LEARN AND AGILE MANAGEMENT FOR CHANGING BUSINESS ENVIRONMENT

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INTRODUCTION

Acceleration of production innovation is attributable to changes in business conditions such as globalization and growing competition from low cost countries, easier access to knowledge, technology, changing of customer requirements due to the impact of the economic crisis, long-term cost reductions in transport and communications, the increasing role of knowledge intensive services, increasing of the environmental factors and other [10].

Historically, global innovation of manufacturing systems had four periods: craft, mass, flexible and agile manufacturing. Hallmarks of the craft are: the use of general-purpose machinery and tools, work skilled craftsmen capable of performing a number of operations, decentralized mode of production parts and a wide range of customisation work [12].

Limits of craft was eliminated by mass production. Innovative starting points for mass production were: consistent interchange ability of parts, division of labour processes to the sequence of operations, the transition belt production, and increased serialised production allowing amortize high production equipment and instruments.

Since the 60s of the last century, defines innovation trends variable manufacturing customer-oriented concepts called Just-in-Time and Lean Production. It is a comprehensive approach to produce immediately, with perfect quality and minimum redundancy. This principle applies these techniques of production management: pull ordering principle i.e. the final operations, minimizing batches and storage, synchronization of the production flow, total quality management and continuous improvement.

In the 90s of last century, attempts to integrate innovative changes in the industry to a new concept future factory production of 21 century e i.

In 1996 a study was published about Technologies Enabling Agile Manufacturing. As the main tool agile technologies have been identified: Simultaneous product design and engineering, virtual manufacturing, production planning and management, intelligent processes and enterprise integration. As support systems were defined: suppliers of technology, industrial and research laboratories and national support agencies [8].

The article deals with issues of differences and similarities managerial methods lean and agile. Briefly describes the principles of lean manufacturing and product development. More detailed analyses of incoming new principles of agility for manufacturing enterprises. Focus is primarily on the philosophy of agile as a response to rapid changes in the business environment. In the next part of the article is analysed the question of the integration of lean and agile management, emphasizing agile as the extension of lean.

1 LEAN MANAGEMENT PRINCIPLES

Lean management is often described as the guiding principle for production in the 21st century. From the original basic orientation as lean production systems are developed for lean product development, lean supply chain and other components of the reproductive process. Further development trends are sustainable lean, lean and innovation. A common feature is the philosophy of lean production as a value for the customer, eliminating redundancy and continuous process improvement.

In their book "The Machine That Changed the World" Womack and Jones introduced new phrase „Lean Manufacturing." The goal of Lean Manufacturing is described as „to get the right things to the right place at the right time, the first time, while minimizing waste and being open to change“. The principles of Lean Manufacturing enabled the company to deliver on demand, minimize inventory, maximize the use of multi-skilled employees, flatten the management structure, and focus resources where they were needed [19].

The essential elements of Lean Manufacturing do not substantially differ from the techniques developed by people at Toyota. The Lean Manufacturing concept was to a large extent inspired by the Kaizen - the Japanese strategy of continuous improvement. Employee empowerment and promotion
among them of a way of thinking oriented at improving processes, imitation of customer relationships, fast product development and manufacturing, and collaboration with suppliers are the key strategies of leading Lean companies.

Continued success of Toyota Motor Company over past two decades created an enormous demand for greater knowledge about Lean. The ten rules of Lean manufacturing management can be summarized [14]:

1. Eliminate waste
2. Minimize inventory
3. Maximize flow
4. Pull production from customer demand
5. Meet customer requirements
6. Do it right the first time
7. Empower workers
8. Design for rapid changeover
9. Partner with suppliers
10. Create a culture of continuous improvement

Lean Product Development can be understood as creating a “product recipe” or set of specifications that are then transformed into a physical product or service. In manufacturing, different raw materials and product parts, or in general physical goods, flow through the Lean Production system.

The essence of Lean is to eliminate waste in all aspects of product development and related processes even before getting the product into production. The term is derived from lean manufacturing. The starting point is the customer’s requirements and determine the value added. All others need not satisfy the customer and the customer must pay for it is considered waste. This includes: identification of features of the product with the highest added value, delete items without value and engage customers in product development stages [13]:

- Focusing on the initial development phase, which takes into account many variations, as there is room for optimisation.
- Parallel implementation of activities supported by the communication strategy.
- Optimise the development process and eliminating waste.
- Linking specialists from functional departments in multi professional teams.
- Waste reduction options in the draft.

