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Evaluation of Badix Information System Implementation Success in Telkomsel Region of Sumbagsel using DeLone & McLean Model

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Abstract: This research tries to examine the success of Badix implementation as Information System in Telkomsel, which is the largest Indonesian telecom company, using DeLone and McLean (2003) model. The success of Badix that has the role of Decision Supporting System (DSS) is measured through user satisfaction variable. This study is purposed to adopt DeLone and McLean model to test the relationship of information quality, system quality, and service quality from Badix with user satisfaction variable. Furthermore, this study will also examine the effect of user satisfaction on the net benefits obtained. The Delone and McLean (2003) models are modified by removing the intention to use and use variables by looking at the fact that Badix Information System is a mandatory DSS in Telkomsel Regional Sumbagsel. The type of research is conclusive research based on data population coming from 47 people who have access (authorization) to Badix DSS. Sampling is done by using purposive sampling, with minimum requirement of respondent to be working in Telkomsel Regional Sumbagsel for more than one year and having used badix for more than six months. From the questionnaire distributed, 37 respondents were in accordance with the minimum requirements to be a sample in this study. Data analysis technique was multivariate dependent-based which is variance-based matrix Structural Equation Modeling (VB-SEM) with Partial Least Square (PLS) as the software used. The result showed that the system quality (path 0.24), information quality (path 0.49) gave significant influence on User's satisfaction by 47%. User's satisfaction from Badix gives significant effect on net benefits of 41% proportion, while Service quality is not proven empirically to give significant influence on User's Satisfaction.

Keywords: Information system, Decision supporting system, Tough business competition

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INTRODUCTION

Increasingly tough business competition requires that every company that wants to survive and grow must be able to create and maintain a competitive advantage. To maintain a competitive advantage in telecommunication industry requires a business that can optimize the quality of service provided to the customer. Telkomsel Regional Sumbagsel consisting of South Sumatra, Jambi, Bangka Belitung, and Bengkulu provinces recorded a profit contribution of Rp 2.9 trillion during the year 2016 or an increase of 13.7% compared to 2015. To maintain double digit growth in 2017, management has released the Key Index Performance (KPI) that must be achieved in 2017. To maintain KPI according to the target, the team of Telkomsel Regional Sumbagsel has implemented Badix Decision Supporting System as a regional information system of Sumbagsel in 2014. Badix is a DSS created by Information and Communication Technology (ICT) regional team of Sumbagsel since 2014. The development of Badix made an information system that helps the managerial staff in the field to optimize the production equipment which is reflected from the achievement of the target company. Badix continues to develop through improved functionality and new features that are useful in helping to make informed decisions on Telkomsel's production problems in Sumbagsel. As time goes by and with the increasing number of production equipment, the problems faced are also getting more complex. This necessarily demands a development in the output produced by Badix to aid in making a decision. Until this research was made in 2017, there were several phenomena that describe the lack of optimal functionality in the Badix feature, thus providing obstacles to the Regional ICT team of Sumbagsel. This is enough to give effect on the quality of the optimization of production equipment, with the service on Badix activities in the form

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of managerial production tools Telkomsel Sumbagsel becomes easier in the process. If the performance of Badix has decreased, of course, ease in the optimization of production equipment is also difficult to obtain by the regional ICT team of Sumbagsel.

In the era of increasingly fierce and dynamic business competition, information systems are no longer seen as a complement or support but become a strategic part of the company (Ward & Peppard, 2002). The role of information systems has shifted from just the current data information system to a strategic role in improving the competitiveness of the company. The concept of a well-known information system capable of presenting data as well as giving influence on decision makers in order to get continuous improvement of network quality is DSS. DSS is an interactive information system that provides information, modeling, and manipulation of data used in assisting decision-making in semi-structured and unstructured situations where nobody knows exactly how decisions should be made (Alter, 2002). In other definition, DSS is an information system to help middle level managers to take half-structured decisions to be more effective by using analytical models and available data (Jogiyanto, 2008).

Informastion System (IS) has a strategic role for the company, in the implementation of many companies that are not having successful result. There are many previous studies that discussed the failure of information systems in large companies. Hewlett-Packard's (HP) suffered a loss of 160 million dollars due to the failure of information system implementation, then Nike had previously lost $100 million in sales and 20% drop in share prices due to an information system failure (Koch & Schneider, 2002).

