

Implementation of Enterprise Resource Planning System in Manufacturing Firm in Indonesia

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Abstract— The purposes of the present study were examine the effects of system quality on user satisfaction, system quality on use, information quality on user satisfaction, information quality on use, reciprocal effect between use and user satisfaction, user satisfaction on individual impact, use on individual impact, and individual impact on organizational impact. The present study used the structural modeling based on partial least squares regression. Empirical results showed that information quality had a significant positive effect on use and user satisfaction. System quality had a significant positive effect on use but a negative effect on user satisfaction. Service quality had a significant positive effect on use and user satisfaction. There was no reciprocal effect between use and user satisfaction. Use, but not user satisfaction had a positive and significant effect on individual impact. The individual impact had a positive and significant effect on organizational impact.

Keywords— system quality; information quality; user satisfaction; use; individual impact; organizational impact

I. INTRODUCTION

Manufacturing is a process of transforming raw materials into finished goods for sale. This effort involves all the production processes and the integration of the required components to produce a product [1]. Enterprise Resource Planning (ERP) is a management process that balances supply and demand for a company as a whole [2]. It is capable of link customers to suppliers in a single supply chain [3]. ERP adopts business processes in decision-making and integrates all the functional parts of a company, including sales, marketing, manufacturing, operations, logistics, purchasing, finance, new product development, and human resources [4]. ERP ensures businesses can run with high levels of customer service and productivity, lower costs and inventory, as well as providing a foundation for an effective e-commerce [5].

Despite the present ERP's popularity as a software system for manufacturing firms, in the future ERP will be an integrated business planning system with execution processes for managing the operational and support functions of a manufacturing firm. ERP is designed based on the best practice in business processes. ERP is capable of transforming the general processes actually applicable to purchasing, stock preparation in the warehouse, into benefits to the greatest possibility for a company [6]. The challenge for the manufacturing industry in Indonesia is

to transform the manufacturing processes in accordance with the work process.

Information systems success model (such as ERP) have been developed by researchers. Of those models, the model of DeLone and McLean is referred by various researchers. DeLone and McLean conducted a study on information systems success represented in the qualitative characteristics of information systems (information quality), consumption of the output (use), user response to information systems (user satisfaction), effects of information systems on user habit (individual impact), and effects on the performance of the organization (organizational impact) [7]. The test results of the model of DeLone and McLean demonstrated inconsistent empirical results with one another.

Several researchers argue that system quality and information quality are significant predictors of user satisfaction, use and individual impact [8]-[11]. Other studies showed that system quality and information quality are significant predictors for use, but not significant predictors of user satisfaction [12]-[14]. The context of voluntary and mandatory use of information systems provides different results. The model of DeLone and McLean is better suited for voluntary application of information systems, as demonstrated by the empirical support given to this model by several studies of voluntary information systems [12], [15]. A study by Livari [13] demonstrated an inaccurate measurement of the variable 'use' using other variables in a model. This

may be influenced by the nature of the mandatory use of information systems.

The purpose of the present study was to assess the extent of to which ERP is successfully implemented by the use of DeLone and McLean model approach. On the basis of in-depth study of literature and previous studies on information systems success, the author believed that the success of an information system can be represented by the qualitative characteristics of system quality, quality of output in the form of information generated (information quality), consumption of output as seen from the user, user response to information systems as seen from user satisfaction, effects of information systems on user habits as seen from individual impact and effects on organizational performance or organizational impact.

