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Small To Medium Enterprises Perspective In Integrating Business Processes And Functions

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ABSTRACT

An increasingly competitive business environment requires the management of industries to consider the effective measures to enhance competitiveness and reduce costs. ERP system is a potential solution to handle these problems. ERP's role is to integrate all the resources, information and activities needed to improve business processes to be more efficient and effective. Nevertheless, the implementation of an ERP system in industry requires detailed research. This is because the implementation cost is high and there are many technical and socio-technical factors to be addressed before the ERP system can be implemented. Therefore, ERP system implementation among industries often leads to failure. Thus, the objective of this study is to develop a holistic framework for ERP system implementation. The framework is then validated by a group of experts from industries. As a proof of concept, this framework is implemented in one small to medium enterprise. The success of using this framework as a case study has shown that this framework is not merely a conceptual framework, but it can be used in industries.

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INTRODUCTION

The fast changing and dynamic global business environment requires firms to compete and provide goods and services. In order to achieve efficiency and effectiveness, firms need to have greater interaction with their suppliers and customers and have efficient planning and control system which enable good synchronisation and planning in the whole of the processes of organization. Therefore, traditional information systems are not sufficient to support these capabilities. Recently, there has been emphasis on integrating company's internal and external activities to gain firm's competitive advantage (Chang, *et al*., 2008). This approach is developed into integrated information system, which known as Enterprise Resource Planning (ERP).

Currently many firms are aware of the benefits of ERP in improving their performance from information perspective. The information in that firm is more easily accessible and the interaction between business functions and units has improved. However, implementing ERP system is not just technological challenge. Investments in ERP systems require major commitments of capital and managerial resources. Taking a cross-disciplinary approach by integrating literature from management information system (MIS) and project management, we develop a holistic framework for implementing ERP system to increase management performance for the firms and confer them with competitive advantage.

Various studies have observed the successful ERP implementation in industries. However, little research has proposed a holistic framework, which considers wider scope of implementation and levels in organization. In practice, the process of implementing ERP system is divided into three stages: pre-implementation, implementation, and post-implementation. Meanwhile, a number of the previous researches only focus on one stage of implementation. In addition, the researchers only consider the involvement of one level of management, whereas the strategic, tactical, and organizational levels have to be involved to obtain rigorous and effective performance of ERP system.

Hence, this study aims to broaden the contribution of research to ERP system implementation. The theoretical contribution thus lies in the introduction of the ERP holistic framework by integrating four aspects:

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critical success factors, implementation methodology, strategy, and processes. In doing so, the finding of this research can direct the future research and management practices in implementing ERP system successfully to create values for the firms and gain competitive advantage. In the following sections, the researchers discuss about related literatures on ERP evolution and implementation in SMEs.

Erp Evolution:

ERP system is the evolution of MRP system II. From the business perspective, ERP has expanded from coordination of manufacturing processes to the integration of enterprise wide back-end processes. From the technological perspective, ERP has evolved from legacy implementation to more flexible tiered client server architecture (Shah & Trivedi, 2009). Table 1 shows the ERP evolution since 1960's until 2000's. This evolution is followed by the description and differences of each developed system.

Table 1: ERP Evolution

Timeline	System	Description	The scope of the system
1960s	Inventory Management and Control	Inventory Management and Control is the combination of information technology and business processes of maintaining the appropriate level of stock in a warehouse. The activities of inventory management include identifying inventory requirements, setting targets, providing replenishment techniques and options, monitoring item usages, reconciling the inventory balances, and reporting inventory status.	Inventory Management and Control system is limited to the process of stock maintenance in a warehouse.
1970s	MRP	MRP utilises software applications for scheduling production processes. MRP generates schedules for the operations and raw material purchases based on the production requirements of finished goods, the structure of the production system, the current inventories levels and the lot sizing procedure for each operation.	MRP system covers only for scheduling production processes.
1980s	MRP II	MRP II utilises software applications for coordinating manufacturing processes, from product planning, parts purchasing, inventory control to product distribution.	MRP II system is the combination of MRP and inventory management and control systems. MRP II system covers the activities of inventory control and production.
1990s	ERP	ERP system integrates business activities across functional departments, from product planning, parts purchasing, inventory control, product distribution, general ledger, accounting to shop floor control.	ERP uses multi-module application software for improving the performance of the internal business processes by integrating the business activities across functional departments in a company.
2000s	ERP II	ERP II system covers business activities from project management, knowledge management, workflow management, CRM, human resource management, portal capability to integrated financials.	The business activities that covered in ERP II are more complete than previous ERP systems. Moreover, ERP II system gives the web-based solution.

Erp Implementation In Small To Medium Enterprises:

Currently, there are several basic problems faced by SMEs. Less ability to access the market and finance (Sin, 2010), low level of technology (Saleh & Ndubisi, 2006), lack of skilled labour, and work culture (Sin, 2010) still become issues for SMEs to implement ERP system. Majority of the companies do not think of long-term business strategy, but focus only on survival (Kale, Banwait, & Laroiya, 2007). The companies who survive and grow are the ones who have ability to take risks and respond to the changing circumstances (Levy & Powell, 2006).

ERP system helps SMEs to improve efficiency of their business operations. Based on previous research conducted by Kale, Banwait and Laroiya (2007), SMEs are keen on adopting ERP systems for several reasons. First reason is pressure from larger counterparts. Majority of SMEs are clients of multinational companies (MNCs). MNCs require SMEs to implement the same ERP system as them to allow for integration in their supply chain, which permits them to design and plan the production and delivery to reduce the turnaround time. Second reason is peer pressure. Considering the growth in ERP implementation in the SME's segment, several SMEs are adopting ERP system because their peers have done so. The third reason is to gain competitive advantage and respond quickly to the dynamic market scenario.

Within an organisation, each department unit typically has its own computer system optimised for the particular ways that the department unit does it work. Nevertheless, ERP system gathers all department units in an organisation into integrated software program that runs off a single database, so that a number of department units can easily share information and communicate each other. This integrated approach can have remarkable

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benefits if SMEs implement the software correctly, because the features of ERP system can bring general reduction of error occurrence due to non up to date data or manual data transfer operations between applications.

