Managing the Risks of Changed Processes with Enterprise Systems

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Abstract

This paper examines the risks and the sources of risks of process changes associated with implementation of enterprise systems. Results of in-depth studies of four utility cases reveal that risks of process changes with enterprise systems are mainly associated with the packaged and integrated nature of enterprise system software, particularly its configurability, in-built processes, multiple options, data and process integration, streamlined processes, and standard processes. Organizations need to invest in on-going software exploration, business examination, and process and software changes to align new processes and management responsibilities to eliminate these risks and gain benefits.

Keywords

Enterprise systems, Process change, Process integration, Packaged software

INTRODUCTION

Enterprise systems (ES) use packaged and integrated software to support a wide range of organizational processes. Packaged software contains in-built processes, which replace in-house development efforts, and can enable or even drive organizations to change to vendor-claimed best practice. The integrated software provides seamless control of operations at all levels, and streamlines inefficient processes. The advantages of such packaged and integrated software have persuaded many organizations to invest in the software in the expectation of beneficial process changes. However, it is unclear whether these process changes are all effective. Are risks associated with use of this packaged software, and if so, what are they?

Risks, in this paper, are defined as the exposure to unfavourable outcomes for the organization, caused by the process changes flowing from ES implementation and use. Rather than estimating probabilities for potential undesirable outcomes (Boehm 1991), this study take the behavioural view (Lytyinen et al. 1998, Barki et al. 1993) in identifying and analysing threats to success (i.e. risks) and actions taken to reduce the chance of failure. Process failure is usually reflected in extra workforce or extra cycle time; more errors; low responsiveness; reduced service quality; and user complaints. These problems are linked to negative impact on earnings. They seem to occur with ES software implementation or upgrading.

Many studies have identified factors affecting the success of on-time on-budget system implementation and stressed the importance of large and complex project management (Holland et al. 1999, Parr et al. 1999), but few have tried to trace the consequences of process changes after system implementation. Some studies observed performance dips (Shang and Seddon 2002, Markus et al. 2000, KPMG 2000, Gartner Group 1998, Deloitte Consulting 1998, Ross 1999) after system implementation and attributed these to the long learning process and to complex change management, but did not examine the sources of these deficiencies. As such innovative information systems differ in their characteristics from in-house or custom-built systems, it would be reasonable to expect the outcomes of process change with ES to be different as well. The questions we seek to answer are:

- What sorts of risk are uniquely associated with the changed processes with enterprise systems?
- What are the sources of these risks?
- What can organizations do to eliminate these risks and gain benefits?
As a result of in-depth study of four Australian utility organizations, and additional verification in seven other firms, this study argues that implementation of enterprise systems is risky not only because of strength or weakness of factors like top management support, user involvement, clearly-defined goals and scope, adequate resources, etc. (Parr et al. 1999), but also because six software-specific factors associated with process change (discussed in detail in Tables 2 and 3) have the potential to bring either benefits or problems to the adopting organization. If each of these characteristics is managed well, the outcomes for the organization are likely to be good. If not, implementation and subsequent use of the software can cause problems.

In the expanding world of enterprise systems research, this study is significant because it explores the sources of risks associated with process change and provides guidance to user organizations on ways to manage such risks. Other packaged software such as CRM (Customer Relationship Management), SCM (Supply Chain Management), and others that integrate processes within and between organizations may also find the result of this study helpful in eliminating risks and developing benefits from packaged software implementation.

INFLUENCES OF PACKAGED SOFTWARE AND PROCESS INTEGRATION

Packaged software was first used to save system development costs, but little was understood about its effects on process changes. However, the influence of information systems on organizational process changes was noted as long ago as 1959 by Jasinski (1959), who said that new information technology could drive changes in organizations but that it would be a challenge for the organizations to manage the ensuing technological and organizational changes. Twenty-five years later, more forceful power was observed with word processing packages (Johnson and Rice 1987), in that the in-built processes drove users to alter daily operations in producing documentation. The same work-pattern change was also found with decision-making packages (Lassila and Brancheau 1999). With the move to enterprise systems, the force for change was found to be even stronger; organizations adapt their processes to the software more than ever before (Gattiker and Goodhue 2002). It was even claimed that enterprise system software could drive businesses to lose their competitive advantages by “putting the enterprise into the enterprise system” (Davenport 1998). The effect of process changes is critical in enterprise system implementation (Summer 2000, Kirchmer 1998), one reason for this being the risk involved in improperly modifying the software for business requirements and overly changing organizational processes for the sake of best practice (O’Leary 2000).

