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Felix Piazolo
Michael Felderer *Editors*

Innovation and Future of Enterprise Information Systems

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ERP Future 2012

Felix Piazolo and Michael Felderer

Abstract This is the introduction of the ERP Future 2012 Research Conference proceedings. It provides a short motivation and an overview of the topics covered by the conference.

Todays distributed business processes cannot be managed efficiently without the use of information technology. In particular, enterprise resource planning (ERP) systems have significantly increased the profitability, productivity and competitiveness of corporations by removing the barriers to sharing information between functional areas and managing processes holistically. The key driver for this productivity and efficiency is the ability of modern ERP systems to manage business processes from beginning to end in an integrated, consistent and highly effective manner. But ERP systems are very complex information systems and the business as well as the technical environment is steadily evolving. Therefore innovations in business and IT resulting in suitable implementations have to be developed, adopted and evaluated to profit from the benefits of ERP systems permanently. According to the customer needs and influences of the rapidly changing business and technological environment the paradigm for ERP systems in general will change in the future.

Actual trends in ERP include without limitation software as a service (SaaS), cloud services in general, mobile solutions, ERP for small and medium sized enterprises (SME), open source and freeware solutions, e-learning support, social media integration, efficient and effective quality management and planning methods as well as techniques and criteria for the selection and evaluation process. The decision whether and how to take these trends into account has to be supported by scientifically evaluated studies. To provide a realistic result, such studies

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have to consider business and IT aspects. For instance, software as a service, i.e. on-demand software hosted on the cloud, comprises business challenges like total cost of ownership or ERP for SME as well as technical challenges like application integration or IT-security.

The ERP Future 2012 Research conference is a platform for research in ERP systems and closely related topics like business processes, business intelligence, and enterprise information systems in general. To master the challenges of ERP comprehensively, the ERP Future 2012 Research conference accepted contributions with a business as well as an IT focus to consider enterprise resource planning from various viewpoints. This combination of business and IT aspects is a unique characteristic of the conference that resulted in several valuable contributions with high practical impact. Revised versions of these conference contributions are collected in the present proceedings of the ERP Future 2012 Research conference entitled "Innovation and Future of Enterprise Information Systems".

A critical outlook regarding the future of ERP is given by the initial keynote speaker [1]. Two contribution related to keynotes discuss on how ERP systems and Lean Management methods fit together [2] and the challenges and potentials for organizations realized by Social Content Management Systems (SCMS) [3].

Understanding critical factors for successful implementation of ERP systems is essential for organizations. On the one hand, critical success factors of SaaS in SME are investigated [4]. On the other hand, critical success factors of implementation projects in U.S. federal offices are analyzed by a survey [5]. Additionally it is investigated, whether predefined ERP implementation methodology works for public companies in transitioning countries [6] and how cross-functional collaboration influences ERP benefits in ERP post-implementation integration projects [7].

Innovative business concepts require suitable implementations in ERP systems. In this context, the consideration of supply uncertainty of renewable resources in the basic data structures of ERP systems [8] as well as total budgeting and the interactive budget warehouse are presented [9].

ERP planning requirements are looked at by two contributions. One addresses the ERP planning garbage and how to prevent it in the manufacturing industry [10], and the other evaluates the need of semantic verification in planning requirements in general [11].

For taking the business perspective in testing ERP systems into account value-based requirements coverage [12] and a cost-benefit analysis for automated testing of ERP GUIs are proposed [13]. Additionally, one contribution presents a quality analysis procedure for request data of ERP systems that is applied in an industrial case study [14].

As SaaS is a major trend influencing the ERP market the analysis pattern for the transformation of ERP system landscapes by SaaS [15] and the customization of on-demand ERP software for SMEs [16] are discussed. To manage business processes, one contribution presents a platform for mobile, distributed workflow enactment services [17].

Looking at the human interaction with ERP systems, it is evaluated based on user perceptions whether a browser-based or a dedicated ERP client is needed [18] and what the critical success factors for e-learning as an end-user training method are [19].

Finally, to what extent ERP is utilized and suitable for decision making is also presented [20].

We thank all authors for their contributions. We hope that the contributions are interesting for the reader and valuable for the scientific community as well as for industrial application.

