



Adexa vs. Lean Manufacturing

White Paper

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Lean Manufacturing

Overview

During the 90's, lured by the promises of the new economy, corporations became primarily focused on fast growth and market share. Oftentimes growth came at the expense of excessive production costs due to high inventories, poor product quality, unused or misused capacity, and other forms of waste. As the economy softened early in the next decade, the focus shifted to a more fundamental indicator for business health, namely profitability. This has caused many corporations in various industries to take a new look at lean manufacturing, a methodology with many decades of success in the automotive industry.

The basic philosophy of lean manufacturing is the minimization of the amount of all resources, including material, capacity, and time required to complete a business activity. Activities could include design, production, supply chain management, or customer service. Another important theme in lean manufacturing is "continuous improvement", indicating an iterative cycle of analyzing, improving, and monitoring to achieve optimal performance.

This paper describes how Adexa's eGPS aligns with lean manufacturing in terms of its overall philosophy and how it supports lean manufacturing planning requirements at the supply chain and factory levels.

Lean and Information Systems

The original model for lean manufacturing is the Toyota Production System, which was developed roughly four decades ago. Considering the computational power of the information systems at the time, it is no surprise that the model relied primarily on simple visual or manual signals to manage scheduling and material flow. It was only in the mid nineties that processing speeds and algorithms became powerful enough to handle challenging manufacturing problems. Therefore, lean manufacturing as it was originally modeled, was implemented directly on the shop floor and outside of any information system.

On the other hand, planning and scheduling solutions developed during this period were mostly focused on optimizing manufacturing operations but paid little attention to how the optimal plans were executed on the factory floor. The early solutions also did not address the continuous improvement aspect of lean manufacturing which is one of the keys to its success. This has led to the formation of two approaches, one is to follow lean manufacturing, and the other to use computer based planning solutions.

It has become clear in the recent years that it is a mistake for manufacturers to pursue one of these strategies to the exclusion of the other, rather it is critical to understand where each strategy is effective and how the two strategies can be married for optimal results.

In the sections that follow, we identify the areas of strength for each strategy and explain how Adexa's eGPS solution suite can help manufacturers carry out their lean strategies.

Planning vs. Execution

As a philosophy, lean can be applied to various levels of planning and execution, finding areas of waste, improving processes to eliminate waste, and doing this repeatedly through constant monitoring of the system. This philosophy has been successfully implemented at the execution level with almost no help from any information system. That is when an empty container can actually trigger an action. At this level, all decisions around the flow of material through the supply chain can be based on the physical presence (or absence) of material at various locations.

At other levels of decision making, however, implementation of lean can be greatly complemented through information systems. Decision making at these levels relies on information that is not physically apparent. The information needed to make such decisions include those that are based on market trends, sales or customer forecasts, or even information that is already physically evident at some upstream or downstream location within the system but has not yet been propagated. For example, a customer demand signal may take days or even weeks to make its way back to the upstream most point of the supply chain if the information system does not provide such visibility. If this demand happens to be outside of forecast, this could create delays at every step of manufacturing.

