ERP vs BoB: Influence on Performance of SMEs in Malaysia

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Abstract *- In recent years, the business environment has become extremely competitive for small and medium sized enterprises (SMEs). SMEs has began to look into the potential of implementing enterprise software systems in adding value towards their businesses. Thus, the objective of this paper is to investigate whether Enterprise Resource Planning (ERP) or Best of Breed (BoB) system, will lead to better productivity, flexibility and ROI and whether in the process of achieving this outcome, it is moderated by technological, organizational and environmental (TOE) factors. The results revealed that out of three performance measures: productivity, ROI and flexibility, the ERP systems is seen to outperform BoB in terms of productivity and flexibility. Additionally, technological factor is not a significant moderating variable on the differences in productivity, cost and flexibility of ERP and BoB, but organizational and environmental factor is. This study provides an avenue for further exploration on the potential of ERP implementation among SMEs.*

Keywords: *ERP, BoB, TOE, software, enterprise, integration*

1 Introduction

In recent years, the business environment has become extremely competitive, with heightened competition due to the globalization of product markets. To survive, it has become vital to achieve sustainable competitive advantages. Recently, the outsourcing trend to gain competitive advantage and operational efficiencies by multinational corporations (MNCs), have created a new business opportunities for SMEs [13]. Therefore, Malaysian SMEs are benefiting from these opportunities, provided they are able to meet the requirements set by the MNCs and government linked corporations (GLCs). The factors that influence decisions by MNCs and GLCs to appoint SMEs are mainly quality, efficiency, ROI and delivery system. Under this circumstances, both practitioners and researchers have begun to observe the types of enterprise software system which can effectively manage the business operations to help SMEs reduce costs whilst increasing the productivity and quality. The types of software system which are closely connected in improving the business processes among organizations are Enterprise Resource Planning (ERP) or Best of Breed (BoB) system [29]. SMEs view both types of system as strategically important and as a source of enhancing its competitive advantage. As it stands today, SMEs literature lacks empirical evidence that examines which enterprise software system could directly relates to their operational productivity, flexibility and cost. Therefore, this study is an attempt to fill this gap. Specifically, the objectives of the study is to investigate whether ERP system outperform BoB system on operational productivity, flexibility and cost and whether operational productivity, flexibility and cost resulting from engaging ERP or BoB system is moderated by the TOE factors.

2 Literature Review

Enterprise software (ES) systems covers a wide range of business functions and being regarded as one of the most complex and costly implementation in any organizations which could affect the productivity, flexibility and cost factors of an organization [21]. The two predominant approaches currently exist for ES are ERP and BoBs [1]. ERP is the implementation of a software solution from a single vendor that provides functionality and interconnectivity across all departments of the company where else BoB is the implementation of multiple software applications from different vendors, each providing optimal functionality for operations and creating interconnectivity within the company [30].

Many aspects need to be considered during the implementation phase. The need for ES to be aligned and fitting with overall company strategy towards increasing efficiency and produce a good ROI is important [9]. Many company has failed to maximize the return on investment (ROI) from the enterprise software systems due to a poor implementation strategy [4]. As an example even multinational companies such as Aerogroup, Boeing, Dell, and Foxmeyer were plagued with ES implementation crisis [23]. Therefore, it is crucial that the chosen ES, the modules implemented, the modifications and customizations undertaken, and the link to existing legacy systems, if applicable, be carefully considered. The final implemented design of the ES should then be able to effectively support the company's goals, reflecting its requirements, constraints, and peculiarities. For example, Berry and Hill [2] stressed the need for manufacturing planning and control systems to be aligned with productivity, while Gattiker and Goodhue [11] presented a model of the organizational impacts of ES once the system has gone live based on flexibility and costing.

Enterprise systems (ES) are complex and their implementation can be a challenging, time consuming and expensive undertaking for any company [5, 10, 21]. Additionally, there is no guarantee of a successful outcome, even with significant investments in time and resources [14]. Therefore, it is crucial that the chosen ES, the modules implemented, the modifications and customizations undertaken, and the link to existing legacy systems, if applicable, be carefully considered. The final implemented design of the ES should then be able to effectively support the company's goals, reflecting its productivity, flexibility and cost [21].