There are a number of researches conducted in terms of achieving successful ERP system implementation in SMEs. For instance, Imtihan, *et al*. (2008) focused on their research in critical factors in ensuring the success of implementing ERP. Another similar research conducted by Noudoostbeni and Yasin (2009), who investigate the success and failure factors of ERP system implementation within SMEs. Supramaniam and Kuppusamy (2009) conducted their research in terms of investigating the critical factors in implementing ERP system in business firms. Nevertheless, none of those researchers integrate the organisational levels, critical success factors, methodology, and process for successful ERP implementation. However, according to the researcher's point of view, the critical success factors, implementation methodology, strategy and process need to be considered in implementing ERP system. These significance components are summarised as an integrative concept, which proposed as a framework in this study.

Critical Success Factors In Erp Implementation:

A well-designed and properly integrated ERP system allows the most updated information to be shared among various business functions, thereby resulting in tremendous cost savings and increased efficiency. When making the implementation decision, management must consider fundamental critical success factors of ERP system implementation that shown in the following Table 2.

Table 2: Critical success factors in each stage of ERP implementation

Critical success factors	References
Pre-implementation:	
Top management commitment and support	Nah *et al*. (2003), Finney and Corbett (2007), Princely Ifinedo (2008)
Clear understanding of strategic goals and objectives	Al-Mashari *et al*. (2003), Umble *et al*. (2003), Wei *et al*. (2005), Osman *et al*. (2006)
Project leader	Newel *et al*. (2004), Wang *et al*. (2005), Boonstra (2006)
Project team competence	Somers and Nelson (2004), Aloini (2007), Plant and Willcocks (2007)
Consultant selection and relationship	Wei *et al*. (2005), Finney and Corbett (2007), Tsai *et al*. (2007), Tsai *et al*. (2012)
ERP package selection	Somers and Nelson (2004), Light (2005), Baki and Cakar (2005)
Legacy system consideration	Mandal and Gunasekaran (2003), Wei and Wang (2004), Finney and Corbett (2007)
Management and users training	Kumar *et al*. (2003), Gyampah (2004), Aloini *et al*. (2007)
Project management planning	Umble *et al*. (2003), Somers and Nelson (2004), Aloini *et al*. (2007)
Implementation:	
Vendor support	Somers and Nelson (2004), Zhang *et al*. (2005), Wei *et al*. (2005)
Change management	Scapens and Jazayeri (2003), Nah *et al*. (2003), Aloini *et al*. (2007)
Interdepartmental cooperation	Somers and Nelson (2004), Soja (2006), Plant and Willcocks (2007)
Business process reengineering (BPR)	Schniederjans and Kim (2003), Somers and Nelson (2004), Kim *et al*. (2005)
Hardware and software	Rajagopal (2002), Calisir and Calisir (2004), Baki and Cakar (2005)
Data conversion and integrity	Okunoye *et al*. (2006), Finney and Corbett (2007), Malhotra and Temponi (2010)
Package configuration	Mabert *et al*. (2003), Light (2005), Kim *et al*. (2005)
System testing and troubleshooting	Nah *et al*. (2003), Motwani *et al*. (2005), Park *et al*. (Park, Suh, & Yang, 2007)
Post implementation:	
Continues training and education	Al-Mashari *et al*. (2003), Somers and Nelson (2004), Kocakulah (2006)
Monitoring and evaluating the performance	Tsai *et al*. (2006), Park *et al*. (2007), Chae (2009)

Erp Implementation Methodology:

Methodology selection is an important process in implementing ERP system. Existing methodologies used for implementing ERP system include big bang, modular, and process-oriented. Big bang approach is the

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installation of ERP systems of all modules happens across the entire organisation at once (Sysoptima, 2005). This is the adoption type of the instant changeover, so everything must be done in a fixed time schedule. This method promised to reduce the integration cost in the condition of thorough and careful execution. It dominated early ERP implementations and partially contributed the higher rate of failure. SMEs might not be ready yet for this, an incorrect dataset might be used, or the information system can be stuck, because of a lack of experience and start up problems (Koop, Rooimans and Theye, 2003).

Modular implementation method goes after one ERP module at a time to one functional department. This approach suits companies that do not share many common processes across business units. Independent modules of ERP systems are installed in each unit, while integration of ERP modules is taken place at the later stage of the project. This has been the most commonly used methodology of ERP implementation. Each business unit may have their own instances of ERP and databases. Modular implementation reduces the risk of installation, customisation and operation of ERP systems by reducing the scope of the implementation (Sysoptima, 2005).

The process-oriented implementation focuses on the support of one or a few critical business processes that involves a few business units. The initial customisation of the ERP system is limited to functionality closely related to the intended business processes. The process-oriented implementation may eventually grow into a full-blown implementation of the ERP system. This approach is utilised by many SMEs that tend to have less complex internal business processes (Sysoptima, 2005).

Erp Strategy:

ERP implementation strategy refers to a plan of action designed that has to be considered by an organisation to achieve the success of an ERP system implementation. The ERP implementation strategies are summarised based on the best practices of ERP system implementation, which are mentioned in the literatures. The researchers categorise the ERP implementation strategy into three phases, include pre-implementation strategies, implementation strategies and post-implementation strategies, which are given in Table 3.

Table 3: ERP strategy

ERP strategy	References
Pre-implementation:	
Choose ERP software that is similar to the organisation's business processes	Mutt (2009)
Check the ERP vendor stability and ability by site visiting where they have implemented similar type of implementation successfully	Mutt (2009)
Make less software customisation based on organisation's needs, because too much customisation can ruin the budget of implementation	Mutt (2009)
Incorporate the risk and quality management plans in the change management plan	Mandal and Gunasekaran (2003)
Breakdown the project into natural phases or subsystems for modular planning and for development of cross-functional communications	Mandal and Gunasekaran (2003)
Consider a phase-based approach for gradual implementation rather than radical approach	Mandal and Gunasekaran (2003)
Use appropriate planning styles for different tasks, detailed task plans for tangible tasks, iterative plans for evolving tasks, and personal communications plans for change management	Mandal and Gunasekaran (2003)
Prepare plans for the recruitment, selection, and training of the necessary personnel for the project team	Mandal and Gunasekaran (2003)
Involve all of the users in ERP implementation planning	Mutt (2009)
Implementation:	
Choose the correct methodology to implement ERP system	Neal
Establish user training along with ERP implementation to create more interest and better understanding in users	Mutt (2009)
Provide a professionally stimulating work environment	Mandal and Gunasekaran (2003)
Promote client consultation and user participation and obtain approval from parties for what is being undertaken throughout the project	Mandal and Gunasekaran (2003)
Use pro-active communications to establish more realistic expectations about the technology capabilities while communicating in tailored way to each division or unit	Mandal and Gunasekaran (2003)
Promote collaborative system development between users and developers	Mandal and Gunasekaran (2003)
Use intra-project teams and intra and inter industry networking for technology transfer	Mandal and Gunasekaran (2003)
Propose possible ways for restructuring personnel and systems to accommodate the new technology including maximising of system integration and interfacing	Mandal and Gunasekaran (2003)
Post implementation:	
The objectives of the ERP system should be fully realised	Mandal and Gunasekaran (2003)
The scheme options should be adequately considered	Mandal and Gunasekaran (2003)
The estimates and project information should be accurate	Mandal and Gunasekaran (2003)
The agreed practices and techniques should be complied with other factors	Mandal and Gunasekaran (2003)