Special thanks go to Kerstin Fink, rector of the Salzburg University of Applied Sciences, and her team for their commitment and cooperativeness to host the ERP Future 2012 Research conference, Kurt Promberger and Christoph Weiss for initializing the ERP Future Business conferences in 2009, Ruth Breu for supporting the set-up of the first ERP Future Research conference, Comarch, Comarch Innovation Lab (CIL) and SIS Consulting as premium sponsors and last but not least all members of the ERP Future 2012 team who enabled us to organize such a very successful and valuable conference.

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Part I
ERP Future

The Future of ERP: A Critical Outlook

Helmut Guembel

Abstract This is a short and critical outlook regarding the future of ERP systems given by the keynote speaker of the ERP Future 2012 Research conference.

Enterprise Resource Planning software is the standard commercial software backbone in enterprises, many financial services companies and even in government agencies, including defense organizations. It has developed over decades and has been around since about 1990. Since then, it has expanded considerably in functionality. Today, organizations using ERP find themselves allocating an ever increasing portion of their IT-budget.

This is accompanied by a strong sense of disillusionment as most of the original expectations have not been met. The once so attractive integration has grown quite uneven in quality and plans to roll out all available functionality globally have been either curtailed or tacitly shelved. In particular, the leading ERP vendors have been very successful in achieving customer lock-in as the costs for switching to other solutions is prohibitively high. Due to the common practice of precluding partial cancellations of maintenance agreements, customers cannot easily migrate function-by-function to a better fitting solution. In some cases, customers are paying for thousands of users that once existed but are no longer required due to organizational changes. This has caused them to think harder when buying ERP software—but by no means hard enough. ERP vendors find new ways to sell additional and often unnecessary software and they really have become good at it.

Well protected by this situation, ERP vendors seek to leverage the situation. Under the pressure of their investors who pride themselves with having achieved maintenance income margins around or exceeding the 90 % level, they have grown into huge organizations with painfully low productivity levels. Huge development budgets have created dozens of mediocre extensions that permeated the installed base in a snail's pace. While the ERP customers were reluctant to

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spend millions migrating to newer versions without any positive effect to their own bottom line, the vendors found themselves having lost contact with their installed base. The newer products often required updating to the latest ERP base product version before a customer could install them.

Sustainability was and is not part of the vendors' agenda. With enormous creativity, they found new ways to make their customers buy add-ons regardless of their ability to install and use them productively. Products that sit on the shelf create maintenance revenue without burdening the vendor as products that are not installed will not break.

In the longer run, however, this is likely to harm both ERP customers and ERP vendors. The customers lose their ability to innovate for a number of reasons:

- Their budgets are increasingly confined to software that is not used.
- The architecture of the ERP products is both antiquated and hard to understand making extensions of any kind difficult.
- The ERP software, once viewed as a business enabler, causes enterprises to adapt to newer market scenarios slowly.

The ERP vendors, on the other hand, face new competition and are increasingly exposed to plans of line of business managers that do not primarily focus on ERP. They rather fancy pursuing their own route to what they believe is emancipation from the limitations imposed by the ERP behemoth. It is a clear repeat of what happened when mainframes started to vanish and departmental computing became a key trend. Cloud computing, mobile applications, and, in some cases, even Open Source offerings challenge the incumbent vendors. They find it difficult to leave their lucrative business models behind. This, however, is a key pre-requisite for their own transformation into a next generation vendor.

In the interim, they aim at achieving this transformation on a cosmetic level. Through acquisitions they increase both their functional footprint and market share. Cleverly working some impressive key performance indicators, they try to convey the impression that they have a leading position in every respect. In actual fact, it is the stable core ERP business that creates 80 % of their revenue with the new business contributing much less. It remains to be seen if the incumbent vendors will continue to prevail or if they will be replaced by new and more agile players who neither want to be in their footsteps nor believe in the once so promising tight integration from a single source—a paradigm that the big vendors themselves can no longer deliver on.

