The Effect Of Successful Enterprise Resource Planning (ERP) Systems On Employee Performance

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***Abstract*— The role of modern information technology such as ERP (Enterprise Resource Planning) systems has recently played an important role in processing data into beneficial information and turn it into integrated database system which, in turn, is useful in supporting the business processes of companies in order to generate strategic business decisions. The purpose of this study is to analyze the effect of the implementation of ERP systems on the performance of employees in order to provide information and feedback for the management of the company. This allows for the formulation of the optimal company strategy thus improving the performance of individual employees. This study employs a qualitative analysis approach based on the Delone and McLean's model of success to analyze the data obtained from the interviews and questionnaires which is designed to resemble the Likert scale and was previously tested on the validity and reliability. This study aims to examine the causal effect of ERP information systems, specifically in utilizing the variable quality of system and information as the independent variable and the performance of employees as the dependent variable with user satisfaction and system users as the two intervening variables. The results display that the quality of sistems has both direct and indirect influence on the performance of employees. Furthermore, the quality of information has proven to show negligible effect on the performance of employees' variable. The performance of employees' variable indirectly affected by the quality variable of information through the both system users and user satisfaction intervening variables.**

Keywords*— *Enterprise Resource Planning (ERP), Employee Performance, Model of Success, System Quality, Information Quality

I. INTRODUCTION

One of the company's strategies to improve its competitiveness is by utilizing information technology as the main tools to support its growth and business processes. There are many benefits that can be obtained with information techcnology such as economy growth due to the contribution of new item, ideas, and innovative work inventions. The application of information technology can improve both productivity and product quality, expand upon the range of services offered, and affect the comparative advantage in the industrial sector (Schacht, 2012). In addition of supporting the company's business processes, information technology can also be used as a tool to improve a company executive's abilities in leadership, statistical measurement, optimization, data analysis, and innovation in order to improve the company's performance. One of the applications that is required to improve a company's performance is the availability of integrated data and information that supports the executive's decision. The information system chosen should be able to improve the performance efficiency by reducing the amount of data transactions, processing, and the elapsed time for processing.

On 2015, Mint Jutras Enterprise Study conducted a survey of the consumers of the ERP systems especially manufacturing companies. Based on the survey, approximately 77% of all manufacturing companies classified as small companies with an annual income under 25 million dollars, medium sized companies with 25 to 250 million dollars in annual revenue, mid-large companies with 250 million to 1 billion dollars in annual incomes, and large companies with over 1 billion dollars in annual incomes have at least one operational service with ERP system. These results concluded that about 90% of companies had based their standard operations on the utilization of the ERP system (Jutras & Lincoln, 2015).

Based on the data conveyed above, a study was conducted to analyze the effect of implementing the ERP system in the company and on its employees especially in analysis of the change in their perception and expectations. In addition, the study analyzed the influence ERP had on the performance, which is shown in 2012 when the ERP system with Systems Applications and Products (SAP) had been successfully implemented.

II. METHOD

Delone and McLean's Model of Success

Delone and McLean's Model of Success measures the success of information system based on its implementation and impact factors. The analysis explains that the success of information system implementation is divided into six dimensions: system quality, information quality, service quality, user satisfaction, use of system as well as the impact on the organization and company systems. This proposed model reflects the dependence of system and information qualities, which affect both user element and satisfaction. The amount of elements used may affect the value of user satisfaction both positively and negatively. System use and user satisfaction could impact

the individuals which ultimately impact the organization (DeLone & McLean, 1992).

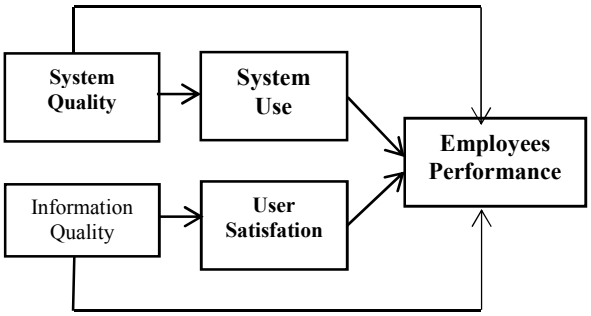

Figure 1: Delone and McLean's Model of Success

This study employed a survey method through the application of questionnaires. The study aimed to examine the causal relationship between the ERP information system with system and information quality as the independent variable and employees' performance as the dependent variable. It also has two intervening variables, namely system use and user satisfaction. The five variables used in this study are:

