



Towards ERP success in SMEs through business process review prior to implementation

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Abstract

Purpose – ERP systems are not the exclusive concern of large companies anymore. More and more small and medium sized enterprises (SMEs) are now engaging with the implementation and exploitation of this type of system. However, reports of ERP failure are numerous and frequent. Very often, this failure results from technical and implementation problems. But even more frequently, it is due to lack of preparation, by the companies themselves, for the implementation process. The purpose of the study reported in this paper was to identify and explore ways in which SMEs may need to prepare themselves before implementing ERP systems.

Design/methodology/approach – The research took a Cypriot SME as a case study and adopted an inductive approach supported by in-depth interviews as the main method of data collection. The qualitative data collected were analysed by using a thematic analysis approach. Subsequently, a rich picture and concept maps were used to represent the findings generated.

Findings – The study identified that business deficiencies and problems, which can impact potential ERP adoption and usage in SMEs, can be localised across business processes boundaries, such as sales order processing, stock control, and bill of materials management, etc. These business problems were found to be attributed to a variety of organisational, technical and human-related reasons. Therefore, this study established that in order to implement ERPs successfully, organisations may require changes in people's work practices and understanding of technology, ownership and control of business processes, as well as organisational wide policies.

Research limitations/implications – This study contributes to the knowledge of ERP preparation and business process improvement in SMEs.

Practical implications – The findings of the paper provide useful insights for both academic and practitioners who are thinking of implementing ERP systems. The paper contributes to the body of literature on issues that SMEs may need to reflect upon before embarking in a costly and resource intensive process of ERP implementation.

Originality/value – Business process improvement is traditionally considered as the result of an ERP project phase. This is how the large majority of the academic literature and the totality of marketing information by ERP vendors portray it. In fact, the reality of practice shows a different scenario with frequent reports of failure and inadequate ERP implementation. This paper aims at breaking with this myth, by proposing that ERPs cannot resolve the large variety of deficient business processes and internal problems that may exist in SMEs. Therefore, this study argues that SMEs need to prepare in advance by engaging in business process reviews prior to the ERP implementation that is engaging in a pre-implementation or preparation phase.

Keywords Preparation, Business process improvement, Enterprise resource planning, Pre-implementation, Small and medium sized enterprises

Paper type Research paper



1. Introduction

Enterprise resource planning (ERP) systems can be defined as “configurable information system packages that integrate information and information-based processes within and across functional areas in an organization” by using a single comprehensive

database (Kumar and Hillegersberg, 2000). ERP is often considered by practitioners and IS researchers as one of the most crucial tools to achieve and sustain business competitiveness (Deep *et al.*, 2008). However, due to technological and economic restrictions, only large companies could traditionally afford and implement ERP in the past (Deep *et al.*, 2008). Nevertheless, over the past few years, the large enterprise market has become increasingly saturated (Gable and Stewart, 1999). This has led ERP vendors to seek for potential alternative markets among small and medium sized enterprises (SMEs) (Deep *et al.*, 2008). In fact, SMEs often account for more than 90 per cent of all firms for most countries, e.g. China (National Bureau of Statistics of China, 2007), and continents, e.g. Europe (GBRW, 2004, p. 1). Therefore, the SME sector presents itself to be an enormous potential market for ERP adoption (Deep *et al.*, 2008). As a consequence, and also because of rapid reduction in the cost of IT and IS (Attaran, 2004; Gable and Stewart, 1999), there has been a substantial and continuous growth in the use of ERP systems by SMEs in recent years (Deep *et al.*, 2008; Everdingen *et al.*, 2000).

However, since ERPs are very complex enterprise-wide applications and can affect all functional areas of an organisation, the implementation of ERP is never a straightforward task. According to Martin (1998), about 90 per cent of ERP implementation projects are late or over budget, and almost half fail to achieve the desired results. The Standish Group, a market research firm (cited by Zhang *et al.*, 2005), also reports that ERP implementation projects in average are 178 per cent over budget, take 2.5 times as long as intended, and deliver only 30 per cent of promised benefits. Overall, Zhang *et al.* (2002) highlight that, ERP implementation success rate is only about 33 per cent in general. The success rate of ERP adoption in SMEs is expected to be even lower, owing to a variety of common drawbacks and barriers that are prevalent in this type of firm, e.g. lack of long-term strategic planning, sparse resources, insufficient IS and ERP knowledge, and irregular business procedures and roles, etc. (Deep *et al.*, 2008; Harindranath *et al.*, 2008; Achanga *et al.*, 2006; Premkumar, 2003).

In order to increase the possibility of ERP success and achieve desired outcomes, it is often critical for SMEs to improve and modify existing business processes and organisational structure to fit in the new ERP environment (Newman and Zhao, 2008; Markus and Tanis, 2000; Jarrar *et al.*, 2000). A business process, as defined by Jarrar *et al.* (2000), is:

[...] set of interrelated activities which [are performed by specific actors and] have definable inputs and, when executed, result in an output that adds value from a customer perspective.

IS researchers, such as Jarrar *et al.* (2000), Martin and Cheung (2000) and Loh and Koh (2004), stress that fundamental and iterative improvement and even redesign of business processes should be carried out during the ERP implementation project, as well as when the system evolves and is being used in the post-implementation phase. However, Nah *et al.* (2001) and Lee *et al.* (2003) argue that broad improvement of business processes should actually be performed well before implementing ERP, and even before choosing the system. In fact it is generally accepted in the literature that there is a need to understand the usefulness of the ERP in organisational terms rather than just understanding the technical capabilities of the ERP system, i.e. what functionality it provides, how easy it is to configure, etc. (Kim *et al.*, 2005; Pan *et al.*, 2011; Peng and Nunes, 2012).

