ERP systems selection in multinational enterprises: a practical guide

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Abstract:
The Enterprise Resource Planning (ERP) system selection is an early phase in the ERP adoption process. When organizations evaluate an ERP, they commonly develop their own selection criteria that usually involve various system and vendor related factors. While the selection process is critical, however, there is an apparent research gap in literature. The ERP selection effort also focuses on the system's fit with the organizational requirements and needs. Thus, the selection phase is critical, because if an organization chooses an unfit ERP, the whole project could be predestined to fail. This research provides an overview of an ERP selection process at an overseas branch office of a multinational company. The process employed a simple multi-attribute rating technique (SMART) for evaluation. In addition, this research presents how cross-border data protection laws between the parent company and its branch have influenced the selection process. As the ERP system has been implemented successfully, the method and the selection factors have been proven adequate for the selection process.

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1. Introduction

Enterprise-wide information systems (IS) adoptions require careful selection and implementation efforts, especially enterprise resource planning (ERP) systems. ERP systems are modular and bundled information systems that integrate the enterprise-wide business processes and functions. ERP systems emerged in order to replace the legacy silo systems through providing a unified and integrated solution for the organization's information-processing needs [1]. One of the main aims of ERP systems is to support the process-oriented view of the enterprise, as well as standardization of business processes across business functions, within the enterprise. Thus, enterprises worldwide are allocating a substantial portion of their IT budgets towards new ERP adoptions, completion of their initial ERP system installations, or upgrades, extensions and integrations to their existing systems. Among the most important characteristics of an ERP, is its ability to unify, automate, and integrate an organization's data and business processes across the entire enterprise, in a near real-time environment. In general, many organizations have their own custom processes set in place, however, several of these businesses re-engineer their non-standard processes to fit the ERP in order to take advantage of future updates, benefit from the standardized best-practice processes, and avoid costly irretrievable errors [2, 3]. Also, this could dramatically decrease the system customization costs.

ERP systems are regularly implemented as multi-phased projects. The implementation projects have several stages and milestones that typically starts with an adoption decision, then goes through selection of the ERP package and vendor, the actual implementation, use and maintenance, and finally future evolution [4]. Generally, ERP implementation projects involve internal IT & key business personnel from inside the organization, as well as, external consultants, or consultants from the implementation partners. This draws a picture of how resource consuming and costly ERP projects are [5].

During the selection phase, system/organization fitness is a crucial endeavor. Several large information systems implementations fail due to the selection of a non-matching system. The matching process happens between the organization needs, requirements, and expected future evolvement and scalability. The topic of "fit" has been frequently discussed in IS literature, specifically in enterprise resource planning literature. A wrong ERP system selection would either fail the project, or critically weaken the system, and hurdle the company performance [6]. In their study, Carton and Adam [7] argued that the ERP selection process in multi-site/multinational organizations may differ from monolith ones. There are several factors that would affect and influence the choice of the ERP system at subsidiaries and international branches. Some of them are related to system standardization issues [7], data sharing regulations across borders [8], and other operational and integration issues [9, 10]. Thus, the ERP selection process is a non-trivial task. This is mainly due to the scarcity of available resources, complexity of the ERP packages, and the diverse ERP system alternatives in the market [10]. In practice, the ERP selection process involves several factors. One of the important factors is the functional fitness of the system with the business requirements [10, 11].

Although the ERP adoption process has several phases, this paper focuses-on the ERP selection criteria and process. The remainder of the paper is organized as follows: section 2 presents the related literature, followed by the research methodology and case description in section 3. Section 4 illustrates the research analysis, and finally the research conclusions are presented in section 5.

2. Related literature

2.1 ERP systems

ERP systems are standard software packages that provide integrated transaction processing and access to information for the multiple organizational units and multiple business functions. These functions include finance and accounting, human resources, supply chain, manufacturing, and customer services. The standard in-house ERP system is based on a unified database. The database could be locally stored in case of on-premise ERP implementations, or residing outside the organization boundaries in cloud-based ERP systems. Regardless of the technical architecture of this database, it

gathers data from the various business functions. The database also feeds the data into modular applications supporting virtually all of the company's business activities – across functions, and across business units. When a new process (transaction) is registered at one corner of the organization, related data in other units is then automatically updated accordingly. Most companies expect their ERP systems to minimize their operational costs, increase process efficiency, improve customer responsiveness, provide process-level integration, enhance reporting, and subsequently decision-making [1]. In addition, several organizations also want to standardize their processes and utilize the best practices embedded in ERP systems, in order to ensure quality and predictability in their global business interests. This also could aid in order-to-delivery cycle time cuts [3].