1. System Quality

   The system quality is used to measure the quality of availability, adaptability, system reliability, and speed of respond. System has the capability for responding to user requests at any time, following the rules and organizational change. Besides that, system must have the reliability to avoid missing data and error as well as avoid the *shutdown.*

2. Information Quality

   Information quality is used to measure the quality of system information's output, namely accuracy, comprehension, relevancy, punctuality, and consistency of information. The information obtained should be accurate and complete for decision-making within the proper time period.

3. System Use

   System use is the output of an information system used by users, such as user habits and number of users. ERP system can be used by organizations to track purchases, sales, and orders as well as helping to make decisions effectively for business purposes.The ease of system use indicates how far the system has seen to be understood, learned, or operated by the user.

4. User Satisfaction

   User satisfaction is the user response to the use of information system output, such as repetitive purchases. Users are more likely to be satisfied with the ERP system when they are capable at using the system effectively. Organizations need to provide the ERP system to match the personalized needs of the user. Moreover, training should be provided so that users can effectively use the ERP system.

5. Employee's Performance

   Employee's performance is a result of work achieved by employees in accordance with their duties. An employee whose job performance is greater than other employees usually tend to enhance their abilities and motivation leading to more productivity.

Structural Equation Model Analysis

Analysis of the effects on ERP system implemention on employee performance uses a Structural Equation Model (SEM) with Partial Least Square (PLS) approach. PLS is a components or variants-based structural equation model. PLS is a powerful method analysis because it is not based on assumptions, so the data doesn't have to follow standard distribution, and the sample size also doesn't have to be large.

In SEM analysis with PLS, there are two prerequisites that must be achieved, namely:

Evaluation of Outer Model

There are 3 criteria to value outer model, namely the validity of convergent, discriminant, and composite. Convergent validity assessment is based on the correlation between the item score or the component score that is calculated by PLS. Outer model with formative indicator is evaluated based on its substantive content, by comparing the statistical significance of the estimated weight value. Formative indicator cannot be analyze by observing the value of convergent validity and composite reliability but can be analyzed by observing statistic value that is significantly matched with bootstrapping calculation.

Evaluation of Inner Model

The testing of inner model or structural model is made to see the relationship between constructs, the significant value, and R-square of the study model. Structural model was evaluated using the *R-square* for dependent constructs, the *Stone-Geisser Q-square test* for predictive relevance, the t-test, and the significance of the structural lines coefficient parameters.

Based on the study model between variables, the hypotheses used are:

H1 - System quality affects the system use
H2 - Information quality affects the system use
H3 - System quality affects the user satisfaction
H4 - Information quality affect user satisfaction
H5 - System's quality significantly affects employee's performance
H6 - Information's quality significantly affects employee's performance
H7 - System use significantly affects employee's performance
H8 - User satisfaction significantly affects employee's performance.

III. RESULT AND DISCUSSION

Data Analysis Research

This study use *Structural Equation Modelling (SEM)* method, which is used to determine the structure and

magnitude of employee's performance as independent latent constructs (endogenous) through system quality, information quality, system use, and user satisfaction as dependent latent constructs (endogenous). The method is analyzed with *Partial Least Square (PLS)* which is processed with SmartPLS v.3.2 software. The result of the analysis can be seen in Figure 4.1. Once the model is established with SmartPLS, the model feasibility test will be held with two phases, namely the *outer and inner model.*