In reality, according to Deep *et al.* (2008), Koh and Simpson (2005) and Cragg *et al.* (2013), SMEs often have an inherent lack of efficient business processes and well established set of business procedures. These authors go on to state that roles and responsibilities of actors involved in diverse business processes may also often be ill-defined and ambiguous. Deep *et al.* (2008) thus conclude that these organizational drawbacks will not just affect efficiency of an ERP system, but actually may trigger complete ERP failure in SMEs. Moreover, Cragg and Mills (2011) found that despite the evidence that the most important operational business processes in SMEs are well supported by management, IT support was found to be low. Consequently, it becomes clear that, in order to enable ERP implementation projects to be conducted successfully within time and budget, it is vital for SMEs to identify and improve any problems and deficiencies embedded in their business processes during ERP preparation/pre-implementation. However, there is currently very little research addressing this particular ERP issue in SMEs.

This paper aims at addressing this gap and presents the results of an empirical study that aimed at trying to identify, explore and improve deficient business processes for SMEs in order to better prepare them for ERP projects. The study adopted a single-case study of a Cypriot firm to conduct in-depth investigation and to draw recommendations and conclusions from the lessons learned. The paper is structured as follows: the next section presents an overview of the literature review, followed by a discussion of the research question and research design; subsequently, the findings derived from the case study are presented and discussed, with conclusions drawn.

2. Summarised findings of the literature review process

The study presented in this paper is concerned with the overlapping of two established research areas, namely ERP and business process management (BPM). According to an extensive literature review, there have been growing numbers of studies focusing on these two research areas. Nevertheless, despite a rich amount of studies on these areas, the literature review identified three important research gaps that should be further addressed by researchers.

Specifically, current research studies on ERPs cover a wide range of issues, ranging from vendor selection processes (Bernroider and Koch, 2001), to ERP implementation and project management aspects (Wong *et al.*, 2005; Zhang *et al.*, 2005; Yusuf *et al.*, 2004), to system post-implementation barriers and risks (Peng and Nunes, 2009a, 2010). However, these studies focus mainly on larger enterprises (Poba-Nzaou *et al.*, 2008). In contrast, ERP adoption by SMEs has traditionally received less attention from researchers (Premkumar, 2003; Poba-Nzaou *et al.*, 2008). This certainly represents a rich area for additional research work (Poba-Nzaou *et al.*, 2008), since as discussed above SMEs face a greater pressure in making adoption decisions, getting training, or collecting relevant information necessary to implement ERP due to their inherent resource constraints (Chong, 2007).

On the other hand, as proposed by O'Neill and Sohal (1999), BPM in the literature is also often referred to as business process reengineering (BPR), core process redesign, business process improvement/innovation/transformation, etc. Regardless the actual term being used, studies in this field focus mostly on tools, models, methodologies and techniques for improving business process (Doomun and Jungum, 2008; Yu and Wright, 1997). However, there is a scarcity of empirical studies that report and explore the following:

- the business process evaluation and management in SMEs; and
- the management of these processes in preparation for ERP implementation in order to avoid automation of existing deficient processes in SMEs.

In fact, and of crucial importance for this paper, studies linking BPM and ERP generally emphasise on the system implementation phase. For instance, in a case study of ERP in Rolls-Royce Plc., Yusuf *et al.* (2004) examine how the company conducted an internal BPR programme during the implementation of SAP R/3. Moreover, many other IS researchers (Loh and Koh, 2004; Jarrar *et al.*, 2000) consider BPM as a critical success factor that is particularly related to the project phase of ERP. However, as discussed above, business process improvement should not merely be performed during ERP implementation. It is in fact essential for companies to make an attempt to identify and address any deficient business processes in the system prior to the implementation stage, in order to increase the chance of ERP success. This is particularly important in SMEs, where processes are not always clearly defined and are characterised by fluid boundaries and responsibilities. However, there is very little research addressing this later aspect. The realisation of these research gaps led the researchers to conduct the study reported in this paper.

3. Research methodology

3.1 Research question

As stated above, the main aim of the study reported in this paper was to help SMEs to have a more efficient preparation for ERP implementation by improving hitherto deficient business processes. In response to this research aim, the following research question was formulated:

RQ1. How to improve current business processes of SMEs in order to prepare them for ERP implementation?

In order to answer this research question, the study aimed at identifying inappropriate business processes and areas that can affect future ERP adoption in the context of SMEs. It also aimed to explore the causes and consequences of the deficient business processes identified.

3.2 Research design

ERP preparation, implementation and exploitation involve inevitable interactions between ERP systems and organisational contexts. In truth, the success of ERP innovation relies heavily on the context of application (Newell *et al.*, 2000; Xue *et al.*, 2005). Consequently, it is impossible to delineate an explicit line to separate ERP from its application context (Xue *et al.*, 2005). Therefore, the phenomenon being studied requires specific rich contexts, in order for all intervening factors to be understood. This pointed the researchers in the direction of trying to find rich case-studies in order to undertake this research. According to Robson (2002, p. 146), case study is “a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence”. Yin (2003, p. 13) reinforces that “a case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident”. Additionally, as highlighted

by Saunders *et al.* (2000, p. 94), case study is an approach particularly suited to generate answers to the “why”, “how” and “what” questions. Consequently, case study was adopted as a suitable approach to answer the established research question of this study.

3.2.1 The case-study. This paper reports on the study of a Cypriot company, namely A.C. Euroblinds Ltd. Euroblinds is a private company and is also one of the most well known SMEs in Cyprus. The company has two branches located in two of the most important economic cities in Cyprus, namely Nicosia and Limassol. Euroblinds is a manufacturer and trader of internal and external shading systems (e.g. external blinds, awnings, sun breakers, venetian blinds and roller blinds, etc.). Currently, the firm has more than 100 employees, and is estimated to hold 75-80 per cent of the local market (www.made-in-china.com/traderoom/costas-christodoulou/companyinfo/A-C-Euro-blinds.html).