II. MATERIAL AND METHOD

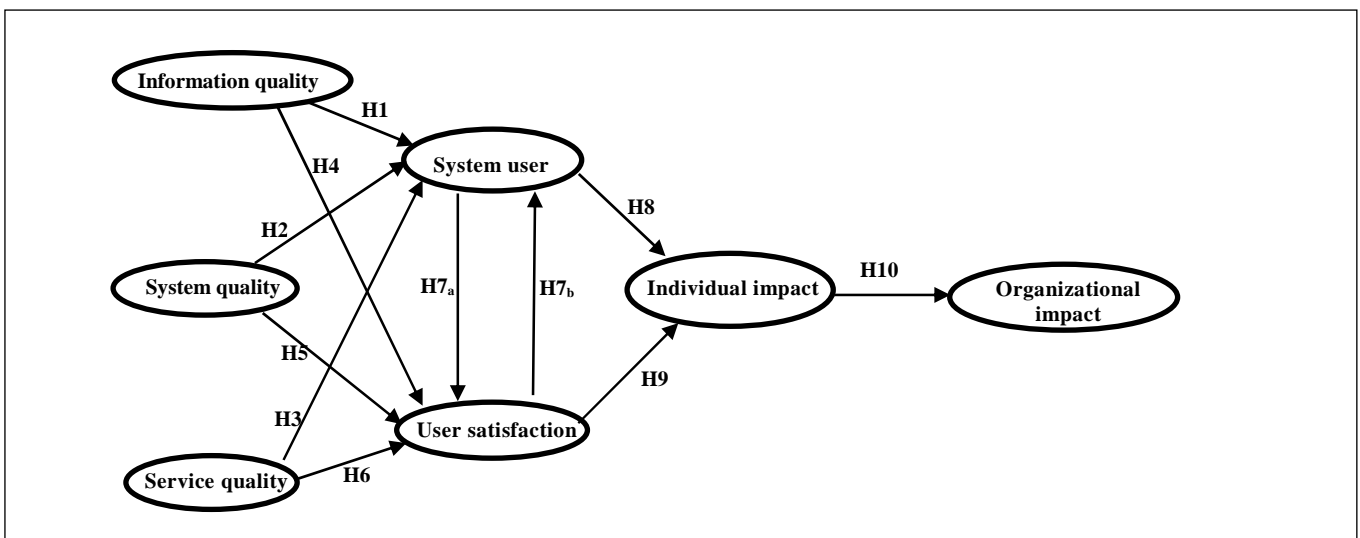
Information quality is the quality of output in the form of information produced by the information system used¹⁶. Information quality is subjectively measured by the user as perceived information quality. The indicators used are completeness, precision, reliability, currency, and format of output [13]. The quality of information systems is the technical quality of the information systems. System quality means combined quality of hardware and software. DeLone and McLean [17] elucidates that system quality is the performance of the system with reference to how well the hardware, software, policies, procedures of the information system are capable of providing the information needed by the user. System quality is measured subjectively by the user so that the quality of the system used is the perceived quality system. The indicators used are system flexibility, system integration, time to response, error recovery, the convenience of access and language¹³.

Service quality is the extent to which the user perceives the quality of services provided by the vendor or provider of the program package [18]. Service quality is

subjectively measured by the user so that the quality of the service used is the perceived service quality. There are five indicators to measure service quality: tangibles, reliability, responsiveness, assurance, and empathy¹³. Use is the use of billing system applications or information systems itself (system use) [19]. In addition to using information systems, the system user also automatically utilize the output (reports) of the information systems generated by the information systems. The indicators used are daily used time and frequency of use [13].

User satisfaction is the information system users' level of satisfaction with the system and output [20]. System user satisfaction is the user's response and feedback after using information systems. User's attitude to information systems is a subjective criterion of the extent to which the user prefers the system being used. The indicators used are repeat purchase and repeat visit [13]. The individual impact is the net results or benefits perceived by an individual and organization after applying information systems. The individual impact is the use of an ERP program packet in improving the user's performance [21]. The indicators used are the average time to make a decision, confidence in decision-making and the quality of decision analysis [13]. The organizational impact is the effect of the existence and use of information systems on the quality of the performance of the organization, in this case, those organizations that develop the systems [22]. The indicators used are a reduction of operating costs of the activities outside the information systems, increase the organization's revenue due to computer-based information systems and the organization's willingness to pay development costs to improve the capability of information systems and effectiveness of public service [13].