The current "sea of tranquility" may be challenged in the near future. The advent of machine to machine (M2M) communication capabilities can easily increase transaction volumes by orders of magnitude. Data volume will explode and transaction networks will emerge. Both Oracle and SAP have understood the impact on data management and preparing themselves to take advantage of "Big Data" even though there are still only a few projects. Financial analysts have bought the story and SAP's stock has climbed to new all-time record levels.

While this certainly will influence the whole ERP market in a great way, it will not unfold overnight. Nor will the effect reach all industries and market segments

at the same time. It will, however, quite likely put up as many challenges for the incumbent vendors as it creates opportunities. It is hard to see the kind of dominance recurring that we have experienced in the ERP market as we know it for the very reason that these transaction networks cannot be dominated by a few vendors. They are much more volatile and we are heading towards increased requirements for openness and interconnectivity. There is no room for the lock-in that we see today.

There are a few requirements that have been stubbornly ignored by the ERP industry. They will become increasingly important in the dawning age of the Internet of things. One is the possibility to scale back maintenance agreements or to replace them altogether by maintenance on demand models. Another requirement is to provide management tools for distributed processes. New requirements in the governance area will cause users to install tools to manage these that are application independent. The user empowerment caused by a plethora of smart devices will create a new breed of ERP users. As the current philosophy of the leading ERP products has its roots in the pre-Internet era, we can sense the approach of a turning point. ERP will not survive as the holy grail of its protagonists hoping for an ERP^{III}. It rather may quite likely emerge in a quite different guise—this time a lot closer to a "best of breed" approach.

Haven't we made good progress with application integration recently?

Lean ERP: How ERP Systems and Lean Management Fit Together

Martin Adam, Johannes Keckeis, Peter Kostenzer and Heiner Klepzig

Abstract Lean Management and ERP systems are seen as contradicting each other. Lean Management goes for low cost automation, simplicity and high visibility of information flow whereas ERP systems might become complex and intransparent. This article outlines a research project that combines pros of both. This is called Lean ERP. First results of a study showed that it really is a niche market while a surprisingly high number of ERP providers already offer Lean support in their software.

1 Introduction

1.1 Lean Management and its Cons

Lean Management has its origin in the Toyota Production System (TPS). TPS is a management philosophy that includes the entire organization—people, culture, processes. Its first elements go back to the 1920′s and were meant to fix cost problems when Toyota was still a loom company. Further elements were developed by Taiichi Ohno to cope with new challenges concerning flexibility in the

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1950's. Low costs, high flexibility and quality lead to profitability which is the ultimate goal of TPS. Costs are reduced by eliminating waste, demand-driven planning and balanced processes. Small batch sizes reduce lead time and drive flexibility. Enabling employees and customer orientation helps to reach quality [1]. "Lean Management" as a term was introduced by Womack et al. [2] in the 1990's after having studied the TPS.

Lean Management nowadays is widely applied in the automotive industry. It also became popular in other industries, even in services. New terms like Lean Accounting, Lean Office or Lean IT demonstrate its popularity. Nevertheless, cons were expressed that will be discussed in the following [3]. As excessive inventory raises costs and huge batch sizes lowers flexibility, Lean Management goes for short planning horizons and produces only according to customer demand. By nature Lean is reaction-based as it does not consider forecast. Lean is more tactical and job-floor oriented than strategic. This might be a problem for companies with long production cycles or for companies that rely on high demand components with long order lead times.

Ideally, production is balanced and the product flows without interruption from one step to the other. If cycle times of the process steps vary too much, balancing is not possible and Kanban signals are used to pull from downstream. The most downstream process step triggers the entire production line. This simplifies planning a lot as only one step in the entire production lines needs to be scheduled. As Supply Chain Management becomes more integrated, critics argue that physical Kanban signals cannot move out of the plant to suppliers. This might also be a problem in case of multisite companies.

Data handling engenders criticism as well. A core element in Lean is Visual Management. Current performance data are displayed on the job floor to everybody. Employees and management see at a glance if the process is in or out of control. Correction actions can be taken immediately. Therefore current performance data are needed. Critics argue that without adequate IT support, data gathering, formatting and displaying might become exhaustive and lead to errors.