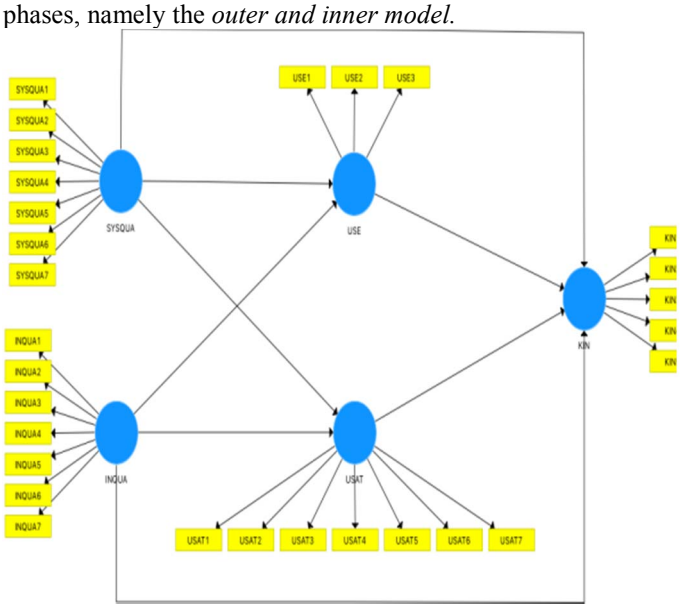

Figure 2: Model Effect of ERP System
(Source : primary data results processed , 2016)

Evaluation of Outer Model

The criteria and standardization to value evaluation of outer model can be seen in Table 1 below.

Table 1: Criteria and Standardization of Evaluation of Outer Model

Criteria	Standard	Remark
Convergent validity	Loading Value > 0.50	Used to assess the indicators in reflecting the latent constructs . If the value of < 0:50 , the indicator should be removed (Chin & Marcoulides, 1998)
Discriminant validity	Rated cross correlation indicator loading latent constructs to be greater than other latent constructs	Measuring accuracy of the model of reflection .
Composite reliability	*ρc > 0.6*	Stability and internal consistency of a good indicator

1. Convergent Validity

Convergent Validity value used to measure the level of interrelation indicator reflection. The reliability indicator reflected by loading factor, which reflects the strength of interrelation between the construct and its indicators.

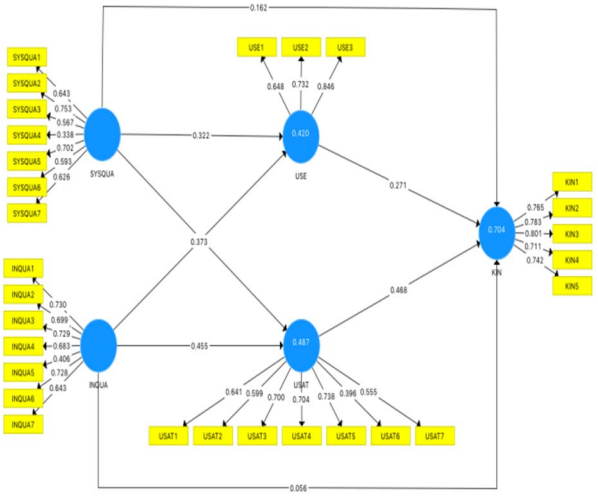

Figure 3: Value of Loading Factor Indicator
(Source: Results of primary data that is processed, 2016)

In Figure 3 shown that there are several indicators, which have a smaller, loading factor value of 0.5, ie X1.4, X2.5, and X4.6. According to Chin (1998), if the value of the loading factor is less than 0.5, then it will be eliminated from the model. However, to ensure whether the indicator should be removed can be seen on the Validity Average Value (AVE). The expected value is 0.5 . If the value AVE <is less than 0.5, then the indicator on variables must be eliminated. Table 4.3 shows that the value of AVE X1, X2, and X4 variable are greater than 0.5 so that the indicator which has a less than 0.5 loading factor is eliminated.