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Erp Implementation Process:

ERP project implementation is a complex and difficult task. It is usually impose changes on employees' work processes. Implementing an ERP system package causes vast change that needs to be managed carefully to get full benefits (Bingi, Sharma, and Godla, 1999; Sor, 1999). Holland and Light (1999) mentioned that ERP package implementation involves a mix of business process change and software configuration to align the software with the business processes. In that sense, it is clear that implementation of an ERP system is radically different from traditional systems development. The key focus in ERP system implementation has shifted from a heavy emphasis on technical analysis and programming towards business process design, business focused software configuration (Kelly, Holland, and Light, 1999), and legacy data clean-up (Smethurst and Kawalek, 1999).

Organisations have to focus on three main parameters before implementing ERP system, which are people, process change, and technology. Employees are the ultimate users of new system and if they disagree upon new system, then whole investments can ruin the business. For that reason, company has to give training for employees, who will be the new system users (Shah and Trivedi, 2009). Due to ERP system implementation, there will be changes in process and technology. Employees as users are always resistance to new system. Organisation structures and employees' roles may be changed. Employees have to learn new things in order to adapt with new technology that makes employees uncomfortable. Myth about ERP that it will reduce labour requirement and make employees will lose their jobs is still occur. Therefore, for those issues, companies have to ensure their employees will not be any lay off due to new system (Shah and Trivedi, 2009).

Implementing ERP system is extremely difficult for in-house skill, so it is highly recommended to hire external consultants and vendors who are professionally trained to implement ERP systems. The types of services that may be employed are consulting, customisation, and support. The length of time to implement also should be considered. It depends on size of the business, the number of modules, the extent of customisation, the scope of the change, and the willingness of the customer to take ownership for the project. There were many researches established in ERP system implementation which was focused on the implementation activities. The researcher summarises four models of the ERP implementation activities from the previous literatures. These four models are derived from researches that are conducted by Bancroft, Seip and Sprengel (1998), Ross (1998), Markus, *et al*. (2000) and Arora (2008).

The first model was presented by Bancroft, Seip and Sprengel (1998) as a view of the implementation process which was derived from research involving discussions with twenty practitioners and from studies of three multinational corporation's implementation projects. The Bancroft, Seip and Sprengel's (1998) model has five phases: focus, as is, to be, construction and testing, and actual implementation. The focus phase can be seen as a planning phase involving the setting-up of the steering committee, selection and structuring of the project team, development of the project's guiding principles, and creation of a project plan. The as is phase involves the analysis of current business processes, installation of the ERP technology, mapping of business processes on to the ERP functions, and training the project team. The to be phase entails high-level design, and then detailed design which is subject to user acceptance, followed by interactive prototyping accompanied by constant communication with users.

The second model has developed by Ross (1998) based on fifteen case studies of ERP system implementation. The five-phase of this model are design, implementation, stabilisation, continuous improvement and transformation. The design phase is a planning phase in which critical guidelines and decision making for implementation are determined. Ross' (1998) implementation covers several of Bancroft, Seip and Sprengel's (1998) phases: as is, to be, construction and testing, and actual implementation. Ross' (1998) stabilisation phase occurs after cut-over, and is a period of time for fixing problems and improvement of organisational performance. This is followed by a continuous period of steady improvement when functionality is added. Finally, transformation occurs when organisational boundaries and systems are maximally flexible.

The third model has developed by Markus, *et al*. (2000) as a four-phase model of ERP implementation: chartering, project, shake-down and an onwards and upwards phase. The chartering phase begins before Bancroft, Seip and Sprengel's (1998) focus and Ross' (1998) design phases. It includes the development of the business case for the ERP, package selection, identification of the project manager, and budget and schedule approval. The description of their project phase is similar to Ross' (1998) project phase and it covers four of Bancroft, Seip and Sprengel's (1998) phases (as is, to be, construction and testing and actual implementation). The main activities of Ross' (1998) project phase are 'software configuration, system integration, testing, data conversion, training and roll-out' (Markus, *et al*., 2000). Markus, *et al*.'s (2000) onward and upward phases are essentially a synthesis of Ross' (1998) continuous improvement and stabilisation phases.

The forth model has developed by Arora (2008), a practitioner from ICAI, who compiled an ERP implementation plan. This plan is divided into several activities that must be performed in implementing ERP system. These activities include study orbanisation's needs, recruit and users involvement, assemble project team, hire consultants to select software and approach, pre-implementation training, install ERP system, configure system, convert data and test, and maintain system.

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Methodology:

The researchers design a research framework, as a research procedure to establish this study. The research procedure is an explanation from the first to the last step to obtain the research objectives. The main steps in the research framework are reviewing the literature to identify the critical success factors in ERP system implementation in SMEs, investigating ERP system implementation process in SMEs, developing a specific framework for ERP system implementation in SMEs, and applying the developed framework in one SME to prove the concept. Each of these main steps has different procedure to obtain. Figure 1 shows the explanation of the research procedure.