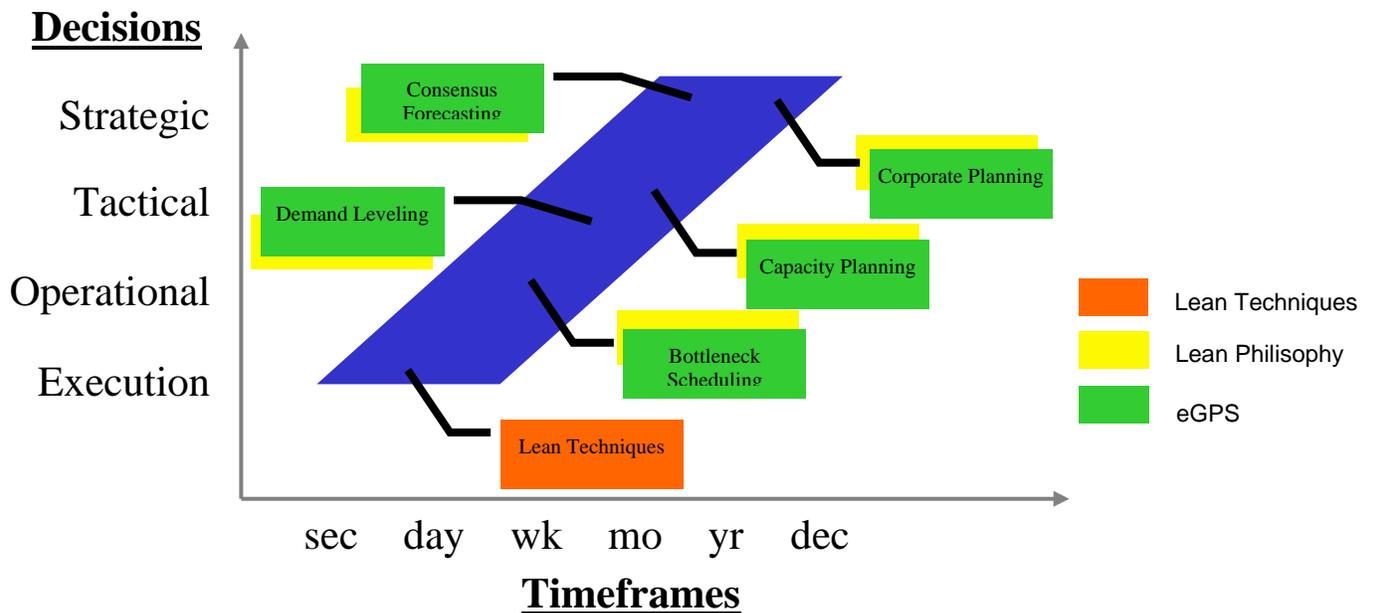


Figure 2. Lean and various levels of decision making

Responsiveness to market demand is a key element to a manufacturer's success. Fast decision making is a requirement for responsiveness in any business. eGPS complements

a company's lean strategy to stay responsive and competitive in volatile markets through fast decision making support and immediate propagation of information throughout the supply chain.

How Lean Can be Complemented

Lean manufacturing methods are designed to be simple but rely on certain assumptions that may or may not be true in a given manufacturing environment or at a given time. Here are some of the areas where a decision support system can complement lean:

Takt Time variability – Arriving at Takt Time is the initial step in orchestrating lean operations. In lean manufacturing, tact time is related to customer demand rates. All operations are then planned to be balanced to the takt time. There are at least two conditions in which takt time computations can become complex:

- 1- Variability in demand causes takt time to vary over time; therefore the system needs to be frequently rebalanced.

High demand variability is the greatest challenge to lean manufacturing. Although lean techniques can be sufficient for order execution and continuous improvement, they need to be complemented with accurate demand forecasting. Lean requires a level loaded factory, where kanban sizing and takt time depend on an accurate forecast of customer demand. If actual orders change significantly, kanbans must be resized, based on an updated order rate. eGPS can help overcome this complexity by improving demand accuracy, speed line design, and provide information to optimally resize kanbans when required.

- 2- Multiple products with different operations, sharing the same resources.

The problem of shared resources becomes even more challenging if the shared resource is a batch resource, or its set up time is sequence dependant, or is a bottleneck resource. How would one decide which orders to process next, which orders to batch together, etc. eGPS can complement lean by optimally sequencing orders on key resources to maximize resource capacity utilization without delaying high priority orders.

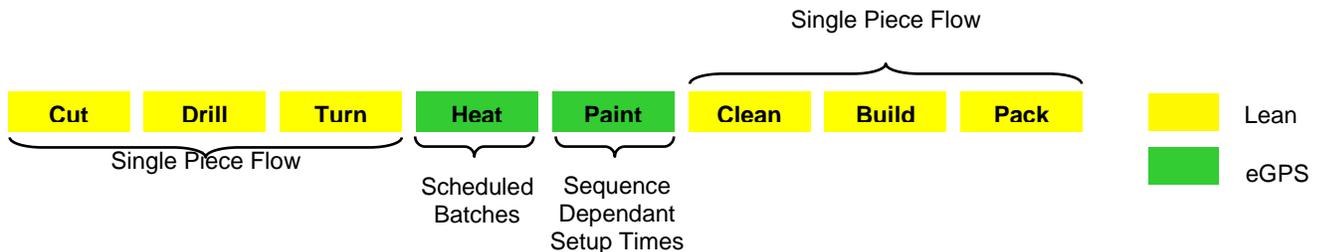


Figure 3. Hybrid Lean-eGPS solution

Complex Manufacturing – Engineer-To-Order (ETO) and Build-To-Order (BTO) environments also present significant challenges to lean manufacturing. This is where