Euroblinds was selected to be the case company due to two main reasons. First, the company is planning to use an enterprise-wide ERP to replace its isolated and not very well integrated legacy systems, which mainly supported the processes of ordering, stock controlling and accounting. The legacy systems were designed and developed by a Cypriot software company seven years prior to the study, and thus have become less efficient in supporting Euroblinds to retain competitive advantage. At the time of conducting this research, the firm was at the pre-implementation stage of ERP (e.g. vendor selection). Second, the company intended to fully implement ERP in all key functional divisions, including sales, production, accounting, inventory, purchasing and logistic areas. Consequently, Euroblinds was identified and evaluated to be appropriate in answering the research question and achieving the research aim.

In order to identify, explore and improve deficient business processes and areas in the selected company, this case study followed an inductive approach. In-depth interview was used as the main method of data collection. The interview schedule was semi-structured and used open-ended questions that focused on four main aspects:

- (1) characteristics of current business processes of Euroblinds;
- (2) problems and drawbacks associated with current processes;
- (3) causes and consequences of existing problems; and
- (4) potential solutions.

Moreover, trigger questions were used in the interviews whenever appropriate, in order to stimulate discussion and trigger interviewee's thinking. Interviewees were encouraged to raise issues at both organisational and departmental levels. Consequently, six in-depth interviews were conducted with key members of the management team, namely the managing director, the IT manager, the production manager, the purchasing supervisor and two supervisors in the sales division. All interviews were tape recorded and then transcribed for data analysis.

In addition, participative observation was used to understand how the current systems were exploited by their actual users in the company. This participative observation was conducted using a structured observation schedule that framed the process itself, enabled the researchers to ask questions, interact with the informants. Conversations were tape-recorded and activities were recorded by taking notes and the use of a field diary. This observation process took place after the interviews. Managers and supervisors advised the researchers on business processes to be observed as well as the sectors of the company (and people) the researchers observed.

3.2.2 Data analysis. The qualitative data resulting from the interview process was analysed by using an inductive thematic analysis approach. This approach is one of the predominant techniques for analysing qualitative data. It is “a method for identifying, analysing and reporting patterns (themes) within data” (Braun and Clarke, 2006). By following the principles of inductive thematic analysis, the researchers went through a process of searching, identifying and exploring codes and themes that emerged as “important to the description of the phenomenon” (Daly *et al.*, 1997). This coding process was implemented through “careful reading and re-reading of the data” (Rice and Ezzy, 1999, p. 258). Subsequently, the findings resulted from the analysis were represented graphically through concept maps (Figure 2).

The data from the participative observation was analysed, cross-referenced with the interview findings and represented through a rich picture (RP). The RP method originates from Checkland’s soft systems methodology (SSM). It is a valuable tool to capture the general problems and the nature of the company concerned (Avison and Fitzgerald, 2006) and it is used iteratively as a communication tool with all the actors of the system being studied. RPs have been widely used in IS research in general (Lewis, 1992; Baskerville, 1999; Willcocks *et al.*, 1996) and in ERP in particular (Skok and Legge, 2002). This type of very straightforward pictorial representation is used in IS research in order to provide a balanced multi-perspective view of the important contextual factors and issues involved in the very complex use of IS in human activity systems.

As described by Avison and Fitzgerald (2006), a RP consists of a set of essential components, including internal and external entities/actors, relationships or information flows between actors, concerns or worries of actors, and conflicts inside the firm. The RP in Figure 1 was initially created from the interview data. It was then used to inform the observation process and at the same time discussed and negotiated with users during the successive observation moments. The RP therefore linked the two processes of data collection and enabled the contextualisation and understanding of the findings of the interviews. As such, it was both a formative and evolutionary representation of the researchers’ understanding of the human activity systems of Euroblinds. The version shown in Figure 1 is the final RP for the IS situation of Euroblinds at the end of the research. This representation clearly identified that IS problems faced by Euroblinds were localised around ten business areas as illustrated by the cross-swords symbol.

Whilst the RP presents an information systems modelling view of the current situation for Euroblinds, in this research we are focusing on horizontal and transversal business processes. The IS view, once translated into business processes revealed three main problem areas:

- (1) sales order processing;
- (2) stock control; and
- (3) managing bill of materials (BOM).

Furthermore, the RP as IS modelling tool does not work well to understand business process. Consequently, we adopted concept maps as a business modelling tool. That is, whilst the RP presents an overview of the current IS situation for Euroblinds, concept maps were used to represent specific business processes where these problems are identified. The specific problems are identified by cross-swords, but were discussed in