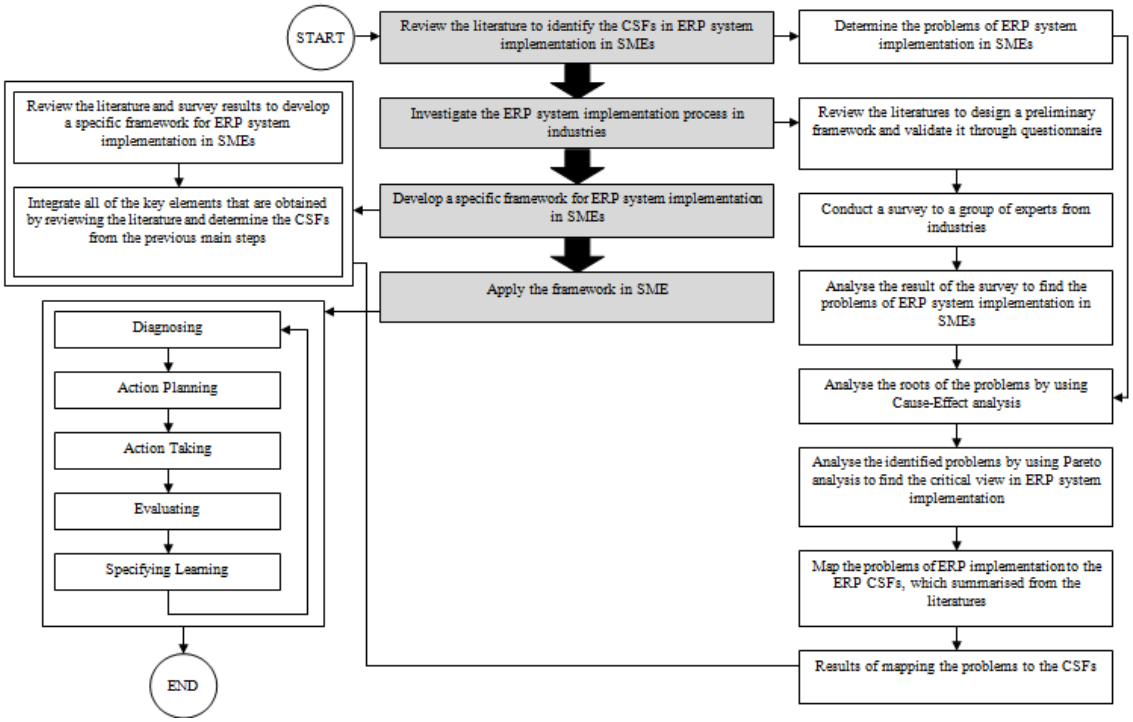

Fig. 1: Research Approach

Framework For Erp Implementation:

The framework for ERP implementation is given in Figure 2. This framework designed by collecting information from literatures and surveys. This framework is then validated by a group of experts in industries. These experts evaluate each of key elements in the framework and provide advice to improve the framework design. This step has been done to prove that this framework can be used by SMEs in implementing an ERP system.

ERP critical success factors:

In the early stage, researchers determine the general issues that are faced by firms in implementing ERP systems. Summary of these issues based on literature and surveys that have been established by researcher in a group of industries. The issues are then analysed by using cause and effect analysis. This analysis is used to obtain the root problems occurred in ERP system implementation. All of these issues are further analysed by using pareto analysis to find the highest, middle and lowest priority of these issues. The results of analysis are mapped into similar critical success factors in implementing ERP system.

The researcher found that there are sixteen factors that are considered important for a successful ERP implementation. Top management commitment and support, and clear understanding of strategic goals are critical factors that are considered before implementing ERP system. The ERP project must receive approval from top management and align with strategic business goals. Top management needs to publicly and explicitly identify the project as a top priority. Management in SME must be committed with its own involvement and willingness to allocate valuable resources to the implementation effort. This involves providing the needed people, in this case is IT staffs, for the implementation and giving appropriate amount of time and budget to get the job done. Additionally, a clear business plan and vision to steer the direction of the project is needed throughout the ERP life cycle. A business plan that outlines proposed strategic goals and tangible benefits, resources, costs, risks and timeline is critical. This will help keep focus on business benefits.

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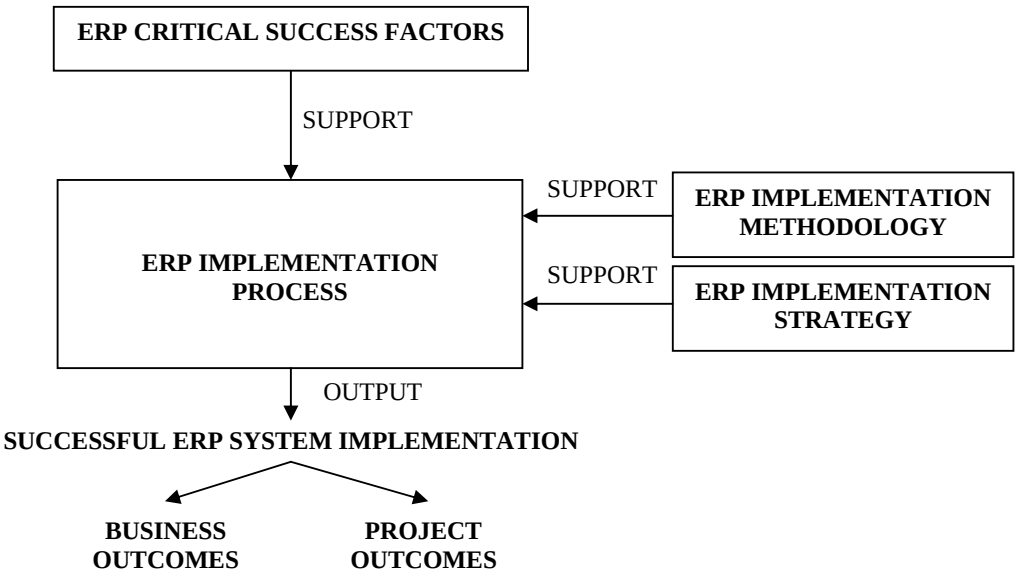

Fig. 2: Framework for ERP System Implementation

Good and effective project management is essential. An individual in ERP project team should be given responsibility to drive success in project management. Scope of project should be established and controlled. The scope must be clearly defined and limited. This includes the budget, time, involvement of business units and the process of the implementation. Project management should be disciplined with coordinated training and active human resource involvement. Project team competence and educational level are important to manage the escalation of issues and conflicts in the system implementation. Additionally, the support of ERP vendor also gives influence to the process. However, the chosen ERP vendors know more about their product and its integration. ERP vendor may help project team in SMEs to solve the problems that arise during the implementation of the system.

In addition, the results of analysis shows that effective communication is critical to ERP implementation. Expectations at every level need to be communicated. Communication includes the formal promotion of project teams and the advertisement of project progress to the rest of the organisation. Employees should be told in advance the scope, objectives, activities and updates, and admit change will occur.