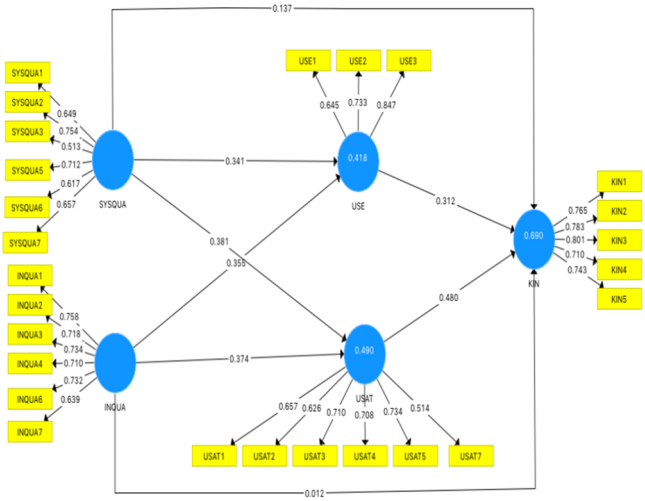

Figure 4: Value of Loading Factor After Several Indicators Eliminated
(Source: Results of primary data that is processed, 2016)

Figure 4 shows that the value of the overall loading factor indicators match the criteria of convergent validity.

2. Discriminant Validity

Discriminant Validity value employed cross loading factor that is useful to determine whether the construct has sufficient discriminant by comparing the certain loading value in latent construct with the other construct's loading value. If the quality indicators system illustrates the reflection of system quality, then the value of correlation indicators in system quality should be greater than the other latent variables.

Table 2: Cross Loading Value

	SYSQUA	INQUA	USE	USAT	KIN
SYSQUA1	0.649	0.364	0.574	0.347	0.396
SYSQUA2	0.754	0.564	0.425	0.539	0.496
SYSQUA3	0.513	0.382	0.230	0.320	0.334
SYSQUA5	0.712	0.472	0.462	0.467	0.459
SYSQUA6	0.617	0.476	0.296	0.408	0.397
SYSQUA7	0.657	0.571	0.302	0.448	0.432
INQUA1	0.518	0.758	0.370	0.476	0.379
INQUA2	0.479	0.718	0.374	0.382	0.318
INQUA3	0.645	0.734	0.508	0.590	0.592
INQUA4	0.494	0.710	0.421	0.402	0.385
INQUA6	0.492	0.732	0.480	0.518	0.459
INQUA7	0.417	0.639	0.388	0.344	0.410
USE1	0.297	0.360	0.645	0.360	0.459
USE2	0.472	0.381	0.733	0.482	0.449
USE3	0.539	0.571	0.847	0.576	0.653
USAT1	0.489	0.400	0.466	0.657	0.544
USAT2	0.482	0.539	0.467	0.626	0.468
USAT3	0.457	0.478	0.323	0.710	0.521
USAT4	0.425	0.403	0.520	0.708	0.560
USAT5	0.439	0.464	0.457	0.734	0.550
USAT7	0.249	0.250	0.310	0.514	0.439
KIN1	0.547	0.487	0.558	0.634	0.765
KIN2	0.540	0.490	0.596	0.604	0.783
KIN3	0.511	0.519	0.579	0.664	0.801
KIN4	0.390	0.364	0.465	0.467	0.710
KIN5	0.439	0.437	0.490	0.564	0.743

The results of the analysis in Table 2 prove that the indicators that reflect constructs in this study are valid.

3. Composite Reliability

Composite Reliability is an index that indicates the reliability of a measure tool.

Table 3: Composite Reliability Value

Variable	Composite Reliability	AVE	Cronbach 's Alpha
System Quality	0.816	0.379	0.730
Information Quality	0.863	0.447	0.811
System Use	0.788	0.557	0.602
User satisfaction	0.822	0.395	0.740
Employee's performance	0.873	0.579	0.819

Source: Results of primary data that is processed, 2016

In Table 3 it can be seen that the composite reliability values for each indicator in the study had values that greater than 0.60 which indicate a good indicator of stability and consistency. Reliability test can be enhanced by seeing the value of Cronbach 's Alpha. The expected value is greater than 0.60.

From the test results on Table 3, the value of composite reliability and Cronbach 's Alpha value match model's criteria, so it can be declared as a good value for hypothesis testing.

Evaluation of Inner Model

Structural model test conducted to examine the relationship between latent constructs. Inner structural models were evaluated using the values of R - Square (R^2) for the dependent latent variables. According to Chin (1998), the R - Square value classified in three groups, namely 0.67 (strong), 0.33 (moderate) and 0.19 (weak) .