1.2 ERP Systems and its Cons

Similar to Lean Management, "Enterprise Resource Planning Systems" (ERP) also face its challenges. ERP started from simple Material Requirements Planning Systems (MRP) and moved into all aspects of a company including its relationship with suppliers and customers. Functionality steadily grows and with it ERP are getting complex. Visibility of processes gets lost.

ERP provide workflows for business processes that are often best practice. On the one hand, companies may reach a better level of process support by implementing ERP. On the other hand, this promotes inflexibility as the processes are primarily hard coded and modification is mostly limited by the companies to a minimum in order to avoid additional costs.

One big advantage of ERP is data handling. All relevant data are inside the ERP database. Decomposing bills of material, analyzing component order lead times, calculating tact, timing and sequencing orders is done automatically. On the other hand, data are often average and variation is not considered. Job floor scheduling ignores real demand and central steering does not react properly to unplanned incidents like broken die.

1.3 Lean Management Versus ERP Systems

Lean Management and high cost automation are often seen as contradictory [4]. This also applies to IT support. Lean advocates argue that IT leads to intransparency of the process flow as visibility is lost. Job floor employees no longer see the information flow. They cannot react immediately if something happens, like postponing material replenishment due to longer change over times, as everything is preplanned and steered centrally by computers in large scale. In that case, IT diminishes the problem solving ability of a single worker just where continuous improvement is essential to Lean. Companies often move towards Lean Management as a response to the complexities and intransparency brought in by IT. So, typically, the Lean advocates resist using IT until lean principles are implemented manually [5].

Nevertheless, IT systems are heavily used in most of the companies. So, whenever, a company moves toward Lean Management, and as we have noticed, a growing number of companies does this, there are always discussions of pros and cons of ERP. Sometimes they follow more the ideological path than the rational. Sometimes simple questions occur like, how much "pull" is needed? Do we still need our push signals from ERP or do we rely purely on paper based pull signals from downstream? Shall we skip forecasting and rely entirely on current demand? These are the kind of questions that laid the ground for the following research.

1.4 Lean Management and ERP Systems

Having highlighted some of the challenges that Lean Management and ERP face today, we argue that both complement each other well. As discussed before, Lean Management has its pros in demand driveness and its short comings in forecasting and coping with long ordering lead times. As far as ERP is concerned it is not able to handle unplanned situations on the job floor. Combining both ERP forecasting functions, including decompositions of complex bills of material with Lean pull job scheduling might help [6].

One main reason why ERP is implemented is accurate real time reporting. This is exactly what Lean needs for its continuous improvement principle: accurate data of current performance with high visibility to those who are concerned. Without a

single database, dedicated data entry points and analyzing and displaying functions as it is offered by ERP and Business Intelligence systems this might become time consuming and error prone. ERP can make these processes less labor intensive and provide visibility to performance, error handling, job status and inventory more easily [7].

So this is what we call Lean ERP: ERP systems that support Lean principles.

2 Spread of Lean ERP

In a recent study conducted by the University of Applied Science in Kufstein/Tyrol 21 out of 35 ERP software producers reported that their systems offered some sort of Lean Management support. These functions have been developed in the last 2–4 years in most cases. Consequently, supporting Lean principles within ERP are quite a new phenomenon. Software producers that are new in business and those that are well-established offer more Lean support than others. The new and small companies often built their ERP on the base of Lean principles and found a new niche. Whereas the established ones, like SAP, Oracle or Infor, augmented their existing wide range of functionalities with Lean support.

Whether an ERP system has implemented Lean functions or not also depends on the industry, e.g. ERP for the construction branch have less Lean support. The more international the users of an ERP system are, the more they use ERP with Lean functionalities. ERP support Lean principles mainly in their material management, production and sales modules. This is not surprising, as this is where Lean comes from and where Lean is mostly applied. Interestingly most of the ERP producers do not plan to further develop into Lean as customer demand is low.

This leads us to the second part of the study. Although many software providers offer Lean functionalities in their systems only 4 out of 80 companies within our study are using them. This means that it is really a niche market. As stated above, Lean advocates are ambiguous about IT support, this has also be proven in the study: companies who go for Lean do not automatically use Lean ERP. They often modify functionalities in their classical ERP systems and they don't buy specific Lean ERP software. On the other hand, if an ERP system offers Lean support, companies are likely to use them. The use of Lean ERP systems depends of the size of the company, showing that mid-size companies are more ahead than small or large ones.

