



# The concurrent application of lean production and ERP: Towards an ERP-based lean implementation process

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## ABSTRACT

Lean production and enterprise resource planning systems are often quoted as being the two most important strategies for achieving competitive advantage in today's global manufacturing environments. Though IT has traditionally been viewed as a contributor to waste within lean production, we suggest that modern developments in IT and the onset of hybrid “push-pull” production control mechanisms have allowed ERP and lean approaches to converge towards a state where ERP systems can in fact be used to support the deployment of lean practices. This paper analyses typical lean and ERP implementation processes contained within the scientific literature, and by further examining a concurrent implementation process in real-time, we develop and propose a process for ERP-based lean implementations. Our findings suggest that the implementation of a contemporary ERP system can act as a catalyst for the application of lean production practices.

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## 1. Introduction

There seems to be a continuous debate in the literature as to whether or not lean production and information technology can be successfully combined in an enterprise (e.g. [6,9,15]). However, in practice, companies have been building hybrid environments in which they take advantage of lean production practices facilitated by developments in information technology for quite some time [48]. This article attempts to shed light on the argument by addressing the parallel application of both approaches. By adopting an action research methodology, we examine the concurrent application of ERP and lean production practices within a single organization, in order to develop an ERP-based lean implementation process. Though coverage of such dual-implementations is currently very low, Masson and Jacobson [35] suggest that ERP-based lean implementations will grow over time. We draw parallels between the ERP and lean implementation processes, and show how the ERP implementation process can in fact behave as a catalyst for lean implementation. In order to guide our inquiry, we pose the following research question:

**RQ.** How can existing methodologies for the implementation of lean production and ERP systems be combined to develop a single “best-practice” process for ERP-based lean implementations?

### 1.1. Enterprise resource planning (ERP) systems

ERP is one of the most widely accepted choices to obtain competitive advantage for manufacturing companies [66]. ERP systems are designed to provide seamless integration of processes across functional areas with improved workflow, standardization of various business practices, and access to real-time data [32]. The fundamental benefits of ERP systems do not in fact come from their inherent “planning” capabilities but rather from their abilities to process transactions efficiently and to provide organized record keeping structures for such transactions [24].

Hopp and Spearman [22] suggest that whilst (at least on the surface) ERP seemed to contain aspects of just-in-time (JIT) by providing modules with names like “repetitive manufacturing” that provided the capability to level load the MPS and to implement pull, the philosophical elements of continuous improvement, visual management, and mistake proofing were missing.

### 1.2. Lean production

Lean production is based on the principles and working processes of the Toyota Production System (TPS), and has been defined as doing more with less [65]. In its simplest terms, lean production can be described as the elimination of waste [30]. It has been most prominent in discrete, repetitive assembly-type operations [43]. Liker [30] suggests that the goals of lean production are highest quality, lowest cost, and shortest lead

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time. Lean production can be considered as a philosophy and as a set of tools and practices for the continuous improvement of operations.

## 2. Existing methodologies for the implementation process

The extant literature in the form of international academic journals and educational textbooks was examined in order to identify existing processes and methodologies for the implementation of ERP systems and lean production. The most frequently cited implementation processes were selected for further analysis. The main criterion for selection was that the identified implementation process should have a definite sequence (i.e. a step-by-step implementation process).

### 2.1. ERP implementation process

Implementing an ERP system is an expensive and time consuming process [51]. In the world of ERP, the term implementation is often used to describe a well-defined project, spanning from the choice of the system, through its configuration and training of users, to “go-live” [5]. However, Kraemmergaard et al. [28] show that go-live only really marks the start of the actual implementation, which is often an infinite process of correcting software errors, adding new functionality and new modules, and implementing updated versions. Needless to say, a formalized project approach and methodology have been identified in the literature as a critical success factor for the ERP implementation process [14,21]. Several researchers have developed process models of ERP implementation [41]. The implementation processes examined herein are Markus and Tanis’s [34] four phase model; Berchet and Habchi’s [7] five-stage model; Rajagopal’s [46] six-stage model (which is based on Cooper and Zmud’s [11] “Model of the IT Implementation Process”), Jacobs and Whybark’s [25] accelerated implementation process for SAP R/3, Harwood’s [16] ERP implementation cycle, and Wallace and Kremzar’s [61] “ERP Proven Path” methodology for ERP implementation. Common elements from each of these methodologies have been identified, and a comparison is made in Table 1. Due to the prominent nature of Proven Path, and the fact that it is by far the most comprehensive methodologies of the five studied, we select the ERP Proven Path model as the basis for the development of a best-practice process for ERP-based lean implementations.

#### 2.1.1. Wallace and Kremzar’s [61] ERP proven path

The most comprehensive and also perhaps the most well-known framework for ERP implementation is that of *ERP Proven Path* [61]. This section will give a brief overview of the methodology. For a more in depth account, see Wallace and Kremzar [61] (Fig. 1).

Though ERP Proven Path appears at first to be a significantly complex framework, it consists of only three main phases: Phase I (basic ERP); Phase II (supply chain integration); Phase III (corporate integration). Though it is not identified in the figure, Proven Path also has a Phase 0 that describes the various elements that must logically occur before Phase I.

**2.1.1.1. Phase 0.** The starting point of ERP Proven Path is to conduct an analysis of the company’s current situation, for example in order to assess current problems, opportunities, and strategies. Wallace and Kremzar [61] suggest that executives and top managers should then learn the basics of how ERP works, and what is required for its effective implementation. They also suggest that a vision statement should be created, in the form of a written document that defines the desired environment to be achieved with the ERP implementation. A cost–benefit analysis is the final part of Phase 0, and this activity will end with a go/no-go decision.

**2.1.1.2. Phase I: basic ERP.** Phase I of the Proven Path methodology begins with creating the project team and executive steering committee, and consists of project planning and setting of performance goals. Phase I includes the selection, configuration and installation of the basic ERP package, including sales and operations planning, demand management, rough-cut capacity planning, master scheduling, material requirements planning, and the necessary applications for finance and accounting; and ends with ERP system “go-live”, or what Wallace and Kremzar call “cutover”. This phase will normally take between 9 and 12 months to complete.

**2.1.1.3. Phase II: supply chain integration.** Phase II consists of all of the processes that extend ERP backwards and forwards in the supply chain: back to the suppliers (e.g. B2B e-commerce) and forward to customers (e.g. CRM; VMI). Wallace and Kremzar suggest that this phase will usually take three to six months, depending on the scope and intensity of the applications.

**Table 1**

A comparison of ERP implementation processes.

	Berchet and Habchi [7]	Harwood [16]	Jacobs and Whybark [25]	Markus and Tanis [34]	Rajagopal [46]	Wallace and Kremzar [61]
Building a business case		X		X		X
First-cut education						X
Establish strategic goals and vision	X				X	X
Investment decisions and cost–benefit analysis	X	X			X	X
Define and establish project organization		X	X			X
Define performance goals		X				X
Define system requirements	X	X	X		X	X
Software and vendor selection	X	X		X	X	X
Define processes	X	X	X	X	X	X
Business process reengineering (BPR)		X		X	X	
Data cleanup and conversion (data integrity)			X	X		X
Software configuration		X	X	X		X
Software installation	X					X
Software customization				X	X	X
System integration				X	X	X
Ongoing training/learning	X	X	X	X		X
ERP system Go-live	X	X	X	X	X	X
Continuous improvement	X	X	X	X	X	X
Evolution (software upgrades, additional modules, etc.)	X			X	X	X

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