Evaluating ERP Implementation Succes in The Pharmaceutical Sector: An Application of The Delone and Mclean Model

Indra Gunawan, Riyanto Jayadi

Information System Management Department, BINUS Graduate Program-Master of Information System Management, Bina Nusantara University, Jakarta, Indonesia 11480
Indra.gunawan007@binus.ac.id, riyanto.jayadi@binus.edu

Abstract. This study aimed to evaluate the net benefits of an ERP system implementation at a pharmaceutical company in Indonesia using the DeLone and McLean IS Success Model. A survey was conducted with 52 ERP users along with interviews to assess system quality, information quality, service quality, use, user satisfaction, and net benefits. The results showed system quality had a significant effect on user satisfaction, while information quality, system quality, service quality, and use did not significantly impact net benefits. User satisfaction had the strongest effect on net benefits. The findings imply improving system quality should be prioritized to increase ERP success. More training and change management may also increase user adoption and satisfaction.

Keywords: Manufacture, ERP, IS Success Model, Delone and McLean, Information System.

1. Introduction

PT ABC is a pharmaceutical manufacturing company established since 2014, it is currently entering a phase of very rapid and high development, Organizations are changing radically to improve synchronization between business and information systems strategies to maintain competitive advantage and improve organizational performance. Information systems are vital tools for organizations to increase productivity and work efficiency. Organizations must have traceable tools to analyze and respond to issues critical to problem-solving skills. The process of implementing ERP systems to support work processes within the company and to support the decision-making process has been widely applied in all industrial sectors, one of which is the biotech and pharmaceutical industries. Both industries require a technology that can support the work process in the company where data and activities carried out in the industry require good accuracy and precision, Because it affects the quality of the work process carried out, systems for managing and integrating multiple company operations are called enterprise resource planning (ERP) systems (Bhatt & Srishti, 2023), An organization can automate and distribute information and efficient methods using the business software package known as ERP (Berić et al., 2018). An organization's information system framework, the ERP is a comprehensive integrated implementation system that can be installed at once or over time. The BPR process must be utilized to support the implementation of ERP. (BPR) (Bagus Syahrial et al., 2016). Currently ERP systems that are run internally, have many obstacles ranging from the features that are owned have not fully met the needs of the company, so there are still many processes that are run manually, the platform owned is still not the latest, so the mobility of use is still limited, and limitations in terms of presenting information from the system are also one of the obstacles that are faced in several parts, In addition, there are several other problems faced by users related to ERP systems that are running today.
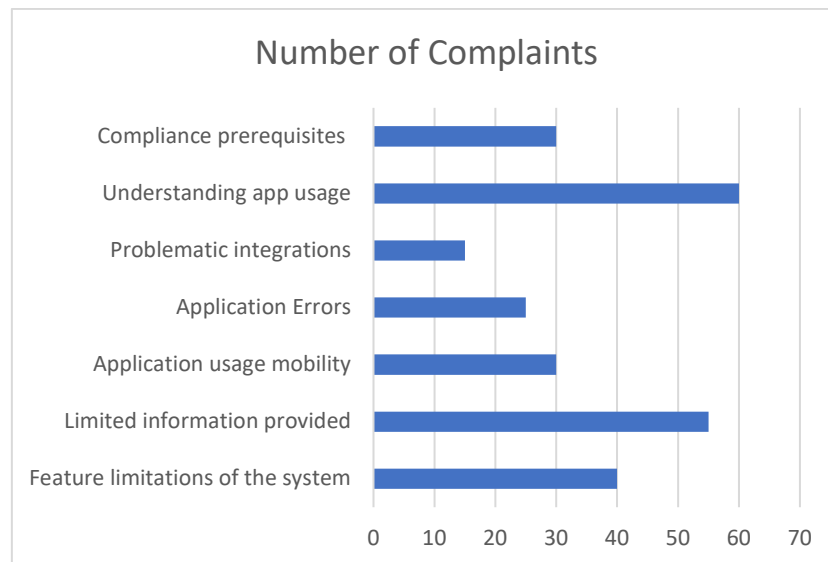

Fig.1: List of Issue using ERP applications.

To find a solution to this problem, need to evaluate the implementation of ERP system in PT ABC companies is needed. In this case, the study tried to conduct evaluation research using Delone and Mclean model, a frequently used methodology to assess the system's effectiveness. This model also from time to time continues to be updated to meet the needs or requirements that are appropriate. Based on research by (Suroso et al., 2018), the results of information system testing using the Delone and Mclean model can be declared successful. Almost all components of ERP system and information qualities positively affect employee performance in the company. Employee performance in the

company is indirectly and positively influenced by the quality of the ERP system, and employee performance is influenced by the variables of system quality, information quality, system usage, and ERP user satisfaction.

