The Role of Enterprise Systems in Process Innovation

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Abstract

Process innovation—redefining the way of doing business—is of paramount importance for the sustainable success of organizations. Innovation initiatives must relate to latest technological developments and opportunities these offer. The important role of enterprise systems in process innovation is neglected in many of these initiatives. This chapter highlights the different roles enterprise systems can play in an innovation scenario and analyzes the interrelation of technological innovation and enterprise systems as process management platforms. The ambiguity of opportunities offered by new technology is illustrated by the example of the cloud computing paradigm. The chapter closes with the description of a solution path for an improved integration of enterprise systems in process innovation initiatives.

1 Introduction

Many contributions have in the last years focused on the way in which IT triggers or enables innovation and the accompanying change (cf. Markus, 2004; Turedi & Zhu, 2012). The findings refer to data integration and business process support as the main benefits of enterprise systems and analyze their potential to rethink and redesign business processes in process innovation activities. Process innovation, as it concerns us in this chapter, focuses on the adoption of new IT in an organization, both in a material and conceptual form (Wang, 2009), and is usually distinguished from product innovation processes targeting new products for customers.

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In search of process improvement, organizations analyze and evaluate emerging technologies, considering fields of application in their process landscape. Following this argumentation, one core area of process innovation must lie in the embedding of technology in an organization, i.e. its enterprise system.

An organization's enterprise system consists of many different applications that form *the* enterprise system of an organization in the sense of an individually designed solution integrating all business applications. Different parts of an enterprise system are in different phases of their application lifecycle. Today's understanding of an enterprise system must consider this specific complexity. Such a system type does not follow a clearly identifiable lifecycle, as pre-packaged, homogeneous solutions did earlier (Davenport, 1998; Shanks, Seddon, & Willcocks, 2003). With regard to innovation, new technologies and concepts are applied and integrated in enterprise systems continuously. Today's enterprise systems are therefore permanently undergoing change and are moved from one stable state to the next by each modification of system parts.

In many cases, enterprise systems are considered to be a supporting tool for existing processes, providing integration and connectivity between different areas or departments of an organization. Enterprise systems used to be custom-made developments for a single organization. Flexibility was achieved by changing program code. This type of system was designed to support an existing process landscape. In the last decades pre-packaged solutions became the most important mode of delivery for enterprise systems. This has led to reduced flexibility in the adaptation to existing processes. At the same time new technologies were integrated in enterprise systems, causing tremendous change in functionality. Therefore, every new software release is an opportunity for process innovation in an organization and a challenge to take maximum advantage of this opportunity.

2   Different Roles of Enterprise Systems in Process Innovation

The following section describes the main roles that an enterprise system can have in a process innovation scenario. These roles relate to the heterogeneous application landscape that makes up such a system. Changes in applications and integration of new technologies lead to opportunities for process innovation. An innovation scenario—besides other components—consists of a trigger (operant resource) and an enabler (operand resource) for innovation (Nambisan, 2013). This basic idea of different roles that IT can take in innovation processes is transferred and extended to the field of enterprise systems in process innovation in the following discussion. Due to the specific characteristics of enterprise systems, three roles are identified.

2.1   Enabler

Enterprise systems are the main component of an organization's IT landscape. Due to the fact that they are highly customized off-the-shelf products or custom-made solutions, a lot of an organization's process knowledge is stored in and represented by these systems.

Process innovation activities always have to relate to an existing enterprise system in an organization in order to create tangible results. The diffusion of process innovation results is achieved by implementing the modified processes in an enterprise system. This is considered to be the role of an enterprise system as an enabler for process innovation. The trigger for process innovation is an event that is not connected to the enterprise system, such as legal changes, business process reengineering projects, mergers, etc.