When organizations adopt ERP systems, they face several challenges. Some of those challenges are related to the degree of business process re-engineering (BPR) needed to accommodate the new system. In addition, customization and change management are also considered critical challenges during the project. On the other hand, in some cases, organizations are leaning to adopt a vanilla implementation approach, which could be the least risky implementation approach [3]. Vanilla implementations radically minimize the degree of customization and clean-slate business process reengineering, as they follow the standard ERP functionalities, best practices, and process models instead of customizing the ERP package to fit the enterprise's unique processes [12]. Regardless of the company size, and the type of implementation, all ERP implementations require careful project management activities, a committed team, and a various degree of BPR. After the implementation, organizations usually experience a "shakedown" phase, during which they encounter performance instability while adjusting to the newly re-engineered processes [13]. This might result in operational commotions or abridged productivity for a certain period of time.

2.2 ERP fit

ERP fit with the organization, is a paramount criterion in the selection process. The fit perspective can be defined as the task to technology fit [14]. Goodhue and Thompson [14] argue that the fit is the degree (or process) of matching the capabilities and functionalities of a certain technology to the demands and requirements of a particular task or process. This has also been linked to employee performance, as information systems will most likely have a positive impact on employees or organizational performance only when the technology functionalities and features are fitting to user task requirements [14, 15]. Hence, identifying the capabilities of the potential ERP system to accommodate the critical business processes of organizations is the first step in insuring a successful ERP selection. Existing research has provided cases of early ERP retirement and project terminations, because of a wrong selection due to the gap or "no fit" between the system and the unique business processes, and organizational requirements [4]. In their study, Haddara & Elragal [4] recommended that organizations should not ignore the formal ERP selection practices, and emphasized the importance of user engagement during the selection process, as this could aid in avoiding ERP failures and erroneous system evaluations. In addition, they have advocated for business process requirements mapping with the potential system's technical capabilities, prior to the acquisition decision [4]. In general, several scholars in IS literature have argued that the organization-specific characteristics and contexts have also been important research aspects throughout IS implementations. Likewise, studies in the ERP domain are prompting researchers to investigate the implications of contextual factors, and organizational characteristics on the ERP implementation process. The majority of literature acknowledges that the organization size has a direct impact on ERP implementation success [16]. Instead, other factors like "ERP size" could also be a critical factor because of its influence on businesses and implementation complexity. The fit between the strategic business goals and ERP objectives is also considered an important factor for creating business benefits from the ERP adoption project [11]. In ERP adoptions, users must identify which goals to achieve with the new system, how the functionality of the system can realize this, and how to configure, customize, and technically implement the package [17].

Research results on Greek SMEs suggest that a number of organization-related factors like business process complexity, change management, and external factors like supply-chain partners and value networks pressure, have a strong effect on the ERP selection process [18]. Other research conducted in Australian enterprises, suggests that business requirements, system flexibility, acquisition costs, scalability of the ERP system [19], and the degree of ERP alignment/fit with the business processes, have a great influence on the ERP selection decisions [20]. In van

Everdingern et al. [21], their study suggested that the *fit* of the ERP application with the adopting enterprise's business processes is the most critical selection criterion in Nordic European SMEs. Other studies suggested and identified critical factors that could lead organizations to a successful selection process. The factors were local support, cost, and suppliers' business domain knowledge [22]. In addition, CEOs' technology awareness, employees' IT competence, firm size, ERP compatibility [23], and project management [24], were also identified among the critical success factors (CSF) for selecting the right ERP for SMEs.