Therefore, this study intends to dig deeper related to the ERP implementation process of this system by analyzing the ERP implementation both from Finance, Supply Chain & Manufacture area of PT ABC. This research process is expected to be useful for companies:

a) To know and understand the variables that affect the Net Benefit of ERP applications at PT ABC.

b) To know and understand the influence between variables that affect the success of ERP applications at PT ABC

c) To provide recommendations in improving ERP applications based on variables that need to be improved, which is expected so that the Net Benefit of ERP applications can increase.

2. Literature Review

Delone and Mclean

DeLone and McLean used the information systems model to evaluate and measure information systems performance (DeLone & McLean, 2014). One of the most popular ideas for evaluating the effectiveness of information systems in terms of technology use is the Delone and Mclean model (Sholihah et al., 2023). The model consists of six interrelated dimensions of information system success: system quality, information quality, usage, user satisfaction, individual impact, and organizational impact (Bakhit Jaafreh, 2017).
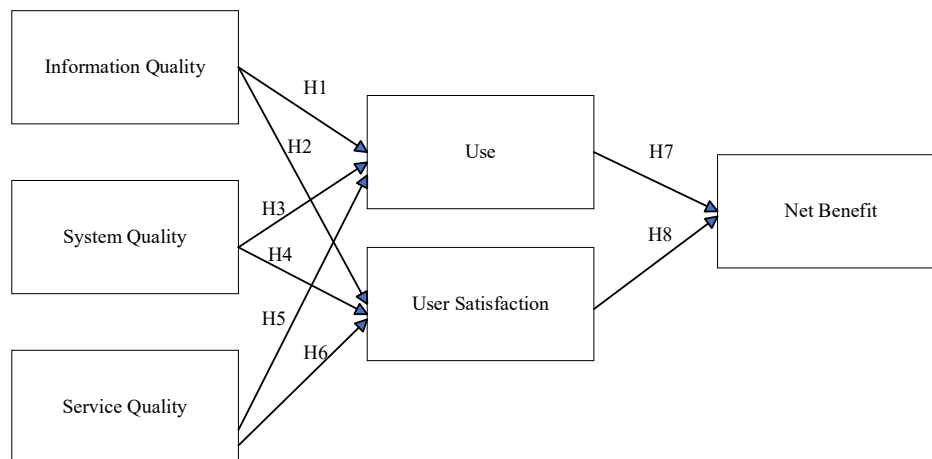

Fig.2: IS Succes Model.

The success model variables measured using; (Bakhit Jaafreh, 2017):

1. System Quality is an IS desirable characteristic. Several factors of usefulness, simplicity, and system adaptability, dependability, and learning simplicity are the focus of system quality variables, reaction time, as well as portrayed SQ's convenience and aesthetics, which enable businesses to provide better products and services, was discovered to have a considerable impact on system use (Anaam et al., 2023), in previous research system quality has not significantly influence on use and net benefit(May Yessi Asih Jaya, 2021)

2. The variable quality of information is a preferred output quality in IS. The system can produce information that is timely, clear, succinct, thorough, quick, and useful, Past research empirically supported that the quality of information has a positive and significant effect on system use. (Satrio Wibisono, 2021).

3. Service quality the quality of support users receives from the IS department and IT support staff is represented by the service quality success variable. (Chow & Legowo, 2023), For example, training, helpdesk, and so on, service quality, on prior research service quality is not have significant influence on net benefit(Fian William, 2021).

4. Use of IS represents the rate and way IS used by its users. Measuring the use can be considered from several perspectives. In terms of voluntary use of IS, and actual use of an IS an appropriate measure of success, on prior research use has significant impact on net benefit (Adrianto et al., 2023)

5. User Satisfaction The degree of user pleasure when utilizing IS a factor in successful user satisfaction.

6. Net benefit variable success to represents the extent IS contribute for the success of an individual, group and organization. This variable gave a summarizes of separate dimensions between individual impact and organizations.

Hypothesis Development

H1: Information quality has a significant effect on use.

H2: Information quality has a significant effect on user satisfaction.

H3: System quality has a significant effect on use.

H4: System quality has a significant effect on user satisfaction.