Change management is important when starting at the project phase and continuing throughout the entire life cycle. Enterprise wide culture and structure change should be managed, which include people, organisation and culture change. A culture with shared values and common aims is conducive to success. SMEs should have a strong corporate identity that is open to change. An emphasis on quality, a strong computing ability, and a strong willingness to accept new technology would aid in implementation efforts. Management should also have a strong commitment to use ERP system for achieving business aims. Effective users must be trained, and concerns must be addressed through regular communication. As part of the change management efforts, users should be involved in design and implementation of business process and the ERP system, and formal education and training should be provided to help them do so. Education should be a priority from the beginning of the project. User training should be emphasised with heavy investment in training and skilling during system implementation. Employees need training to understand how the system will change business processes. There should be extra training and on-site support for staff as well as managers during implementation. A support from management in organisation is also critical to meet users' needs after implementation.

Suitability of hardware and maintenance are a concern. ERP system requires network and system reliability. ERP vendor always gives the hardware requirements to the organisation. Network or system failures result in a standstill in the organisation. Business disruptions due to this failure added significant pressure to the project team. SMEs should be willing to change the business to fit the software with minimal customisation. It is inevitable that business processes are moulded to fit the new system. Aligning the business process to the system implementation is critical. Organisation should be willing to change the business to fit the software with minimal customisation. Software should not be modified as far as possible. Modifications should be avoided to reduce errors and to take advantage of newer versions and releases.

Assuring that the new system will work well when it goes live is a challenging task. Therefore, software testing and troubleshooting are essential in the project's implementation phase. This prevents reconfiguration at every stage of implementation. There is a choice to be made on the level of functionality and approach to link

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the system to legacy systems. In addition, to best meet business needs, SMEs may integrate other specialised software applications. Troubleshooting errors is critical. SMEs should work well with vendors and consultants to resolve software problems. Quick response, patience, perseverance and problem solving capabilities are important. There should be a plan for migrating and cleaning up data, because there are also problems of bugs in the software and consistency of data. As all the relevant historical data has to be converted. Data conversion is a major activity for some SMEs to produce high quality of data in ERP system.

Monitoring and evaluation of performance come into play at the implementation phase. Milestones and targets are important to keep track of progress. Achievements should be measured against project goals. The progress of the project should be monitored actively through set milestones and targets. Based on research conducted by Roberts and Barrar (1992), there are two criterias may be used for monitoring and evaluating the performance of system implementation. Project management based criteria should be used to measure against completion dates, costs and quality. Then operational criteria should be used to measure against the production system. Monitoring and feedback include the exchange of information between the project team members and analysis of user feedback.

ERP implementation methodology:

ERP implementation methodology is one of the key elements in the framework. This involves the various processes and procedures, which constitute the condition or means for formulating the actual implementation of ERP project. There are several ways for handling the project. The big bang, modular implementation and process-oriented implementation are methodologies that are commonly used for implementing ERP system. Each methodology has a different method of system installation. This depends on the ability of SME to handle the implementation issues.

The ERP implementation methodology includes extensive services from the ERP vendor. It is important for the companies to analyse each ERP implementation method, since the risk of failure in ERP implementation is existent and can be a highly expensive ordeal. Based on research conducted in a group of SMEs, modular implementation and process-oriented implementation are the most common methodology adopted by SMEs to install ERP software package. Modular implementation approach goes after one ERP module at a time to one functional department, and process-oriented approach focuses only on one or few critical business process. Therefore, these methodologies reduce the risk of installation and operation of ERP system by reducing the scope of implementation. SMEs might not be ready for adopting the big bang approach because it needs a solid ERP project team which has enough experience to implement this.

Apart from the above methodologies, ERP implementation is also accomplished by basing all the implementation on the present needs and resources of the SME. SME can first go for a total ERP system and then have the ERP implementation on the organisation. This would help connecting the whole process with the people concerned. However, the underlying fact is the importance to choose appropriate ERP software package for generative ERP system implementation. The company must be able to utilise the software to its full potential, to have successful ERP project.

ERP implementation strategy:

ERP implementation is not an easy job. This requires proper plan and strategy. SMEs may refer to the critical success factors to make strategies for their implementation process. Based on proposed framework, the researcher divides ERP implementation strategy into three phases: pre-implementation phase, implementation phase and post-implementation phase (see Table 4). These strategies are plans of action designed to achieve successful implementation.

Table 4: ERP implementation strategy

ERP strategy	Description
Pre-implementation:	
Top management commitment and support	Top management plays an important role throughout the ERP system implementation. Top management must know in advance the benefits of ERP system implementation for an organisation, as well as the challenges to be overcome if the organisation implements an ERP system or not. In addition, top management must be fully committed and have a willingness to allocate resources to the project. This includes provision of required resources for the project and giving an appropriate amount of time and budget to get the job done.
Risk analysis plan and list of critical issues that must be addressed	ERP projects may represent new challenges and present new risk factors that have to be handled differently. An ERP project is a major and risky exercise for any size of enterprise. However, risks are higher for SMEs as the cost overruns during implementation may put financial strain on the firm and thus substantially impact firm performance. The main reason for any IT project failure is that managers do not properly assess and manage the risks involved in their projects. The main risks effects for SMEs are budget exceed, time exceed, project stop, poor business performances, inadequate