Many aspects must be considered when implementing and designing an ES. For example, whether the system is adapted to the firm's processes, or whether the processes are modified to fit the system, is an important decision that can have long-term ramifications on the productivity of the system [24]. Similarly, whether to maintain legacy systems whose processes cannot be replicated in the new ES, as well as their potential interlink with the package ES, is a choice that needs to be made. Furthermore, the selection of the system provider, and the implementation of a single system or the practice of a best-of-breed approach needs to be well thought-through as it involves a check on the flexibility [28]. Above decisions should result in an ES that is ideally suited for the company, fitting its unique needs and objectives [20]. However, depending on the firm's situation, the structure of the system can become quite complex; for instance, when legacy systems have to be interlinked with new components [28]. As ES evolve and grow over time, this complexity can increase exponentially. Therefore, based on the above studies ES has contributed towards productivity, flexibility and cost and hence decisions to implement ES must be carefully evaluated to ensure it meets the relevant objectives [20].

2.1 ERP

Integrated ERP systems are single integrated enterprise applications that are purchased from a single vendor and provide a broad functionality and interconnectivity across all departments of the SME [8]. This type of enterprise application can provide an opportunity for the SME to eliminate inefficiencies through the implementation of new work systems [19], may offer a broader functionality for the operations of the SME, and assist in the creation of work processes that might have not otherwise been considered [3, 7]. There are significant benefits for an SME that has informal operational processes, as the ERP system can provide new processes and increase structure.

If implemented correctly, an integrated ERP system can offer operational efficiencies, reduced staff requirements, and the ability to improve information technology capability seamlessly through vendor supplied upgrades [19]. The benefit of implementing an ERP system can be great, as an organization has to maintain a relationship with only one vendor, the vendor provides services to implement, maintain and upgrade the system and as such, the organization does not need to rely significantly on internal information technology expertise [19]. The information technology expertise that will be required in the operation of the ERP system will necessitate only a single skill set from the information technology department and therefore, potentially require fewer employees in the management of the system. For an SME that is focused on outsourcing, does not want to invest in the development of internal information technology expertise, and does not mind the control of daily operations being in the hands of an external party [25], the ERP system should be considered.

Despite the ability to integrate functionality from each department and improving efficiency, it has its disadvantages. Emphasis has been placed on the benefit of dealing with a single vendor; however, should this vendor be unresponsive, inefficient, or financially unstable, the SME could be left with an ERP system that no longer has optimal utility [8]. By placing the functionality of all operations in the control of a single application and a single vendor, the SMEs do face some information system risks. Furthermore, ERP is not easily modifiable and could pose a challenge during new product launches, new acquisitions and other activities [3].

In order to obtain the full benefits of the ERP system, the recommended implementation plan for all organizations is adaptation of 'best-practices work model' approach to accommodate the functionality of the software. However, in order to adopt such an approach, SMEs must have sufficient resources and time to review their business processes.

2.2 BoB

The BoB system offers functionality through the implementation of multiple software components from different vendors. Each of these applications is developed by a vendor who is generally focused on one business problem and as a result, BoB systems can provide a very rich functionality for each business process [3].

The main advantage of the BoB system is its' flexibility and the ability to choose a collection of software applications that may each individually suit a need of the SME [19]. The BoB system does not demand the employees of an organization to change their business process and roles but instead the software will be fine-tuned to meet their tasks.

In order to effectively implement a BoB system, there must be an information technology infrastructure in place. Without the existing hardware, software, and internal information technology expertise, implementation of a BoB system would be very expensive as this infrastructure would need to be developed [25]. The disadvantages of the sytem is that the organization need to maintain the interconnectivity of

a variety of application and this requires different skills and knowledge [19]. Hence, usage of BoB could increase the cost in long term due to recruitment, training and renewal of multiple software licensing [3].

Another factor that must be accounted for by the SME in implementing a BoB system is the requirement to work with and facilitate cooperation among multiple vendors. BoB systems necessitate the development of relationships with multiple parties on the part of the SME, and require BoB vendors to work together to create interconnectivity [8]. Despite the potential costs of working with multiple vendors, the SME does mitigate risk when implementing a BoB system, as the demise of one vendor or one application is not likely to denote the failure of the entire system [19].