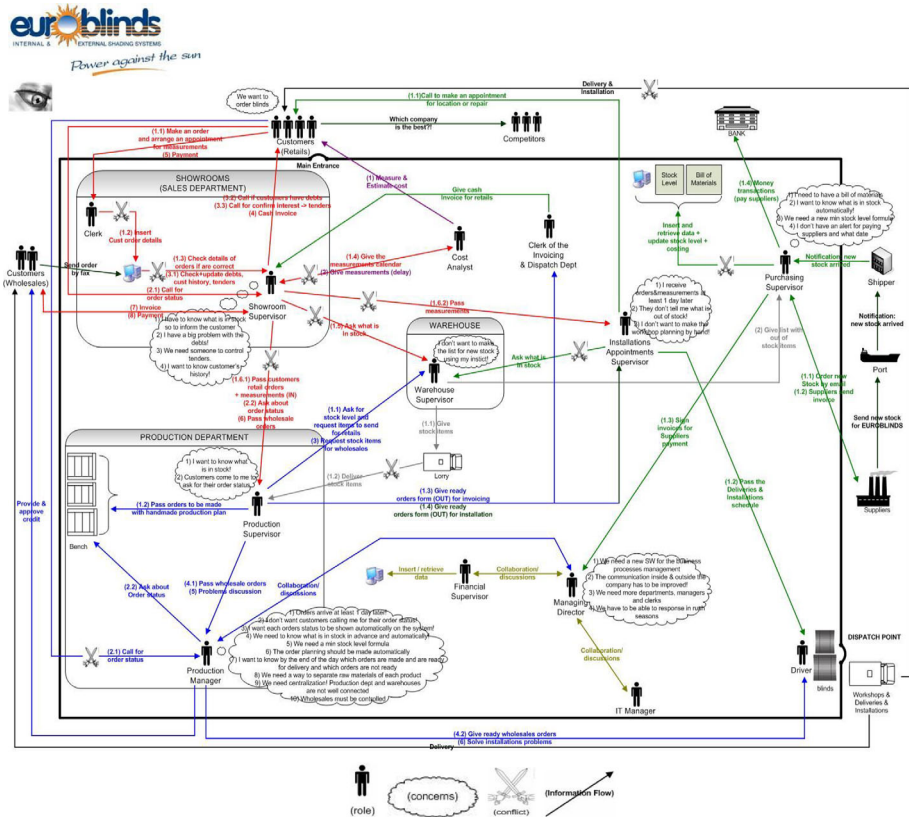
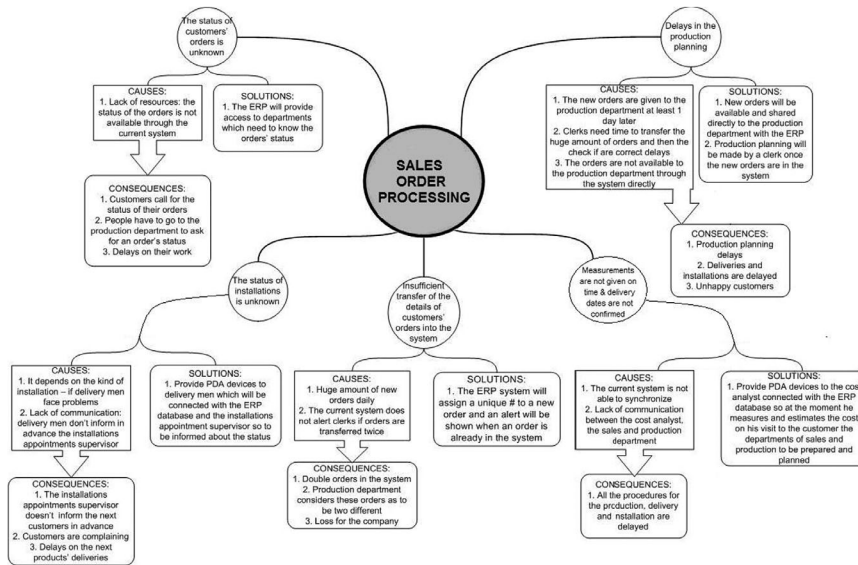


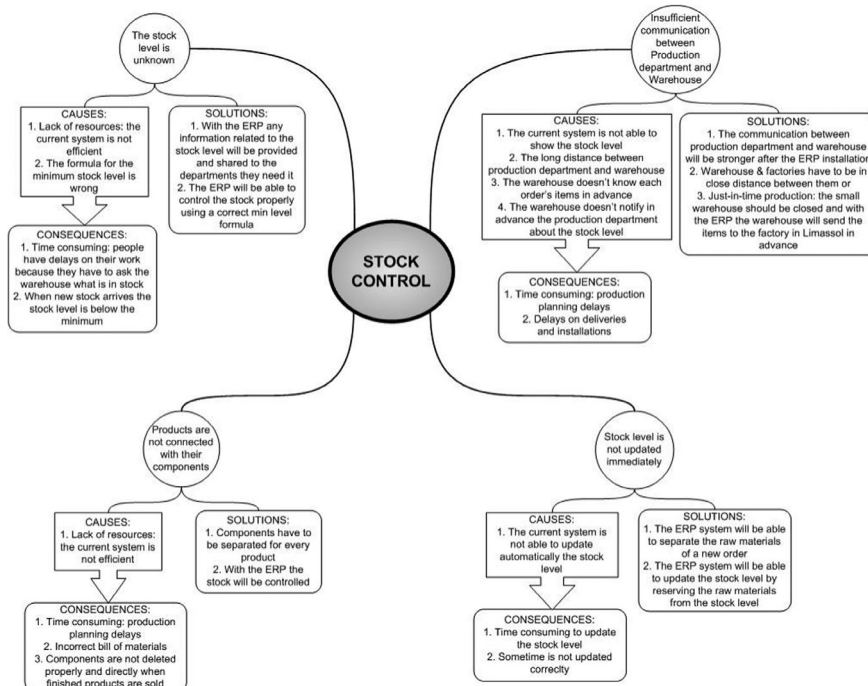
Figure 1.
RP of Euroblinds

the context of the identified business processes which were modelled by concept maps, which allowed the translation from an information system's view to a business process view that was the aim of this study. Concept maps are “graphical tools for organizing and representing knowledge [and . . .] include concepts, usually enclosed in circles or boxes of some type, and relationships between concepts” (Novak and Cañas, 2006). These maps are useful exploratory tools and an efficient method to share, discuss and represent concepts and findings derived from qualitative data analysis (Nunes *et al.*, 2004).