2.3 Cross-border and data privacy laws

Due to globalization, communication and technology advancements, the need for cross-border data exchange is becoming increasingly needed and desired. Multinational and global organizations with international offices and branches seek to exchange data among its various locations in order to generate consolidated reports and analyze their global data. In addition, several of these multinationals have certain centralized operations, like centralized human resource management at the headquarters for example. Yet, nowadays such data exchanges and transfers are becoming more problematic and costly from a business perspective. This is due to the fact that an increasing number of countries and regions (e.g. EU) are adopting more strict data exchange and privacy laws that regulate and limit cross-border transfers of personal data, including transfers to headquarters, branch offices, and subsidiaries [25]. Many of these laws were decreed based on the mounting public concern about the potential misuse of personal data by some organizations or parties. Thus, these regulations and laws either clearly forbid transfers to other countries except particular pre-set conditions are met, or enforce regulatory requirements on the organizations exchanging the personal data [25]. Hence, the ERP selection process usually differs in the contexts of multinational organizations. In best-case scenario, if a subsidiary needs an ERP system, the easiest option is to create user accounts on the main ERP system at the headquarters. However, due to cross-border and data privacy laws in some regions, and separation of operations and finances, this scenario is not suitable in most situations [7]. In many cases, the headquarters enforces subsidiaries and international branches to adopt a pre-designed implementation, which would be replicated in each site; this could lead the individual sites to lose the richness of their local practices and competitive edges. This may lead to large-scale organizational problems [7]. Thus, the ERP selection process at subsidiaries might be dramatically influenced in cases of multinational enterprises.

2.4 ERP selection

In order to better understand and evaluate the selection and acquisition process, several studies identified the factors that affect ERP selection in organizations, and proposed criteria to optimize the selection process. For example, Velcu [26] has identified several factors that affect the selection criteria, which includes the ERP-to-organization fitness as an important factor. In addition, Velcu [26] has argued that all the ERP adoption phases are highly interdependent with the critical success factors of each stage. Moreover, Deep et al. [27] have developed a framework for the ERP system and vendor selection process, presented in figure 1. The framework demonstrates several phases in the selection process, which starts with the requirements and project planning, identifying potential vendors, evaluation, and finally selection of the appropriate ERP package. The framework also illustrates several iterative tasks to be accomplished by the project team at each stage.

In their research on ERP implementations risks, Aloini et al. [6] underlined the importance of fitness between the organizational business process requirements and the ERP system's functionalities and capabilities. They have categorized the inadequate ERP package selection as being the paramount cited risk factor in ERP implementations (see table.1). They have also suggested that a wrong package selection is a key concern and could lead to time, cost, and risk escalations, which can lead to dire events that could ultimately result in total project failures [6]. In addition, they have encouraged for a structured multi-criteria approach for evaluating the ERP system and vendor. The criteria are comprised of several factors, including functionality, technology, support, and costs.
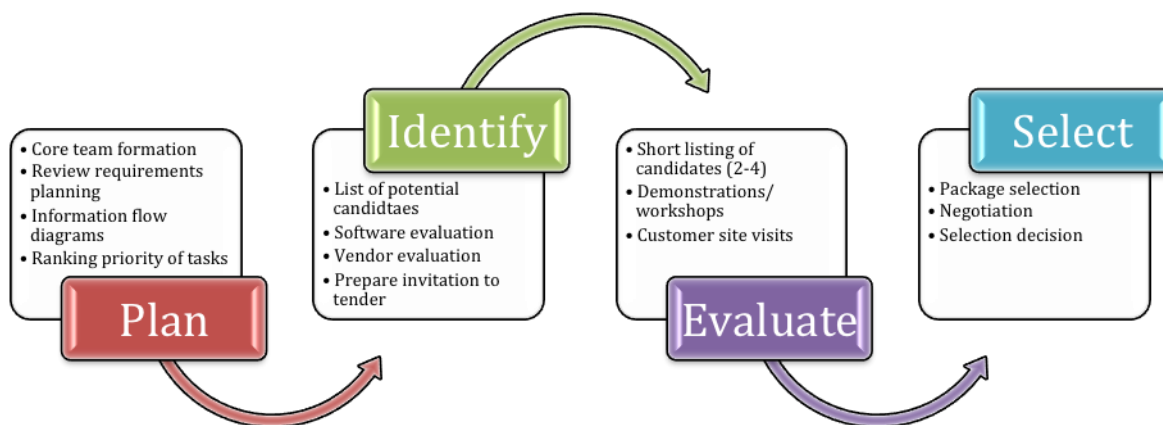
Fig. 1. ERP selection framework. Adapted from [27]

Table 1. Risk factors frequency in ERP literature. Adapted from [6].

