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# The When, Why and How of **ERP support for LEAN**





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A white paper clarifying the situations where ERP supports LEAN, the benefits of this support and why it only applies to some situations

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## Executive Summary

**LEAN Manufacturing** is a powerful approach used by manufacturing companies to drastically improve manufacturing processes. The same approach is yielding business benefits outside of manufacturing; such as in LEAN Logistics.

Manufacturing was also the original spawning ground of MRP and MRP II which later evolved into the now ubiquitous ERP (Enterprise Resource Planning) that we find in virtually every type of corporate entity.

In the business world of 2007, it is appropriate to ask how LEAN and ERP interact – if at all – and specifically whether they are mutually supportive, mutually exclusive or independent concepts altogether.

In this paper we respectfully present our conclusion, namely that some LEAN initiatives can be hugely strengthened with a synergistic ERP implementation and *vice versa*, whereas in other cases the two efforts should really be viewed as separate initiatives and managed independently from each other. This is, however, not an open ended “it depends on what you want” answer; we conclude that *specific* LEAN initiatives will eventually fail without considerable attention to *specific* ERP aspects but that other *specific* LEAN initiatives and *specific* ERP functionality have little in common.

We base this conclusion on the key point of departure that LEAN is essentially a philosophy that is applied to improve the way processes work but that nowadays those processes in business rely on systems to support the actual operations. In short, LEAN addresses *how* processes should work and ERP makes sure the processes work consistently.

It also works the other way round: Systems that operate without embedding long-term improvements essentially miss the point. A frequent problem with ERP implementations is that the question “What are we trying to achieve?” is met with only vague answers. Thus we conclude that some *specific* ERP implementations require the guiding strategy of *specific* LEAN principles to fulfil their business improvement objectives.

Thus LEAN and ERP can and should be mutually supportive in some situations but there are also many combinations of LEAN initiatives and ERP implementations where the connections are tenuous and attempts to put a single “umbrella” over them are inappropriate.

To put structure to these conclusions we documented *fourteen methods* used in LEAN implementations and we summarised the functionality typically found in modern ERP systems into *nine major components*. Our conclusion is that the interaction between LEAN and ERP takes place at the intersection points of the resulting “LEAN-ERP” matrix, on the next page, where we designated with an “x” where we concluded that LEAN initiatives and ERP should be closely integrated and left blank the intersection points where we believe they should be considered independent endeavours.

<b>Lean:</b> <b>ERP:</b>	<b>FIN</b>	<b>HR</b>	<b>S&amp;D</b>	<b>Mfg</b>	<b>MM</b>	<b>Logis- tics</b>	<b>Report</b>	<b>Bus Rules</b>	<b>Work flow</b>
<b>Value stream Mapping</b>	x		x	x	x	x	x	x	x
<b>Quality at the source</b>	x	x		x			x		x
<b>Workplace organization: 5 S</b>	x			x	x				
<b>TPM</b>	x			x			x	x	x
<b>Visual management</b>							x		x
<b>Set-up reduction</b>	x			x	x		x	x	x
<b>Batch size reduction</b>	x			x	x		x	x	x
<b>Cellular manufacturing</b>				x	x		x		x
<b>Standardized work</b>								x	
<b>Work balancing</b>				x				x	x
<b>Production levelling</b>				x	x		x	x	x
<b>Point-of-use systems</b>				x	x		x	x	x
<b>Kaizen</b>							x		x
<b>Kanban</b>					x		x	x	x

In the following chapters of this document, we first note the concepts and fourteen methods of LEAN, subsequently present a summary of the nine components of ERP, and then elaborate in some detail on how exactly ERP supports LEAN in the applicable situations. The practical use of the results of this paper is discussed in the final chapter.

# LEAN

## What is LEAN?

LEAN represents the convergence of a number of manufacturing philosophies with labels and acronyms such as Just-in-Time (JIT), Quality-at-the-Source (Q@S), Total Quality Management (TQM) and others. Although LEAN is increasingly applied in other industries, the key understanding comes from defining LEAN in its manufacturing context:

The basic goal of LEAN Manufacturing is to get more done with less by minimizing inventory at all stages of production, shortening the product cycle times from raw materials to finished goods and by eliminating waste.