Process integration has been praised by many studies (Manners 1998, Ratliff 1995, Schroeder 2001) for providing better control and coordination. However, studies of its downsides are limited. One study observed manufacturing process integration and found that greater data integration tends to lead to more bureaucratic delay (Goodhue et al. 1992), and tightly linked processes may lead to loss of flexibility in responding to unanticipated events. Since data integration can reduce a local subunit’s efficiency in responding to special customer needs, choosing the appropriate level of data integration may require trading off improved control against increased local flexibility (Gupta and Govindarajan 1986, Conti 1989). Meanwhile, practitioners also noted that, while all-in-one packages offer some benefits of integration, users must at times sacrifice high quality in one function for high quality in another (Gasaway 1985).

Although studies are limited, the driving force of packaged software and the effects of integration seem influential in facilitating process changes. No study on enterprise systems to date has focused on these two unique characteristics, nor is there a contextual explanation of their influences. In sum, the unique consequences of packaged integration software are yet to be investigated.

RESEARCH METHODOLOGY

The aim of this study is to understand the risks of process changes with enterprise systems and the sources of these risks. Since there has been little in-depth research on process change risks with ES, we chose to use multiple case studies in a single industry for this research. Use of multiple case studies is the recommended method for studying poorly understood phenomena in a real-world setting (Yin 1994). Like Yin, our epistemological stance in this paper is positivist, and our goal is to build theory. Thus the bulk of the paper presents and justifies a process model showing steps an organization can take to maximize benefits from its ES. We hope that these insights will provide useful guidance for managers in many organizations seeking to maximize benefits from their enterprise systems.

After initial discussions with a number of different ES-using organizations, it was decided that the study would focus on ERP systems in the four utility companies described in Table 1. These four mid-size organizations were selected because by the time of the study they had all used their ES for more than three years, so there was time for organizational learning to have occurred. Further, although they chose software from two different ES vendors (three SAP R/3, one PeopleSoft), they had all chosen similar application modules for their core processes: finance, human resources, sales, and project and material management.
In each organization, interviews were conducted with five to seven people in a range of roles including: project managers, key decision-makers, frequent users and process owners. Interviews were typically one hour. A total of 31 interviews were conducted, with multiple interviews with some key informants. During each interview, subjects were asked to think retrospectively regarding the details of business conditions, the implementation project and performance of the changed processes in the years since implementation, and causes of those results. They were also asked to supply examples and other supporting evidence to illustrate their arguments.

Using an approach similar to that described by Eisenhardt (1989) for within-case and cross-case analysis, all interviews were transcribed, compared with other interviews and documents from the same organization, and tables of consequences in the first and later years, and interviewees’ explanations for those consequences, were prepared.

The next step was to use coding techniques to screen various common process problems and identify links between risks and factors of risks. The findings presented in the remainder of this paper emerged from this process. The findings were then verified by ES managers and process managers in seven large organizations in a wide range of industries. Although some have pointed to different problems in changed processes with the enterprise system, the main patterns of risks and sources of risks were agreed upon.

**FINDINGS, RISKS AND SOURCES OF RISKS**

After going live, most of the four case-study companies experienced process problems in the early post-implementation stage. These problems arose mainly from inappropriate changes made to organizational processes. Looking deeply into the problems revealed that most were related to the influential features of packaged and integrated enterprise system software. Packaged software is configurable, with in-built processes and multiple options to support various business situations. Such software integrates enterprise data and processes, streamlines over-complex processes, and provides a wide range of standard processes. These influential features seem beneficial but are complicated to understand. In most of the cases, they interplayed and created mixed problems in the organizations. These features, their functions and the risks are summarized in Table 2 and discussed below. To clearly explain the risks of each feature, typical examples were abstracted to show the unique consequences of these features.