Risk factor	Frequency rate
Inadequate ERP selection	High
Poor project team skills	Medium
Low top management involvement	Medium
Ineffective communication system	Medium
Low key user involvement	Medium
Inadequate training and instruction	Medium
Complex architecture and high number of modules	Low
Inadequate business process reengineering (BPR)	Medium
Bad managerial conduction	Medium
Inadequate financial management	Low
Inadequate change management	Medium
Inadequate legacy system management	Low

A multiple case study conducted in Egypt, indicated that *the weighted scoring SMART* (simple multi-attribute rating technique) analysis is commonly used as an ERP selection technique among Egyptian organizations [28]. In addition, the paper suggested that the responses from the vendor's references were one of the top deciding factors in the ERP selection in their target case. Although it is facile to apply and widely used in practice, the SMART analysis' quality and usefulness varies between organizations, depending on the factors and weights they ascertain and include in the analyses. While there is plenty of research on the ERP selection phase, only a few papers present real-world cases.

Due to limitations of available resources and expertise, the high complexity of ERP systems, and the diversity of selection criteria, selecting the proper ERP system is thus not a trivial task.

3. Research methodology and target case

This research employs a single in-depth explanatory case study research approach [29]. Explanatory case studies are useful in presenting cases when exploring new phenomena, or when there is a lack of theory [29]. In addition, according to Yin [30], the explanatory case study research method is recommended when "how" and "why" questions are demanded, when the researcher has little control on the occurrences, and when the focus of the researcher is on a current phenomenon that occurs in a real-life context. In general, case studies may involve the analyses of persons, events, decisions, periods, projects, institutions, or any other systems that are scrutinized and studied holistically through one or more research methods [31].

Generalizability and transferability from qualitative research and case studies may present some challenges to researchers. This is mainly because of the relatively small samples or cases in which it could be difficult to replicate their findings in other contexts [32]. On the other hand, several researchers have argued that it is viable to generalize and develop theories from such case studies [33]. Guba and Lincoln [34] argue that the well-reported and 'thick descriptions' of case studies could help other researchers in considering the transferability of the descriptions to their own contexts and lexicons.

The purpose of this study is to increase our knowledge of the factors, which lead to a successful and systematic ERP selection decision. The study also aims at providing rich descriptions of the ERP selection phase in a manufacturing SME in its natural setting. Although single case studies generalizability is limited, this research may provide important insights and directions for future research.

3.1 Data Collection

During this research, the author had access to various data sources. In total, ten qualitative face-to-face and semi-structured interviews were conducted [30]. The interviews were carried out in one Egyptian branch and strategic business unit of a multinational enterprise, and the interviews were mainly focused on the ERP system selection process at the organization. The interviews ranged from 30 to 60 minutes, and notes were taken during the interviews. The participants included a mixture of stakeholders who had been involved in the ERP system selection and evaluation. The interviewees' positions included the general manager, IT manager, business function managers, mid-level staff, and the external ERP selection consultant. The variety of interviewees stimulated different perspectives, which augmented the data collected through data triangulation [32], and the analysis consequently.

In general, convenient access to all the resources needed for the successful completion of this research was granted. In addition, the author had access to the selection criteria, and the final selection report proposed by the ERP consultant who assisted Sphinx company in the selection process. In addition, the author had access to the data used for the comparison of the ERP packages, project documentation, internal organizational documents, company profiles, vendors' websites, and emails related to the selection process. During the selection process, the consultant asked all the employees to fill out a "business process form", in which they described all the business processes they conduct in their day-to-day operations. Then the consultant compiled and modelled all of this information as business process maps (e.g. Fig. 2), which the author also had access to.