The purpose of this research is as follows:

- To test and analyze the effect of quality information generated IS Badix on user's satisfaction (user satisfaction).
- To test and analyze the effect of Badix system quality on user's satisfaction.
- To test and analyze the effect of Badix service quality on user's satisfaction.
- To test and analyze the effect of user's satisfaction on net benefits.

THEORETICAL REVIEW

This research modified the Delone and McLean model (2003) by removing intention to use and use variables, because the Badix system is a mandatory DSS in Telkomsel ICT Regional Sumbagsel. Variables used to measure information systems are user's satisfaction, system quality, information quality, service quality, and net benefits.

Information system

Information systems can be a regular combination of people, hardware, software, communication networks, and data resources that collect, transform, and disseminate information within an organization (O'Brien & Marakas, 2009). The concept of information systems that exist in every organization has emerged before the development of information technology (Ward & Peppard, 2002).

Decision Supporting System (DSS)

The DSS is an interactive information system that provides information, modeling, and manipulation of data used in assisting decision-making in semi-structured and unstructured situations where no one knows for sure how decisions should be made (Alter, 2002). DSS is an information system to help middle-level managers to take half-structured decisions to be more effective by using analytical models and available data (Jogiyanto, 2008). By classification of information systems, DSS is included in Management Information Sytsem (MIS) which is tasked to provide support for decision-making on the company's management operations (O'Brien & Marakas, 2009). The role or function of the DSS is as follows (Jogiyanto, 2008):

- To help managers make half-structured decisions faced by middle-level managers.
- To help or support management take decisions instead of replacing them.
- Improving the effectiveness of management decision-making is not to improve efficiency.

Information system success model

Company expects the information system to be implemented successfully. But measuring the success of the implementation of an information system is a difficult thing (Jogiyanto, 2008). Use of cost benefit analysis can not be done perfectly because not all benefits can be quantified. Benefits such as more timely decisions, increased employee skills, and employee satisfaction over information systems may escape the calculations of financial analysis (Laudon & Laudon, 2011; Ilias, Razak & Rahman, 2015; Rahman & Qi, 2016).

In the year of 2003, DeLone and McLean revised the model into "The DeLone and McLean Information System Success Model". In this new model, DeLone and McLean added service quality dimensions. In addition, DeLone and McLean also combined the two dimensions of individual influence and organizational influence into net benefits. The DeLone and McLean models are simple but valid models to include as parismic models (Jogiyanto, 2008).

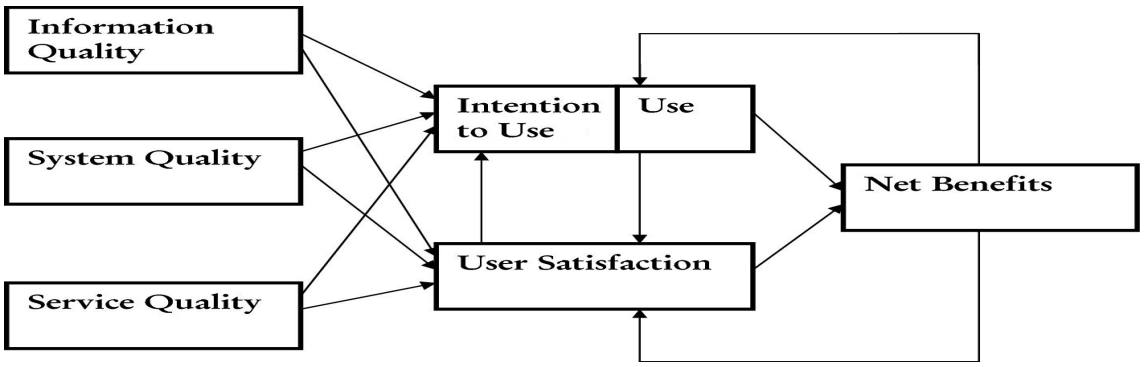

Figure 1. Success model of DeLone and McLean information systems
Source: (DeLone & McLean (2003))

EMPIRICAL REVIEW

Wu and Wang (2006) conducted a study to measure the success of a knowledge management information system known as the Knowledge Management System (KMS) in a company with the approach to the success model of DeLone and McLean information systems developed. The research was conducted on 50 companies in Taiwan who have implemented KMS in their company. Data analysis was done using SEM with the help of LISREL program. As a result, 5 of 7 hypotheses are accepted and 2 hypotheses are declared rejected. This study is empirically proven and supports the DeLone and McLean Model. The existence of inconsistency with previous research concerning insignificant effect of system quality on perception of KMS benefit and KMS use on perception of KMS benefit.