The term “LEAN” is used because LEAN manufacturing uses less:

- Human effort in the factory,
- Manufacturing space,
- Capital investment,
- Materials, and
- Time between the customer order and the product shipment.

LEAN then, is a strategy for remaining competitive by identifying and eliminating wasteful steps in products and processes. The following are common practices:

- Continuous flow production
- Continuous improvement
- Improvement of equipment reliability
- Quality at the source
- Pull production

## LEAN Manufacturing Concepts

Some of the terms in the above description of LEAN as well as related concepts bear further explanation:

### *Value*

In LEAN manufacturing, the value of a product is defined solely by the customer. Value-adding activities transform the product closer to what the customer wants but non value-adding activities do not create customer value. Anything that is not value-adding is defined as waste.

### *Value stream*

The value stream is the end-to-end collection of processes that create value for the customer. The value stream includes people, tools and technologies, physical facilities, communication channels and policies and procedures.

### *Waste*

Waste is any element of production that adds time, effort and cost but not value. Waste is usually a symptom of a problem.

### ***Equipment reliability***

Reliable equipment is required to meet daily delivery requirements. When equipment is not reliable, high inventories must be maintained which in LEAN manufacturing is considered a major source of waste.

### ***Continuous flow***

The ideal flow of products through production is one-piece flow: make one part, move one part (in contrast to batch and queue material handling). With the linking of manual and machine operations into the most efficient combinations to maximize value-added content while minimizing waste, the stagnation of work in and between processes is eliminated.

To really achieve and maintain the benefits of flow production one must transition the organization from a functional structure to a product-focused, cross-functional structure.

### ***Pull production***

Pull production is a system of cascading production and delivery instructions from downstream to upstream activities in which nothing is produced by the upstream supplier until the downstream customer signals a need. Actual end customer demand drives the manufacturing process as much as possible and the goal is that the rate of production for each product is equal to the rate of customer consumption.

### ***Continuous improvement***

The guiding principle is that perfection is an ideal, so anything and everything can be improved. Continuous improvement is thus an ongoing activity to strive for doing things better one step at a time.

Some principles:

- The status quo is unacceptable.
- Put aside preconceived ideas.
- Find root causes to problems, not symptoms.
- Attack the process, not the people.
- Employees are usually the experts.
- Give yourself the right to fail.
- Do it now!

### ***People involvement***

A lean organization develops highly-trained, motivated employees who investigate problems and find solutions as part of their job. An empowered team approach is essential so that decision making and system development are pushed down to the lowest levels

## **Fourteen LEAN techniques**

Many LEAN initiatives focus on only one or a few techniques and as long as business benefits are achieved that is of course sufficient. For our purposes in this paper, it is important to note that there are actually fourteen techniques under the umbrella of LEAN:

### **LEAN 1: Value Stream Mapping**

Value stream mapping is a method to describe the flow of material and information through the production system. By graphically portraying the process, one is able to see where value is added and value is lost.

The visual representation allows one to see where costs can be reduced and improvements can be made. A future state can be designed where wasted steps are left out, and continuous flow and pull production are introduced.

The ratio of value added to total lead time is determined by documenting the current lead time, inventory levels and cycle times

## **LEAN 2: Quality at the Source**

The guiding principle is that quality should be built-in, not inspected-in.

Some of the techniques used to achieve this are the following:

- Machines should have the intelligence to be self-operating and self-stopping when an error occurs.
- People should be served by machines and not vice versa.
- It is more efficient to have human work separated from machine work so that people are freed up to do value-added work.
- One should reduce the need for rework and prevent further work (and cost) to be added to a product that is already defective.
- Simplify prevention and repair of defects by placing the responsibility directly on the worker.
- Poka Yoke is a method that uses simple, low cost devices to prevent defective parts from being made or passed into the process:
  - Contact devices
  - Limit switches
  - Sensing devices
  - Vibration, pressure, temperature sensors
  - Warning devices
  - Colour codes and lights

## **LEAN 3: Workplace Organization: 5 S**

The five “S”s of workplace organization are “sort”, “sustain”, “stabilize”, “scrub” and “straighten”.