2.3 ES Adoption Framework

The TOE framework argues that ES adoption is strongly influenced by three factors; technology, organization and environment [27]. Since its establishment, many studies have used the TOE framework as an ES Adoption Framework to evaluate the performance of ES towards the business objectives e.g. [22, 18, 17, 12, 3]. Some studies have modified the TOE framework to suit their research needs in the area of Enterprise Information system [19]. The intent of the study is to answer the questions pertaining to the SMEs' productivity, flexibility and cost implication of adopting the ERP or BoB within their businesses. In order to produce high-quality product or services as well as business diversification, it is essential that the enterprise software provides a competitive levels of productivity, flexibility and cost.

Hypothesis 1: ERP and BoB implementation will result in different level of operational productivity, flexibility and cost.

In this study, the ES selection and performance relationship were moderated by the TOE factors. The selections of these two elements are largely based on the literature review. Other elements, which may have impact on the relationship, are the company policies and international exposures. However, they are not widely discussed and supported in the literature and hence are excluded in this study.

Hypothesis 2: The impact of enterprise software selection strategy on operational productivity, flexibility and cost are moderated by TOE factors.

The technological factors, which is making major breakthroughs among SMEs will ultimately, determines the labor productivity and other inputs. It is one of the three competitive forces that were introduced by Tornatzky and Fleischer's [27]. Usually SMEs will go through several levels of ICT implementation. Recent advances in technology have had a huge impact on the value chain [26]. IT affects the firm at all levels: from primary activities, including the likes of automated warehouses, flexible manufacturing, automated order processing, telemarketing and computer scheduling and routing of repair trucks; to support activities, such as planning models, automated personnel scheduling, computer-aided design and online procurement of parts. The enterprise software system allows businesses to reduce operational costs by decreasing material, procurement and transaction costs, resulting in lower prices for intermediate and finished goods, and ultimately improves their value chain [7].

Hypothesis 2a: The impact of enterprise software selection strategy on operational productivity, flexibility and cost are moderated by technological factors.

Kuan and Chau [17] considered organizational elements such as financial readiness and human resource readiness, as perceived ones. Also, fast communication, proper structure to implement, enough financial resources, rich and competent knowledge and skills, and top management support are examples of organizational readiness. Organizational readiness, as perceived measure, will have positive impact on the attitude towards the selection of enterprise software adoption [16].

Hypothesis 2b: The impact of enterprise software selection strategy on operational productivity, flexibility and cost are moderated by organizational factors.

Many companies are willing to adopt enterprise software system not only because of internal capability but also because of environmental factors [15]. According to Stratman & Roth [26], external pressure refers to influences from the organizational environment. Thus the external pressure and support will have an impact on the attitude. A higher level of external pressure and support will have positive impact on the attitude toward the selection of enterprise software system and its adoption [5].

Hypothesis 2c: The impact of enterprise software selection strategy on operational productivity, flexibility and cost are moderated by environmental factors.

3 Research Methodology

Generally, organization practice mixed ICT implementation strategies depending on its operating environment and the perceived benefits that the new software system will bring along with the type of implementation strategy being adopted. The literature review thus far concentrated on the perspective of productivity, flexibility and ROI dimensions at product or component level when ERP or BoB system is empirically tested against those performance dimensions. Hence, the following diagram can depict the theoretical framework for the study.

Even though it is not explicitly cited that ERP or BoB systems give rise to the differences in productivity, flexibility and ROI, however, based on the arguments put forward, it can be indirectly generalized from the literature that ERP and BoB implementation strategy yield different levels of outputs in terms of productivity, flexibility and ROI.