The research model tested in this study is shown in Fig. 1.



(Source: adapted from the model of DeLone and McLean)

Fig. 1 The research model

Hypotheses proposed in this study were:

- H1 : The information quality had a significant effect on system use of ERP system in Manufacturing firm
- H2 : The system quality had a significant effect on system use of ERP system in Manufacturing firm
- H3 : The service quality had a significant effect on system use of ERP system in Manufacturing firm
- H4 : The information quality had a significant effect on user satisfaction of ERP system in Manufacturing firm
- H5 : The system quality had a significant effect on user satisfaction of ERP system in Manufacturing firm
- H6 : The service quality had a significant effect on user satisfaction of ERP system in Manufacturing firm
- H7_a : The system use had a significant effect on user satisfaction of ERP system in Manufacturing firm.
- H7_b : The user satisfaction had a significant effect on system use of ERP system in Manufacturing firm.
- H8 : The system use had a significant effect on the individual impact of ERP system in Manufacturing firm.

- H9 : The user satisfaction had a significant effect on the individual impact of ERP system in Manufacturing firm.
- H10 : The individual impact had a significant effect on the organizational impact of ERP system in Manufacturing firm.

Samples were large manufacturing firms that have been implementing ERP in Indonesia. A sample of companies in Jakarta and Surabaya was taken by using a non-probability sampling technique or by means of non-random selection by using purposive sampling technique. Data were analyzed by using the component-based SEM with the partial least-squares (PLS) regression. PLS regression was selected since this technique is widely used for a complex causal-predictive analysis and is suitable for use in predictive applications and theory development. PLS regression does not require many assumptions. Data are not required to have multivariate normal distribution and the sample size does not have to be large (Ghozali [23] recommends 30-100 samples). Due to the small size of the sample used in the present study (<100), PLS regression was used as the analytical tool. Testing was carried out by using the component-based SEM or PLS regression with SmartPLS version 2.0. The Inner model is shown in Fig. 2.