- Sort: Sort out what is needed and what is not needed. When in doubt, throw it out.
- Sustain: Make the 5 S’s a way of life; this requires discipline.
- Stabilize: Make cleaning and checking a routine practice.
- Scrub: Keep machines and work areas clean.
- Straighten: Arrange essential things in order for easy access.

The focus of 5S activity is to organize the workplace in order to make it more productive. After 5 S, one expects to see a place for everything, and everything in its place.

## **LEAN 4: Total Productive Maintenance (TPM)**

TPM is the philosophy and practice of preventing the loss of productive machine time due to:

- Breakdowns
- Minor stoppage
- Idling
- Operating at less than planned for cycle times
- Changeovers / setups
- Unacceptable quality

TPM involves everyone in identifying, monitoring, and correcting the root causes of each of these losses.

### **LEAN 5: Visual Management**

Visual management systems enable anyone to immediately assess the current status of an operation or process at a glance, regardless of their knowledge of the process.

Elements:

- Visual displays relate information and data to employees in the area
  - Charts
  - Metrics
  - Procedures
  - Process documentation
- Visual controls are intended to control the actions of group members
  - Production status boards
  - Quality controls
- Visual process indicators
  - Painted floor areas for good stock, scrap
  - Direction of flow indicators
- Visual documentation of processes

### **LEAN 6: Set-up Reduction**

The objective is to reduce the time lost during machine setups and product changeovers.

Some concepts:

- External versus internal activities
- Component and tool reduction
- Quick changeover fasteners
- Teaming
- Point of use storage of materials
- SMED targets (Single Minute Exchange of Dies)

### **LEAN 7: Batch Size Reduction (one-piece-flow)**

Product should move (flow) from operation to operation only when it is needed, in the smallest increment, one piece being the ultimate (one-piece-flow). The LEAN philosophy tries to reduce batch, lot or mass processing as wasteful.

### **LEAN 8: Cellular Manufacturing**

Cellular manufacturing focuses on a product-centred sequence of operations instead of operations-centred. The layout is usually a U-shape or a semi-circle. Equipment is movable and is placed closely together for quick feedback between operators. Workers in manufacturing cells are typically cross trained to perform multiple tasks.

### **LEAN 9: Standardized Work**

Standardized work is the documentation and application of the best practices of a manufacturing process. It may include photographs and/or drawings. It ensures that production operations are performed the same way each time. It is developed together with the operators and is posted at the workstation.

Standardized work consists of three elements:

- TAKT time – matches the time to produce a part or finished product to the pace of sales and is the basis for allocating work among workers.
- Standard in-process inventory – the minimum number of parts, including units in machines, required to keep a cell or process moving
- standard work sequence – the order in which a worker performs tasks at various processes

Once standard work is set, performance is measured and continuously improved.

### **LEAN 10: Work balancing (TAKT-time)**

Work balancing maximizes operator efficiency by matching work content to TAKT time. TAKT time is the rate at which customers require the product.

TAKT time is computed as:

$$\frac{\text{Available work time per day}}{\text{Daily required customer demand in parts per day}}$$

### **LEAN 11: Production Levelling / Smoothing**

The objective is to average both the volume and sequence of different model types on a mixed-model production line.

### **LEAN 12: Point-of-use Systems**

Point of use storage reduces material handling requirements and makes it easier to determine raw material needs due to smaller shipments from vendors. All material is stored where it is going to be used in the process.

### **LEAN 13: Kanban**

Kanban is a pull material replenishment system, based on the principle that material is pulled through the production process based on actual usage of material. Kanban uses visual signals, usually a card, to move material through the value chain.