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	system reliability and stability, low organisational process fitting, low user friendliness, low degree of integration and flexibility, low strategic goals fitting and bad financial performances.
Recruitment and selection plan for the necessary personnel in ERP project team	The ERP team should consist of the best people in the organisation. Top management has responsibility to provide the necessary personnel, who are decision makers from all functional business units. The appropriate compensation and incentives should be given to the team for successfully implementing the system on time and within the assigned budget. Incentives and risk-sharing agreements will aid in working together to achieve a similar goal. The team should be familiar with the business functions and products, so that they know what needs to be improved to the current system and thus, support major business process.
Project management plan	Managing an ERP project is a staggering undertaking. Strong project management skills are a must. During the life of the project, hundreds of tasks must be staffed, scheduled and controlled. The project manager has to build and execute project management plan that contents of project scope, project schedule, project timeline, project organisation, project budget and produce reports. Project manager and the team should be organised, disciplined and use schedule and budget metrics. This effective project management plan will help ERP project team to reach successful ERP system implementation.
Communication plan	ERP project team should make a project communication plan, which includes information about content of communication, types of communication, methods of delivery and who's responsible for each type of communication. Communication provides an appropriate network and necessary data to all key actors in the project implementation. Organisations have to develop a communication plan and issue regular reports to keep users well informed and ensure that they are aware of the system's impact on their responsibilities. Communication is viewed as having a high impact from initiation to system acceptance, as it helps to minimise possible user resistance.
Training plan	A training plan includes technical training needed to implement the software, functional training, end-user training, management training, and any teamwork or leadership development that will be needed to carry out the project successfully. The training should contain operations skills of new system, procedural training, revised business process and management change. This should not only focus on software procedure but also management change and the concepts of process-orientation.
Implementation:	
Preparing solutions for unexpected challenges	The best way of dealing with crises is to avoid one in the first place. But if crises are inevitable, then organisation needs to identify all vulnerabilities and map out possible crisis scenarios. The effective strategic crisis management depends on the decision-making. Rushed strategic management decisions, incorrect statements, actions or inactions have caused many of business crises during or following the project. The effective strategic crisis management begins with effective decision-making. In an emergency, the first major decisions made regarding how to handle the unfolding situation are almost always the most important ones. Bad decisions can fatally exacerbate a small problem. The strategic corporate response must be coordinate and effective. The ERP project team should be fully trained for making the decision and preparing solutions for unexpected crises during ERP implementation. The team members should know how to identify incidents and crises, so they can cultivate and harness the potential successes of a crisis.
Provide a person who has strong leadership in project team to control the project implementation.	Management of an organisation should appoint a person as a project manager who has strong leadership. Project manager's responsibility is to direct and coordinate all activities to meet the objectives of the project within budget and schedule. A project manager has to make the implementation as easy as possible, and create a pleasant atmosphere and environment for the project members to work in. The project manager reports directly to the steering committee the project status and seeks advice from the committee on a variety of project issues including direction, scope and funding.
Provide a professional work environment	Organisational culture is known to be important in the success of ERP project involving organisational change. Insufficient attention to the organisational culture is a reason for ERP implementation failures. Professional work environment and interactions among people inside and outside the organisation are included in this organisational culture. This perception can be influenced by people's behaviour on things like how to solve problems, how to conduct a job and how to communicate. In turn, people's behaviour can influence the firm's performance. This has been shown that organisational culture can have a positive effect on competitive advantage and increase productivity.
Promote users' participation throughout the project implementation	User involvement refers to participation of the user in the process of ERP implementation. The functions of the ERP system rely on the user to use the system after going live, but the user is also a significant factor in the implementation stage. Resistance to new ERP system may be involving the user early on while the project is still being defined, since the user has then also contributed to this decision. The experienced users who take part in implementation can also communicate with the newcomers. Another benefit of involving some users early on is that it facilitates in-house expert training. In the long-run the company may not be willing or able to rely on consultants or vendors because of the expensive consulting cost. However, this depends on the organisational culture in an organisation. There are organisations that do not involve users' participation in the project

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	implementation stage.
Collecting users' feedback about the new system for user acceptance and testing	By participating in the ERP implementation, the user can understand the new system sooner and give feedback from user's point of view. This method can shorten the gap between the old and new systems and make easier for the user to cope with the new system. Since the user understands some of the ideas sooner, the training is more easily accepted. Creating opportunities for users to provide feedback on everything from the system design to the GUI definition will develop a sense of users' ownership in the system and see it as an improvement rather than a threat to their jobs.
Use multi-functional project team to bring complementary capabilities during the total life of the project	Building a cross-functional team is vital. The ERP project team should have a mix of consultants and internal staff from multi-functional business units, so that the internal staff can develop the necessary technical and business skills for implementation. Acceptance is much easier to facilitate if participation in the implementation is both cross-functionally wide and vertically deep in terms of the organisation hierarchy. In this case, effective communication is essential. This can reduce the occurrence of conflicts during the implementation of ERP system.
Provide stakeholders with a detailed plan of the implementation process, explain how it achieves business objectives, and keep them informed about the system implementation progress	ERP project team must provide detailed information about implementation planning, executing and other activities that are related to the ERP implementation process to the stakeholders. Progress reports are most useful as a way to keep everyone apprised of project progress. The reporting structure will differ for various groups within organisation.
Post implementation:	
Measuring the effectiveness of an ERP system that has been implemented	Measuring the effectiveness is a must in ERP post-implementation to observe whether the objectives of the project were realised fully or not. This strategy can help the management to improve IT investment decision-making in the future, to understand capabilities of ERP system and to identify areas to target for future development.
Keep communicate with chosen ERP vendor for ongoing support	An ERP system embodies the organisation's business rules. An ERP system must be closely tied to the organisation's business needs to realise the system's full benefits. Therefore, organisations should periodically review this system by the way keep communicate with, such as do maintenance tasks. The maintenance tasks consists of major upgrades, service packs installation and problem solving.

ERP implementation process:

ERP implementation process is sequential tasks, which consist of both functional and technical activities. In initial phase, management of an SME must conduct an observation of current condition to assess the organisation's needs. Management must establish the objectives of implementing ERP system for organisation and appoint a person as a project manager to control and handle the project. The next activity is the project manager recruits end-users as project team members. The end-users should be taken from functional units in an organisation to facilitate decision making that is related to business process in organisation. Once an ERP project team has established, the project team members have to study the organisation's business requirements. The objectives of this stage are to get better understanding the objectives, benefits and challenges of ERP system implementation, and continued with an ERP project's proposal. This proposal is given to the top management to determine whether the company needs an ERP system or not.

The kick-off meeting for a new ERP project implementation is the next stage. This is the best opportunity to energise the project team and establish a common purpose toward completing the work. The team members should keep the meeting flowing and avoid wasting time. The basic functions of kick-off meeting are publicly state the beginning of the project, outline the project goals as well as the individual roles and responsibilities of team members, clarify the expectations of all parties, create commitment by all those who influence the project's outcome. The result of this meeting is a good and effective project planning. After the project planning is made, and then it is time to select the consultant for business and operational analysis.

Choosing an ERP system is the next step that must be done. This is not an easy task, because ERP systems are complex pieces of software, which manage many components of a business. When choosing an ERP system, it is important to ensure that the system deals with all the functions of the company. Paying for software modules that deal with business processes that a company does not have or deems unimportant can be costly. In order to make a good choice, the role of an ERP vendor should not be ignored. An ERP vendor should be able to advise on the type of training that is needed to ensure end-users can use the system effectively. The points that should be considered by ERP project team as minimum requirements to choose an ERP system are shown in Table 5.

The organisations have two options to consider when implementing an ERP system. Either the organisation must reengineer business processes before implementing ERP or directly implement ERP and avoid reengineering. This task can be done in business and operational analysis stage. In reengineering business processes option, the organisation needs to analyse current processes, identify non-value adding activities and redesign the process to create value for the customer. The second option is to adopt ERP with minimum deviation from the standard settings. All the processes in a company should conform to the ERP model and the

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organisation has to change its current work practices and switch over to what the ERP system offers. This approach of implementation offers an efficient and effective process and is likely to be quickly installed.

