Enterprise Resource Planning Systems Selection Criteria in Indonesia

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Abstract: The objective of the study was to identify prevailing selection criteria for Enterprise Resource Planning (ERP) System in Indonesia both in general and for three company size categories, i.e., small, medium and large size companies. Based on literature review, 32 criteria that allegedly affected the selection of an ERP System were tested. To perform the analysis, data were collected using questionnaires from 75 respondents representing the three categories of companies. Logit Regression Statistical Model followed with ANOVA were used to test significances of the criteria. The result from this study was that from the total of 32 criteria there were 9 criteria that significantly influencing the ERP System selection at 95% confidence level. Among the three most important criteria, requirements fulfillment is the only criteria that are significantly different between the three company sizes.

Key words: Enterprise resource planning, selection criteria, ERP System, logit regression, size

INTRODUCTION

Information technology has an important role in companies. Information technology has always been used to optimized process in companies to enable the achievement of their target in a strategic way. Unfortunately, in general, introduction of information technology requires big investment. That is why company always want to use information technology resources as effective and efficient as possible. To be able to achieve this goal, ERP System as an integrated system offers a solution that can make company achieve this goal. Many ERP vendor nowadays are offering different kind of product with their plus and minus of the system. Company as a user must be careful in choosing the right ERP System for their company because ERP System implementation cost substantial investment money and ERP System solution is always a long term and strategic solution for company. It is therefore this solution will either make a company to grow bigger or else will destroy their company. That is why the right selection criteria before selecting the right ERP System will make a crucial role and indeed should be pursued carefully if a company is to be able to survive in a competitive environment.

Literature review: Literature review from ten previous researches indicated that there were 32 criteria that significantly influence the selection of an ERP System. Majority of the researchers considers functionality of the system as the most important factor, considered by Kumar *et al.* (2002), Keil and Tiwana (2006),

Valsamidis *et al.* (2009), Anonymous (2008) and Das Neves *et al.* (2004). There is one of the researcher however, consider it as the second important factor, i.e., Stefanou (2000). Kumar *et al.* (2002) and Keil and Tiwana (2006) in their study found out that system reliability was considered as the second important factor while from the study by Keil and Tiwana (2006), Anonymous (2008) and Valsamidis *et al.* (2009) revealed that total cost of ownership was considered as the third most important factor.

Baki and Cakar (2005) found out in their research that fit with parent/allied organization systems was the first important criteria followed by cross-module integration as the second important and compatibility with other systems as the third important criteria. On the other hand, Hurbean (2006) develop an implementation plan prior to selection, vendor have a clear understanding of the business and vendor act as a change agent revealed to be the first the second and the third important criteria for selection.

Benroider and Koch (2000) in their study suggested that increased transparency and better information flow was the most important criteria followed by well tried software system as the second and vendor service and support as the third important criteria for selection. Factors such as better fit with organizational structure, total cost of ownership and vendor have a clear understanding of the business were considered as the first the second and the third important criteria for selection, rspectively by some researchers (Motwani and Argyropoulou, 2007). Stefanou (2000) considered

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requirements fulfilment as the most important criteria followed by functionality of the system as the second and business best practices availability in the system as the third important criteria.

Again, from the previous studies in general that the most important criteria of all criteria is the criteria for functionality of the system while the second priority criteria is the criteria for system reliability and third priority criteria is the criteria for total cost of ownership. However, this does not mean that other factors are not to be considered important or even belong to the mentioned three most important factors. Some other factors were considered number one or two or three but only by one researcher. In this research, researchers would like to check again the priority level of important of all the factors or indicators, in particular for Indonesia as this might be different due to local condition specific to the country. In addition, researchers would also like to see whether the criteria and their level of importance are different among three categories of company sizes, small, medium and large company. A complete set of criteria being considered in the previous studies are listed in Appendix 1.

Objectives and benefits: The objectives of this research are as follows:

- To know what are the most significant selection criteria being used in ERP System selection process in Indonesia
- To know what are the most significant selection criteria being used in ERP System selection process by small, medium and large company categories

The benefits of this research are as follows: for company that wanted to implement ERP System, they can find out what are the important selection criteria so that they can pay more attention to these selection criteria when they are selecting the right ERP System solution for their company accordding to the size of the company.