### **LEAN 14: Kaizen**

*Kai (To modify, to change make better) + Zen (Think, make good, make better) = Kaizen*

The secret to Kaizen is to create an atmosphere, a culture, of continuous improvement by focusing people on problems. The objective is continuous improvement through incremental steps.

## ERP

### Modern ERP

ERP has evolved from a technique to plan dependent demand materials (“Material Requirements Planning” or “MRP”) in the seventies via a coherent set of best practices to plan and control the resources in a manufacturing concern (“MRPII”) in the eighties to “Enterprise Resource Planning” (ERP) systems in the nineties. Nowadays, ERP is seen as an integrated computer system that powers the business processes of any business, not just manufacturing, via embedded best practices and a unified database.

### ERP Functionality

#### *Integrated Information*

- Integrates information across all departments
- Allows users to input data in one location that can be processed with other data and accessed as informational reports in real-time

#### *Flow of Information*

- Facilitates the flow of information between the different functions and processes of an enterprise
- Functions: manufacturing, finance, HR, sales and distribution, material management, logistics
- Processes: order entry, reporting, receiving, shipping, accounting

#### *Plan Events*

- Plans future events

#### *Track Events*

- Tracks a wide range of events in the enterprise in an integrated fashion

#### *Analyze Events*

- Supports analysis of trends, to improve the performance of the enterprise.

### NINE ERP Components

There are many different ERP systems on the market and each is configured differently in terms of modules and major elements. We present the following *nine components* as characteristic of any modern ERP system:

#### ERP 1: Financials

**General Ledger** tracks financial transactions, monitors account balances, and produces financial statements and comparisons. One can produce detailed or summary GL reports that include a single entity or a range of entities.

**Accounts Receivable** monitors customer balances, supports credit management, produces statements and aging, and records customer payments.

**Accounts Payable** manages supplier accounts, monitors outstanding payables, and processes payments to suppliers.

**Asset Management** is used to set up, maintain, transfer, and retire a company’s assets.

**Treasury Management** provides combined treasury requirements and projection reports for planning purposes.

## ERP 2: Human Resources

**Personnel Development** automate the processes related to personnel and employee information management by using a centralized database to enable employees and management to access up-to-date, consistent information that support HR decisions.

**Payroll and Shift Management** facilitates effective time-management and provides convenient tracking, monitoring, record keeping, and evaluation of time-management data.

## ERP 3: Sales and Distribution

**Prospect and Customer Management** manages the response to a customer's request for a quotation, monitors the quotation's status, reports on quotation history by item or customer, and reports on expired quotations that did not result in sales orders.

**Sales Order Management** enables one to create sales orders, confirm the order, allocate needed inventory, ship products and invoice the customer.

**Sales Analysis** can be integrated with Sales Order Management to generate data on year-to-date sales, margins, costs, and quotas. Sales analysis can be by item, product line, customer, ship-to, or salesperson and maintain monthly and year-to-date totals for quantity sold and cost of sales.

**Forecasting** calculates the number of units of a given item one expects to sell in the future using different forecasting methods.

## ERP 4: Manufacturing

**Bills of Materials** define and maintain the relationships between products and the materials, sub-assemblies, components and ingredients that are the inputs to the manufacturing process.

**Routings** define the physical locations where manufacturing activities are performed (departments, work centres) and the sequencing of the manufacturing process itself (operations).

**Production Planning** plan, schedule and sequence production in order to deliver to promised customer orders.

**Capacity Planning** uses planned orders (from MRP – material requirements planning – calculations, work (job, shop) orders and repetitive schedules to determine expected work-centre load and generate a capacity requirements plan for a department, work centre, or machine.

**Shop Floor Control** tracks activities and records operation times and status for manufacturing jobs.

**Production Scheduling** sequence operations to obtain the best feasible workload on work centres.

**Project Management** provides a set of functionality that enables business organizations to manage and complete complex tasks that require items, labour, and expenses. A project is defined as a series of such tasks delivered to a customer in one or more steps over time.