**Enterprise systems are configurable but inefficient processes can also be configured.**

The first source of risk identified in Table 2 is configurability. Packaged software is configurable to support a variety of processes but it can also support inefficient processes. In UtilityA, the new system was an imitation of the previous finance process. As the finance staff were under time pressure to complete the implementation as soon as possible, they decided to adapt the new system to support their old processes. The old ledger, old order types and the old way of data processing were put in.

![Table 1: The Four Utility Companies in the In-depth Case Studies](image)

<table>
<thead>
<tr>
<th>Companies</th>
<th>UtilityA</th>
<th>UtilityB</th>
<th>UtilityC</th>
<th>UtilityD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employees</td>
<td>950</td>
<td>1,122</td>
<td>900</td>
<td>1,200</td>
</tr>
<tr>
<td>Utility businesses</td>
<td>Electricity, Gas</td>
<td>Electricity</td>
<td>Electricity, Gas</td>
<td>Electricity</td>
</tr>
<tr>
<td>Customers</td>
<td>1,100,000</td>
<td>733,783</td>
<td>800,000</td>
<td>555,000</td>
</tr>
<tr>
<td>Total sales</td>
<td>A$ 700 M</td>
<td>A$ 600 M</td>
<td>A$ 711 M</td>
<td>A$ 692 M</td>
</tr>
<tr>
<td>Motivation for adoption of the ES</td>
<td>Support business changes Year 2000 (Y2K)</td>
<td>Reduce costs Year 2000 (Y2K)</td>
<td>Enable business changes</td>
<td>Support new strategies Year 2000</td>
</tr>
<tr>
<td>Period of implementation</td>
<td>10/95-07/96 9 months</td>
<td>12/96-12/97 12 months</td>
<td>01/97-11/97 one more year for two phases</td>
<td>06/96-11/97 17 months</td>
</tr>
<tr>
<td>Years of ES use</td>
<td>3.5</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>ES users</td>
<td>450</td>
<td>250</td>
<td>600</td>
<td>630</td>
</tr>
<tr>
<td>ES adopted</td>
<td>SAP</td>
<td>SAP</td>
<td>PeopleSoft</td>
<td>SAP</td>
</tr>
</tbody>
</table>

![Shang, Seddon (Paper #124)](image)
14th Australasian Conference on Information Systems 26-28 November 2003, Perth, Western Australia
We had a brand new system real time on-line processing the old stuff. (Financial Controller – UtilityA)

Every month end, the A/P clerk needed to verify goods received with employees who issued the purchase orders. The process could have been easily modified by having staff update purchase order status when goods were received so that when invoices arrived, the clerk could process payments and allocate job costs immediately. But in reality, the inefficient processes were not changed and more problems occurred.

This process has never been evaluated and changed. And it has caused more administrative work at month end to manually verify these wandering invoices all over the company and manually allocating costs to jobs. Also, because of the delay of staff reply, more mistakes were developed and required further corrections. (Financial Controller – UtilityA).

Table 2: Risks and their Sources Associated with Enterprise Systems

<table>
<thead>
<tr>
<th>Sources of Risks – Influential Features of ES</th>
<th>Functions of the influential features of ES</th>
<th>Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configurability</td>
<td>Support a variety of business processes</td>
<td>Support inefficient processes, repeat redundancies, ignore functionality excesses</td>
</tr>
<tr>
<td>In-built processes</td>
<td>Save time in designing appropriate processes and opportunities to learn or to change to the best practice</td>
<td>Businesses adapted to misaligned processes</td>
</tr>
<tr>
<td>Multiple options</td>
<td>Manage a wide range of business situations</td>
<td>Complicated data input and data retrieval processes reduced the efficiencies and created errors</td>
</tr>
<tr>
<td>Data and Process Integration</td>
<td>Complete information for detailed data analysis and thorough business controls</td>
<td>Bureaucratic processes with excessive crosschecks and reduced responsiveness</td>
</tr>
<tr>
<td>Streamlined Processes</td>
<td>One time data entry, duplicate tasks reduced</td>
<td>Increased work and accountability making it hard for end-users to adjust to new roles</td>
</tr>
<tr>
<td>Standard processes</td>
<td>Can build inter and intra enterprise integration across a wide range of functional areas.</td>
<td>Incomplete or insufficient functions and inconsistent quality between modules.</td>
</tr>
</tbody>
</table>

Enterprise systems contain in-built processes with knowledge of best practice, but misaligned processes can also be imposed on user organizations.