3.2 The Sphinx Company

Sphinx is an Egyptian branch, and strategic business unit (SBU) of a multinational enterprise. Sphinx is a small-to-medium-sized enterprise, which manufactures and supplies oil derivatives that are used as raw materials in several industries. The company's headquarters is located in Europe. The parent company has been in business for more than sixty years, and is listed in the New York Stock Exchange (NYSE). It has nine SBUs that virtually cover the world. The Egyptian company's name has been concealed for anonymity. There are currently twenty-three employees at Sphinx. Given the separate operations, financial, scale, and market size of the Egyptian SBU, the Sphinx Company has been regarded and categorized as an SME, and a small enterprise in particular. At the end of 2013, the parent company

directed Sphinx to prepare for an ERP implementation. The ERP selection process started in January 2014 and was completed in April 2014. The selection process was conducted by an external ERP consultant, which was brought into the project to aid Sphinx in their ERP evaluation and selection process.

The parent company has an SAP™ ERP All in One installed at its premises. When the consultant was asked to join the ERP adoption project team, he inquired about the possibility of just creating accounts for the Egyptian SBU users on the main ERP system at the headquarters. While Sphinx is a branch of the parent company, the creation of users on the main ERP wasn't possible, due to the European Union (EU) Directive and cross-border data privacy and protection laws [35]. As Sphinx resides out of the EU, the 1995 EU Directive on data protection legislation (DPL) prohibits the sharing and transferring of data to countries without proper DPL. Until now, Egypt does not have any formal data protection laws [36], which makes it difficult for multinational organizations operating in Egypt to share the same data repository [8]. Hence, the Sphinx company had to have a fresh and separate ERP implementation.

According to the ERP selection consultant, the selection process at Sphinx was limited to SAP products. That is mainly because the parent company and all its SBUs use SAP ERP. Thus, Sphinx was directed to acquire an SAP ERP to facilitate yearly reporting and interoperability, and as the ERP has proven fitting to their industry. A previous consultant, who worked briefly on the selection process, suggested implementing an SAP All in One ERP, like at the headquarters. With a great difference in implementation complexity, target organization size, and costs between SAP's All in One and Business One, the current ERP consultant decided that the selection decision should be based on business requirements, processes, organization size, and other factors. Initially, there were three SAP ERP system candidates in the evaluation process, SAP All-in-One™ (A1), SAP Business-one™ (B1), and SAP ByDesign™ (BYD). However, based on a decision by the Sphinx Company, only two SAP ERP systems have been short-listed for selection. The systems were SAP A1 and SAP B1. The third system (SAP BYD) was eliminated from the comparison. SAP BYD is only available as a software-as-a-service in the cloud. While a recent survey on cloud-based ERP suggests that security is no longer regarded as a prime barrier for cloud-ERP adoptions in organizations [37], the headquarters communicated to Sphinx that it is not a favourable option due to security concerns. Additionally, B1 is already available on both: premise as well as in-cloud. Thus, the ERP consultant had a narrow window of selection options at Sphinx company. The ERP implementation was successfully completed at 2015.

In the next section, details about the ERP selection criteria and comparisons between SAP A1 and B1 ERPs are provided in more detail.

4. Analysis

The ERP system fit with the organization is a critical factor in the selection process. Thus, the ERP solution must accommodate the company's information needs and processes. If the selected ERP system is not able to match the organization's strategic goals, it could lead to an early ERP retirement or project termination. Software and hardware aspects are also very important dimensions and factors to be included in the appropriate ERP system evaluation and selection. At the target case, the criteria for the selection and package comparisons was set after the consultant met with the Sphinx company's top management and key users. The selection criteria was not directly dictated, instead, it was inferred in part, and suggested in part.

The selection process principally employed a process mapping method, and adopted a structured multi-criteria evaluation that had been developed through literature and the consultant's practical experience in the field. Besides the organization's size and specific contextual dimensions, the evaluation and assessment factors mainly included 11 factors: functionality of the ERP system - Business process mappings with the ERP package, technical criteria, cost & budget, service and support, vision, systems reliability, compatibility, market position, modularity and integration, implementation methodology, and organization size and context.

The abovementioned factors are discussed in more detail below, and an overview of the ERP systems evaluations and comparisons are provided in table 2.

1. The first criterion included in the evaluation was the *functionality of the ERP system*. Functionality is said to be the most essential selection factor. This factor should usually carry a heavy weight in the whole evaluation procedure. The first aspect in the functionality is called completeness or comprehensiveness. Completeness entails that the ERP solution should have adequate or even more modules related to the organization's main activities, and supports the critical business processes.