Rai, Lang and Welker (2002) examined the DeLone and McLean model by conducting research on 274 integrated student information users at Midwestern University. Variables used are System Quality, Information Quality, Information System Use, User's Satisfaction, and Individual Impact. Organizational impact variable is not used in this research. In addition, the relationship or influence of variable IS Use on User's Satisfaction is also omitted in the model because IS Use is considered as behavior that is affected by user's satisfaction but does not affect user's satisfaction. Using the Structural Equation Model (SEM) analysis, this study supports the DeLone and McLean model by showing that empirically, the quality of information and system significantly affects user's use and satisfaction, and user's satisfaction significantly affects usage.

Livari (2005) conducted a study to test the DeLone and McLean model on accounting information systems at City Council Oulu, Finland. Field studies were conducted using longitudinal data by taking 78 samples who were the primary users of the system. This study proves that perceived system quality is a significant predictor of user's use and satisfaction. While the quality of perceptions of information (perceived information quality) affects user's satisfaction but does not affect the usage. The use and user's satisfaction are not proven to affect each other (reciprocally). Individual impact is significantly affected by user's satisfaction, but not by usage.

Pramadani and Mujahidin (2013) in his research mentioned Indonesian e-Government information systems in the Public service sector, should be assessing the effectiveness, security, and improvement of the system making it easier to use. Measurement is done by looking at system quality from information system to user's satisfaction which is adapted from Delone and Mclean model. This study is empirically proven and supports the DeLone and McLean Model that Individual impact is significantly affected by user's satisfaction.

The hypothesis of research

- Quality of information significantly affects user's satisfaction.
- Quality of system significantly affects user's satisfaction.
- Quality of service significantly affects user's satisfaction.
- User's satisfaction significantly affects net benefits.

RESEARCH METHODOLOGY

The research type is conclusive (causal) that is to examine the influence of system quality, information quality, and service quality on user's satisfaction of Badix DSS system and its effect on the net benefit that is individual and organizational performance. The data were collected by distributing questionnaires to the Regional Telkomsel Sumbagsel ICT team who had access authorization to 47 Badix DSS.

Operational variables

Variables used in this study are system quality, information quality, and service quality as independent variables. While the dependent variable used in this study is variable user's satisfaction and net benefits. The net benefit variables used in this study are the impact of individuals and organizations. Individual impact is the effect of the use of information systems on individual user's performance. The impact of the organization is the influence of the use of information systems on organizational performance. The intention-to-use and use variables are excluded from DeLone and MecLean (2003) basic models, since Badix is a mandatory application in Telkomsel ICT Regional Sumbagsel. Previous research has shown that the use and satisfaction variables do not affect each other as Mandatory applications such as research conducted by Livari (2005).

Analysis method

This research uses SEM. Structural equation model or SEM is a tool to analyze multivariate data, especially to test causality relationship (Latan & Gudono, 2012). While the type of SEM used in this research is variance-based matric structural equation modeling (VB-SEM) with PLS program. PLS program was also used by Livari (2005) who examined the success of information systems to test DeLone and McLean model on accounting information system in Oulu City Council, Finland. According to Ghozali and Latan (2014), to conduct analysis with PLS is done through two stages:

Assessing outer model or measurement model

The validity of research variables is defined as the relationship between indicators with latent variables. There are two criteria to assess the measurement model: convergent validity and discriminant validity.

Assessing inner model or the structural model

Inner model or structural model testing is performed to see the relationship between constructs or latent variables, seen from the R^2 values of the research model and also by looking at the magnitude of their structural path coefficients. The higher the R^2 value, the better the model can predict from the research object.