The second source of risk identified in Table 2 is in-built processes. Embedding as it does the accumulated experiences of many businesses, ES software contains so-called “best practice” processes. Unless reconfigured, the software will suggest some processes as defaults. The advantage for businesses in using these processes is that they can adopt to the best practices. For instance, UtilityC and Finance Management in UtilityD reviewed business requirements and changed to a few selected ES processes and produced early operational benefits. However, in-built processes also create process difficulties if systems are not configured according to the needs of the business. For instance, UtilityA and B transformed their centralized human resources systems to self-managed processes, in which employees entered their own work hours and were responsible for their own payroll and job costs. This sounds fine. However, UtilityA and B used the new time-recording process in SAP that made workers record job times every quarter hour. This process works well with law or engineering firms who need to allocate costs of highly paid staff to various clients. But the jobs provided by utility companies are mostly regular, such as fixing light poles or installing pipes, and the costs are quite standard and apply to one job at a time. Frequent time recording frustrated workers and decreased work efficiency.

Another example of in-built processes causing trouble was automatic procurement. In UtilityA and D an integrated process linked project planning with purchasing. After a project was planned, the required materials would be purchased automatically to be ready for the project to start. This process assumption works well for companies that have stable project planning. However, UtilityA and D had many projects that needed to be planned beforehand but which changed frequently. Automatic purchasing created overstocking for subsequently cancelled or changed projects. The obvious conclusion from these examples is that the built-in out-of-the box functionality in ES may fit some companies but will not be ideal for all.
Default enterprise system processes can serve various situations, but operational errors and inefficiencies from complicated processes can occur.

Third, to provide comprehensive support for all kinds of businesses, ES software has multiple options for processes and data retrieval. The advantage of these options is that users can configure processes to suit a wide range of requirements and collect a wide range of information for different situations. However, these multi-level processes and data retrieval flows require extra effort from end-users when entering transactions and accessing data.

In the UtilityA case, it took nine data entry screens to enter control data for a small project. Staff needed to go through three screens to review the different levels of employee costs and another five screens to specify different types of materials required in this project. As a business manager in UtilityA commented: “It took 100 man-hours to close a $100 job”. Similarly-complicated data processing and retrieval were noted in the early stages in UtilityB and D. These problems caused process deficiencies, difficult reporting, and low organizational acceptance.

Enterprise systems integrate data and processes for better control, but bureaucratic processes with excessive crosschecks can also occur.

Fourth, integrated processes link closely all stakeholders and their activities. The benefit is that managers can obtain complete information with detailed data analysis, enabling them to build comprehensive control reports. However, in order to maintain a complete flow of resource movements, ES require inputs from every single process point. One missing point can delay the whole process. In other words an ES can impose a bureaucratic process with excessive crosschecks on an organization. For example, “detail-tracked” project control and “everyone-involved” procurement in UtilityA and C not only required more work from busy project managers but also confused occasional users. Each person who wanted to obtain business services was responsible for creating a purchase requisition in the system. To do this, everyone needed to learn the purchase requisition process and make sure they entered purchases correctly. Occasional users, including external contractors, were required to enter requisitions. Many incorrect orders were posted and it took days to trace these wrongly-processed documents. The whole accounting process was consequently delayed. Additionally, users were afraid that their manual flexibility was being diminished because the bureaucratic processes allowed no flexibility for exceptions and urgent customer requests.

Another example of problems arising from tightly-linked tasks was with the project control process in UtilityA. It required data entry even for “nuts and bolts” spent on each small job. The supervisor needed to enter the cost allocation for each object. There was a link from each piece of equipment to each part in an order, and these items were kept in the asset file. For an order with multiple objects and components, users needed to go through multiple assets to divide the costs. It took a long time to assemble an order. To speed the process, users estimated. This created many mismatched links between jobs and costs, and delayed job close-off.

Enterprise systems streamline processes, but increased work and accountability can make it difficult for end-users to adjust to new roles.