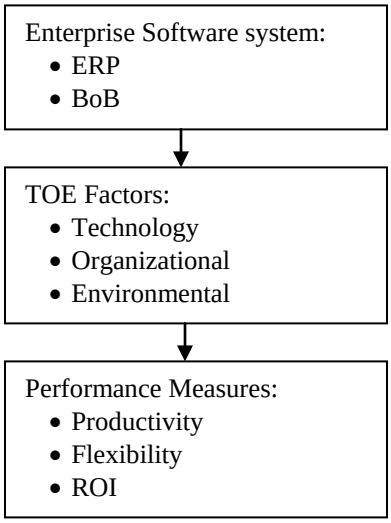

Figure 1: Conceptual Model

Table 1: Profiles of the respondents and organizations

Profile	Description	No. of respondents	%
Designation	Manager	67	55
	Executive	54	45
No. of emp	Less than 100	45	37
	101 - 300	60	50
	More than 300	16	13
Equity struct	Local	59	49
	Foreign	37	31
	Local and foreign	25	21

3.1 Method

The population for this study consists of SMEs located in Klang Valley, Malaysia comprising both manufacturing and service based industry. The population frame is drawn from about 150 companies listed in the SME Directory published by SME Corporation dated March 2009. The objective of this study is to identify which enterprise software system strategies, ERP or BoB, will yield greater level of productivity, flexibility and ROI. Therefore, the samples of interest in the population will be restricted to those organizations that practices both ERP and BoB for the same or similar type of departments. The data of SMEs' productivity, flexibility and ROI were collected at departmental level. Hence, each organization selected may response to more than one questionnaire.

The design of the questionnaire is primarily derived from the issues and questions raised in the literature. Section A consists of five general questions where respondents were requested to provide some general information pertaining to individual and organizational profile. Section B has six questions dealing with the same or similar departments where the firms have implemented a partial of ERP and a part of BoB system. Section C with 13 questions, measuring three performance dimensions with ERP implementation. They are related to productivity, flexibility and ROI measures. Section D consists of identical questions set as Section C with the respondents are now requested to rate the BoBs. Section E contains six questions of the TOE factors related to the identified departments. Each item is also measured on a 6-point Likert scale anchored by 1 (Strongly Disagree) and 6 (Strongly Agree).

So as to ensure the reliability of the measures, the multiple statements dealing with enterprise software systems' productivity, flexibility and ROI as well as TOE factors were first assessed for reliability using Cronbach's alpha. The reliability coefficient obtained ranges from 0.78 to 0.92 indicating acceptable reliability (Nunnally). Data collection is accomplished primarily by email and by personal delivery.

3.1.1 Respondent and Organization Profiles

A total of 150 questionnaires were sent and only 121 were collected from the respondents in this survey. Table 1 provides the descriptive statistics for the sample.

Table 2: Departments and Enterprise software profiles

Profile	Description	No. of respondents	%
Depts	Production	30	25
	Finance	39	32
	Inventory	23	19
	Sales	15	12
	Others	14	11
ERP	Local	10	15
	Foreign	25	38
	Both	31	47
BoB	Local	13	24
	Foreign	19	35
	Both	23	42

4 Data Analysis and Findings

4.1 Descriptive Analysis

It can be seen that the mean on technological influence is rather low (below than the average-2.83) on a six-point scale, indicating that the current ICT infrastructure in the firm's departments play a limited role in the selection of enterprise software system. The mean for ERP's ROI and BoB's flexibility are about the average. The rather high mean of ERP and BoBs' productivity indicates both the software are producing efficient productivity rate in the departments. Additionally, high mean of ERP's flexibility imply that ERPs increases the flexibility in business process reengineering compared to lack of scale of flexibility as been mentioned in the literature review. Finally, the mean of 4.39 for organizational factor indicates that selection of enterprise software generally depends on the top management support and organizational readiness in adopting enterprise system. Subsequently, the ERP's ROI has the lowest mean indicating that the respondents have difficulties to meet the ROI for ERP implementation compared to BoB. The standard deviation for all variables is very small, indicating that most respondents are very close to the mean of all variables.

Table 3: Description of the composite variables

Variable	Means	Standard Deviation	Variance
ERP			
Productivity	4.56	0.96	0.92
Flexibility	4.20	1.03	1.06
ROI	3.97	0.91	0.83
BoB			
Productivity	4.17	0.93	0.85
Flexibility	3.64	0.89	0.75
ROI	4.01	0.92	1.02
Business Environment			
Technological	2.83	1.41	2.00
Organizational	4.39	0.87	0.76
Environmental	4.25	0.85	0.75

4.2 Impact of ERP and BoB system on Productivity, Flexibility and Cost

Each respondent is requested to rate the ERP and BoB for the same or similar departments, which the responding organization implemented partial ERP and partially from BoB related system. The performance measures are with respect to productivity, flexibility and ROI. The parameter of interest is whether firms that use ERP or BoB will result in different level of enterprise softwares' productivity, flexibility and ROI. The performance is the difference between the performance of ERP and BoB among the SMEs. Table 4 summarizes the paired sample t-test for the differences in system performances from the two enterprise software. On all measures of performance, ERP has outperformed BoB except for ROI.