RESULTS AND DISCUSSION

Assessing outer model or measurement model

Discriminant validity

Ghazali and Latan (2014) mentioned that the discriminant validity of measurement models with reflexive indicators is assessed based on measurement cross measurement by constructs. The method for assessing discriminant validity other than by looking at the value of cross loading is to look at the square root of the AVE for each construct whether it is greater than the correlation between constructs with other constructs. Prior to comparison, we must first find the value of AVE for each model. A good AVE, required by Ghazali and Latan (2014), has a value greater than 0.5. Having found that the AVE value of each construct is greater than 0.5, it can be continued by comparing the AVE root in each construct.

Table 1: Cross loading on construct

Indicator	Information Quality	Service Quality	User Statisfaction	Quality System	Net Benefits
KI1	0.6438	0.5899	0.3773	0.5035	0.5522
KI2	0.7615	0.518	0.3498	0.3729	0.5695
KI3	0.8475	0.4688	0.5526	0.4364	0.6368
KI4	0.858	0.4747	0.6477	0.4465	0.6433
KI5	0.6904	0.5208	0.3773	0.3629	0.481
KI6	0.7052	0.3633	0.5203	0.2577	0.4483
KL1	0.4797	0.7925	0.3396	0.5337	0.5096
KL2	0.5516	0.7989	0.3327	0.3307	0.5146
KL3	0.4867	0.8143	0.5287	0.4804	0.5777
KL4	0.4721	0.6644	0.3721	0.3476	0.5886
KL5	0.3601	0.7373	0.1798	0.5239	0.4102
KP1	0.2623	0.1748	0.6542	0.3422	0.3111
KP2	0.561	0.3228	0.8661	0.3401	0.4615
KP3	0.6386	0.5899	0.867	0.5458	0.6748
KS2	0.2731	0.2858	0.3062	0.6417	0.2282
KS7	0.4039	0.5277	0.539	0.838	0.5015
KS8	0.4332	0.4023	0.3575	0.7995	0.3948
KS9	0.5111	0.5285	0.3996	0.846	0.4821
MB10	0.4078	0.5253	0.2327	0.2762	0.718
MB2	0.5823	0.6402	0.6237	0.7282	0.8327
MB3	0.6646	0.6137	0.6124	0.4457	0.8141
MB4	0.6667	0.4989	0.617	0.4824	0.8428
MB5	0.7414	0.6123	0.5741	0.323	0.813
MB6	0.6371	0.5151	0.3354	0.278	0.7987
MB7	0.2819	0.4592	0.2951	0.1945	0.6599
MB8	0.2756	0.3929	0.2835	0.2451	0.6585

Table 2: AVE and AVE square root

Construct	AVE	Square Root AVE
Information quality	0.5704	0.755248304
Service quality	0.5829	0.763478888
User statisfaction	0.6432	0.801997506
Sytem quality	0.6173	0.785684415
Net benefits	0.5937	0.770519305

Table 3: Comparison AVE construct

Construct	Information Quality	Service Quality	User Statisfaction	System Quality	Net Benefits
Information Quality	0.755248				
Service Quality	0.6275	0.76347888			
User Statisfaction	0.6491	0.5027	0.801997506		
Sytem Quality	0.5192	0.5715	0.5281	0.785684	
Net Benefits	0.7363	0.7006	0.641	0.5298	0.770519

The results of cross loading, as can be seen in Table 1, show that the correlation value of construct with indicator is bigger than correlation value with other construct. It can be concluded that all latent constructs predict indicators on their blocks better than indicators in other blocks. From Table 2, it can be seen that the construct shows the AVE value greater than 0.5. This corresponds to the first condition that the value of any construct AVE is greater than 0.5. From Table 3, it is known that the AVE root for each construct (which is bold) is greater than the AVE correlation between the other constructs. By looking at the value of cross loading and AVE root comparison, both meet the discriminant validity test criteria based on Ghazali and Latan (2014). This can be confirmed that the data in this study are valid.

Asessing structural model/inner model

Assessing the inner model can be done by looking at the structural model consisting of the hypothesized relationship between the latent constructs in the research model. The explanatory power of the model, or nomological validity, can be assessed by looking at R^2 (2014).