MATERIALS AND METHODS

To collect responses of customers on the 32 factors/indicators in selecting ERP Systems, data collection instruments in the form of questionnaires were developed. The questionnaire was further tested pre-test of its validity and reliability to 30 samples of the company. Questionnaire will be consisted of questions that are structured in such a way as to not confuse the respondents who will fill these questionnaires thus expected to be filled correctly and to minimize the possibility of mistakes made by respondents. Likert scale with ordinal value of 1 representing strongly disagree, 2 representing disagree, 3 representing, neutral, 4 representing agree and 5 representing strongly agree was used as measurement of the data in the questionnaire.

Questionnaires were distributed by making contact to each sample company to provide for email address of the intended respondents from the sample companies and questionnaires were sent electronically via email to the respondent. After several weeks, if there is still no email reply from the respondent, the respondent will be followed-up to response.

Since, the dependent variable is a binary variable that is having value of 1 for to choose ERP and 0 for not to choose ERP, researchers will need to transform it to a continuous function between 0 and 1. Otherwise these dichotomous values will pose problem in estimating values of the parameters βs using traditional Ordinary Least Square (OLS) Method or Maximum Likelihood Estimation (MLE). To resolve this problem, researchers introduce odds ratio that is if some event (Y) occurs with probability p then the odds of it happening are $O(Y) = p/(1-p)$ and to ensure that the transformed value of Y is ranging from $-\infty$ to ∞, researchers take the logarithm of it, called the logit of Y or $\ln (Odds(Y))$ or $\ln[p/(1-p)]$. The data collected will then be processed using logit regression statistical models as follows:

$$\ln\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 +, ..., +\beta_{32} X_{32} + \varepsilon$$

which now can be estimated using MLE. The result of this process will be used to meet the first objective of this research which is to find out what criteria are dominantly used by the company in the ERP selection process in Indonesia.

To answer the second objective, that is, to find out what are the dominant ERP System selection criteria by company size, a Logit Model was built for each company size (small, medium, large) and further analyzed using Analysis of Variance (ANOVA).

Small, medium and large company grouping is done by dividing the companies based on the government established criteria, law number 20 year 2008 where the criteria are as follows:

- Small companies are companies that have annual sales of up to a maximum of Rp. 2,500,000,000.00
- Medium companies are companies that have annual sales of more than Rp. 2,500,000,000.00 up to a maximum of Rp. 50,000,000,000.00
- Large companies are companies that have annual sales of more than Rp. 50,000,000,000.00

RESULTS AND DISCUSSION

Validity test was first performed using SPSS 17 and the results were presented in Table 1. There were 23 criteria declared valid and 9 criteria are not valid because it has not met the criteria of validity where all of the nine correlations have p-value of less than or equal to the significant level $\alpha = 0.05$.

Regression test was conducted using obtained data from 75 respondents. The distribution of the data is presented in Fig. 1. It can be seen from the Fig. 1 that the distribution of the data between the three sizes are relatively balanced.

Based on the data collected, statistical analysis was performed using Logit Regression Model having independent variables those which were valid (Table 1, consecutively for X_1-X_{23} by skipping non-valid variables). The result can be seen in the Table 2.

From the results of this test with 95% confidence level or 5% significant level, there are nine variables that significantly influenceing the selection of an ERP System with the following model:

$$\ln\big(p/(1-p)\big) = 7.999 + 4.1X_1 - 3.518\,X_8 - 2.280\,X_9 + 1.540\,X_{11} + 2.592\,X_{12} - 2.655\,X_{14} + 1.309\,X_{17} - 1.621\,X_{20} - 0.045\,X_{21} + 2.935\,X_{22} + e$$

While with by relaxing the alloable error, i.e., the significant level to 10%, another three variables are included in the equations which are X_2, X_3 and X_4 with the following model or equation:

$$\ln(p/(1-p)) = 7.999 + 4.1X_1 - 1.905\,X_2 + 1.011\,X_3 - 2.362\,X_4 - 3.518\,X_8 - 2.280\,X_9 + 1.540\,X_{11} + 2.592\,X_{12} - 2.655\,X_{14} + 1.309\,X_{17} - 1.621\,X_{20} - 0.045\,X_{21} + 2.935\,X_{22} - 4.111\,X_{23} + e$$