**Plant Maintenance** performs cost-effective preventive and risk-based maintenance. One can streamline procurement and revision processes and plan for outages and managed work-order activities.

**Quality Management** defines testing procedures and retains quality test results in the data base.

## ERP 5: Materials Management

**Materials Planning** assesses supply and demand and generates planned order and action messages.

**Procurement** manages the process of ordering materials and services — requisitions, approvals and the creation of purchase orders. It supports purchasing of direct material as well as indirect (non-product) materials and services — such as subcontracting services and maintenance spares.

**Inventory Management** keeps track of stock levels in multiple locations and processes inventory receipts, shipments, returns, and adjustments. Inventory management includes data base inquiry and reporting functions to provide current information.

## ERP 6: Logistics

**Warehouse Management** provides information about inbound and outbound shipments as well as current inventory levels.

**Transportation Management** covers a wide range of features that can include complex local and international transport requirements such as numbering control, document formats, multiple carrier management and transaction based security.

The above six major components represent the most generally accepted ERP functionality since the term was coined in the early nineties. Nowadays, however, one would expect a modern ERP system to also incorporate **reporting**, **business rules** and **workflow** that support the already listed “silo” functionality in all of the above components:

## ERP 7: Reporting

**Reporting** give users the ability to obtain insights and details on current data in user definable formats that support the different needs of different jobs, skills roles and temporary business requirements.

## ERP 8: Business Rules

The task of configuring the ERP system to enable a particular organization to use it profitably requires the mapping of the organizational structures, processes and environment onto a corresponding model of the organization embedded in the ERP software. Further customization require the creation of master data, input-output forms, validations, reports, queries, formats, authorizations, backup and restore procedures, data administration procedures, disaster recovery processes and so forth.

## ERP 9: Workflow

Workflow automatically triggers predefined actions based on linking business objects with organizational structures to speed up communication and co-ordination in the organization.

## How ERP supports LEAN

It is readily apparent that LEAN and ERP are two different things and that there will be cases where they have nothing to do with each other. For example, the LEAN-ERP matrix below shows no interaction between the LEAN technique of “**Visual Management**” and the ERP component of “**Financials**”. Indeed, the financial functionality in an ERP system is neutral towards any efforts to implement visual management on a shop floor.

Lean: ERP:	FIN	HR	S&D	Mfg	MM	Logis- tics	Report	Bus Rules	Work flow
<b>Value stream Mapping</b>	x		x	x	x	x	x	x	x
<b>Quality at the source</b>	x	x		x			x		x
<b>Workplace organization: 5 S</b>	x			x	x				
<b>TPM</b>	x			x			x	x	x
<b>Visual management</b>							x		x
<b>Set-up reduction</b>	x			x	x		x	x	x
<b>Batch size reduction</b>	x			x	x		x	x	x
<b>Cellular manufacturing</b>				x	x		x		x
<b>Standardized work</b>								x	
<b>Work balancing</b>				x				x	x
<b>Production levelling</b>				x	x		x	x	x
<b>Point-of-use systems</b>				x	x		x	x	x
<b>Kaizen</b>							x		x
<b>Kanban</b>					x		x	x	x

On the other hand – and again using an example from the LEAN-ERP matrix – any improvements made possible by the LEAN technique of “**Batch size reduction**” has to be embedded in the parameters of the “**Manufacturing**” component of ERP for those benefits to actually materialise.

Another consideration is that a key requirement for many LEAN initiatives is readily available and accurate data – which typically reside in ERP systems. Furthermore, information need to flow from wherever it is captured to where it is needed to support the LEAN initiative – which is best achieved by the integrated nature of an ERP system’s database.

A typical modern ERP system supports both the data and parameter implementation requirements of LEAN. However, most ERP systems do not cover all of the nine major components equally well and some rely on integration with other systems for additional functionality instead of providing it in the “core” system.