Table 4: R^2 on latent variable

Construct Laten	R^2
User Statsfaction	0.4732
Net benefits	0.4109

Table 4 shows that the latent variable dependent user's satisfaction has R^2 value 0.47 which means the variables of System Quality, Quality of Service, and Quality of Information from Badix give influence of 47% on user's satisfaction. In addition, User's Satisfaction at Badix has an influence of 41% on the net benefits of users. The R^2 values also show that the model in this study is in the range of moderate to strong limits according to Ghazali and Latan (2014). The R^2 value in this study is similar to the value generated in the Livari study, where R^2 for independent user's satisfaction variable is 0.56 and individual impact (net benefits) has a value of 0.35 (Livari, 2005).

Hypotheses

Hypothesis testing in the research will be done by performing Bootstrapping technique to get standard error values, path coefficient, and value from T-Statistics.

Table 5: Output bootstrapping smart PLS

Variables	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)	T Statistics (—O/STERR—)	p-value
Information quality towards user's statisfaction	0.4864	0.4885	0.0927	0.0927	5.245	0.000002
Service quality towards user's statisfaction	0.0594	0.0767	0.1318	0.1318	0.4508	-
System quality towards user's statisfaction	0.1549	0.152	0.0731	0.0731	2.1193	0.034311
User's statisfaction towards net benifits	0.641	0.66	0.0685	0.0685	9.3589	0.000001

In Table 5, T-Statistics can be obtained which is useful for testing the hypotheses that have been proposed before. The following will be discussed one by one for the four hypotheses' test based on information from Table 5. By comparing the value of T-Statistics with T-Table for students, it will obtain the results of hypothesis testing as follows:

Table 6: Summary hypotheses

	Hypotheses	Result	Significant
H1	Information quality significantly affects user's statisfaction	Significant	$p \leq 0.001$
H2	System quality significantly affects user's statisfaction	Significant	$p \leq 0.05$
H3	Service quality significantly affects user's statisfaction	-	-
H4	User's statisfaction significantly affects net benefits	Significant	$p \leq 0.001$

H1

Hypothesis testing on information quality is done by comparing T-Statistics Information Quality with T-Table Student. In the two-tailed test and the significance $p \leq 0.001$, critical ratio received was ≥ 3.29. Based on the information in Table 5, it can be seen that Quality of Information has a value of T-Statistics 5.245 whose value is greater than T-Table Student 3.29 significant at $p \leq 0.001$. This shows that the Quality of Information has an influence on User's Satisfaction. Hypothesis 1 was proved empirically and stated that Ho is accepted. As in previous studies of Wu and Wang (2006), Rai et al. (2002) and Livari (2005), it is shown that empirically, the quality of information has a significant effect on use's statisfaction.

H2

Hypothesis testing on System Quality is done by comparing T-Statistics Quality System with T-Table Student. In the two-tailed test and the significance $p \leq 0.001$, critical ratio received was ≥ 3.29. Based on the information in Table 5, it can be seen that Quality System has a T-Statistics value of 2.11 whose value is greater than T-Table Student 3.29 which is significant at the value of $p \leq 0.001$. This shows that the Quality of System has an influence on User's Satisfaction. Hypothesis 2 was proved empirically and stated that Ho is accepted. As in previous studies of Wu and Wang (2006), Rai et al. (2002) and Livari (2005), it is shown that empirically, the quality of system has a significant effect on user's statisfaction.

H3

Hypothesis testing on Service Quality is done by comparing T-Statistics Quality Service with T-Table student. In the two-tailed test and the significance $p \leq 0.3$, critical ratio received was ≥ 1.03. Based on the information in Table 5, it can be seen that Service Quality has a T-Statistics value of 0.45 whose value is smaller than T-Table 1.03. This shows that the Quality of Service is not proven empirically to affect the User's Satisfaction. So in this study, Hypothesis 3 Ho is rejected. Another result of research that states that Information Quality has no effect on User's Satisfaction is in the research of Wang and Liao (2008). In a study entitled "The Rescue KMS success: A respecification of the DeLone and McLean's model" to 50 companies in Taiwan who have implemented KMS (Knowledge Management Systsem) stated no significant influence of Quality of Service on User's Satisfaction. Badix is a DSS developed by the ICT Telkomsel Regional Internal team of Sumbagsel. The Badix application is not a third party information system application that provides enterprise software such as SAP, ORACLE, or any other company. Enterprise companies adopt the SERVQUAL concept through a clear Service Level Agreement (SLA) to guarantee system reliability and service to usage. Until this research has been made, Badix has not defined the official administrators particularly those who are closely related to helpdesk, SLA, and business processes clear to Badix services. The ORACLE company based on ERP owned by Telkomsel gives SLA which is clear enough like uptime guarantee of cyclicity, uptime guarantee from ORACLE server and recovery time, data security, contact center, as well as administrative guarantees such as billing and taxes. With a guarantee such as recovery time, contact center for helpdesk, or connectivity from Badix, quality of service Badix will be more measurable.