product variability is early in the manufacturing process. Constrained resources such as centralized paint lines or ovens are often shared across multiple product lines disrupting the lean manufacturing flow.

When constraints cannot be eliminated, real-time scheduling is required, as is visibility to production status to update availability dates to customers. eGPS can complement lean by optimizing around constraints and providing accurate Available-To-Promise dates to customers.

Data Accuracy – Data accuracy is even more important with lean manufacturing because there is no buffer inventory to cover errors. Metrics are also key in measuring and improving the lean manufacturing process, as is access to underlying data for root cause analysis.

Not too long ago, an automotive manufacturer had to completely shut down productions for several days because of the unexpectedly high number of leather seats ordered, leading to millions of dollars in lost sales. Such occurrences can be avoided altogether with shortening information cycle time and improving forecast accuracy. eGPS can help increase data accuracy, including demand accuracy, and through its Business Analytics framework provides an up-to-date picture of the system and process metrics for performance analysis. eGPS also allows manufacturers to instantly propagate demand information through a multi-tier supplier network the moment information becomes available.

Lean and eGPS

Lean can be described as “A systematic approach to identifying and eliminating waste through continuous improvement by flowing the product at the pull of the customer in pursuit of perfection”. The key elements of this approach are

- Identifying waste
- Eliminating waste
- Flowing the product with customer pull
- Continuous improvement

Figure 4 highlights the parallels between the eGPS and lean philosophies.

At the highest level of planning, Adexa’s Corporate Planning Solution helps identify the biggest opportunities for financial improvements in the business. It then ties these opportunities to the underlying business processes and prioritizes them based on their overall financial impact. Adexa’s Corporate Planning Solution provides the basic tools for manufacturers to start with the first step of lean, which is the detection of waste.