H5: Service quality has a significant effect on use.

H6: Service quality has a significant effect on user satisfaction.

H7: Use has a significant effect on net benefit.

H8: User satisfaction has a significant effect on net benefit.

3. Methodology

3.1. Data Collection

In this study, we conducted a survey through an online questionnaire that included 5-Likert scale using an online survey form Microsoft. The questionnaire is distributed and carried out by sharing via WhatsApp & Email, this questionnaire is distributed to all users / users of ERP applications in PT ABC, which consists of 52 users spread across several related departments that use ERP applications module Finance, Inventory, Manufacturing, Purchase, Sales Order, Cashflow, Asset, Invoice and related departments namely, Finance & Accounting, Procurement, IT, Warehouse, Production, PPIC, QA and QC departments, the response rate for this study is 100 % for fulfilment of gathering response of ERP application evaluation, we also collect demographic data of the respondents: gender, occupation, education, the length of use and frequency of use of ERP application.
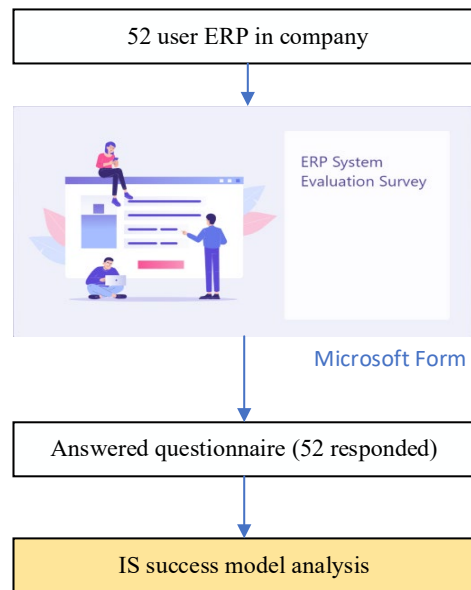
Fig.3: Survey Design.

3.2. Analysis Using PLS-SEM

The research model consists of 6 variables and 29 indicators. PLS-SEM method used in this study to analyse data; after we have gathered the respondent's data, we perform the analysis data using the SmartPLS 4.0 software application. The data file format must be '.csv' when uploading the questionnaire responses into the SmartPLS and recognized as an indicator of latent variables. Evaluating PLS-SEM involves two steps (Sarstedt et al., 2017). The first steps examine of measurement theory; measurement method is assessed by examining the convergent validity of each factor and reliability, the Second step, the structural theory, conduct testing the hypotheses are proposed and addressing the relations among the latent variables.

3.3. Validity & Reliability Testing

According to Chin (1998) in Suroso et al (2018), questionnaire instruments or questions can be assessed by examining the AVE value; statements in the questionnaire are deemed invalid when AVE is lower than 0.5.

Reliability test is the degree of reliability (consistency) of a measurement instrument. Reliability tests are evaluated based on Cronbach's alpha. To assess reliability using Cronbach's alpha, the value must be greater than 0.60 (Suroso et al., 2018).

3.4. Hypotheses Testing

Hypothesis test, we use the R square to analyse the influence between latent variables. The greater the R square, the more definite exogenous latent variables will affect endogenous variables. The models can be categorized as strong, moderate, and weak based on their R square of 0.67, 0.33, dan 0.33. (Suroso et al., 2018). A statistical T test is applied through bootstrapping results. The effect is considered significant if the T statistic should be >1.980 (significant level 5%) for each path relationship (Suroso et al., 2018). When comparing t-statistical values and p-values, it is possible to identify significant correlations between latent variables that can be used for hypothesis testing <0.05 is the suggested p-value.(Lessa & Negash, 2022).

4. Result

4.1. Respondent Characteristics

Descriptive from respondents the study showed that data from 52 respondents based on gender were obtained as many as 25 people (48.08%) male respondents and 27 people (51.92%) women, on the positions obtained, there were 24 people (46.15%) staff respondents, 19 people (36.54%) supervisors

and 9 people (17.31%) managers, based on the educational background obtained, 44 people (84.62%) respondents were undergraduates, 4 people (7.69%) high school/ vocational schools and 3 people (5.77%) diplomas and 1-person (1.92%) postgraduates, based on the length of use of the Exact ERP module obtained by 22 people (42.31%) respondents > 3 Years, 14 people (26.92%) 1-2 Years, 10 people (19.23%) 6-12 Months, 5 people (9.62%) 5-6 Months and 1 person (1.92%) 1-6 Months, and on the old aspect of ERP use in this study, it was found that respondents with the frequency of using ERP 1 time a week as many as 1 person, the frequency of using 3 times a week as many as 1 person and the frequency of use every working day as many as 45 people and others as many as 5 people.