Table 4: Summary of the paired samples T-Test

Performance Dimension	Mean rating		p-value
	ERP	BoB	
Productivity	4.5634	4.1683	0.000
Flexibility	4.1998	3.6402	0.003
ROI	3.9682	4.0092	0.001

4.3 Impact of ES Selection Strategy through Moderating Factors

To test hypotheses 2, 2a, 2b and 2c, the differences in performance of ERP and BoB were regressed against the moderators, technology, organization and environment. Table 5 further tabulated the results. In terms of flexibility all the moderators were not able to explain the variations in the differences in performance. However differences in productivity and ROI performances can be explained (approximately 60% of the variance) by the moderator variables. In particular we found that differences in enterprise softwares' productivity and ROI is negatively correlated to the organizational and environmental factor. This implies that the greater the influence of organizational and environmental factor, the greater the differences in productivity and ROI between ERP and BoB implementation. Hence, Hypothesis 2b and 2c is supported.

Table 5: Summary of the regression analysis amongst the variables

Attr	Difference in productivity		Difference in flexibility		Difference in ROI	
	Beta	Sig. T	Beta	Sig. T	Beta	Sig. T
Tech.	0.185	0.094	0.269	0.831	0.103	0.311
Org.	-0.003	0.000	-0.127	0.104	-0.692	0.000
Env.	-0.004	0.091	0.190	0.799	-0.103	0.342
R^2	0.114		0.104		0.610	
Sig. F	0.000		0.246		0.000	

*p-value < 0.01

From the result of the paired-samples t-test, it can be concluded that ERP implementation resulted in better productivity and flexibility. This seems to be inconsistent with other studies which explains that ERP has failed in being flexible towards the changes in operations. While the performance dimensions are different, the increased in market performance have been quoted by [13], citing that when a firm implement ERP system, it will provide the firm with potential single vendor advantages, assurance in quality through efficient and productive business process and delivery. Contrary to Nah et al. [22], technological factor is not a significant moderating variable, between the relationship of ERP and BoB selection strategy. The differences in ERP and BoBs' ROI and productivity are influenced by the organizational and environmental factors. The greater the organizational and environmental influence, the larger will be the difference in productivity and ROI between ERP and BoB.

5 Conclusions

Generally, the findings of this study are consistent with the literature, with ERP resulting in better productivity and flexibility as opposed to BoB. The literature have stated that BoB is much more flexible compared to ERP. Possible reasons for ERP being more flexible in this study could be due to the new generations of ERP systems being introduced by vendors such as SAP and Oracle which are more customizable and flexible. It should also be noted that most of the SMEs were having difficulties to meet their ROI expectations. The organizations may not be aware that ROI comes from the process improvements supported by ERP and hence if their business processes continue to be the same as in the pre-ERP days, it will fail. Thus they could have implemented inconsistent ROI expectations based on the wrong performance metrics. Hence, the organizations need to review their business process to suit the ERP model to gain a good ROI. This study also found that the difference in ERP and BoBs' ROI and productivity is influenced by organizational and environmental factor. A strong top management support, project team competence, interdepartmental communication, global business exposure and pressure from competitors affects the differences in ERP and BoBs' productivity and ROI. It is likely that if the companies have excess capacity, expertise and resources available for investment, they will opt for an ERP system. As with any studies, there are limitations in this study. The study used the key respondent approach to capture the relevant information. The responses could differ if they were answered by other personnel such as IT executives or users. A cross-validation with different group of respondents would have increased the robustness and confidence of the empirical results [15]. The findings in this study have both theoretical and practical implications. In theoretical context, this study extends a conceptual framework to analyze the selection and implementation criteria of ERP and BoB. In practical sense, the findings highlighted that ERP implementation success among SMEs requires diligent management of organization and environmental factors.

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