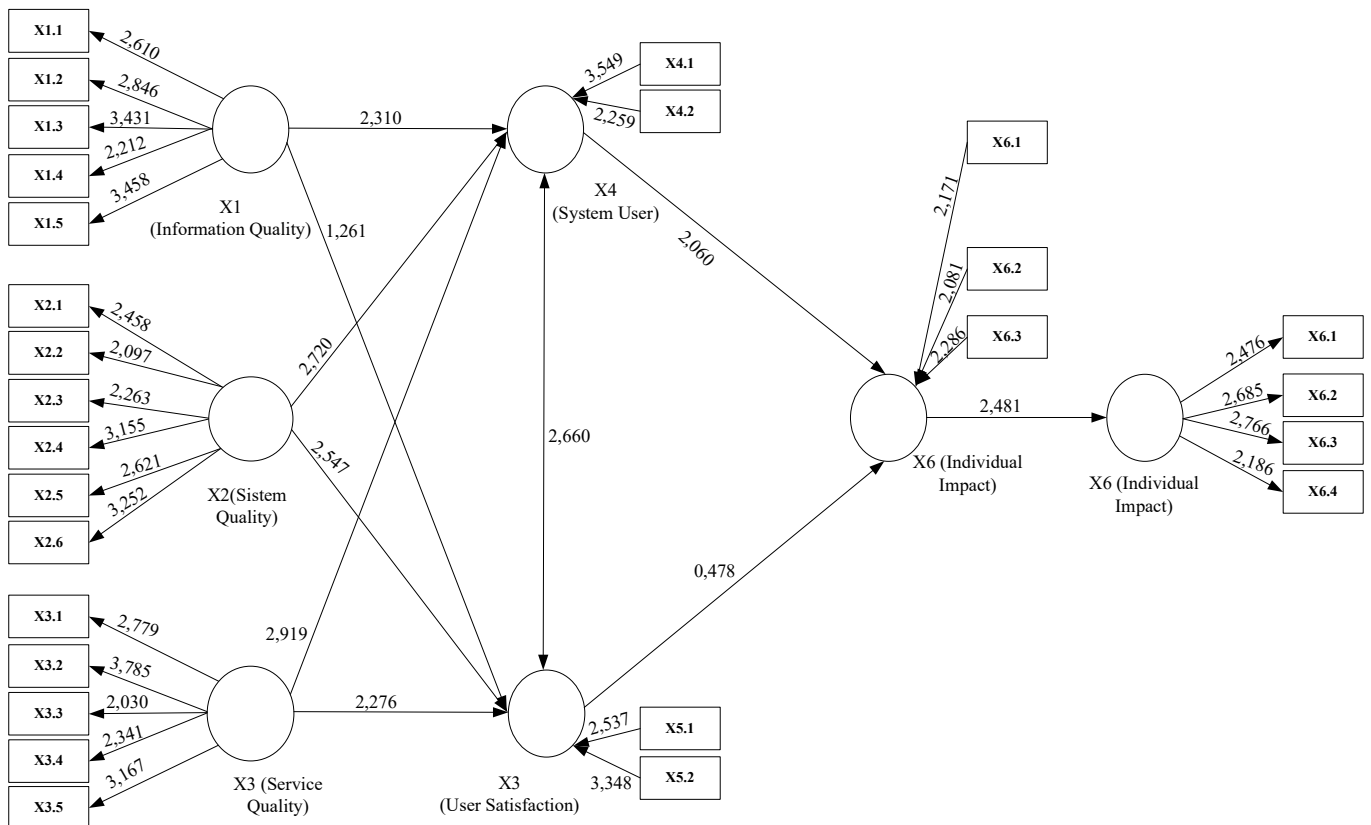


Fig. 2 The inner model

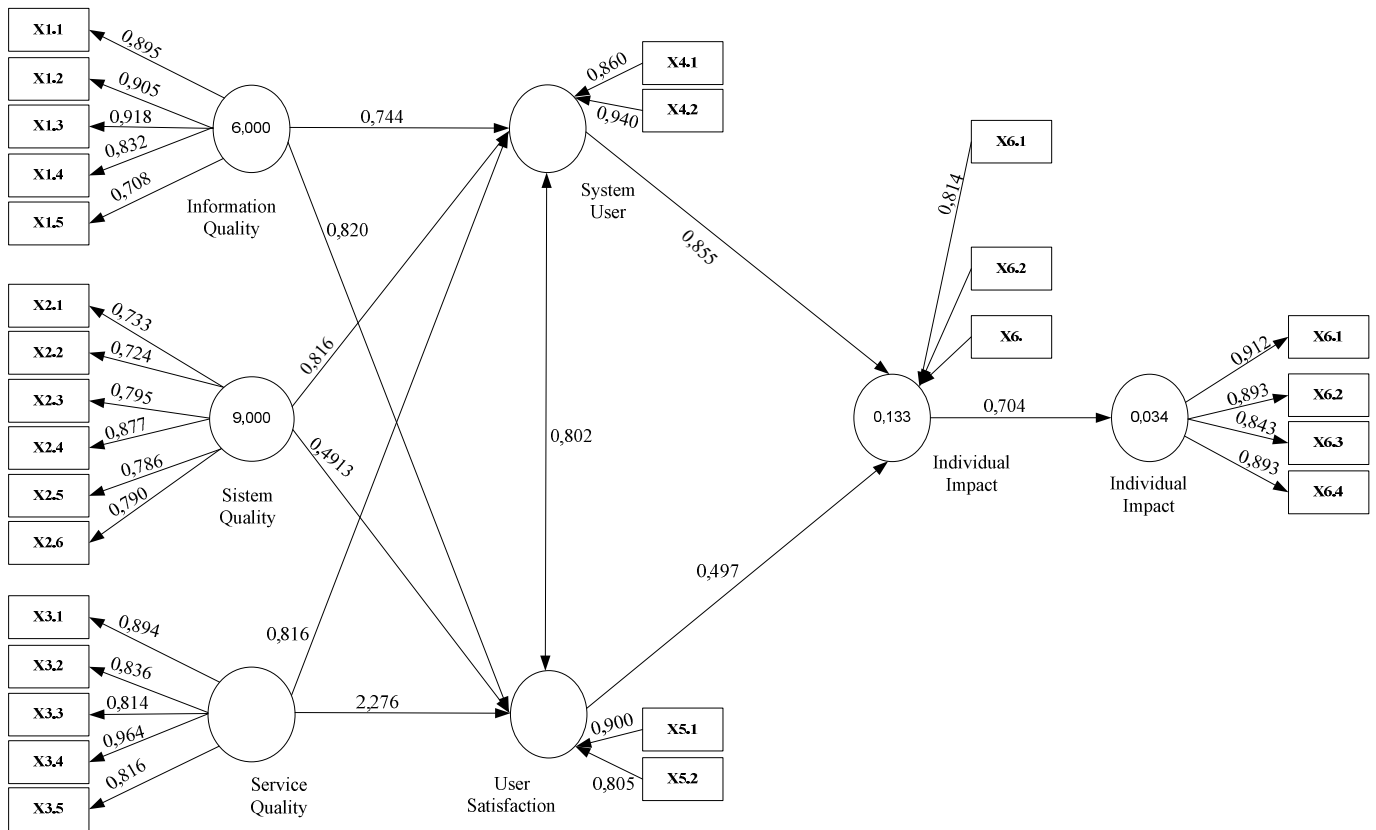


Fig. 3 The outer model

III. RESULTS AND DISCUSSION

A. Final SEM Analysis

Fig. 3 shows the relationship between the study variables. In formative constructs, conserve the items that have Outer loadings > 0.50 ; only if theory says that it is an important indicator. In SmartPLS, if $\lambda > 0.50$, the indicator has significant influence in the construct. The magnitude of the influence is the outer weight give you that information [24]. Here are the results of research hypothesis testing as Table 1.

TABLE I
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Hypothesis	Variable	Loading (λ)	Note
H1	Information quality \rightarrow System user	0.744	Significant
H2	System quality \rightarrow System user	0.818	Significant
H3	Service quality \rightarrow System user	0.814	Significant
H4	Information quality \rightarrow User satisfaction	0.820	Significant
H5	System quality \rightarrow User satisfaction	0.492	Non Significant
H6	Service quality \rightarrow User satisfaction	0.932	Significant
H7a	System user \rightarrow User satisfaction	0.802	Significant
H7b	User satisfaction \rightarrow System user	0.802	Significant
H8	System user \rightarrow Individual impact	0.844	Significant
H9	User satisfaction \rightarrow Individual impact	0.497	Non Significant
H10	Individual impact \rightarrow Organiz. impact	0.704	Significant

ERP systems include the techniques and concepts used for the overall business management from the viewpoint of the effective use of resources to improve the efficiency of the company. ERP has many advantages, either directly or indirectly. Direct advantages include increased efficiency, integration of information for better decision-making, and faster response time to customer demand. Implementation of ERP systems makes all information systems to be integrated with each other into an enterprise information system totally integrated with data, voice and video media converged digitally. ERP systems help improve efficiency by strengthening the ability of the company management to monitor and control the existing processes closely.

Myers [25] states that information quality, as with system quality and service quality, has an effect on user satisfaction. When information system users perceive the quality of services provided by the provider of ERP program package as good, they will tend to be satisfied with using the system. It is predicted that the higher the quality of the services provided, the higher the level of user satisfaction will be. A study by Delone and McLean [16] provided empirical evidence that service quality had a positive and significant effect on user satisfaction. Information system quality has a positive effect on user satisfaction [12], [13], [17], [26]. User satisfaction with an information system is how the user views an information system in real, rather than doing so technically [27]. User satisfaction with an information system plays a significant role in determining the use of the application system [28].