Judging from the magnitude of the impact which is represented by the parameters or the coefficient of the regression, X_1, X_8 and X_{22} the three most influencing criteria are functionality of the system. Domain
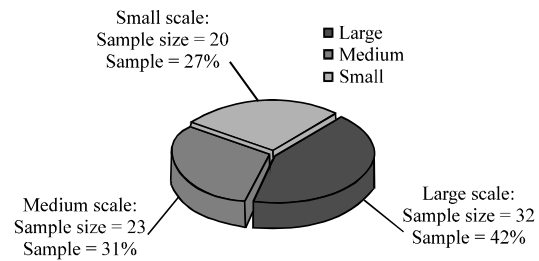

Fig. 1: Distribution of respondents by company size

Table 1: Validity test result

Correlation between	Pearson correlation	Correlation p-values	Conclusion	Description
Q1 with total	0.604	0.000	Valid	Q1 = Functionality of the system
Q2 with total	0.493	0.006	Valid	Q2 = System using latest technology
Q3 with total	0.548	0.002	Valid	Q3 = Total cost of ownership
Q4 with total	0.550	0.002	Valid	Q4 = Vendor service and support
Q5 with total	0.281	0.133	Not valid	Q5 = Vendor's vision
Q6 with total	0.268	0.152	Not valid	Q6 = System reliability
Q7 with total	0.621	0.000	Valid	Q7 = Compatibility with other system
Q8 with total	0.530	0.003	Valid	Q8 = Ease of customization
Q9 with total	0.605	0.000	Valid	Q9 = Market position of vendor
Q10 with total	0.262	0.162	Not valid	Q10 = Better fit with organizational structure
Q11 with total	0.382	0.037	Valid	Q11 = Domain knowledge of vendor
Q12 with total	0.174	0.358	Not valid	Q12 = References of the vendor
Q13 with total	0.449	0.013	Valid	Q13 = Fit with parent/allied organization systems
Q14 with total	0.410	0.024	Valid	Q14 = Cross-module integration
Q15 with total	0.412	0.024	Valid	Q15 = Implementation time
Q16 with total	0.416	0.022	Valid	Q16 = Implementation methodology of the software
Q17 with total	0.234	0.214	Not valid	Q17 = Consultancy
Q18 with total	0.454	0.012	Valid	Q18 = Develop an implementation plan prior to selection
Q19 with total	0.288	0.122	Not valid	Q19 = Vendor have a clear understanding of the business
Q20 with total	0.223	0.237	Not valid	Q20 = Vendor act as a change agent
Q21 with total	0.401	0.028	Valid	Q21 = Business best practices availability in the system
Q22 with total	0.442	0.015	Valid	Q22 = Availability of regular upgrades
Q23 with total	0.637	0.000	Valid	Q23 = Ease of use
Q24 with total	0.323	0.082	Not valid	Q24 = Increased transparency and better information flow
Q25 with total	0.367	0.046	Valid	Q25 = Well tried software system
Q26 with total	0.447	0.013	Valid	Q26 = Process improvement
Q27 with total	0.660	0.000	Valid	Q27 = Increased organizational flexibility
Q28 with total	0.371	0.044	Valid	Q28 = Increased customer satisfaction
Q29 with total	0.260	0.165	Not valid	Q29 = Operating system independency
Q30 with total	0.524	0.003	Valid	Q30 = Improved innovation capabilities
Q31 with total	0.459	0.011	Valid	Q31 = System's demonstration
Q32 with total	0.407	0.026	Valid	Q32 = Requirements fulfilment