Since virtually all LEAN initiatives only involve a subset of the fourteen LEAN methods listed here, it may or may not be relevant that not all ERP systems provide all ERP functionality and do it equally well. In this chapter we elaborate on the specific ERP-requirements for each particular LEAN method and why one would want to pursue that specific LEAN initiative

## **LEAN Benefits, ERP functionality**

### **Lean 1: Value Stream Mapping**

#### ***Benefits implementing Value Stream Mapping***

- “See the flow” of your value stream and wastes in the flow
- View all products from a system perspective
- Understanding both material and information flows of your value stream
- Draw a blueprint for LEAN transformation—the Future State Map
- Prioritize activities needed to achieve the Future State

#### ***ERP functionality required to support Value Stream mapping implementation.***

##### ***ERP 1: Financials***

- General ledger
- Accounts receivable
- Accounts payable
- Asset management
- Treasury management

##### ***ERP 3: Sales and Distributions***

- Prospect and customer management
- Sales order management

##### ***ERP 4: Manufacturing***

- Bills of Material
- Routings

##### ***ERP 5: Materials Management***

- Procurement
- Inventory management

##### ***ERP 6: Logistics***

- Warehouse management
- Transportation management

##### ***ERP 7: Reporting***

- Information is made available to particular users in the form of specific reports

### ***ERP 8: Business Rules***

- Customization

### ***ERP 9: Workflow***

- Decisions making and approval points
- Alert/warning rules

## **LEAN 2: Quality at the Source**

### ***Benefits implementing Quality at the Source***

- Will eliminate material waste
- Minimize work in process
- Optimize floor space
- Reduce lead-time
- Improve customer response time
- Leading to reduced costs
- Greater production capacity

### ***ERP functionalities required to support Quality at the Source implementation***

#### ***ERP 1: Financials***

- Asset management
- Treasury management
- General ledger

#### ***ERP 2: Human Resources***

- Personnel development

#### ***ERP 4: Manufacturing***

- Bills of materials
- Routings
- Quality management

#### ***ERP 7: Reporting***

- Information is made available to particular users in the form of specific reports

#### ***ERP 9: Workflow***

- Decisions making and approval points
- Alert/warning rules

## **LEAN 3: Workplace Organization: 5 S**

### ***Benefits implementing the 5S System***

- Improved quality
- Achieve work standardization
- Decreased changeover time
- Improved safety
- Reduced storage costs
- Reduced cycle time
- Reduced machine down time
- Boost employee morale as well as work environment

### ***ERP functionalities required to support 5S implementation***

#### ***ERP 1: Financials***

- Asset management
- Treasury management
- General ledger

#### ***ERP 4: Manufacturing***

- Bills of materials
- Routings
- Shop floor control

#### ***ERP 5: Materials Management***

- Inventory management

### **LEAN 4: Total Productive Maintenance (TPM)**

#### ***Benefits implementing TPM***

- Overall Equipment Effectiveness (capacity)
- Quality improvement
- Maintenance expenditure reductions
- Planned versus unplanned maintenance improvement

#### ***ERP functionalities required to support TPM implementation***

##### ***ERP 1: Financials***

- Asset management

##### ***ERP 4: Manufacturing***

- Plant maintenance
- Quality management

##### ***ERP 7: Reporting***

- Information is made available to particular users in the form of specific reports

##### ***ERP 8: Business Rules***

- Customization

##### ***ERP 9: Workflow***

- Approval points
- Alert/warning rules

### **LEAN 5: Visual Management**

#### ***Benefits implementing Visual Management***

- Highlights variation from the expected condition
- Keep everybody informed

#### ***ERP functionalities required to support Visual Management implementation***

##### ***ERP 7: Reporting***

- Information is made available to particular users in the form of specific reports.