Since lean business cannot produce “bold” products, the Lean Design and Lean Product Development methods get into concern. Chances to dramatic reductions of costs during the product design are:

- Reduction of direct material costs: platform components and material, simplifying of design, reduction of useless waste, samples, prototypes, etc.
- Reduction of direct costs on experiments and testing simplifying of design - design for lean manufacturing and assembly, reduction of part count, adaptation of product tolerances to operational possibilities process standardizing, etc.
- Reduction of operational costs: minimum impact on reconfiguration of manufacturing processes and systems, modular design, standards for modifications according to customer’s demands, better utilization of manufacturing capacities and human resources.
- Minimizing development costs: platform of design strategies, lean QFD, Six Sigma, design of experiments, value engineering, and others.
- Acceleration of product development process affects basic lean principles.
- Concentration of development activities: perform the work tasks in the shortest time possible, and minimum moving of project documentation between individuals and departments. That can be achieved with simultaneous solving and strong IT support.

2 AGILE MANAGEMENT

Agility emerged in the USA in 1990 as a program of enhancements for competitiveness of the industry [7]. It is an enterprise-wide strategy with keys characteristics: the customer is the first priority; change is an opportunity to improvement.

Companies functioning in ICT area and software market segment have been the earliest adopters of agility in their processes. They usually iterate numerous versions of programs, and they assess
them against customer preferences before the software is ready for mass release. IT firms utilize customer co-development and extensive testing at the beginning of the development cycle [11].

Essential impulses for implementation of agility principles in enterprises causes: global competition is still intensifying, mass markets are fragmenting into niche markets, necessary cooperation is present among companies, network-based partnerships are created.

Nowadays, customers are expecting: low volume products with high quality, custom design, and very short product life cycles. Focusing is shifted on a unique solutions and not just products.

Agile innovative approaches to meet the main needs of industry are:

- Cost-effectiveness, with the adoption of standards in production and inspection equipment and massive use of lean approaches;
- Optimised consumption of resources, efficient use of energy and materials, processes and machines, and intelligent control of their consumption;
- Short periods of innovation in the market (from concept to market new products), made possible by information technology – it is necessary including ability to adapt IT systems to support new processes;
- Adaptability and reconfigurability of manufacturing systems to maximize the autonomy and capacity of machines and people with use of existing infrastructures;
- High productivity coupled with increased safety and ergonomics, thanks to the integration of technical and human factors.

Characteristic feature of agility in production systems is linked to computer-aided technologies. Those tools enable to get very high speed of response to customer’s demands and new market opportunities.

The scope of agility – definitions and overview

The definition of “agility” accurate expressed by Goldman, Nagel & Preiss: "Agility is dynamic, context specific, focused on aggressive changes and growth oriented. It is not about improving efficiency, cutting costs, or avoidance of competitiveness. It's about succeeding and about winning profits, market share and customers in the very centre of competitive storms that many companies now fear" [5]

In the scientific literature are differences in interpretations the agility:

**Managerial views**

Combine organization, people and technology into an integrated and coordinated entity to meet the rapid changes in the products and services. Abair (2012) [1].

**Market views**

Capability to survive and prosper in a competitive environment of continuous and unpredictable change by reacting quickly and effectively to changing markets. Gunasekaran (2002) [6].

**Systemic views**

Emend of speed, flexibility, innovation, quality, proactively and profitability through the integration of reconfigurable resources that must be achieved in synergy. Yusuf et al., (1999) [18].

**Technological / operational views**

Modular production facilities that can be organized into ever changing manufacturing nodes. Ferris (2002) [4].

**Organizational views**

It is necessary to utilize all existing resources regardless of their location and cooperate internally and with other companies. Effectively mastering changes requires flexible organizational structures that allows for rapid reconfiguration of the human and physical resources. Goldman et al., (1995) [5].

Factories, based on Agile Manufacturing and customisation, are characterized [7] by: future production sites for a large variety of sophisticated products are offering flexible, short cycle time and variable manufacturing capability. These manufacturing approaches ensure energy-efficient, reliable and cost effective production as well as production set-up/ramp-up with reduced cost and time through lean and simpler ICT.

The adaptive (agile) enterprises exploit capabilities to thrive in uncertain and unpredictable business environment. Firms are capable of rapidly responding to changes in customer demand. They are flexible to increase or decrease production volumes through modular and reconfigurable production facilities.

The transformation of enterprise to agile structures requires application of specifics management tools and techniques e.g.: Knowledge management, Information technology management, Business intelligence, Customer relationship management, Supply chain integration management, Outsourcing,
3 LEAN AND AGILE MANUFACTURING APPROACH

Today, manufacturing companies in their management strategies emphasize lean principles. Lean principles are particularly dominant in automotive production. Non-production oriented enterprises sequentially take over this concept of management [8].