The concept maps shown in Figure 2 are related to the three critical problem processes discussed in this paper. These clearly illustrate the complexity of the findings and the richness of the data collected and were discussed and negotiated with operational managers as well as the managing director. As shown in the diagram, each concept map highlights various issues (e.g. inappropriate formula for calculating minimum stock level) found in a specific business process (e.g. stock control) of the case company. Moreover, these concept maps also contained elements regarding causes and consequences of the identified issues and corresponding solutions proposed by interviewees. These maps were then used as the basis for constructing findings and argumentation, as presented in the remainder sections of this paper.



(a)



(b)

(continued)

Figure 2. Three examples of the established concept maps

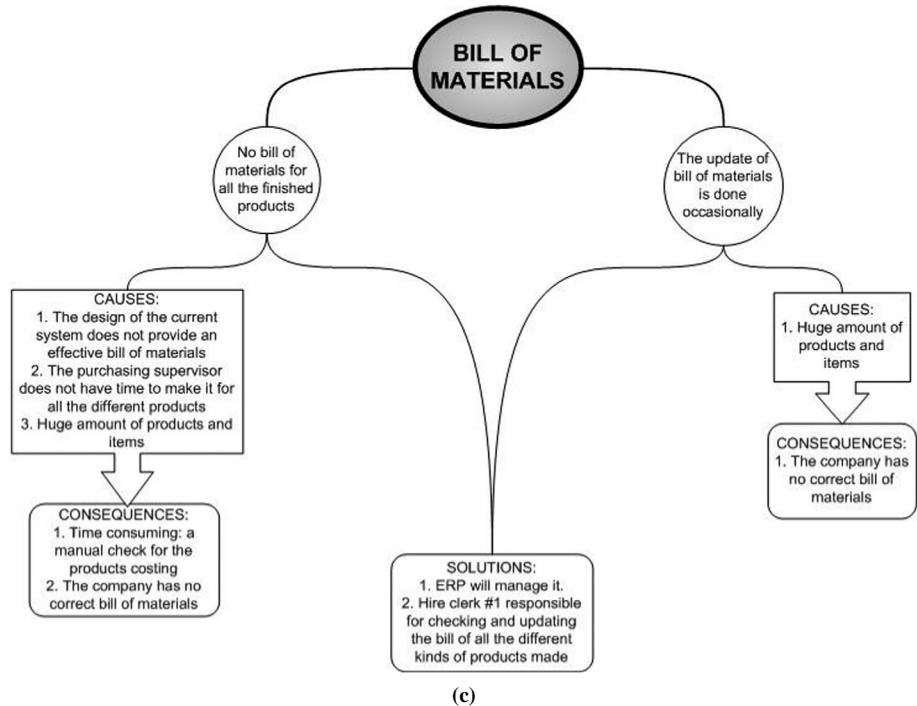


Figure 2.

4. Research findings

As mentioned above, the findings reported in this paper focus on the three most critical problem areas identified, and are therefore divided into three sections below. Moreover, the following sections do not just present and discuss current business problems identified in Euroblinds, but more importantly also analyse and discuss, with support from the literature, how these problems may affect future ERP adoption and usage in the firm. A set of recommendations to address the identified issues are also proposed.

4.1 Sales order processing

4.1.1 *Current issues.* As a leading player that possesses 75-80 per cent of the local market, Euroblinds receives a large amount of sales orders daily. Nevertheless, order-taking is currently a time-consuming process, in which sales staff have to first write down the order on paper and then transfer it into the legacy sales system. However, as shown in another case study reported by Palaniswamy and Frank (2001), this issue can often be easily addressed when the firm is equipped with better hardware and software facilities after ERP implementation. In fact, the interview data indicated a further set of issues that are particularly crucial and specific to the case company:

- The interviewees indicated that mistakes occur very frequently when entering orders into the sales system. Specifically, details of customer orders were not always transferred correctly and accurately into the system by sales clerks. Moreover, the same order might often be inputted twice, and thus resulting in the system to contain duplicated sales orders. The interviewees went on to state that

- incorrect or duplicated customer orders could often lead to confusion to the production department and thus affect normal production.
- For each order, a cost analyst of the firm will need to visit the customer's place in order to take measurements (e.g. size of windows). However, results of these measurements were often not passed on time by the cost analyst to other related departments (e.g. production). This could directly lead to delay of production and order delivery.
 - More importantly, after taking measurements, cost analysts need to provide a delivery date to the customer. However, they currently would do so without communicating and confirming with the production and delivery department, who might actually not be able to produce and deliver the order on a specific date. The interviewees pointed out that these issues were caused by a lack of synchronized communication between cost analysts and the production department, which resulting in very poor collaboration between both sides.
 - On the other hand, during product delivery and installation, unexpected problems (e.g. not able to find the exact location of the customer) can often arise, and thus requiring delivery staff to take extra time to complete the job. In these circumstances, the delivery man currently would not be able to notify the company immediately. As a consequence, the firm is unable to make alternative arrangements, and thus leading to significant delay of delivery to the next customer.

These problems are clearly not necessarily going to be resolved by an ERP system. Lack of communication, delays in inputting data, inaccuracies in the introduction of data in the system and delays on receiving data from out of office surveyors cannot be resolved by any IT system and need to be addressed by internal regulatory measures and enhanced communication processes. In response to these problems, the senior management team proposed to purchase and use mobile devices like tablet PCs and smartphones, which could allow cost analysts and delivery staff to exchange data synchronously and wirelessly with their ERP database in the future. This solution however needs to be implemented very carefully, as further discussed in Section 4.1.3.

4.1.2 Potential impact on ERP adoption/usage. The problems identified above can lead to critical impacts in the ERP environment. In particular, by using a centralised database, ERP systems enable the integration of data within and across all functional areas of user companies (Kumar and Hillegersberg, 2000). This integration feature of ERP however determines that all inputted data will flow "so quickly through the system that there was little opportunity to track down mistakes before they showed up on everybody's screens" (Scapens and Jazayeri, 2003). In other words, if a sales staff input incorrect or duplicated data into the ERP system, it will raise immediate impacts to not just the production department but all other related functional divisions (e.g. finance, warehouse and purchasing) in the firm. Therefore, the occurrence of such human mistakes must be prevented in order to ensure both the ERP system and the company to operate effectively and efficiently.