##### ***ERP 9: Workflow***

- Alert/warning rules

### **LEAN 6: Set-up Reduction**

#### ***Benefits implementing Set-up Reduction***

- Reduce defects
- Reduce inventory costs
- Increase production flexibility
- Improve on-time delivery

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***ERP functionalities required to support Set-up Reduction implementation***

***ERP 1: Financials***

- Asset management
- Treasury management
- General ledger

***ERP 4: Manufacturing***

- Bills of materials
- Routings
- Production planning
- Capacity planning
- Shop floor control
- Production scheduling
- Quality management

***ERP 5: Materials Management***

- Procurement
- Inventory management

***ERP 7: Reporting***

- Information is made available to particular users in the form of specific reports

***ERP 8: Business Rules***

- Customization

***ERP 9: Workflow***

- Alert/warning rules

**LEAN 7: Batch Size Reduction (one-piece-flow)**

***Benefits implementing batch size reduction***

- Eliminate material waste
- Reduce work in process
- Optimize floor space
- Reduce lead-time
- Improve customer response time
- Reduce costs
- Greater production capacity

***ERP functionalities required to support Batch size reduction implementation***

***ERP 1: Financials***

- Asset management
- Treasury management
- General ledger

***ERP 4: Manufacturing***

- Bills of materials
- Routings
- Production planning
- Capacity planning
- Shop floor control
- Production scheduling

***ERP 5: Material Management***

- Procurement
- Inventory management

### ***ERP 7: Reporting***

- Information is made available to particular users in the form of specific reports

### ***ERP 8: Business Rules***

- Customization

### ***ERP 9: Workflow***

- Approval points
- Alert/warning rules

## **LEAN 8: Cellular Manufacturing**

### ***Benefits implementing Cellular Manufacturing***

- Product flows continuously
- Parts movement is minimized
- Wait time between operations is reduced
- Inventory is reduced
- Productivity increases

### ***ERP functionalities required to support Cellular Manufacturing implementation***

#### ***ERP 4: Manufacturing***

- Bills of materials
- Routings
- Production planning
- Capacity planning
- Shop floor control
- Production scheduling

#### ***ERP 5: Materials Management***

- Inventory management

#### ***ERP 7: Reporting***

- Information is made available to particular users in the form of specific reports

#### ***ERP 8: Business Rules***

- Customization

## **LEAN 9: Standardized Work**

### ***Benefits implementing Standardized Work***

- Reduce defects
- Reduce inventory costs
- Improve on-time delivery
- Quality improvement

### ***ERP functionalities required to support Standardized work implementation***

#### ***ERP 8: Business Rules***

- Customization

## **LEAN 10: Work Balancing (TAKT-time)**

### ***Benefits implementing Work Balancing***

- Product flows continuously
- Parts movement is minimized
- Wait time between operations is reduced

- Inventory is reduced
- Productivity increases

***ERP functionalities required to support Work balancing implementation***

***ERP 4: Manufacturing***

- Bills of materials
- Routings
- Production planning
- Capacity planning
- Shop floor control
- Production scheduling

***ERP 8: Business Rules***

- Customization

***ERP 9: Workflow***

- Alert/warning rules

**LEAN 11: Production Levelling / Smoothing**

***Benefits implementing Production Levelling***

- Product flows continuously
- Parts movement is minimized
- Wait time between operations is reduced
- Inventory is reduced
- Productivity increases

***ERP functionalities required to support Production Levelling implementation***

***ERP 4: Manufacturing***

- Bills of materials
- Routings
- Production planning
- Capacity planning
- Shop floor control
- Production scheduling

***ERP 5: Materials Management***

- Procurement
- Inventory management

***ERP 7: Reporting***

- Information is made available to particular users in the form of specific reports.

***ERP 8: Business Rules***

- Customization

***ERP 9: Workflow***

- Alert/warning rules

**LEAN 12: Point-of-use Systems**

***Benefits implementing Point-of-use System***

- Product flows continuously
- Parts movement is minimized
- Wait time between operations is reduced
- Inventory is reduced
- Productivity increases

***ERP functionalities required to support Point-of-use implementation***

***ERP 4: Manufacturing***

- Bills of materials
- Routings
- Shop floor control

***ERP 5: Materials Management***

- Inventory management

***ERP 7: Reporting***

- Information is made available to particular users in the form of specific reports.