Fifth, a centralized database with streamlined processes can reduce redundancies by using one-time data entry. The advantages are that duplicate tasks can be reduced, processes made more efficient, and end-user accountability increased. The role and skill of all level of stakeholders are changed but the dramatic change can bring higher resistance and low morale if the changes are not aligned with management practice.

One-time data entry can mean that some end-users need to input more data than they had to in the past, to meet the needs of managers in other departments. For example, in their new system, supervisors in UtilityB needed to enter details of work hours and materials movements. These figures had been previously entered by data-entry clerks, purchasing officers and warehouse clerks. Business managers were pleased to receive reports quickly with comprehensive information, but supervisors complained about the extra work needed for tracking and reporting small job costs and goods movements.

Enterprise systems provide wide-ranging standard processes, but uneven quality of different modules may cause difficulties.

Finally, the sixth source of risk identified in Table 2 is standard processes. Enterprise Systems are designed to provide standard industry processes for all organizations. Organizations can build enterprise processes with a wide range of functions, but the large scope means that some modules may not be as stable as others.
To build a large suite of various application modules, ES vendors rush to develop new modules as well as to acquire other vendors’ packaged products. System integrity is thus compromised, and users experience inconsistent quality, and incomplete or insufficient functions in some modules. For example, the SAP Finance module has been used and enhanced for more than twenty years. Likewise, the PeopleSoft Human Resources modules have been used and enhanced for more than ten years. These modules have mature functionality and a wide variety of options to fit many business needs. Other modules, however, do not have the same quality. The inventory module in PeopleSoft V6.0 for UtilityC, and the payroll module in SAP for UtilityD, were difficult to apply because they were first versions in Australia. The inventory replacement, and leave management functions, respectively, were incomplete. Users had to work around these inefficiencies by manually maintaining an inventory record and employ attendance sheets.

FINDINGS: MANAGING RISKS

From the cases studied, business managers had a number of ways of managing these risks. Their approaches, summarized in Table 3 and explained in the six bulleted paragraphs below, were applied to prevent or fix problems either during system implementation or after the system went live. Although some of these management tasks were implemented as individual projects, many were undertaken together. In summary, organizations did three things interactively and continuously while implementing or enhancing the software: 1) explore process-enhancement opportunities with ES functions; 2) assess relevance of ES processes to business situations; and 3) make necessary process and software changes and align management programs. These three types of action to manage risk are summarized in the three columns of Table 3.

<table>
<thead>
<tr>
<th>Sources of Risks – Influential Features of ES</th>
<th>Explore process-enhancement opportunities</th>
<th>Assess relevance of the ES processes</th>
<th>Make required changes &amp; align management programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configurability</td>
<td>Explore opportunities for redesigning processes</td>
<td>Examine the effectiveness of existing processes</td>
<td>Change processes and configure the software for process effectiveness</td>
</tr>
<tr>
<td>In-built processes</td>
<td>Explore improvement opportunities inspired by the inbuilt “best practice” processes</td>
<td>Assess the relevance to the business</td>
<td>Select appropriate process options according to business situations</td>
</tr>
<tr>
<td>Multiple options</td>
<td>Learn available optional processes and analyse their fit to current and future business needs</td>
<td>Review data input for operation smoothness; review data retrieval according to specific management objectives</td>
<td>Simplify multiple levels of data input processes; customize data retrieval processes</td>
</tr>
<tr>
<td>Data and process integration</td>
<td>Explore new uses of integrated data</td>
<td>Assess the appropriate level of process integration and data control</td>
<td>Adjust the links between processes and sub processes</td>
</tr>
<tr>
<td>Streamlined processes</td>
<td>Explore opportunities in reducing redundant tasks</td>
<td>Review work changes of all stakeholders and recognize increased or decreased work loads</td>
<td>Educate users overall view of process, and adjust users’ responsibilities and the reward systems</td>
</tr>
<tr>
<td>Standard processes</td>
<td>Explore opportunities for system expanding and extension</td>
<td>Analyse processes quality of different modules</td>
<td>Reconcile inconsistencies between ES modules</td>
</tr>
</tbody>
</table>

- Examine the effectiveness of existing processes; explore opportunities for improving processes.
  In UtilityA, a task group of business users was formed to explore the available process options in the software and review existing financial processes for improvement. As a result, the ledger was rebuilt, the order was redesigned, and a few processes changes were implemented and the software were reconfigured to support the redesigned processes.