4.1.3 Recommendations. The interviewees claimed that their current data problems should be attributed to the deficient legacy system, which lacked alert functions for invalid data. They thus expected that the new ERP system could help them to cease these problems. Nevertheless, the analysis of the data collected during the study identified that in the case company, data entry mistakes often occurred because of inappropriate work

behaviour, job overload, or just negligence of users, rather than due to any technical reasons. Moreover, it is apparent that not all ERP systems will be efficient enough in automatically detecting invalid, incorrect and duplicated data. This may not even be desirable in the case of repeat or sequential orders. In truth, in order to prevent staff from inputting invalid data into the ERP system, there seems to be a need for Euroblinds to develop in advance some rigorous system usage rules and policies to restrict and regularise user activities. These ERP policies should specify all working procedures in detail, as well as highlight what consequences may arise from irregular and inadequate system usage. These regulations will be useful in formalising business procedures, which are vital in forming “the core of efficiency for an ERP system” (Deep *et al.*, 2008).

Furthermore, if the company is to use mobile devices to facilitate synchronized communication between fieldwork staff and the company, the future ERP system must be able to support this strategy. This means that IT manager of the firm needs to handle these business requirements very carefully when selecting their ERP package, in order to ensure that the selected system would be compatible with the purchased mobile devices, such as tablet PCs and even smartphones. The ERP system may also need to be customized during ERP implementation, in order for it to be integrated with any mobile devices. This clearly points to the need and importance for user companies to prepare themselves adequately before ERP implementation and even selection, as discussed at the beginning of this paper.

4.2 Stock control

4.2.1 Current issues. As a manufacturing company, Euroblinds holds a number of different types of stock, i.e. stock of raw materials, components and finished products. Dransfield and Needham (2004, p. 661) state that effective control of stock is essential for manufacturing firms to run efficiently. However, it emerged from the findings that stock control in Euroblinds was very inefficient at the moment. In particular, the company always faces problems of stock overage or shortage. Further analysis of the data identified that these issues were mainly attributed to the failure in setting proper stock levels (i.e. maximum and minimum stock to be kept) in the firm.

In reality, in order to identify how much stock to keep, companies will often need to take into account a comprehensive set of factors, such as the nature of the business, type of stock concerned, supplier lead-time, sales demand, inventory capacity, and seasonal reasons, etc. (Steele and Plunkett, 1994). However, the findings showed that the case company often failed to consider and evaluate any of these factors when deciding stock levels, probably due to a lack of knowledge on advanced business practice.

In addition, as stated by Steele and Plunkett (1994), different departments within the firm always have controversies about what the “best” stock levels are, e.g. the sales department wants to have additional stock to prevent sales losses, but the financial department’s mission is to minimise inventory cost by reducing stock level. Therefore, the established stock levels must balance the aims of different business divisions (Steele and Plunkett, 1994). However, this was not currently the case in Euroblinds, due to poor cross-functional collaboration and communication within the firm.

In sum, the findings showed that, insufficient business environment knowledge, inefficient organisational communication and deficient operational planning seemed

to be the main reasons for the case company to establish inappropriate stock levels, which in turn impacted efficiency of stock control. If organisational communication can be clearly improved by an integrated centrally controlled system such as the ERP, it is clear that knowledge of the business environment and good planning can only partially be improved by this type of system. Therefore, these issues can certainly also affect ERP adoption and usage in the case company, as discussed below.

4.2.2 Potential impact on ERP adoption/usage. It is widely acknowledged that ERPs do not just consist of the latest technologies of information systems, but more importantly also contain many implicit advanced business concepts and practice. System users must possess sufficient understanding and knowledge on these advanced business concepts. Otherwise, they may not be able to use the system properly and may also fail to exploit the full power of ERP. Moreover, due to a lack of knowledge and understanding, system users may often be reluctant to accept and use the ERP system (Peng and Nunes, 2010; Wright and Donaldson, 2002). Such user resistance is certainly a barrier to successful ERP adoption and usage.

On the other hand, successful implementation and exploitation of ERPs rely on involvement, collaboration and communication from all functional departments. Therefore, poor cross-functional collaboration and communication is frequently mentioned as a crucial barrier to successful introduction of ERPs (Peng and Nunes, 2010; Fletcher and Wright, 1995).

Furthermore, an ERP system cannot replace (or, it could be argued, appropriately exploited without) good strategic and operational planning based on solid knowledge of the business environment. The implementation of a new ERP system for Euroblinds would therefore not resolve the stock problems identified above.

4.2.3 Recommendations. All ERP packages contain specific modules and functions addressing stock control and management. Moreover, a well-designed ERP will also involve mathematic tools to assist companies to forecast sales demands and stock requirements, as well as to answer “what if” questions (Agarwal *et al.*, 2000). The managers interviewed thus perceived ERP as the solution towards current problems related to stock control, forecasting and planning.

However, this is actually an overestimation of the power of ERPs due to two main aspects. First, stock levels generated by using statistical techniques are not always appropriate and reliable, because unexpected changes and problems can often arise in real practice (Steele and Plunkett, 1994). Second, and more importantly, “an ERP system is only the tool you need to [improve the problematic situation, but] it is not a solution [to the problem] in its own right” (Robinson, 2003).