The quality of information systems is a characteristic of the inherent information about the system itself [15]. The quality of information systems is perceived ease of use, which is the extent to which computer technology is perceived as relatively easy to understand and use [29]. When the user of an information system perceives the system as easy to use, the user does not require a lot of effort to use. The user will have more time to carry out other things that are likely to improve their overall performance. There is a positive relationship between system quality and user satisfaction [30]. There is a positive relationship between user satisfaction with system quality when the user is not simultaneously the developer of the system [31].

The better the quality of information, the higher the satisfaction of the user will be [15]. This is supported by a study by Rai *et. al.*, [12], Livari [13], McKiney *et. al.*, [26], McGill *et. al.*, [28]. When the end users of information systems believe that the quality of information generated by the information system is good, they will be satisfied with using the information system. Rai *et. al.*, [12] states that perceived usefulness has an effect on user satisfaction. The success of an information system of a company depends on how the system is run, the ease of the system for the users, and the utilization of technologies used [29]. Information system end-user satisfaction can be used as one measure of the success of an information system [32]. Managers provide a user-friendly system in order to improve the quality of services and increase consumer awareness of the usefulness of the system [33]

It turns out that there is no significant positive relationship between user satisfaction with system quality. The measure of user satisfaction with a computer system is reflected by the quality of systems owned [34]. When the quality of information system is perceived as good by the user, they will be likely to be satisfied with using the system. A study by Venkatesh *et. al.*, [29] provided empirical evidence that the quality of information systems had a positive and significant effect on user satisfaction. The higher the quality of information system used, the higher the level of user satisfaction with the information system will be. User satisfaction is reflected by the repeat purchases and use of the system in daily work. User satisfaction is achieved when the ERP system is capable of solving all the problems of the company.

Despite the implementation of ERP systems by manufacturing firms in Indonesia, it has not given effect to the firms in generating new ERP product innovations; instead, ERP has been used only to support an integrated administrative system. Ince *et. al.*, [35] noted that there is no change resulting from ERP system implementation in the short term. ERP implementation is capable of reducing costs and improving efficiency. Maroofi *et. al.*, [36] argues that the presence of such information technology as ERP provides many advantages for the company. ERP generates reliable, relevant, timely, complete, easy to understand, and tested information in the context of planning, control and management decision making. Baker and Yusof [37] states in the use of ERP management success is influenced by increasing

knowledge sharing. However, this condition causes the user to become stressed and work under pressure, thus preventing from the achievement of user satisfaction.

Information quality is the quality of output in the form of information generated by the information system used [12]. The better the quality of information, the more precise the decisions were taken will be. Poor information will have a negative effect on user satisfaction. Delone and McLean [16] tested the effects of information quality on the satisfaction of the user of information systems. Their results indicated that information quality is positively related to the satisfaction of the user of information systems. Users of information systems certainly hope that they will obtain the information they need by using the systems. The characteristics of information generated by a particular information system may differ from those generated by other information systems. An information system capable of generating information that is timely, accurate, appropriate, relevant and meets the criteria and other measures of information quality will affect user satisfaction. A study by Venkatesh *et. al.*, [29] provided empirical evidence that information quality had a positive and significant effect on user satisfaction. The higher the quality of information generated by an information system, the higher the satisfaction of the user of the information system will be.