2.2   Trigger

An external trigger for innovation is usually assumed when discussing the role of an enterprise system as innovation enabler. Process innovation is initiated by activities external to the enterprise system and implemented by changing it. This scenario relates to changes in the enterprise system (e.g. new software releases and adding mobile computing components) triggering the process innovation. Additional capabilities of the system allow a new way of doing business. Process innovation is triggered within the enterprise system in this scenario. The new opportunities offered by the enterprise system lead to a redesign of processes and creates an increased value contribution. An enterprise system represents a strategic resource creating sustainable competitive advantage due to a unique orchestration and usage pattern of applications in this scenario.

2.3   Enforcer

While triggering an innovation is characterized by an increase in possibilities that a system is offering, the role of an enforcer describes the situation when modifications to an enterprise system force a process innovation due to changed system capabilities. An enterprise system consists of applications in different lifecycle phases. Especially the replacement and disintegration of legacy systems forces process change: a new system is brought into use and must be integrated in an organization's process landscape. The significant difference to triggering an innovation lies in the *change* of system capabilities—compared to a capabilities *increase* in the case of triggering. Similar to the trigger role, the source of innovation lies in the enterprise system. In many cases organizations use this role to justify a business process redesign because of the implementation of a new enterprise system component. They back up a process innovation initiative by the changed capabilities of a new system component to achieve increased acceptance of

changing routines by the end user. The role of an enforcer is one of the reasons why enterprise system implementation projects are considered to be highly complex, causing tremendous change to an organization.

2.4   Implications

CIOs have to consider all three roles that an enterprise system can play in process innovation when discussing changes to the system. The enterprise system is an innovation platform that triggers innovation and enables the diffusion of process innovation in an organization at the same time. Considering only one of these roles is an oversimplification that is likely to cause the misunderstanding and failure of innovation initiatives. This shows the importance of a thorough understanding of the possibilities of new technologies, as the embedment in enterprise systems (e.g. mobile computing, in-memory computing, cloud computing) is a possible source of process innovation.

To achieve successful process innovation in a digital world, the interrelation between existing enterprise systems, new technologies, and process innovation triggers must be understood and the complexity must be considered. A definition of the enterprise systems' role in an organization process innovation initiative can help to identify the system's importance as a strategic capability supporting a sustainable competitive advantage. Enterprise systems do not only provide a platform for process implementation in an organization—even more, they are *the* process management platform of an organization. One of the latest developments to enable process support is the implementation of a dedicated process management layer, which enables process modeling based on semi-formal process modeling languages, including the invocation of software services by an activity. This new design paradigm enables a detailed adaptation of the software and implementation of process innovation while using the standard methods provided.

However, enterprise systems are only able to provide value contributions when optimized business processes are deployed. Best-practice process templates provided by enterprise system vendors are tempting—especially for SMEs. Adopting standard processes can jeopardize competitive advantages based on company-specific process excellence. The necessity for process standardization evoked by an implementation project represents an important business process improvement activity for many organizations at the same time.

3   Application Example: Implications of Cloud Computing

The following section illustrates the complexity and ambiguous opportunities an organization is confronted with when considering the implementation of a new technology. It exemplarily highlights the potentials of cloud computing paradigm adoption based on company size as classification criterion.

Cloud computing has been a buzzword in the area of enterprise computing for some years now. However, the expectations towards the implementation of a cloud computing model for an organization's enterprise system are ambiguous. In many cases cloud computing is understood as a pure *cost-cutting* measure which enables an easier operation of enterprise systems. Due to economies of scale, a cloud computing provider can deliver higher performance at lower cost compared to on-premise (in-house) operation models. Cloud computing is therefore understood as *new generation outsourcing* within many organizations (Salleh, Teoh, & Chan, 2012). Another field of application is the implementation of an enterprise systems extension, like customer relationship management software or the establishment of a common integration platform along a supply chain. In these areas cloud computing is understood as a *rapid deployment solution* providing flexible scalability in run-time phase, while also providing standardized access for different organizations at the same time.

Cloud computing is, moreover, used for *integration of new technology* while using standardized platforms. Cloud computing enables, inter alia, integration of in-memory computing and mobile device access to enterprise systems. Integration can be achieved much easier *in the cloud* by using the existing infrastructure of a cloud solution provider than by implementation in conventional on-premise solutions.

