or total) with a hierarchical network of computers in a new organization system (partial or total) type JIT, in order to increase technical and economical performances.

**3.3 Lean execution.** *Lean execution* consists of all functions related to pull signal generation, signal distribution throughout the shop floor, and production/material movement tracking.
- Supports different techniques for pull signal creation: terminal, RF handheld, RFID devices, EDI, and XML messages
- Different flavors of kanban – pull – signal distribution: printing, EDI, mail, and so forth.
- Support for different replenishment flavors: internal supermarket- and pacemaker and heijunka scheduling/scheduling and external procurement including Web-based kanban
- RFID-enabled kanban

- Manual and automatic supply to production with container-independent summarized JIT-calls
- Operational method sheets
- Production tracking and back flushing

Lean Manufacturing Performance is shown in figure 2.

## 4. MANUFACTURING INTEGRATION WITH SAP

**4.1 Success in lean manufacturing.** Success in lean manufacturing is heavily dependent on quality data collection, integration, and analysis. Through MII – manufacturing integration and intelligence – and SAP Business Objects solutions, SAP delivers the integration, information visibility, alert based process monitoring, and analytical functionality you need to turn data into knowledge.

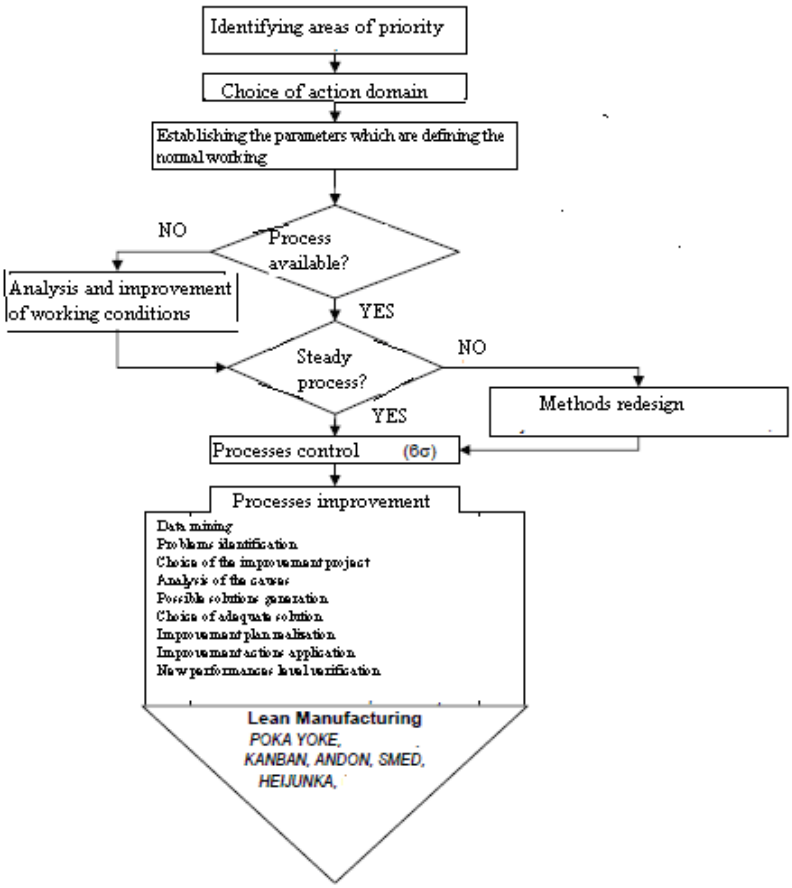


Figure 2. Lean Manufacturing Performance

Its powerful business intelligence solutions and data collection/integration functionality gives you the ability to capture and monitor data on a continuous basis and deliver it to the right person, at the right time and in the right format – all in real time.

Beyond lean techniques, SAP supports most manufacturing processes like high volume make-to-order manufacturing, repetitive manufacturing (order-less production), production order manufacturing, and assemble-to-order manufacturing.

Implementation of Lean Manufacturing principle leads to:

- Reduction by half the length of human effort in production workshop;
- Reduction by half the finished product defects;

- Reduction in third during the preparation of production;
- Reduction by half the production space to obtain the same results;
- Reduction to a tenth or less of work in progress.

Methods of the LEAN:
- OEE (Overall Equipment Effectiveness);
- TPM (Total Productive Maintenance);
- SMED (Single Minute Exchange of Die).

**4.2 Total productive maintenance (TPM) and JIT.** TPM is a critical technique for Lean manufacturing. Total Productive Maintenance is a technique to increase the degree of efficiency and productivity of the equipment, widely used in developed countries enterprises. TPM can be seen as "preventing damage", not "car repair". So, TPM is an approach based entirely on prevention.TPM seeks to involve all functions of the organization in order to obtain optimal overall efficiency of production equipment. Lean concept implementation begins with the production. Receiving orders until delivery involves developing and implementing a set of measures. Implementing the concept is eliminating waste by managing time of production, from design - production and distribution; planning activities are following the development and implementation of Quality manual.

**Just in Time.** Just-In-Time (JIT) approach is based on a philosophy built on the next requirements: only items required are produced in required quantities, in required time with the desired quality (figure 3).


Figure 3. Just in Time concept

## 3. CONCLUSIONS & ACKNOWLEDGMENT

In conclusion, the results of implementing Lean concepts are:
- reduce costs and shorten the reaction time to market signals;
- increase productivity and reduce inventory;
- improving the quality, delivery terms and conditions of work;
- motivating employees;
- total customer satisfaction

CIM is a comprehensive enterprise management processes for industrial automation. It appears as a special program under which industrial automation projects are planned, executed and integrated. CIM creates effective systemic links between isolated compartments that will influence the quality of manufacturing. Lean production eliminates waste and creates continuity in any flow of value creation.

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