

# The Synergy between New Industrial Technologies and Lean Methods

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## The need to search for synergy between new industrial technologies and Lean methods

Many firms do not gain competitive advantages after the introduction of new industrial technologies. Important reasons are (i) the lack of attention for the strategic, logistic and organizational integration, (ii) a poor design of the automated system, (iii) not understanding the need to adapt the planning and control system to the demands of the new equipment, and (iv) a poor implementation process. Case studies, shortly indicated on this poster, illustrate the reasons for not gaining competitive advantage.

Table 1 presents the performance characteristics of new automated technology. Not all characteristics are helpful to gain

competitive advantages. These disabling characteristics need to be dealt with. Table 1 illustrates which Lean methods can be used for this purpose, indicating the synergy between Lean and new industrial technologies. This is also confirmed in survey studies (see Khanchanapong et.al., 2014).

Table 2 is meant to support decision makers in finding synergy between Lean and new industrial technologies. Asking the correct questions is essential in order to avoid wrong, unprofitable, investments.

New industrial technologies may also be an enabler of the application of Lean methods. IT for instance, may improve the application area of kanban (e-kanban).



## What is Lean? What is the focus of Lean Methods?

A lean organization understands customer value and focuses its key processes to continuously increase it. The ultimate goal is to provide perfect value to the customer through a perfect value creation process that has zero waste (source: Lean Enterprise institute). Lean methods can be organized in methods (i) to improve the connection with suppliers and customers (SCM), (ii) to improve the quality of the process activities (TQM), (iii) to realize a flow of activities (FLOW & PULL) and (iv) to involve employees in improvement activities (Shah & Ward 2007). Most used tool in Lean is Value Stream Mapping: a method to describe and draw the flow of goods and information in a system, from supplier to customer. Value Stream Analysis and Design are focused on discovering the root causes of wastes in the Current VSM and the design of a Future VSM which copes with these root causes. New industrial technologies may play a role in the Future VSM and may support the use of Lean methods.

Table 1. Some Connections between Market Requirements, Performance Characteristics of New Automated Technologies and Supporting Lean Methods

	Market Requirements	Performance Characteristics of New Automated Technologies		Required Lean Methods to cope with negative characteristics of New Automated Technologies	Illustrated by case
		Enabling Characteristics	Disabling Characteristics		
1	Low price	Automation (less labor needed)	Expensive, high investment. Preparatory tasks	Focus on reducing waste, automation (avoid production of waste).	1
2	Good quality	Automation (accuracy, repetitive)	Acts only well if input is uniform and of high quality	Standardization, SPC	1
3	Short delivery times	Flexibility (programmable, no setup times)	High desired utilization may lead to high waiting times	Balancing the workload (Heijunca).	2, 3
		Integration (integration of functions, IT connections)	Integration is usually local and does not cover all functions in the supply chain	Focus on the whole Value Stream. Use of Kanban connections. Supermarkets	4
4	Better delivery performance	Flexibility (no setup times for machine)	Lack of understanding ways to cope with variability of arrivals and processing times	Capacity buffer enabling to cope with strategic flexibility	2
5	Higher flexibility (more variants, small batches)	Flexibility (no setup times at machine)	Preparatory work is usually extensive. Changeover times can be substantial	Streamlining preparatory work (Office Cells). SMED	4
6	More innovative / integrated	Information Technology	i. Lack of communication standards. ii. Limited accuracy of data - time lag iii. Information everywhere available iv. No clear linkage with desired control system	i. Standardization ii. Use of real time data iii. Principle: Information arises first where it need to be used iv. Pull Control Systems and Obeya Project management systems	5

### CASE 1

A small company decided to invest in an industrial robot for the automatic loading of glass plates on a conveyor system. It was not foreseen that the number of glass plates in a batch needed to be counted beforehand and that the positioning of the batch of glass plates was critical. The company sold the robot.

### CASE 2

A company invested in a Flexible Manufacturing System in order to be reduce delivery times. In order to gain a high utilization of the equipment, management decided to use the system for stock production. The original purpose of the system got lost. No Lean alternatives were considered.

### CASE 3

A company invested in an automated machine. There were not setup times anymore. The machine was also able to produce on a substantial higher speed. This was the reason why operations of different value streams were assigned to the system. This created planning complexity and logistic problems. It increased a substantial amount of WIP.

### CASE 4

A firm invested several robots for the unloading and loading of sequentially located pressing machines. This enabled one-piece-flow and reduced the energy consumption in manufacturing (heating the products to be pressed). Additional technical qualifications of operations were needed to cope with disturbances.

### CASE 5

A firm applies successfully a manually controlled pull system (CONWIP) in their manufacturing department. New information technology enabled more central control. However the software was not able to support the pull system. The company is puzzling about pull planning & control software.

Table 2. Lean questions to avoid unprovable investments in new industrial technology

	Critical issues for success	Some Lean questions to be answered when investing in new industrial technologies	Illustrated by case
(i)-1	Strategic Integration	Which Value Streams are supported by the new technologies? Does the new technology solve a strategic bottleneck?	2
(i)-2	Logistic Integration	What is the effect of new technologies on the material flow in the company? Where does WIP arises? Can this be avoided?	3
(i)-3	Organizational Integration	What is the impact of new technology on the processes to be performed by support functions?	1
(ii)	Design of the automated system	Can the system run without operator attendance? (automation). Are the elements of the system in balance and able to absorb variability in demand?	4
(iii)	Planning and control of the goodsflow	How to cope with sequence constraints of the new machines? How to balance the workload (Heijunca)? How to integrate Kanban and MRP orders?	4,5
(iv)	Implementation	Where and how to involve employees?	4

## Research Project and Contact

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