Consequently, in order to improve efficiency of stock control, Euroblinds cannot merely rely on the use of ERP. Instead, substantial training and business awareness workshops should be provided to current staff, in order to enhance their understanding of business knowledge and improve organisation-wide communication. Clear procedures for this communication and mediation of the different interests in the company need to be established. These processes of communication need ultimately to be taken into account in more transparent planning and more participative forecasting. In turn this transparency of planning can only be achieved through changes in the management style. This is vital for enhancing both the operational efficiency of the case company and the chance of ERP success.

4.3 Managing BOM

4.3.1 Current issues. In manufacturing firms, the term “material” refers to any components (e.g. raw materials, parts, sub-assemblies, accessories and casings, etc.) used in production (Zhou *et al.*, 2005). Traditionally, information about materials that are used to make up a product is recorded in the form of a BOM. A BOM is a hierarchical chart that shows:

A list of the component parts required to make up the total package for a product [...] together with information regarding their level in the product or component structure and the quantities [costs, and specifications] of each component required (Slack *et al.*, 2004, p. 770).

Having accurate BOMs are essential for ensuring final products to be manufactured adequately by using the right materials in the right sequences and quantities. Moreover, data contained in BOMs will also be used in a wide range of business activities, e.g. material requirements planning and product costing, etc. (Koh *et al.*, 2000; Stonebraker, 1996). However, despite these important facts, BOM management in Euroblinds seems to be fraught with problems at the moment.

Specifically, the purchasing supervisor is currently responsible for managing and updating BOMs manually. The firm has a set of BOMs for regular products. However, due to serious job overload of the purchasing supervisor, these BOMs are only occasionally updated and thus often contain inaccurate and outdated data. Curiously, the findings showed that these inaccurate BOMs did not cause any significant consequences in the case company. The explanation to this phenomenon is that, the official BOMs maintained by the purchasing supervisor is actually not fully used by other departments, that is the BOM exists but nobody pays any attention to it. This is indeed a common phenomenon in SMEs. In particular, Zhou *et al.* (2005) state that, under irregular working environments, different functional divisions (e.g. sales, engineering and production) may often keep and use their own versions of BOMs and neglect the official ones. This is also the case for Euroblinds where these unofficial BOMs are often inconsistent and different from each other. This situation does not seem to result in disaster due to inefficient purchasing (often purchasing is done in excess), improvisation and fast decision making at operational level. Moreover, the fact that the main BOM is disregarded may also be one of the reasons for the stock control problems discussed above. However, this type of flexibility and inconsistency is not possible when the ERP is installed. So if the overload of the purchasing director is not resolved and the BOM is not periodically updated and checked then the BOM may cause critical impacts in production.

On the other hand, one of Euroblinds’s strategic business objectives is to satisfy all standard and personal requirements raised by customers. In order to achieve this objective, the company is currently concerned with two types of production:

- (1) Make-to-stock (MTS) production: for regular products with fixed design and using default materials.
- (2) Made-to-order (MTO) production: for products with customised design and using specific materials based on requirements of customers.

While the management of regular MTS products is quite straightforward, the management of MTO products is very complicated. Specifically, each MTO product involves certain modifications and customisations to a regular product structure and design. A modified BOM should normally be created to reflect the unique

configuration of each MTO product (Howard *et al.*, 1999). However, this currently is not the case in Euroblinds, because managers of the firm considered it would be very time-consuming to do so by using the current manual system. These managers thus hoped that ERP could provide a more efficient way for them to create and maintain BOMs for MTO products. In fact, although this situation may be substantially improved with the support of ERP, this issue needs to be addressed very carefully during ERP implementation in order to avoid potential system usage problems, as discussed below.

4.3.2 Potential impact on ERP adoption/usage. BOMs are one of the most important elements of data stored in ERPs (Peng and Nunes, 2009b). By using BOMs as inputs, ERP systems will generate a set of important outputs (e.g. material requirement plans, production plans, production orders and purchasing orders, etc.) to guide production and material procurement. However, due to inappropriate maintenance, BOMs stored in ERP systems may not always be accurate and complete (Peng and Nunes, 2009b). Moreover, BOM maintenance will surely become more difficult and complicated, if functional departments keep various versions of BOMs outside the ERP database. When BOMs are inaccurate and incomplete, related ERP outputs will inevitably become misleading and invalid. This can lead to a wide range of destructive impacts on the user company, e.g. failure in ordering required materials at the right time and in the right quantities, delay and/or crease of production, and significant increase in customer delivery lead time, etc. (Zhou *et al.*, 2005, p. 53).

Moreover, as introduced above, BOMs contain information about quantities and costs of each component used to make up a final product. By using these BOM data, ERP systems can automatically conduct product costing for final products. This is actually a default function for most ERP packages. However, in Euroblinds BOMs will ultimately depend on the quality of the input from the purchasing manager. The current problems are due to the lack of discipline and regularity of the updates to the BOM, due mostly to overload of that manager. These problems are therefore not of a technical nature, but an organisational problem that, if not resolved, will just be transposed to the ERP system.

On the other hand, ERPs are traditionally designed for and used by MTS companies (Deep *et al.*, 2008). As mentioned earlier, MTS products consist of fixed materials and thus have constant BOMs and unit costs. MTS products also involve a high volume of production for each product type. Standard ERP configurations for BOM management and product costing thus normally match with these MTS features. However, the situation becomes completely different and more complicated with MTO products. As discussed before, each MTO product has a unique design and BOM structure. These products generally involve a very low volume of production but include a high variability in each product type (Deep *et al.*, 2008). The standard ERP system thus must be reconfigured, customised or embedded with additional modules (e.g. advanced planning and scheduling – APS module) during the implementation phase, in order to address special features of MTO production (Deep *et al.*, 2008). Otherwise, production planning and product costing conducted by ERPs will be distorted completely, and thus leading to the same set of destructive consequences as discussed above.