H4

Hypothesis testing on System Quality is done by comparing T-Statistics User's Satisfaction with T-Table. In the two-tailed test and the significance $p \leq 0.001$, critical ratio received was ≥ 3.29. Based on the information in Table 5, it can be seen that User's Satisfaction has a value of T-Statistics 9.35 whose value is greater than T-Table 3.29 which is significant at the value of $p \leq 0.001$. This shows that the user's statisfaction has an influence on Net benefits. Hypothesis 4 was proved empirically and stated that Ho is accepted. As in previous studies, Pramadani and Mujahidin (2013) and Livari (2005) showed that empirically, the user's statisfaction has a significant effect on net benefits.

CONCLUSION AND RECOMMENDATIONS

Conclusion

Table 4 shows that the latent dependent variable user's satisfaction has R^2 value 0.47 which means the variables of System Quality, Quality of Service, and Quality of Information from Badix give influence of 47% on user's satisfaction. In addition, User's Satisfaction at Badix has an influence of 41% on the net benefits of users. The R^2 values also show that the model in this study is in the range of moderate to strong limits according to Ghazali and Latan (2014).

On Hypothesis Test of Quality System and Quality of Information give significant influence on Badix User's satisfaction. While User's Satisfaction gives influence on the net benefits. There are benefits to the company that are about achieving the target through improvement of individual performance. Thus, Telkomsel needs to improve the quality of the system and information from Badix to be able to help achieve better company targets.

Quality of service is not proven empirically to give a significant influence on User's Satisfaction. A study entitled "Assessing eGovernment systems success: A validation of the DeLone and McLean model of information systems" found no significant effect ($p \leq 0.05$ or $p \leq 0.001$) of Quality of Service on User's Satisfaction (Wang & Liao, 2008). No dedicated administrators, SLA (Service Level Agreement), and clear business processes to ensure the reliability and guarantee of serivce to users. This makes the measurement of Badix service quality to user's satisfaction have no significant or immeasurable effect.

Recommendations

Looking at the research results, suggestions that can be given are as follows:

For the company:

User's Satisfaction Badix from the results of the research proved to give effect with enough category (on R^2 value 0.41) on the net benefits of individual performance against the target company. Telkomsel, especially regional of Sumbagsel, is suggested to continue to maintain and develop Badix for better target achievement.

Maintaining and developing Badix can be done through continuous improvement of Information Quality proven to have a greater effect on User's Satisfaction than Badix System Performance. Improved data accuracy on Badix DSS is important. This can be done by shortening the Badix autotask time to retrieve data to Telkomsel BTS measurement for more realtime data. With more information available, the alarm or detection of BTS nili or down production equipment can be done even better.

At Badix, service is made an SLA which includes guarantee of recovery time, contact center guarantee, and guarantee of connectivity so that service satisfaction from Badix users can be measured. Warranty recovery time can be exemplified as a minimum time if service from Badix has a problem. The contact center guarantee itself is a dedicated helpdesk or administrator who is always there to help users when experiencing access constraints on Badix. And connectivity guarantee is access to Badix connection to be done through user's desktop and when user is mobile.

For further research:

For future researches, the program used can be other than SmartPLS such as LISREL. The advantage of LISREL software is its ability to identify relationships between complex variables with emphasis on normal distributed data. With this LISREL is more optimal in terms of parameter accuracy. Different on SmartPLS that use non-parametric statistics that sometimes ignore certain information.

Further research can separate net benefit variables into individual performance variables and organizational benefit variables. With the separation of these variables, the influence of information systems on individual performance and organizational benefits will be more clearly defined.

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— This article does not have any appendix. —