Table 4: R Square Value

Variable	R Square Value
User Satisfaction	0.490
System Use	0.418
Employee's Performance	0.690

Source: The results of processed primary data, 2016

From Table 4 it can be seen that the ability of system quality and information quality variable on user satisfaction, R_1 explains the variable is equal to 0.490 or 49 %, while the ability of system quality and information quality, R_2 variable in explaining the system is equal to 0.418, or 41.8 % . The calculation result also showed the value of R - Square R^2 obtained the employee's performance, R_3 for 0.690, or 69 %, means that the employee's performance is influenced by the variable of system quality, information quality, system use, and user satisfaction.

In addition to calculate the R2, structural model test is also done by calculating the value of Q2. Q - Square predictive relevance is used to measure how well the observed values generated by the model and parameter estimation. The formula for calculating the value of Q2 are :

$$Q^2 = 1 - (1-R_1^2)\,(1-R_2^2).\,(1-R_p^2)$$

$$Q^2 = 0.91$$

From the calculation above, it can be concluded that the value Q2 > 0, ie 0.91 approaches a value of 1, so it can be stated that the model has predictive value relevance.

Hypothesis Testing

Hypothesis testing is done by analyzing the *bootstrapping* on coefficient path which compare the T-count with T-table value. If the T-count value is greater than the T-table value of 1.98, then the formulation of the hypothesis is accepted.

Table 5: Hypothesis Testing of Output

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T-Tabel	T-Statistic	P Value
SYSQUA -> USE	0.341	0.332	0.124	1.98	2.756	0.00
SYSQUA -> USAT	0.381	0.380	0.101	1.98	3.756	0.00
INQUA -> USE	0.355	0.367	0.12	1.98	2.968	0.00
INQUA -> USAT	0.374	0.384	0.103	1.98	3.662	0.00
USE -> KIN	0.312	0.312	0.088	1.98	3.588	0.00
USAT -> KIN	0.480	0.467	0.087	1.98	5.533	0.00
SYSQUA -> KIN	0.137	0.146	0.114	1.98	1.202	0.11
INQUA -> KIN	0.012	0.006	0.103	1.98	0.118	0.45

Source: The results of processed primary data, 2016

- ERP's System Quality Significant Effect on System Use

  Table 5 shows that the quality system positively affects the system use, which is indicated by parameter coefficient value of 0.341, means the greater quality of ERP system in company will also be followed by the greater intensity of system use. The analysis of coefficient path results indicate system quality significantly affects system use. This is evidenced by the value of the T-statistic (T-test) of 2.756 which is greater than the T-table value of 1.98 on a 95% confidence interval. This shows that the hypothesis-1 accepted.

- ERP'S System Quality Significant Effect on User Satisfaction

  Based on the hypothesis testing, states that system quality positively and significantly affects user satisfaction. It can be seen from the path coefficient of 0.381 which states that there is a positive influence between the system quality to user satisfaction. Besides that, the T-statistics (T-test) value of 3.756 is greater than 1.98 T-chart value which states that the effect is significant. This shows that the hypothesis-2 accepted.

- ERP'S Information Quality Significant Effect on System Use

  Table 5 shows that the information quality affects system use upon the employee's performance, which have a path coefficient of 0.355, where its influence is significant with T-statistics (T-test) value that is greater than the T-table (2.968> 1,980) with a p value less than 0.05, ie at 0.00. This shows that the hypothesis of-3 accepted.

- ERP's Information Quality Significant Effect on User Satisfaction

  Based on the hypothesis testing, states that information quality affects user satisfaction. This is indicated by a positive path coefficient value of 0.374. Moreover, it can be seen form the value of T -statistics (T -test) which is greater than the T - table value at the 95% confidence interval (3.662 > 1. 980). This shows that the hypothesis - 4 accepted.

- ERP's System Quality Significant Effect on Employee's Performance (Individual Impact)

  Table 5 shows the effect of system quality to employee's performance has path coefficient of 0.137, where its influence is insignificant with T-statistics (T-test) which is smaller than the T-table (1.202< 1.980) and with a p-value greater than 0.05, that is equal to 0.011. This shows that the hypothesis-5 is not accepted.