    During this evaluation criterion, the consultant had developed business process maps (e.g. Fig. 2), which were compiled from the business process profiles created by the Sphinx Company's employees. The process maps were then compared against the candidate systems' business process maps and best practices. This was a critical criterion, as it was a yes/no evaluation factor. This means that if the required business requirements were not matched by a system, the system would be directly excluded from the candidacy.
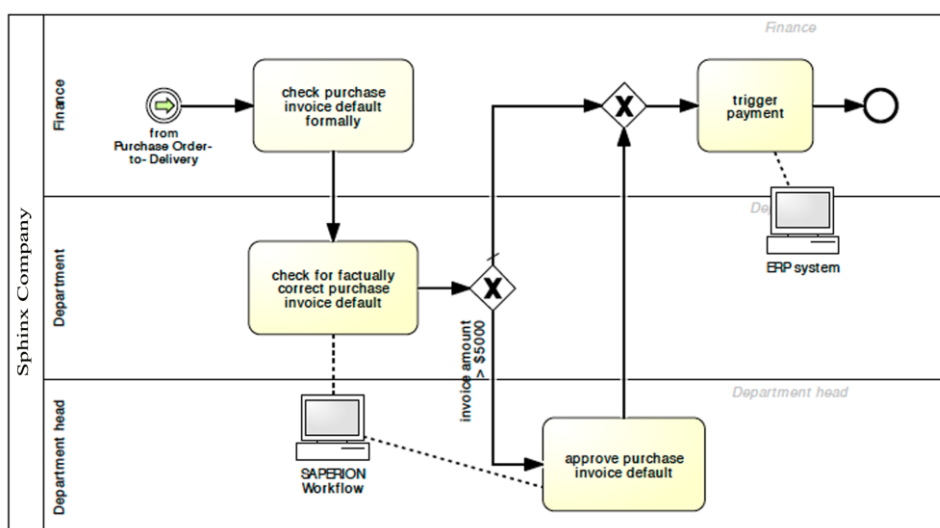

Fig. 2. Process map sample: delivery-to-payment

    As Sphinx's business processes were mainly following the market standards, both systems turned out to be accommodating and compliant with the Sphinx's core business processes. Thus, both systems went through all of the selection and evaluation stages.

2. The second criterion is the *technical criteria*. The selection of hardware and software is of huge importance during the approval of an ERP solution. Preferably, the system should accommodate the current trends and state-of-the-art in information and communication technologies. Organizations should verify that vendors will provide upgrades to their ERP products to ensure best utility of technologies and security updates that are more likely to exist in the future. It is fundamental for organizations to use knowledgeable internal staff, or an external consulting group to assess and evaluate the ERP system's technical features. Technical criteria would

also reveal the simplicity of using the software, and other technical aspects, such as system stability and quality.

3. The third criterion considered in the evaluation is *the cost & budget* of adoption. Organizations must have financial strategies to estimate the required budget, which also must include maintenance and upgrade costs in the total budget. Although the ERP solution should have an attractive price, putting realistic expectations for the whole cost is crucial for top management and the acquisition procedure. The cost is not only about the ERP solution and license costs, it contains many other cost factors including the hardware, software, consulting, training, human resources, organization change management (OCM), etc.

4. Another criterion is *service and support*. The service and support linked with the implemented application are with high importance to the success of the strategic project. The majority of organizations usually face technical issues with the application during the implementation, execution, or after the go-live period. Integration with currently available systems, customization, and security measures are the most severe problems for organizations. For handling these difficulties, organizations require maintainability and support from suppliers, both in provision of information technology expertise and the availability of contextual field/industrial knowledge.

5. The *vision criterion* is regularly included in the selection criteria, which relates to the evaluation of the ERP vendor. Organizations should observe and evaluate the vendor's vision properly. The vision includes investigating the future direction of the vendor's business, and whether it is prone to continue in its current position during the lifetime of the ERP solution. In addition, the continuous enhancements of the vendors' products and services are also important, as well as how the vendor is planning for these future enhancements. The vision would also reveal the supplier's business image, the current international state, as well as its background and history. The market position (below) of the vendor is also considered to be an important aspect when evaluating the ERP vendor. In addition, improvement support and constant support are also crucial.