We analysed the key issue of relationship management approach Lean vs. Agile:
- Principles Lean and Agile are controversial, i.e. agile concept replaces of Lean?
- Can those approaches to business process management exist simultaneously?
- Is agile conception one of extension of Lean?

Attention of Lean philosophy on managing manufacturing operations is primarily focused to eliminate all activities that do not add value. Agile management concept emphasizes the company's ability to respond quickly to new customer's orders and changes in market. Agile manufacturer is generally able to quickly change the layout of production facilities, in order to promptly support the new demand. It focuses on the removal of technical and organizational barriers that prevent of achieving a degree of flexibility that is able to adapt very quickly to large and fundamental changes in business process, including the supply chain network [17].

Management of the manufacturing company prefers the concept of Agility, if:
- range of their products is growing significantly, because from their customers, there is considerable demand for alternatives and versions;
- it is impossible to predict demand.

Management of the manufacturing company prefers the procedure of Lean, if:
- range of manufactured products is limited, preferably in large quantities;
- demand is predictable.

The characteristics of Lean are extremely important for understanding of Agile. Agile manufacturing is a continuation of the concepts of flexible and Lean manufacturing.

Lean production is methodology developed originally for Toyota (it is known as the Toyota Production System) [15]. The goal of Lean production was initially described as "to get the right things to the right place at the right time, the first time, while minimizing waste and being open to change". In addition to eliminating waste, this concept led to improvements of product flow and better quality. The techniques of Lean are focused on reducing system response time so that the production system was capable of immediately changing and adapting to market demands; products became made-to-order [9].

Lean Manufacturing provides continually reducing lot sizes, lead-times, errors, and all unnecessary activities that add cost but not value. Lean manufacturing is a business philosophy that continuously shortens the time between customer order and shipment by eliminating everything that increases the cost and time [2].

Lean production is also a different concept to Agile manufacturing, as show results described in Table 1.

<table>
<thead>
<tr>
<th>Characteristics - Lean</th>
<th>Characteristics - Agile</th>
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<tbody>
<tr>
<td>is a response to competitive pressures with limited resources,</td>
<td>is a response to complexity brought by constant change,</td>
</tr>
<tr>
<td>is bottom-up driven, incrementally transforming the mass-production model,</td>
<td>is top down driven responding to large forces,</td>
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<tr>
<td>is a collection of operational tactics focused on productive use of resources,</td>
<td>is an overall strategy focused on succeeding in an unpredictable environment,</td>
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<tr>
<td>brought flexibility with its alternate paths and multiuse work modules,</td>
<td>brings reconfigurable work modules and work environments,</td>
</tr>
<tr>
<td>is process focused.</td>
<td>is boundary focused.</td>
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Source: [3]

CONCLUSION

To be Agile, organizations must be Lean as a prerequisite. Agile might be viewed as the next wave after Lean and most of the requirements for Lean are also requirements for Agile [13].
Agile manufacturing is a vision of manufacturing that is a development from the concept of Lean production. In Lean production, the emphasis is on the elimination of sources of waste. Lean implies high productivity and quality, but it does not necessarily imply being responsive to unique customers’ demands. Agile stresses the importance of being highly responsive to meet the ‘total needs’ of the exact customers [6].

The agile manufacturing system should be able to produce a variety of components in a short time period. To achieve Agile Manufacturing status, companies primarily need implement Agile design processes. Agile product development system is capable of addressing frequent iterations of multiple design options early in the process, based on continuous testing and highly sophisticated customer-driven design changes [11].

Agile manufacturing suggests certain future directions for the further evolution of the lean enterprise system to help enterprises develop capabilities to thrive in fast-changing and uncertain environmental conditions.

Acknowledgments

This contribution is the result of the project implementation: VEGA 1/0879/13 Agile, the market is adapting business systems with highly flexible corporate structure.

REFERENCES

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Abstract

This article deals about the challenges of structural innovation in production systems. Changes in manufacturing conditions resulted to the development of multiple conceptual frameworks. The topic of lean and agility in management is associated with the reaction of changing business strategy under the conditions of changing business environment and knowledge-based economy. Lean and agile management is often described as the guiding principle for production in the 21st century. From the original basic orientation for production systems are product development, supply chain and other components of the reproductive process. The principles of Lean Manufacturing enabled the company to deliver on demand, minimize inventory, maximize the use of multi-skilled employees, flatten the management structure, and focus resources where they were needed. The definition of agility expressed that agility is dynamic, context specific, focused on aggressive changes and growth oriented. It is not about improving efficiency, cutting costs, or avoidance of competitiveness. It's about succeeding and about winning profits, market share and customers in the very centre of competitive storms that many companies now fear.

Key words

lean manufacturing, agile manufacturing

JEL Classification

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