Table 5: Minimum requirements for choosing ERP system

Criteria	Requirement
Fundamental	- Ease of use - Cost effectiveness - Ability to cover all business processes - Ability to share the data among different functional units
Technical	- Ability to integrate with current database - Ability to integrate with current reporting tools - The number of active users per session that system can serve at same time - Ability to schedule backup policy - ERP client software should support different operating system platform - The amount of information could be listed and displayed through the Log File - Ability to upgrade new modules that will not affect or cause data loss to the system
Security	- Strong authentication procedure to assure the right user access the right data - Ability to create different groups and menus for users - Administrative panel should contain monitoring tools - Ability to integrate with current Active Directory for more security.

After all functional activities are performed, this is time to carry out technical activities in the implementation phase. These technical activities consist of pre-implementation training, ERP software installation, ERP system integration and testing, data migration and testing, documentation, post-implementation training and ERP system go-live. A pre-implementation training is given to all the end-users. The goal is to detail the concepts and features of ERP software. This training may help to reduce resistance to change. Effective pre-implementation for end-users is mandatory, because if user resistance increases, it may negatively impact the implementation process. Another technical activity that should be performed in ERP implementation stage is system integration testing. The purposes of integration testing are to verify functional, performance and reliability requirements of the software, and also to verify hardware and software configuration items are interacted correctly. In addition, the data is also important to be tested after data migration process. The purpose of this task is to keep the data remains consistent. In the implementation phase, post-implementation training should be performed before system go-live. This program is the crucial phase for end-users to deliver knowledge in the context of how employees perform their day-to-day jobs.

A post-implementation review is recommended to ensure that all business objectives established during the planning phase are achieved. The project team has plenty of cross departmental things to coordinate. Therefore, the project team need to begin a plan to clean up any dirty data, which always creep after data conversion. Reviewing all the new processes and seeing if improvements can be made should be done in post-implementation support activity. The project team can look for the benefits taken after ERP implementation process. The end-users are often overwhelmed with the implementation process. They do not have time to explore the full potential of the new system. They implement only the bare necessities needed to get the system operational. For that reason, ERP project team in a company needs to go back to review those processes, and take advantage of anything the software has to offer. ERP project team has to look at cross-departmental processes and ensure that the end-users are not trying to make the new system look like the old one, but this can improve the process. This should be done after the end-users have had an opportunity to work with the new system and become thoroughly familiar with its processes.

ERP system maintenance and upgrade activities are receiving much attention in organisations. These activities can be done by ERP vendor or internal IT staff. The vendor plays an important role in maintenance supports, maintenance management, upgrade decisions, and upgrade processes. The advantages of maintenance model are helps to defines, plans and manage maintenance activities, improving maintenance processes, and facilitating modification of the software. This is useful to the organisations, so they can maximise the use of a new ERP system.

Case study and discussion:

Company X is one of SMEs which is principally engaged in the precision plastic injection moulding of quality and precision parts for the audio/video, electronics, computer peripherals, and automotive industries. Company X bought ERP software from vendor since 2007 and attempted to implement it. But at that moment ERP system implementation in Company X failed, because the team project could not handle expected or unexpected issues from their plans. Since the first decision process, there were no IT staffs involved. The General Manager appointed the Quality Management Manager to handle ERP software package installation. The Quality Manager did not use external consultants for helping Company X to determine its business strategy. A number of ERP vendors were selected, and then the management of company invited them to present their products. The management of Company X had chosen an ERP software package from the selected ERP vendor

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because the management of Company X saw that the software package fits with the business process in Company X.

The General Manager and the Quality Management Manager did not make a formal plan about the overall ERP system implementation budget and schedule before they bought ERP software package. However, the General Manager and the Quality Management Manager agreed to spend a big amount of budget to buy ERP software package and expected that the implementation would be completed within twelve months. Company X started to implement ERP system by following the recommendation of ERP vendor. Meanwhile, there was no recruitment for IT technicians. This causes Company X got problem in technical part.

Company X used the big bang ERP implementation methodology to implement ERP system, which is highly risk to be adopted by SMEs if they do not have enough expertise. The training that became a part of implementation was given by chosen ERP vendor to Company X, but the vendor did not separate head of departments and their staffs. This causes insufficient knowledge transfer and high users' resistance to change their old style of works. ERP system implementation found failure at that time, because Company X had to face many unexpected problems that cannot be solved. According to this condition, ERP system implementation project was delayed by the management of Company X.

The second implementation, Company X recruited a number of IT staffs and technicians to handle ERP project. However, there were many internal conflicts occurred during the implementation. The IT staffs expected cooperation from other departments to provide accurate data. Due to an unavailability of time concerned in implementing ERP, the project schedule changed. The top management did not contribute to solve this problem. This led to the IT staffs quitted from their jobs. This process happened repeatedly and management of Company X delayed ERP implementation project again.

Afterwards, Company X recruits a new IT staff to implement ERP system. In this time, the researcher is involved as a part of the ERP project team. The researcher proposed the framework that is designed to solve the problems in implementing ERP system in Company X. The researchers use action research cycle as a methodology to solve the problems. The process of each step in the action research cycle is given in Table 6.

Table 6: Analysis process by using action research cycle

Step	Process
Diagnosing	The researchers analyse the problems that occurred in the previous ERP system implementation in Cor
Action Planning	The researchers make a plan for solving the problems in Company X.
Action Taking	Propose the framework to the project manager in assisting the ERP system implementation in Compan
Evaluating	Evaluate the ERP system implementation process in Company X and compare it to the implementation process in the framework.
Specifying Learning	Describe the contribution of the research and framework to the ERP system implementation in SMEs.

Diagnosing the problems:

Company X has good support from the top management in budget provision and understanding the objectives of ERP system implementation. The failure that occurred at the first implementation was due to the functional problems. There were no good communication, cooperation and culture in Company X. Most of the employees in Company X do not have knowledge about ERP system. The top management did not try to promote the benefits of ERP system to the end-users. For that reason, the end-users in Company X had high resistance to change their old style of working. Table 7 shows the explanation of the problems in each stage of previous ERP system implementation in Company X.

In current ERP system implementation, Company X adopts process-oriented implementation methodology to implement ERP system. This methodology is appropriate to be used, because the management wants to focus on critical business processes to be implemented at the first time. After these modules are successfully integrated, and then proceed with other modules that are contained in ERP software package.