4.2. Validity & Reliability Testing

Validity testing, an instrument or questionnaire question can be assessed by examining the AVE value; statements in the questionnaire are deemed invalid when AVE is lower than 0.5. Reliability testing values are Composite Reliability, each variable is valued greater than 0.7 and Cronbach's alpha values are each valued more than 0.6. This is in accordance with what has been mentioned by (Suroso et al., 2018.

Table 1: Validity and Reliability Testing

Variable	Alpha	CR	AVE
Information Quality	0.898	0.901	0.715
System Quality	0.86	0.86	0.589
Service Quality	0.912	0.928	0.740
Use	0.808	0.831	0.629
User Satisfaction	0.935	0.831	0.885
Net Benefit	0.936	0.936	0.796

4.3. Hypothesis Test

R Square

R square (R^2) testing is method by which structural model evaluation. R square analysis can be used to determine (inner model). The greater the R square, the greater the influence of certain exogenous latent variables on endogenous variables. R square values ≥ 0.67, $0.33 - 0.67$, and ≤ 0.33 can be concluded that the models are strong, moderate, and weak (Suroso et al., 2018).

Table 2: R Square

Variable	R Square	R Square Adjusted
User Satisfaction	0.355	0.315
Net Benefit	0.567	0.549
Use	0.495	0.463

Hypothesis testing result

Path coefficient testing is done by doing bootstrapping calculations first. analyze the influence between variables that are linked to hypotheses that have relationships and to test the significance of the influence of dependent variables on independent variables, statistical T tests are used through bootstrapping results. The effect is considered significant if a higher T statistic than 1.980 (significant level 5%) for each pathway relationship (Suroso et al., 2018).

Table 3: Path Coefficients Results

Hypothesis	T Statistics	P Values	Result
Information Quality -> Use (H1)	1.343	0.179	Not Significant
Information Quality -> User Satisfaction (H2)	0.579	0.563	Not Significant
System Quality -> Use (H3)	1.248	0.212	Not Significant
System Quality -> User Satisfaction (H4)	2.389	0.017	Significant
Service Quality -> Use (H5)	1.106	0.269	Not Significant
Service Quality -> User Satisfaction (H6)	1.082	0.279	Not Significant
Use-> Net Benefit (H7)	1.870	0.062	Not Significant
User Satisfaction-> Net Benefit (H8)	7.349	0.000	Significant

Hypothesis Analysis

H1. The Information Quality variable on System Use, shows a p-value smaller than 0.05, which is 0.179, and a t-statistic value smaller than 1.98, which is 1.343. It is therefore evident that information quality does not have a significant influence on System Usage.

This is in accordance with the results of interviews with ERP system users in the company who stated that the information obtained is still not optimal and in accordance with what is expected to support operational activities, there is still some information that does need to be improved so that it has a positive impact, accuracy still needs to be improved because the data input process is still not meeting the criteria, because there are still frequent errors in the input process.

H2. The information quality variable on user satisfaction, shows a p-value of 0.563, which means greater than 0.05, and a t-statistic value of 0.573, which means smaller than 1.98. From the results of these two numbers, it can be explained that information quality does not have a significant impact on user satisfaction.

Based on observations and interviews, this situation is caused by the system implementation process, which is indeed not optimal and comprehensive, so that the process of operational activities is still carried out semi-manually, so that users do not really make information from ERP is the main thing, so that no matter how much quality of information produced by the ERP system does not affect user satisfaction.

H3. System quality variables on system use show p-value of 0.212, which means greater than 0.05, and t-statistic 1.248, which means smaller than 1.98. It can be explained that system quality does not have a significant impact on system use.

Based on the results of interviews with users, the quality of process, some that is currently used is still not as expected, there are still many processes that are still run manually due to the limitations of features in the ERP system, ERP systems have not been able to meet compliance standards in the pharmaceutical industry, namely 21CFR11 which regulates system standards that need to be met to be used in the pharmaceutical manufacturing process, So there are still many processes that cannot be run using the system.

H4. Fourth hypothesis result, namely the effect of system quality variables on user satisfaction, p-value results were obtained <0.05, which is worth 0.017, and t-statistic greater than 1.98, which is worth 2.389. From the results of these numbers, it can be concluded that system quality has a significant influence on user satisfaction.