Table 2: Logit regression result for each independent variable

	Variables in the equation					
Variables	B	SE	Wald	df	Sig.	Exp(B)
Step 1ᵃ						
Q1	4.101	1.471	7.773	1	0.005	60.423
Q2	-1.905	1.027	3.440	1	0.064	0.149
Q3	1.011	0.565	3.204	1	0.073	2.748
Q4	-2.362	1.318	3.213	1	0.073	0.94
Q7	0.692	0.875	0.627	1	0.428	1.999
Q8	0.008	0.879	0.000	1	0.993	1.008
Q9	1.039	1.001	1.078	1	0.299	2.825
Q11	-3.518	1.285	7.491	1	0.006	0.030
Q13	-2.280	1.171	3.794	1	0.051	0.102
Q14	0.853	0.927	0.847	1	0.357	2.346
Q15	1.540	0.747	4.252	1	0.039	4.663
Q10	2.592	1.029	6.348	1	0.012	13.350
Q18	0.178	0.835	0.046	1	0.831	1.195
Q21	-2.655	1.299	4.178	1	0.041	0.070
Q22	-0.937	0.924	1.027	1	0.311	0.392
Q23	-1.024	0.865	1.400	1	0.237	0.359
Q25	1.309	0.649	4.069	1	0.044	3.703
Q26	1.692	1.154	2.149	1	0.143	5.430
Q27	1.342	0.849	2.498	1	0.114	3.827
Q28	-1.621	0.671	5.835	1	0.016	0.198
Q30	-0.045	0.624	0.005	1	0.942	0.956
Q31	2.935	0.986	8.857	1	0.003	18.827
Q32	-4.111	1.315	9.771	1	0.002	0.016
Constant	7.999	6.922	1.335	1	0.248	2976.760

ᵃVariable (s) entered on step 1: Q1, Q2, Q3, Q4, Q7, Q8, Q9, Q11, Q13, Q14, Q15, Q16, Q18, Q21, Q22, Q23, Q25, Q26, Q27, Q28, Q30, Q31, Q32

Table 3: ANOVA test results

	Q32 (Requirements fulfilment)		Q31 (System's demonstration)		Q1 (Functionality of the system)	
Company size	Mean	SD	Mean	SD	Mean	SD
Small	4.7500	0.44426	4.0000	1.02598	4.4000	0.75394
Medium	4.2609	0.86431	4.2174	0.85048	4.6087	0.58303
Large	4.7188	0.52267	4.1563	0.91966	4.5625	0.50402
Sig.		0.01500*		0.73400		0.49700

*The mean difference is significant at the 0.05 level

knowledge of vendor and system's demonstration. This conclusion is being used to answer the first question which is to know what criteria are used dominantly by company in ERP selection process in Indonesia.

To answer the second question which is to know what are the dominant criteria for small, medium and large company in the ERP selection process in Indonesia, analysis will be focused on three criteria that significantly influence the selection of ERP System and analysis will be done with ANOVA test. Results of ANOVA test can be seen in Table 3.

From these results, it can be concluded that requirements fulfilment is considered as the most important by small company and then followed by large and medium company. Systems demonstration and functionality of the system however are not significantly difference among the three company sizes.

CONCLUSION

The following are the conclusions obtained from the research of the thirty two factors thought to significantly affect the selection of an ERP System in Indonesia, based on the results of the study concluded that at 95% confidence level there are only nine factors that significantly influence the selection of an ERP System in Indonesia.

Nine factors that significantly influence the selection of an ERP System in Indonesia (ranked by significance from the smallest to the largest) are requirements fulfilment, system's demonstration, functionality of the system, domain knowledge of vendor, implementation methodology of the software, increased customer satisfaction, implementation time, business best practices availability in the system, well tried software system.

When categorized by company size, the requirements fulfilment criteria is considered to be the most important by small company followed by large and medium company. While systems demonstration and functionality of the system criteria are not significantly different among the company size.

APPENDIX

ERP selection criterias

No.	List of criteria
1	Functionality of the system
2	System using latest technology
3	Total cost of ownership
4	Vendor service and support
5	Vendor's vision
6	System reliability
7	Compatibility with other systems
8	Ease of customization
9	Market position of the vendor
10	Better fit with organizational structure
11	Domain knowledge of vendor
12	References of the vendor
13	Fit with parent/Allied organization systems
14	Cross-module integration
15	Implementation time
16	Implementation methodology of the software
17	Consultancy
18	Develop an implementation plan prior to selection
19	Vendor have a clear understanding of the business
20	Vendor act as a change agent
21	Business best practices availability in the system
22	Availability of regular upgrades
23	Ease of use
24	Increased transparency and better information flow
25	Well tried software system
26	Process improvement
27	Increased organizational flexibility
28	Increased customer satisfaction
29	Operating system independency
30	Improved innovation capabilities
31	System's demonstration
32	Requirements fulfillment

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