- Explore opportunities for improving business performance inspired by the inbuilt “best practice” processes; assess the relevance of these in-built processes to the business and configure ES processes according to business situation.
After suffering for a year with its misfit SAP time-recording process, UtilityA learned to reconfigure the system to meet their needs. The new process assumed fixed job hours for employees and required exception entries only when overtime or leave occurred. When the operation became smooth, many new time-management functions were tested and applied. In UtilityB, some third-party software was added to protect errors. Occasional manual checks were put in place as an extra level of data quality control.

- **With the automatic purchasing, UtilityA changed the process by allowing automatic purchasing only for projects that had certain confirmed criteria. UtilityD also reviewed its order-releasing process and put in an extra confirmation process.** Learn available optional processes and analyse their fit to current and future business needs; simplify multiple levels of data input processes and data retrieval according to specific operational and management objectives. Business leaders and users in UtilityC reviewed all the possible alternatives during the design phase for their new Financial Management processes. Many summarized screens were designed so that users did not have to fight their way through a maze of screens and transactions. Operational benefits (i.e., time and cost savings) for this process were apparent within a short time after implementation. Whereas UtilityA learned to review the relevance of all the fields a year after the implementation. In UtilityA, system-tailing options (screen masks, workflow programming, and extended reporting) were applied and a 38-screen project closeout process was condensed into three screens.

- **Assess the appropriate level of process integration and data control and adjust links between processes; explore new uses of integrated data.** UtilityA formed a team of business users who reviewed the level of linkage between financial and work management functions. A variety of ways of modifying the system (configuration, workflow management, some ABAP/4 programming) were adopted. The project management module was reconfigured to loosen tight links, allowing the project coordinator to roughly divide the costs between jobs. It gave work managers flexibility in managing their jobs. As a result, it sped up the job closing, and asset management, and maintained reasonable links with the financial system. UtilityC added error checking and re-established batch data-processing staff to process occasional-user jobs. As operations went more smoothly, managers started to request new ways of processing and organizing the integrated data.

- **Explore opportunities for reducing redundant tasks; educate front-end users in an overall view of processes; simplify data-entry screens while adjusting the workloads and responsibilities of front-end users.** To assist supervisors to adjust to the new process, UtilityB reviewed its information and data capture requirements with its business managers. Instead of the generic SAP front-end that had numerous screens, a customized version of data entry was designed (with workflow management) to collect needed information. Moreover, process training was conducted for front-end users to explain the overall business effects of single-point transaction entry and many end-users’ job responsibilities were adjusted. Change management was implemented for all levels of stakeholders, aligned measurement and reward system were rebuilt. Guidance for system use was provided for regular users as well as casual workers.

- **Reconcile inconsistencies between ES modules and explore opportunities for expanding enterprise integration with more functions.** To ensure smooth integration with other implemented ES modules, UtilityC and D modified their systems and developed their own functions to link with the ES. Various system-tailoring techniques including SAP’s ABAP/4 programming and interface programming techniques were applied. In addition, using more mature system-modification techniques, UtilityD adopted more application modules in order to gradually achieve wide-scope process integration; UtilityC expanded system use with six more newly-acquired gas, water and communication companies.

**DISCUSSION**

Enterprise systems are a major departure from traditional custom-made systems. They realize the concept of outsourcing system development and maintenance, and also achieve the goals of data and process integration. Although the software is designed to support a wide range of business needs it is also a force for change to business processes. The influences of ES are greater than those of other software packages because the enterprise-wide integration extends the scope of those influences. In addition to changing work patterns, packaged enterprise systems can influence both single operations and whole organizational processes. The dilemma between changing organizational processes to fit the software and changing software to fit business
needs is an on-going issue throughout an enterprise system’s life because of evolving software functionality and the changing business environment.