6. Another criterion is the *system reliability*. This is sometimes considered to be the second essential criterion in the whole evaluation process. Integrating the business practices of all areas, including the new information technology developments, is often imperative for the new ERP system. Having a strong vendor, which is considered a market leader in this type of business, can be beneficial for the organization. For example, some information like knowing how many years the ERP vendor has been working with the core of ERP business solutions, and if the current users of the system in other organizations are satisfied with the system.

7. *Compatibility* is deemed as a critical criterion, which means the ERPs compatibility with other legacy or current systems. There is virtually no one application that can cover all organizations' requirements. Thus, the chosen ERP solution must be compatible and ready to be integrated with all the internally grown systems as well as the niche software or products that the organization may be using to accomplish specialized requirements. From this perspective, compatibility or integration with other systems is a crucial criterion when selecting the ERP solution.

8. The *market position* of the supplier. A large number of organizations rely heavily on vendor's reputation, status, as well as service infrastructure when choosing the ERP solution. The world's leading ERP suppliers have been following the best global practices in their ERP products. From this perspective, organizations can look at the ERP products as a process helper or advisor. Specifically, the successfully completed ERP projects in the same type of business or industry can be considered as a vital criterion and indicator during the selection process of the ERP system. In addition, the company should choose the ERP supplier based on the industry experience.

9. A very important criterion is the system's ***modularity and integration***. The ideal ERP system should have its modules integrated with one another and provide modularity, in which it should enable organizations to freely choose the modules they seek to implement, without the need to implement the whole package.

10. Another chief criterion is the solid ***implementation methodology*** while running the project. The presence of a reliable, previously tested, and consistent methodology would enhance the project's success likelihood. In each phase of the methodology, activities should be defined; carrier, inputs, outputs, milestones, etc.

11. Finally, ***ERP package fitness*** with the organization's size must be evaluated. Larger packages implemented in small-to-medium-sized enterprises (SMEs) may impose unneeded and avoidable challenges and complexities during the project implementations and use.

Table 2. Selection overview at Sphinx.

	A1	B1
Functionality of the ERP system	Both systems have the ability to manage core business operations *(e.g. Sales-Purchasing-Accounting)*.	
	According to SAP, both A1 and B1 are able to support virtually all industries [38].	
Technical criteria	- Requires more complicated, as well as higher IT footprint.	- Entails simple IT footprint.
	- A1 could only be offered on-premise.	- B1 could be offered on-premise and on-demand.
	- Requires NetWeaver.	- Does not require NetWeaver.
Cost & budget	- Requires a substantial budget (IT footprint; annual license; SAP User; Personnel), as well as, a higher total cost of ownership (TCO)	- Requires a substantially smaller budget (IT footprint; annual license; SAP User; Personnel) as well as less total cost of ownership (TCO).
	- Requires a team of: Database Administrator (DBA); Basis Consultant; as well as Functional Consultants (at least 3 consultants).	- One of the key strength here is that, B1 requires only 1 person to manage and support.
	- The starter package of 5 users (5000) + 1 developer (9000) + 1 professional (5000) + 22% annual maintenance *(total cost of USD 45,000; rough before partner discounts)*. Add, cost of required *H/W*.	- As for the costs, B1 starter package could be between 1 and 5 users *(Total cost of USD 7,000 in USA)*. Reusable budget when upgrading to full-fledged B1.
Service and support	Both systems would not be different when it comes service and support, as they come from the same vendor (SAP), which manages the upgrades, fixes, and Enhanced Packages (EHP). To avoid the complexity of full system upgrades, the gap between the current version at the organization and the new versions from SAP, SAP releases enhanced packages with minimal updates that include only the main new features.	
Vision	Both systems come from the same vendor; SAP. In fact, more than 80% of SAP's revenue comes from the SME market. The same business segment to which Sphinx Company belongs.	
System reliability	Both systems come from the same vendor; SAP. With higher rates of successful ERP implementations (A1 and B1), the system reliability score of both systems marks high ratios that are sufficient to secure Sphinx Company's future business.	
	In 2015, SAP B1 had more than 50,000 customers, in 150 countries and available in 41	