The relationship is completed based on the results of interviews with users, the quality of the ERP system currently used is still not as expected, there are still many processes that are still being run manually due to the limitations of features in the ERP system, ERP systems have not been able to meet compliance standards in the pharmaceutical industry, and users feel that they are still not very helped by ERP systems because there are still many processes that run outside the system so that operational activities have not been effective, this is why system quality is very influential on user satisfaction.

H5. According to the results of the fifth hypothesis test, namely, the effect of service quality on system use, which shows a p-value greater than 0.05, which is worth 0.269, and t-statistic greater than 1.98, which is worth 1.106. This means that the quality of service does not have a significant impact on system usage.

The results above agree with interviews conducted directly with users, the services of the IT team that are currently running are good enough and help every question and problem that exists, but there needs to be an improvement in terms of human resources who master the ERP system itself, which is still limited. This also does not affect the use of the system by users.

H6. The sixth hypothesis result, namely the impact of service quality on user satisfaction, a p-value >0.05 is 0.279 and a t-statistic <1.98 is 1.082. From the results of these figures, it can be concluded that Service Quality does not significantly affect User Satisfaction.

The insignificant relationship between the two variables is because the ERP system itself has not become a major part of daily operational activities because there are still many processes that are carried out not using the system, so the quality of service has not greatly affected user satisfaction.

H7. The results of this seventh hypothesis test regarding the relationship between system use to net benefits, which has a p-value <0.05, which is worth 0.062, and a t-statistic <1.98, which is worth 1.870. It can be concluded that the relationship between system use and net benefit has no significant effect.

The results of interviews conducted with users based on several variables that exist to support the use of the system from the ERP system itself, the basic thing about this ERP system is that the process of implementing this ERP system has not been optimal and comprehensive due to system features and compliance standards that have not been able to meet the expectations and needs of the organization which makes the existence of this system has not become a reference for daily operational activities to make relationships these variables did not have a significant influence on each other in this study.

H8. In testing this hypothetical effect of user satisfaction on net benefits, it has a p-value < 0.05 which is worth 0.000 and a t-statistic >1.98 which is worth 7.349. From the results of these values, it can be proven that user satisfaction has a significant impact on net benefits.

Based on interviews conducted with several users who are process owners in several areas that already use this system, the variables and things that are carried out above are very referenced, one of which is System Quality, and also the ERP implementation process which is not yet optimal and comprehensive, this is due to the ERP system selection process that is not in accordance with the characteristics of the existing industry, namely the pharmaceutical manufacturing industry which has several compliance standards are needed to be applied to a system in the process, besides that this company is a new company, so the process of implementing a system into the business process still depends on user assessment, which causes user satisfaction to greatly affect net benefits, user assessment of the existing system has not met expectations, thus making the implementation process not optimal and thorough which causes some variables to have no significant influence.

5. Discussion & Conclusions

This study contributes to IS research by demonstrating the applicability of the updated DeLone and McLean model for evaluating ERP implementation success in the pharmaceutical industry. The findings confirm system quality as a key driver of user satisfaction and net benefits, the results suggest organizations rolling out ERP systems should focus efforts on enhancing system quality, such as ensuring software reliability, features, and compliance with industry regulations. Increased training and support can also boost user adoption and utilization. In this case the process of implementing the system in the pharmaceutical industry environment has special prerequisites, namely the prerequisite computer validation system regulated by prerequisite 21 CFR Part 11 FDA's, which regulates electronic recording, electronic signatures, which will be used in the pharmaceutical industry environment, so that the system will be tested with a computer validation system so that the system is indeed feasible and can be used in the pharmaceutical industry manufacturing process environment. This is very much a reference in this study, so that it can increase the net benefit.

6. Limitations and Future Research

The limitations faced in this study are deepening the quality of the system that is needed related to prerequisite 21 CFR Part 11 regulated by the FDA's, a prerequisite required by a system to be applied for use in the pharmaceutical industry environment and this study include in sample size from single company.

Further research is expected to be more in-depth related to the prerequisites 21 CFR part 11, which is required by an ERP system that may be used in the pharmaceutical industry environment, so that the application of the system can increase the ERP system net benefit in the pharmaceutical industry environment and could be survey the ERP application across multiple pharmaceutical firm to improve the finding related the successful of ERP implementation in pharmaceutical industry.

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