3 Areas of Research in Lean ERP

We found that Lean Management and ERP systems is not a question of one or the other but that they might fit together. We have identified fives areas of interest for further research (see Fig. 1).

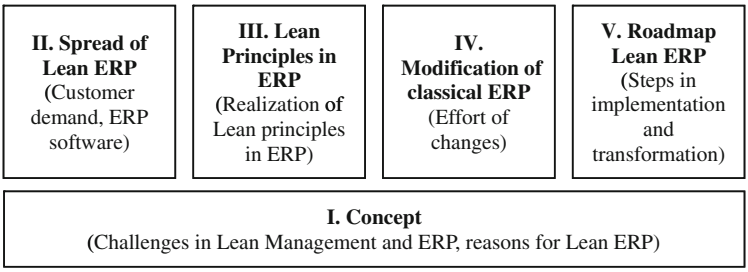

Fig. 1 Areas of research in Lean ERPLean ERP

A first comparison of the Toyota Production System and a modern ERP system showed the following differences (see Fig. 2).

Categories:	Toyota Production System	Modern ERP
Motivation	• Raise profit by flexibility & quality (e.g. elimination of waste, demand-driven planning, balanced processes, continuous	• Get better information and higher productivity by automation of processes and integration of functions
Orientation	• Optimization of single business processes	• Integration of all business processes
Tools	• Low cost automation • Visualisation	• IT- support • Digitalisation
Production strategy	• Continuous flow & Pull – System • Shopfloor orientation • Mainly „Bottom-up“	• Push – System • Management orientation • Mainly „Top-down“& partly „Bottom-up“
Planning / Scheduling / Controlling	• Local • In-house view • Short-term planning (demand driven) • Small batch sizes • Physical Pull signals (Kanban)	• Centralized • In-house & cross-company view • Long-term (forecast) & short-term planning • Large batch size • Electronic central steering

Fig. 2 Differences between the Toyota Production System and ERP systems

The comparison shows that modern ERP systems follow a philosophy that emphasizes on large-scale production and full load of machinery. This is contrary to the Lean principles.

4 Conclusion and Further Research

In this paper we have outlined that Lean Management and ERP systems are seen as contradicting each other. On the one hand, modern ERP systems implemented a production system that focuses more on equipment efficiency than on demand flexibility. On the other hand, Lean advocates have their doubts about the in-transparency and complexity of fully IT-automated processes. Nevertheless, most of the companies have implemented ERP systems in order to overcome some of the cons of Lean Management. This is the motivation of a research project which looks for opportunities to combine both, Lean Management and ERP systems. This is called Lean ERP. First results of a study showed that Lean ERP is a niche market while a high number of ERP providers already offer Lean support in their software. Further areas of research were, besides the realization of Lean principles in ERP systems, the modification of classical ERP towards Lean and a roadmap for Lean ERP.

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Social Content Management Systems: Challenges and Potential for Organizations

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Abstract At around the time of the new millennium, Enterprise Content Management (ECM), a concept for the enterprise-wide management of information, emerged. However, the trend toward adapting social media technology brings a new situation for ECM, as organizations are challenged to manage diverse "social content" from social media in order to ensure quality and compliance. At the same time new opportunities arise from social content as a powerful asset for creating business value. Recognizing the importance of social content has led to the development of a new generation of information systems, Social Content Management Systems (SCMS). SCMS are ECM systems that focus on the management of social content. SCMS have yet to receive much attention in research, particularly in terms of their potential benefits and the challenges organizations may face in using them. This paper evaluates the importance, potential benefits, and challenges of SCMS for organizations through a survey of 89 professionals from several countries and industries. For the survey we draw on challenges and potential addressed in the existing literature of SCMS and social media use in organizations.

1 Introduction

Organizations are continuously challenged by the management of increasing amounts and varieties of digital information types and formats [24]. Particularly the management of unstructured information, such as emails, presentations, and Word documents, which constitutes around 80 % of an organization's information

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