	A1	B1
	country specific versions and 20 languages.	
	SAP ERP systems also provide Arabic support.	
Compatibility	A1 is 100% compatible with Headquarters in Europe, which also runs the same system (SAP ERP A1).	B1 is fully integrated with A1 out of the box, based on its powerful Integration Framework. Various scenarios e.g., Business Suite-to-B1 or NetWeaver-to-B1 for master data, sales, purchasing, HQ reporting, and finance.
Market position	Both systems come from the world's leader in ERP systems SAP. Therefore, they have the best market position.	
Modularity and integration.	- All A1 modules are fully integrated. - CRM is a different license/product. - Has a mobile application, which is free and ready out of the box, for access from smart phones and tablets (same as B1). - Can run on Oracle, MS SQL Server, IBM RDBMS. - Can run on SAP HANA (same as B1).	- All B1 modules are fully integrated. - B1 comes with both CRM, as well as WHM functionality. It should also be clear that there is no independent CRM product. Instead, the CRM functionality has been integrated into the sales and marketing module/functionality. - Has a mobile application, which is free and ready out of the box, for access from smart phones and tablets (same as A1). - Can run on MS SQL Server RDBMS (does not run on Oracle). - Can run on SAP HANA (same as A1).
Implementation methodology	In fact, both systems follow the same implementation methodology from SAP. That is, the "ASAP" (accelerated SAP). The ASAP implementation methodology is consisted of five phases: project preparation, business blueprinting, project realization, final preparation, and go-live and support. According to SAP [38], implementation time takes 2-4 weeks with B1, while it takes 8-16 weeks with A1.	
Package fitness to size	A1 targets medium to large organizations.	B1 targets small-to-medium-sized organizations. More suitable to Sphinx.

The two SAP ERP systems have been evaluated against the selection criteria factors as presented in table 2. After the selection process was completed, SAP B1 was recommended for implementation at the Sphinx company, as on-premise rather than in-cloud/on-demand solution. This is fundamentally due to the security recommendations by the parent company and other integration related issues. As a matter of fact, both SAP ERP systems are able to meet the requirements of Sphinx Company; and able to integrate with HQ's ERP system; but B1 has significantly less TCO and reduced implementation complexity. Table 3 provides a summary of the two ERP systems, the selection criteria, and their match with the organization requirements and characteristics.

Table 3. Selection summary.

Criteria	A1	B1
ERP Functionality	✓	✓
Technical Criteria		✓
Cost and Budget		✓
Service and Support	✓	✓
Vision	✓	✓
System Reliability	✓	✓
Compatibility	✓	✓
Vendor's Market Position	✓	✓
Modularity and Integration	✓	✓
Implementation Methodology	✓	✓
ERP Package Fitness		✓

5. Conclusions

The selection process and ERP acquisition decisions are becoming increasingly complex in a rapidly changing and competitive environment. Established vendors and third-party partners are offering a large assortment of ERP core and extended modules, and various support services. In addition, several free and open-source ERP alternatives are offered over the web. Organizations pursuing systems standardization and integration should evaluate and select ERP systems that contribute to these goals without sacrificing the functionality of applications they believe are crucial for their business. Thus, the careful selection of vendors, products, and services provided is necessary, but the final decision has to be made considering the amount of organizational change required for the adoption and the implementation of the selected ERP system. This research provides an example of the ERP selection process at an SBU of a multinational organization. The ERP selection in this case, was to a great extent, narrow in the scope of ERP choices. The reasons for this limitation were mainly due to cross-border data exchange regulations, integration, and interoperability issues between the SBU and headquarters. As the parent company uses SAP A1 ERP, thus the headquarters recommended the exclusive evaluation of the various SAP ERP packages for Sphinx.

This study also illustrates the actual ERP selection process and criteria applied at the Sphinx Company. The selection process followed the SMART analysis in an innovative manner. That is, 11 criteria factors have been devised and weighted in order to score the two shortlisted ERP systems. The selection criteria factors included business process mappings, and packages comparisons among other dimensions. Finally, the final ERP selection/recommendation report was submitted by the ERP consultant to the Sphinx Company's top management and the parent company. The report was approved, then the company progressed in the acquisition, and later in the successful implementation of the chosen SAP B1 package.

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