***ERP 8: Business Rules***

- Customization

***ERP 9: Workflow***

- Alert/warning rules

**LEAN 13: Kaizen**

***Benefits implementing Kaizen***

- Immediate results
- Involvement of the workforce
- Visual, action orientation
- Can use ongoing, once the concepts had been learned
- Fosters communications
- Creative versus capital investments
- People think from a “business” perspective
- Implementation is smoothed due to the team concept

***ERP functionalities required to support Kaizen implementation***

***ERP 7: Reporting***

- Information is made available to particular users in the form of specific reports.

***ERP 9: Workflow***

- Approval points
- Alert/warning rules

**LEAN 14: Kanban**

***Benefits implementing Kanban***

- Reduced lead times
- Reduced work in process
- Optimized floor space usage
- Simplify production signals
- Improved on-time delivery to customers
- A single integrated system
- Streamlining processes and workflows
- Reduce redundant data entry and processes
- Establish uniform processes that are based on recognized best business practices
- Information sharing across departments
- Improved access to information
- Improved workflow and efficiency
- Improved customer satisfaction based on improved on-time delivery, increased quality, shortened delivery times

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- Reduced inventory costs resulting from better planning, tracking and forecasting of requirements
  - Turn collections faster based on better visibility into accounts and fewer billing and/or delivery errors
  - Decrease in vendor pricing by taking better advantage of quantity breaks and tracking vendor performance
  - Track actual costs of activities and perform activity based costing
  - Provide a consolidated picture of sales, inventory and receivables

***ERP functionalities required to support Kanban implementation***

***ERP 5: Material Management***

- Procurement
- Generate purchase orders
- Receive goods into inventory
- Inventory management
- Visibility into all stock locations
- Stock movement tracking

***ERP 7: Reporting***

- Information is made available to particular users in the form of specific reports.

***ERP 8: Business Rules***

- Customization

***ERP 9: Workflow***

- Approval points
- Alert/warning rules

## Application

In this paper we concluded that *specific* LEAN initiatives will eventually fail without considerable attention to *specific* ERP aspects and that *specific* ERP implementations require the guiding hand of LEAN principles to fulfil their objectives.

Simply put, LEAN initiatives develop superior 'parameters' to plan and control the business; those 'parameters' are often used to configure the ERP system – as well as companion systems such as MES (Manufacturing Execution Systems), APS (Advanced Planning and Scheduling Systems), supply chain collaborative systems and even planning boards, PCI's and tracking devices – that then ensure consistent execution.

When considering whether or not ERP in general or a specific ERP system in particular has the potential to support LEAN, the first step must be to establish the nature of the LEAN initiative, particularly which of the fourteen LEAN methods are relevant.

Subsequently, using the LEAN-ERP matrix as a look-up table, one can then find the supporting ERP core modules that should be in place or be planned for implementation concurrently with the LEAN initiative.

Finally, these requirements for ERP support can then be compared with the capabilities of the specific ERP system under consideration. If the ERP system is strong in its core functionality in the particular area demanded by the specific LEAN initiative, it is a good fit. If the ERP is a lightweight or relies on companion products for functionality in this area, one should conclude that for this *specific* LEAN initiative this *specific* ERP system is probably not a good fit.

It is also critically important to note that the way the ERP system is *implemented* determines whether any benefit will accrue to the LEAN initiative. Naturally, ERP functionality that is not implemented or is not working probably in a particular instance will remain a *potential* to support LEAN and not a reality.

Furthermore, one needs to consider the long term: LEAN strives to continuously modify processes in order to move closer to the ideal status whereas ERP works best when a particular configuration is set up once and then left to run consistently. Even where the mutually supportive nature is obvious, this will not happen automatically and will require specific attention.

***Our conclusion: Without good systems that ensure consistent and routine execution, the process improvements achieved through LEAN initiatives are unlikely to be permanent.***

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