The relationships between user satisfaction with information systems and individual performance have been tested. The use of information systems has a positive effect on individual performance. However, it has an insignificant positive relationship with user satisfaction. Delone and McLean [16] suggests that the individual performance-improving effect of the use of information systems will not have an effect on the level of user satisfaction. This is in contrast to a study by Rai *et. al.*, [12] that examined the relationships between the increase in the performance of end-users of information systems and user satisfaction. Their results showed that use of information systems had an effect on user satisfaction. Furthermore, Livari [13] conducted a study on the success of a new information system mandatorily applied to users of information systems in an organization. Their results showed that individual impact was positively related to user satisfaction. A study by Venkatesh *et. al.*, [29], [28] provided empirical evidence that user satisfaction had a positive and significant effect on individual performance. The present study would be focused on determining the extent to which the satisfaction of an information system's users has an effect on their performance. When an individual is satisfied with the information system used, then they will tend to feel comfortable and safe during their work with the system so that they will find it helpful in completing their work.

McGill *et. al.*, [28] argues that perceived system quality and information quality are significant predictors of user satisfaction, but they have no significant effect on the use. User satisfaction has an effect on individual impact. Use has no effect on individual impact, and individual impact has no effect on organizational impact. Roldan and Leal [38] states system quality and information quality have a positive effect on the satisfaction of EIS users; however,

there is no significant relationship between system quality and information quality and use. Au *et al.*, [39] argue that system quality has an effect on the user, while information quality has a weak effect on user satisfaction.

Livari [13], Roldan and Leal [38] states perceived quality system represents a significant predictor of use and user satisfaction. Perceived information quality has an effect on user satisfaction, but not on use. There is no reciprocal effect between use and user satisfaction. User satisfaction, but not use, has a significant effect on individual impact. Lu *et al.*, [40] argues that the factors of technology have an important role in ensuring the successful implementation of information systems in government organizations.

B. Managerial Implications

The results of this study have implications that by improving and enhancing the quality of ERP systems and the quality of information will increase usage and user satisfaction. Increased user system and user satisfaction of the information system will enhance the benefits provided by the ERP information system. Model success and McLean DeLone information system are not fully proven empirically, in the case of ERP information system development in the manufacturing industry in Indonesia. Results showed that the quality of the system does not provide a significant positive effect on user satisfaction. Users still assume that ERP information system is a burden for the user. The user using ERP information systems for companies requiring the use of this information system.

The user has not fully benefited from the use of ERP information system as a whole. The response that arises is user dissatisfaction. This response came after users using ERP information system. The attitude of the ERP information system is a subjective attitude towards the user dislikes ERP information system that is used. An understanding of the user about the importance of ERP information system to their personal an important thing that should be done immediately. Manufacturing companies applying ERP in Indonesia must immediately clean so that users realize the importance of ERP information systems for the company's business processes and enabling them to complete the job.

Other managerial implication is the impact of positive people could not be proved significantly influenced by user satisfaction. ERP information system developed by manufacturing firms in Indonesia did not have an impact on increasing the quality of individual professionalism. Ideally, the existence of ERP information system will be a stimulus and a challenge for individuals to work better. User dissatisfaction with ERP information systems has an impact on the individual user. However, this effect does not directly affect the organization. Dissatisfaction that arises with the implementation of the ERP information system impact only on each individual user. This proves that the user does not respond positively to the implementation of the ERP information systems, but the user still trying to do his job in accordance with the user's commitment to the company.

IV. CONCLUSIONS

Information quality, information system quality and ERP service quality had an effect on use. Similarly, user satisfaction, but not ERP information system quality had an effect on use. ERP system quality, that refers to the extent to which the hardware, software, policies, procedures of information systems capable of providing information required by users, on the contrary, created confusion among users of the system, eventually leading to user dissatisfaction. The variable ERP user satisfaction is mandatory; thus, it is inappropriate to use it as a measure to assess the real use of an ERP information system. Empirically, the use of ERP was shown to have an effect on individual impact; however, user satisfaction was not shown to have an effect on individual impact. There was no reciprocal effect between use and user satisfaction. Mandatory use of an ERP system was not an appropriate proxy to measure user satisfaction. Long use of an ERP system could be due to the task; thus, it does not necessarily provide satisfaction with using an information system. The individual impact was empirically shown to have an effect on organizational impact.

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