The examples given above show the different expectations towards cloud computing deployment. While it is a clear cost-cutting measure when it is considered an outsourcing activity, it can be a trigger for business process innovation, driven by the new opportunities offered by technology in other cases. It is therefore of paramount importance to take a closer look at the details of the cloud computing model and especially its service models.

Although there is no common definition of cloud computing and its components, the NIST definition of cloud computing (Mell & Grance, 2011) has achieved wide acceptance in literature and praxis. Following the argumentation above, when considering the opportunities and consequences of cloud computing for an enterprise, the service and deployment models as given in Fig. 1 should receive more attention. In many cases the umbrella term cloud computing is used and no further distinction is made between either different service models or deployment models. This causes ambiguous expectations towards the cloud computing paradigm which lead to fuzzy assumptions about cloud computing's potential value contribution in an organization. This, in turn, can lead to frustration and disappointed expectations in an organization.

In this example a special focus should be placed on the usage of cloud computing in the sector of highly integrated enterprise systems. As stated, these systems differ from other IT solutions as they (1) support the core business processes of an organization, (2) show a high degree of horizontal and vertical integration on different system layers, and (3) are adapted to specific needs of an organization by different means (from configuration to customization by individual code to service orchestration in a process layer). The challenges of process innovation in
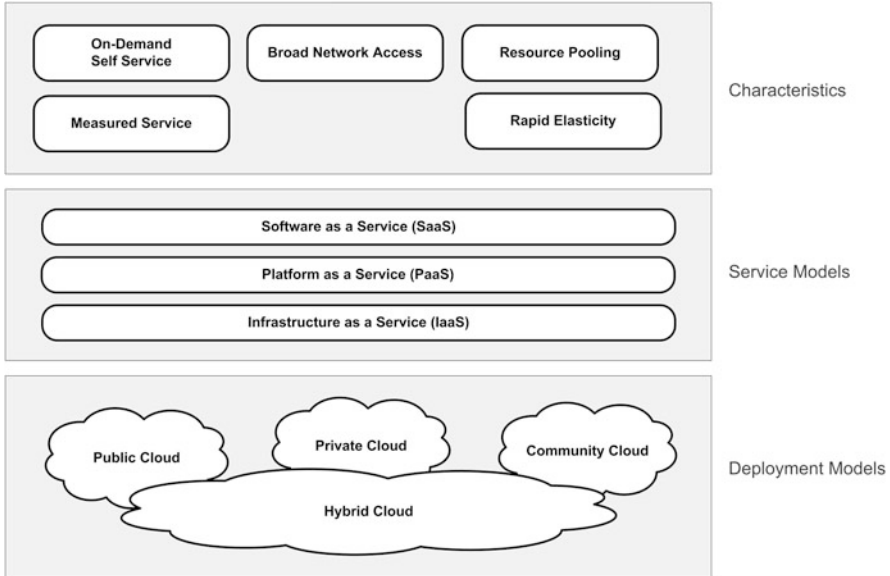
Fig. 1 NIST model of cloud computing (Mell & Grance, 2011)

relation to cloud computing are illustrated by focusing on different service models, which can be divided in SaaS on the one hand, and, on the other hand, PaaS/IaaS.

A seemingly homogeneous paradigm can have different implications for organizations and the way they are using enterprise systems for business operations. Cloud Computing is considered to be a new delivery model enabling a focus on core competences while outsourcing the IT-related activities to professional cloud sourcing providers. Software vendors and consulting companies subsume many different applications and solution packages under this umbrella term. The intention of signaling the capabilities of their solutions is understandable; however, this causes a lot of confusion in the market (Lenart, 2011). It is tempting to use the cloud metaphor in order to emphasize the ease with which such a solution can be used and maintained. However, it implies a set of characteristics, service models, and delivery models, which have the potential to change IT operations and implementation tremendously. An organization must therefore analyze in a detailed manner what functionalities a solution offers and what value contributions can be expected from it.