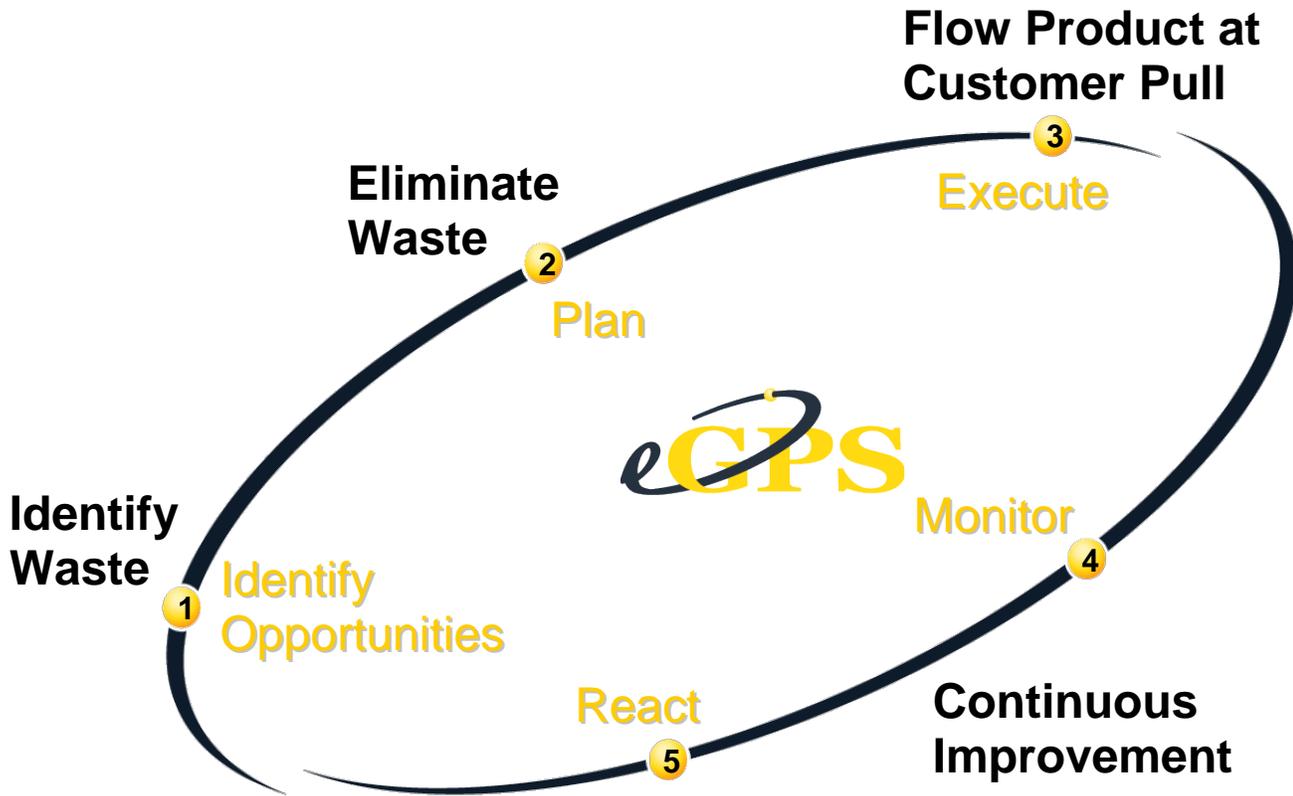


Figure 4. Parallels between eGPS and lean

At the tactical level, Adexa’s Sales, Inventory, and Operations Planning (SIOP) helps reduce demand forecasting errors, optimize inventory levels, and remove capacity constraints before they happen. It also helps you establish a collaborative environment between you, your customers, and suppliers so benefits can be realized throughout the entire supply chain by providing business partners the information and visibility they need to optimize their operations. In a way, Adexa’s tactical planning solutions can pave the way for manufacturers to be able to effectively execute lean.

Adexa’s Factory Planning & Scheduling solution can also help lean manufacturers at the operational level by scheduling bottlenecks, speeding line design, and resizing kanbans, and demand smoothing when required. eGPS’s Order Fulfillment solution can also provide accurate Available-To-Promise dates to customers in the presence of constrained resources. At this level, Adexa’s Supplier management solution can also help implement Vendor Managed Inventory (VMI) to aid material flow through a multi-tier supply chain.

To be able to continually make improvements to a lean process, manufacturers need to monitor its behavior through tracking Key Performance Indicators corresponding to the process. Adexa’s Business Analytics solution allows manufacturers to keep track of KPIs

for all significant business processes, allowing them to constantly identify areas that need attention or detect any adverse trends before problems occur.

Conclusions

Accelerated change is a readily accepted constant in the design criteria of modern business strategy. Also accepted is the need to support the greater variability in customer demand associated with mass customization. Lean was originally focused on elimination of waste and the pull basis of material flows; projects were very much manufacturing-centric. The battleground now is to do traditional lean but with lower levels of inventory while supporting the velocity and variability demands of supply chain models such as BTO and CTO. The problem needs to become a supply chain problem rather than being restricted to just manufacturing, which often results in a shift upstream rather than an elimination of waste.

Adexa's eGPS solutions complement lean manufacturing with improved data visibility through web-based VMI and collaborative planning. They also help improve demand data accuracy through seamlessly integrated demand planning and forecasting system. They provide an environment to facilitate information flow for problem resolution, and enable fast rebalancing of the system, speed line design, and resize of heijunka box and kanbans with changing customer demand. eGPS also provides a method of dealing with constrained resources that cannot be eliminated from the manufacturing process and provide reliable Available-To-Promise dates to customers.

Even after all the effort to simplify, efficient and profitable manufacturing remains complex and challenging. Only by leveraging available technologies to speed information flow, increase responsiveness and flexibility could companies gain competitive advantage in the marketplace. eGPS provides the elements of technology that can complement lean as both a philosophy for running the business and a method of execution.