On the other hand, despite the fact that individual operations sometimes suffer, enterprise integration software standardizes and streamlines processes, and managers enjoy the control offered by comprehensive information. Keeping a balance between control and flexibility is another critical issue for ES management, especially with software that is both complicated but adaptable to both these requirements. Therefore, managing such a unique system requires new knowledge and skills, which are a combination of both business and technical professionals (Markus 2000, Raymond et al. 1999). Business managers not only need to explore the advantageous functions of the software but also to assess the relevance of these compelling opportunities and decide on a proper fit between software and processes. Technical professionals need to understand the software modification options in light of later maintenance needs or problems. As software functionality and business situations are constantly changing, these efforts are required throughout the life of the system.

The findings of this study shed light on the uniqueness of process changes introduced by ES. In particular, it was found that opting for ES does not necessarily lead to effective process change, and that the “best practices” in-built in ES may not be best for all organizations. Although an enterprise system can offer dramatic process changes, it cannot ensure dramatic performance improvement if changes are not business aligned. If a business changes processes to fit standard system processes without assessing its own business needs or retaining existing effective processes, it may experience problems from misfit processes. ES implementation cannot re-engineer a business; only business-aligned changes can achieve this.

Although past studies have argued that “vanilla ERP” is a critical success factor for ERP implementation (Parr and Shanks 1999, Pereira 1999), and although consultants may advise against modifying system code due to the high cost of later maintenance, the present study found that software modification is sometimes necessary and can be managed. In reality, “No ERP can completely fit business needs, tailoring systems sometimes is needed” (SAP Manager of Utility D). In the four in-depth case studies, inappropriate processes needed to be reconfigured, complicated processes simplified, and process errors prevented. As suggested by Brehm et al. (2000), there are options on screen simplification, bolt-on software, or user interfaces available for customizing an enterprise system without creating serious difficulties in later maintenance. As learned in the cases studied, comprehensive understanding and selective use of system tailoring options can ameliorate risks in ES use.

Instead of discussing high-level principles of software project management, this study has presented in-depth contextual details about what to manage and what to look for in an enterprise system implementation. The evidence of influential ES features enhances the understanding of both packaged software and process integration. The finding that the in-built processes and integration of packaged software have a combined force leads the study of enterprise systems into a new area where the pre-built architecture and functions of software may affect how businesses are run.

CONCLUSION

Enterprise systems are a new form of information system where the software itself has the potential to exert strong influences on business processes. This paper has discussed six sources of influence, namely, configurability, in-built processes, multiple options, data and process integration, streamlined processes, and standard processes. Its key finding is that implementation of enterprise systems is risky not only because of strength or weakness of factors like top management support, user involvement, clearly-defined goals and scope, adequate resources, effective leadership, clear communications, etc. but also because each of these six software-specific factors has the potential to bring either benefits or problems to the adopting organization.

With respect to configurability, in-built processes and multiple options, the good news is that enterprise systems can be used to support, enable or even drive process changes towards much improved processes. The bad news is that because the software is so configurable, it can also be used to perpetuate existing process inefficiency if process-change opportunities are ignored. Alternatively, if default processes are just imposed on the organization without regard to end-user and management needs, inappropriate processes may be imposed on the organization.

With respect to integration, streamlined processes, and standard processes, the good news is that (a) enterprise systems can help streamline processes and remove redundant work, (b) information is rapidly shared across the organization leading to greater coordination of activities across the organization, and (c) user accountability is increased because enterprise systems are able to control and provide minute information on what everyone is doing. The bad news is that (a) unless changes in roles are facilitated by redefining new job responsibilities, changing reward systems, and offering educational programs to assist users as they transition to their new roles, users and managers are likely to resist change, (b) bureaucratic processes with excessive crosstchecks may be
imposed on the organization, and (c) inconsistencies between modules and bugs in the software supplied by the vendor can have far-ranging consequences.

As more and more organizations adopt enterprise systems it is important to recognize the potential benefits and risks associated with such software. The software itself is neither inherently good nor bad. With sound management, i.e., with thorough analysis and matching of software capabilities and organizational needs, and care in introducing change and motivating employees, the potentially good outcomes of software adoption can be reinforced and potentially bad consequences minimized. Although the data for this study were collected from organizations using ERP systems, the key idea presented in this paper, i.e., that packaged software has the potential to bring either benefits and risks to the adopting organization, should be widely applicable in developing ongoing benefits with other software packages that integrate processes both within and between organizations.

REFERENCES


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