To exemplarily illustrate the range of opportunities service models do offer, the implications of different service model/delivery model combinations for large enterprises (LE) and small and medium sized enterprises (SME) have been outlined based on experiences from several implementation projects.

The indications illustrated in Fig. 2 are a first evaluation of opportunities for companies of different sizes. The table shows how diversified the implications of cloud computing for an organization are. Coming back to our claim that the usage

		SaaS	PaaS/IaaS
Public	LE	Harmonizing IT Landscape Increasing User Convenience Standardizing Processes	Reducing Cost Increasing Flexibility / Scalability Provisioning of new Company Services Testing new Applications
	SME	Reengineering Processes Accessing new Technologies	Developing new Applications Evaluating Software Increasing Performance Accessing Business Analytics
Private	LE	Deploying own developments Provisioning rarely used software	Standardizing IT Services Industrializing IT Service Delivery Standardizing Device Communication
	SME	*Unusual combination due to high ramp-up costs*	Increasing IT Service Level Virtualizing IT Landscape

Fig. 2 Opportunities of different service model/delivery model combinations with relation to company size

of unclear terminology could lead to unsatisfactory outcomes of an organization's process innovation initiative, the example of cloud computing shows the potential of severe mismatches of expectations and outcomes. A lack of knowledge and understanding of new paradigms like cloud computing and their applicability to enterprise systems might cause obstacles to process innovation in an organization.

Enterprise systems have shown a low frequency of change in the past. Companies try to keep the system in operation as long as possible since the initial investment for a system is high and an implementation project is considered to be a risky endeavor. Nevertheless, the analysis above shows that this picture is changing and enterprise systems play a vital role for innovation in a digital world. We see that a continuous modification process, which enables innovation support in manifold roles, as described above, nowadays characterizes enterprise systems. Their role must be completely understood and carefully considered in order to maximize the value contribution throughout the lifecycle.

Continuing the evaluation of service model/delivery model combinations leads to a mapping of the different roles of an enterprise system in the clusters shown in Fig. 2. Although more than one role can be allocated to a cluster, the differences are clearly visible. In some areas enterprise systems take a more passive role of an enabler for process innovation. In some other areas the modified enterprise system is triggering or enforcing innovation due to modifications in functionality and modes of accessing the system. A brief description of the role allocation is outlined in Fig. 3.

The example showed the potential of enterprise systems for process innovation in connection with technological changes. The enterprise system's importance as a process management platform must be considered to achieve an optimal value contribution from technology adoption initiatives.

		SaaS	PaaS/IaaS
Public	LE	**Enforcer / Trigger** Using standardized software usually reduces the degree of flexibility. Existing procedures must be changed. New functionality is available at the same time.	**Enabler / Trigger** Existing functionalities are transferred to the cloud. The enterprise system is not changed by this. The ubiquitous availability triggers process innovation and is enabled by the enterprise system.
	SME	**Enforcer / Trigger** Using standardized software while having only limited budgets for adaptation usually leads to decreased functionality and a necessity for process standardization. Existing procedures must be changed and standard processes inherent to the solution adopted.	**Enforcer / Enabler** Due to budget restrictions and complexity of the solution, dependency on third-party support is increasing. The flexibility of the solution is therefore reduced and change enforced. New modes of access can be realized at the same time.
Private	LE	**Trigger / Enabler** Standardization of software delivery while keeping the whole solution in-house implicates high ramp-up costs, but allows maximum flexibility for changing processes due to new software functionality.	**Enabler/Trigger** Existing functionalities are transferred to the new service platform. The enterprise system is not changed by this. The ubiquitous availability triggers process innovation and is enabled by the enterprise system. In-house service delivery further increases flexiblity for process innovation.
	SME	*Unusual combination due to high ramp-up costs*	**Enforcer / Enabler / Trigger** Due to budget restrictions and complexity of the solution, dependency on third-party support is increasing. The flexibility of the solution is therefore reduced and change enforced. New modes of access can be realized at the same time and enabled by the solution. The service model might trigger process innovation as well.