The ERP system implementation is only done by one IT staff, who is also a project manager, and the researcher. The top management and project manager do not request an opinion and feedback from end-users during implementation process. The chosen ERP vendor also does not provide sufficient training and user manual. The process of transferring the knowledge becomes ineffective. Therefore, although the ERP system has been implemented, but there are still a lot of mistakes made by end-users.

There is no formal meeting for starting the ERP project. The top management appoints a project manager directly as a person who is responsible with the project, and then the project manager performs his roles and responsibilities. Company X changes its business process and does not do customisation. This means that there is no modification in term of ERP software. Therefore, all of the operational activities in Company X are not covered in the current ERP software package and there are many features in the software that are useless. The ERP software is also not completely compatible with what is desired by the project manager. For that reason, the ERP vendor makes a different application as a sub-system to assist end-users' works, such as data entry for invoices. The ERP software that is chosen by Company X does not support reporting in a good template. The project manager should make a reporting application to design and generate the reports.

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Table 7: Previous ERP system implementation in Company X

ERP Implementation Stage	Problem
Pre-implementation	- The top management did not try to promote the benefits of ERP system to the end-users - No recruitment for IT staffs - No user involvement - Insufficient education level and knowledge transfer from the ERP vendor to the end-users - Insufficient training to the end-users - Lack of vendor support - High of staffs' turnover - Absorption of resources from other companies - No scope management
Implementation	- Lack of internal and external communication - Lack of internal cooperation - Insufficient training to the end users - Lack of vendor support - High user resistance to change - High of staffs' turnover - Absorption of resources from other companies - No recruitment for IT staffs - Low quality of data - Adopt s Big Bang implementation methodology - ERP system implementation failure
Post-implementation	- ERP system implementation failure

The ERP software package has been installed and used by the top management and end-users in Company X. Nevertheless, there are still many critical success factors and strategies, which are contained in the framework, are not addressed by the top management and project manager in implementing ERP system. These factors and strategies are related to the functional issues, such as effective communication, internal and external cooperation, change management and organisational culture. These issues involve many problems that arise after implementation phase. One such problem is unlimited knowledge of end-users in understanding ERP system. The end-users have difficulty in using the ERP software. In their opinion, ERP system is not helpful to simplify the way their work. Therefore, there are many errors in term of data entry. These problems influence the effectiveness of ERP system to the business process in Company X.

Action planning and action taking:

The researcher has proposed the framework to the project manager in Company X regarding to the ERP system implementation. The main objective of this proposal is to evaluate the framework and assist the project manager in every implementation stage. By following the framework, the project manager of Company X can solve the problems in terms of project management, data quality, IT staffs' support, gathering the user feedback in terms of system usage, testing and troubleshooting. Company X also adopts process-oriented methodology, which has been suggested by the researcher to implement the ERP system. Nevertheless, there are still critical success factors and strategies, which are contained in the framework, are not applied by the project manager. As mentioned in the previous section, these critical success factors and strategies are related to the functional issues that are difficult to be changed because this is the role and responsibility of the top management in Company X. The researcher does not have authority to change the management and organisational culture in Company X. In the current ERP system implementation, the top management of Company X still does not consider to these functional issues. This problem affects to the ERP system implementation process in Company X.

Evaluating the ERP system implementation process in Company X:

In this section, the process of ERP system implementation in Company X is evaluated and compared to the system implementation process in the framework. The researcher evaluates the project implementation in Company X based on key elements in the framework, include the involvement of organisational levels, critical success factors, implementation methodology, and implementation process. Table 8 shows the evaluation of the ERP system implementation process in Company X.

The result of analysis reveals that the most ERP system implementation activities at Company X are same as activities in the proposed framework. Nevertheless, there are many critical success factors and strategies, which are contained in the framework, are not addressed by the project manager in implementing ERP system. This involves many problems that arise after implementation phase. One such problem is unlimited knowledge of end-users in understanding ERP system. The end-users have difficulty in using the ERP software. In their opinion, ERP system is not helpful to simplify the way their work. Therefore, there are many errors in term of data entry. In addition, another problem that arises after implementation phase is the software itself. The software is unstable and error when the users execute many transactions. The ERP vendor cannot help Company X to solve these. The format of reporting is also difficult to understand by users, particularly the top

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management. To overcome this problem, the project manager makes his own report format by using other reporting application that can be integrated to the ERP software.

Table 8: The evaluation of ERP system implementation process in Company X compare to the conceptual framework.

Key Element in the Framework	Implementation Process in Company X
ERP critical success factors	There are many critical success factors, which are contained in the framework, are not addressed by Company X. All of them are related to the functional factors, such as insufficient training for end-users, lack of vendor support, ineffective communication, high user resistance to change, and organisational cultures. The absence of these critical success factors are resulting in the ineffectiveness of Company X in obtaining the benefits from the ERP system.
ERP implementation methodology	Company X adopts process-oriented methodology in implementing ERP system. This methodology is appropriate to be used, because the management wants to focus on critical business processes to be implemented at the first time.
ERP implementation strategy	The strategies, which are not adopted by Company X, are there is no risk analysis plan for the project implementation, no recruitment and involvement of the end-users, ineffective communication plan in terms of training to the end users, no professional work environment related to the behaviour of the employees to conduct their jobs and no multi-functional project team. The absence of these strategies involves the problems that arise after the project implementation stage.
ERP implementation activity	Most of the project implementation activities in Company X are same with the project implementation activities, which are contained in the framework, but their sequences are different. This difference does not effect to the implementation process. Different organisation might have different project implementation activities. This depends on the chosen ERP vendor.

Specifying learning:

Based on the case study, the success or failure in implementing an ERP system is not only in terms of software installation. There are still functional factors that are critical to support the successful implementation of ERP system. Company X does not pay attention to these factors. Consequently, Company X has to face the problems that should not be exists theoretically after implementation phase. The ERP system implementation experienced by researcher at Company X can serve as lessons for other SMEs to implement an ERP system. SMEs can use the proposed framework in this research to assist them how to successfully implement an ERP system.

Conclusion:

ERP systems are being widely used by SMEs to integrate the business processes and functions into a single centralised system. A number of SMEs in the developing countries face to numerous challenges in implementing ERP system, including the technical and functional challenges. Some of the SMEs have been implementing ERP system successfully, but some others have failed. Therefore, the researcher establishes this study to assist SMEs in implementing ERP system. In this research, the researcher develops a specific framework for ERP system implementation in SMEs. The researcher expects that the existence of this framework can assist SMEs to achieve successful ERP system implementation.

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