4.3.3 Recommendations. Based on above discussion, three recommendations were drawn to the case company. First, instead of relying merely on the purchasing supervisor to handle BOM maintenance, there seems to be an imperative need for the company to recruit or assign additional staff to get involved in this complicated task.

Second, after ERP is implemented, all BOMs of the firm need to be centrally stored in the system. No alternative BOMs should be kept and used by individual departments in order to maintain consistency, integrity and accuracy of BOM data in ERP. Third, and more importantly, managers of the firm must distinguish the features between MTS and MTO production, and understand how these features can potentially affect ERP configurations. They must take these issues into consideration when selecting their ERP vendor. For Euroblinds, it is vital that the selected ERP package is efficient enough in supporting both MTS and MTO production with minimum customisation.

5. Overall discussion of lessons learned

Following the investigation of the case study at Euroblinds, the researchers identified a list of key lessons that are valuable for helping SMEs to better prepare themselves for ERP implementation. These key lessons learned are summarised and further discussed below:

- (1) As also noted by Deep *et al.* (2008) and Koh and Simpson (2005), SMEs often have an inherent lack of efficient business processes and regular business procedures. This is particularly true in the case company.
- (2) The findings identified deficiencies, redundancies of processes and tools, inaccuracies of stocks and production figures and inconsistencies across different areas of the organisation. These problems that characterised this SME in particular can be found across diverse business processes and functional areas and are common for SMEs in general. However, ERPs are integrative systems that will have one centralised version of the SME operation. Therefore, the identified deficiencies, redundancies and inconsistencies that guarantee the operation, and often the success, of the company today, may originate the failure of the ERP exploitation in the future. So the effort of understanding, homogenising and integrating deficient business processes needs to be done prior to the all sweeping ERP implementation done by ERP consultants, so that no crucial aspect to the operation of the SME is forgotten or disregarded. This should consist of an exhaustive and in-depth investigation involving all key functional areas and actors. It is worth to note that, in comparison to large enterprises, this task is often much more complex to achieve in SMEs, which have multifaceted and fluid organisational structures, very ill-defined functional boundaries and distributed power sharing.
- (3) SMEs often have diverse but crucial business features and requirements (e.g. remote access to the system via mobile devices or BOM requirements for MTO products in the case company). It is vital for SMEs to identify these special needs very early in the system pre-implementation stage, and thus selecting a suitable ERP package that can satisfy these requirements with minimum customisation. Failing to do so may result in either high reconfiguration cost in ERP implementation or even a complete ERP failure in SMEs.
- (4) It was established in this study that a deficient business processes (e.g. sales order processing in Euroblinds) could often be attributed to a variety of reasons related to diverse aspects, namely:
 - organisational (e.g. irregular working climate, ill-designed business processes);
 - operational (e.g. inconsistencies of BOMs); and

- human (e.g. user lack of discipline or even negligence).
These problems cannot be solely resolved by ERPs and if not addressed they will just be transposed to the ERP implementation and exploitation. To improve these deficient business processes, it is necessary to make changes not only in the technology, but more importantly in the business process themselves, in people implementing the processes and using the technology and in organisational policies, as shown in the recommendations given above.
- (5) Furthermore, through such internal improvements, SMEs may also be able to identify and address sets of existing barriers (e.g. inefficient cross-functional collaboration) and potential risks (e.g. user inputs incorrect data into the ERP system) that can affect ERP success.
 - (6) Finally, when asked how existing business problems might be overcome, interviewees of Euroblinds almost always stated that the new ERP would be the solution to resolve any deficiency, as shown in Figure 2 (a)-(c). This is a prevalent view in the SME universe where as stated by Deep *et al.* (2008) ERPs are perceived as the panacea to resolve all problems and achieve competitive advantage. However, this is clearly over optimistic view. Although ERPs may potentially lead to a set of substantial business improvements in SMEs, it is unrealistic to expect the adoption of ERP can resolve all business problems, especially those that are related to deficient business processes and human aspects (e.g. overloaded staff, unclear authority or inappropriate working behaviour and attitudes of employees). Indeed, managers' perception of ERPs as all solving systems may blind them to the impacts and threats of existing organisational issues (e.g. inappropriate staff working behaviour in Euroblinds), which can lead to potential ERP failure. Therefore, prior to the implementation of the ERP and strong effort of expectations management need to take place both at managerial and operational levels.

6. Conclusions and implications

This paper reports on an in-depth case study, which provides valuable insights to help SMEs prepare for the implementation of an ERP system. The paper proposes that improving business processes in SMEs prior to the start of the ERP project, will ensure better rates of success in both implementation and exploitation. The study confirmed that a wide range of deficient business processes and internal problems are inherent to SMEs operations. Disregarding these business problems in the ERP preparation stage, will result in the transposition of these deficiencies to the ERP implementation and may substantially affect the use of the system after it goes live. It is therefore vital for SMEs to address these drawbacks as early as possible in order to increase the possibility of ERP success. This is particularly critical to SMEs, which often have limited resources and are thus less likely to be able to afford the losses and reductions in operational efficiency caused by ERP failure. Therefore, engaging in a preparation phase before the implementation of the ERP may be crucial, not only for the success of the ERP system exploitation, but also to the very survival of the SME.

The results of this study have important practical and research implications, however as any case-study based qualitative study it is not necessarily generalizable. Therefore, in practical terms the problems identified and recommendations drawn are

specific to the case company. Nonetheless, the findings of the research are likely to be meaningful and valuable for other SMEs, especially for those that are engaged in similar business sectors and contexts as the one studied. Moreover, the overall lessons drawn and discussed provide useful insights for SMEs that are preparing to adopt ERP systems. In research terms, this study added to the knowledge of ERP in general, and contributed to the research gaps in ERP preparation and business process improvement in SMEs in particular. However, since the study examined only one case, further empirical research of the same type is certainly required.

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