Fig. 3 Potential roles of enterprise systems in process innovation while adopting the cloud computing paradigm

4   Openness of Enterprise Systems

In the last years we have seen that a clear differentiation of an enterprise system's lifecycle in the build-time and run-time phase (or even more detailed in different phases of the implementation project (Shanks et al., 2003)) does not serve the purpose of analyzing an enterprise system's role in process innovation. Many such implementation projects are not concerned with an initial greenfield-implementation, but deal with the extension of existing solutions, rollouts to new subsidiaries, merging systems of different branches, or integrating new technologies like in-memory computing or the cloud computing paradigm.

What Weick (1977) calls a chronically unfrozen system in management theory can be transferred to the area of enterprise systems as a new modus operandi. The concept of organizational change (containing the phases unfreeze—change—refreeze) points to the fact that companies can be efficient when working in a stable environment. Enterprise systems are considered to be at the core of enterprise operations and therefore follow the dynamics of organizational change. The tendency to become a chronically unfrozen system (Weick, 1977) is valid for enterprise systems, too. Fast changing environments, like value webs as a form of inter-organizational cooperation, increase the frequency of change for both an organization and its systems, and make permanent openness to change necessary.

A main challenge when trying to bring together enterprise systems and innovation initiatives is therefore to establish such openness for change and a

platform for innovation enablement in an organization. A chronically unfrozen system comes with a lack of structure, making employees feel uncomfortable—as their routines can be subject to change anytime. Innovation initiatives have to consider and take precautions against this to keep the enterprise on a high level of productivity permanently.

At the same time, the effects of this trend towards increased openness (as given in open organizations, open innovations, open systems) on enterprise systems must be analyzed. Nowadays, many of these systems are still very stable, monolithic solutions that support the preservation of an existing process landscape, rather than serve as an innovation platform. Enterprise systems must be transformed to chronically unfrozen systems to serve a company's needs. This transformation process is supported by achievements such as new technologies (e.g. in-memory computing enabling real-time-process monitoring and process orchestration during run-time), new modes of service delivery like cloud computing (including SaaS, PaaS, IaaS), and presentation layer extensions (e.g. mobile computing allowing intensified interaction with the system in daily operations).

To transform an enterprise system into a process innovation platform, organizations must have a comprehensive understanding of new technologies and concepts in this area, allowing them to identify possibilities from such advances for their process portfolio and potential innovation.

Interconnectivity can be used as an example. Where interconnectivity between organizations could be established on a long lasting and stable basis in earlier days, the need for a flexible and run-time-based connection of systems is increasingly emerging over time (Nandhakumar, Rossi, & Talvinen, 2005). The requirements for enterprise systems have therefore been changing in the last years—the aim is not to increase efficiency but to redefine the solution space for a problem, finding new levels of effectiveness. The value contribution is not achieved only by doing the same things quicker or more efficiently; enterprise systems are expected to be an important source of innovation as they inherit most of an organization's process knowledge. Combining this with latest achievements in technology makes them an important cornerstone of an organization's process innovation initiative.

System vendors relate to this changing role from a process support tool to a source of process innovation by using innovative thinking in their product development and improvement (e.g. SAP's latest design thinking and business process transformation initiatives)

5   Summary

Enterprise systems research has become a mature area in the field of information systems in the last years. The numerous publications focusing on implementation and critical success factors support this picture. Only in a few cases are the enterprise systems related to current topics like process innovation and challenges of a digital world in general. This chapter should illustrate that enterprise systems must not be neglected when talking about innovation in organizations. Furthermore,

the potential touch points and different roles of these systems in an innovation process have been shown.

A necessary and important precondition is a thorough understanding of changes in the area of enterprise systems. Only when the possibilities offered are understood, can the applicability for an organization be recognized and reflected in innovation, which leads to new levels of organizational performance.

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