- ERP's Information Quality Significant Effect on Employee's Performance (Individual Impact)

  Based on the hypothesis testing, states that system quality insignificantly affects the employee's performance. This shown by the T-statistics value that is greater than the T-table value at the 95% confidence interval (0.118< 1.980) with the path coefficient of 0.012. This shows that the hypothesis-6 is not accepted.

- ERP's System Use Significant Effect on Employee's Performance (Individual Impact)

  Table 5 shows system use positively affects employee's performance as indicated by the coefficient value parameter of 0.312, means the greater quality of ERP system in company will also be followed by the greater intensity of system use. The analysis results of path coefficients indicate the system quality significantly affect system use. This is evidenced by the value of the T-statistic (T-test) of 3.588 which is greater than the T-table of 1.98 on a 95% confidence interval. This shows that the hypothesis-7 accepted.

- ERP's User Satisfaction Significant Effect on Employee's Performance (Individual Impact)

  Based on the hypothesis testing, states that user satisfaction affects employee's performance. This is indicated by a the positive path coefficient value of 0.480. Moreover, it can be seen in the value of T-statistics (T-test) that is greater than the T-table at the 95% confidence interval (5.533> 1.980). This shows that the hypothesis-8 accepted

Analysis of Effect

Analysis of effect is used to see the strength of both direct and indirect effect on variables. Based on the SmartPLS software calculation (Mean, STDEV, T-Values), all of the coefficient value in each relationship is on the positive level, but not all of T-statistics value of each variable correlation is greater than the t-table (1.98) so that the overal relation give positive but insignificant effects. Both direct and indirect effects in the testing results can be seen in the table below.

Table 6: Variable Effect on Employee's Performance

A -> B -> C	(A->C) I	(A -> B) II	(B -> C) III	I + (II * III)
X1 -> X3 -> Y	0.137	0.341	0.312	0.243
X1 -> X4 ->Y	0.137	0.381	0.480	0.320
X2 -> X3 -> Y	0.012	0.355	0.312	0.123
X2 -> X4 -> Y	0.012	0.374	0.480	0.192

Sources: Processed primary data

The system quality variable has both direct anf indirect effect on employee's performances. It positively but insignificantly affects the employee' performance variable through the use of intermediate variables and user satisfaction. System quality variable affects system use and also significantly affect the employee's performance

variable with a total value of 0.243. System quality variable affects user satisfaction variable and also significantly affect the employee's performance variable with a total value of 0.319.

The information quality variable has both direct and indirect effects on employee's performance variable. It has positive but insignificant influence on employee's performance variable through the use of intermediate variables and user satisfaction. The information quality variable affects the system use variable and also insignificantly affects the employee's performance variable with a total value of 0.123. User satisfaction variable is affected by the system quality variable which also insignificantly affects the employee's performance variable with a total value of 0.192.

IV. CONCLUSSION

Based on the research that has been described above, the conclusions in this study are as follows:

(1) Test the system information Mclean & DeLone Models can be declared a success. Almost all of the components of system quality and information quality ERP positive influence on the performance of employees in the company.
(2) The performance of employees in the company Vivere Group positively influenced indirectly by the quality of the ERP system.
(3) The performance of employees affected by the variable quality of the system, the quality of information, system use, and satisfaction of ERP users.
(4) The quality of the ERP system has direct and indirect influence on employee performance variables.
(5) The quality of the ERP system has positive influence on employee performance, but not significantly.
(6) The performance of employees positively influenced indirectly by the quality of the ERP system
(7) System use of ERP is influenced by the quality of ERP systems and significantly affect the performance of employees.
(8) User satisfaction ERP influenced by the quality of ERP systems and significantly affect the performance of employees.
(9) The quality of ERP information has direct and indirect influence on employee performance variables.
(10) Quality of information ERP positive influence on employee performance, but not significantly.
(11) Employee performance positively influenced indirectly by the quality of ERP information through the use of intermediate variables and user satisfaction.
(12) Use of ERP influenced by the quality of information and not significant influence on employee performance.
(13) User satisfaction ERP influenced by the quality of ERP systems and no significant influence on employee performance.

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