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KNOWLEDGE MANAGEMENT SYSTEM EVALUATION USING DELONE MCLEAN MODEL: A CASE STUDY OF IT SERVICE DESK BANK XYZ

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Abstract

Bank XYZ is one of the biggest banks in Indonesia. It has IT Service Desk function under Information Technology Division that specifically handles complaints or problems related to IT. Knowledge management in IT service desk can help to increase the availability of information and knowledge for the IT service desk team who must provide explanations to users. IT Service Desk of Bank XYZ has built knowledge management system using open-source platform since 2017. It is called SDKPedia which was developed inhouse by IT Service Desk team and never been evaluated since it was built. The objective of this study is to evaluate SDKPedia as knowledge management system used in IT Service Desk Bank XYZ. Evaluation was carried out based on Delone and McLean assessment criteria. Survey is distributed to IT Service Desk worker and 31 valid feedback is used in this study. To determine the indications that have a substantial impact and result in a net advantage for SDKPedia, the PLS-SEM algorithm is utilized. Service quality is the only exogen latent variable that affected intension of use. While the other two exogen latent variables are system quality and information quality, did not have significant impact for intention to use or user satisfaction. Considering the findings of this study, several improvements can be made by the IT Service Desk manager to make the quality of SDKPedia better. The points that need more attention are information quality and system quality.

Keywords : Knowledge Management System, Knowledge Management Evaluation, IT Service Desk, Delone and Mclean

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INTRODUCTION

IT Service Desk is a critical function in an organization or company, especially those who offer public services. It is a primary single point of contact for all customers or users that need help or assistance with IT services [1][2][3]. It usually can be contacted 24 hours, 7 days through various communication media, such as telephone, email, messenger, etc. In the current digital era, IT Service Desk can even be accessed via social media.

IT Service Desk provides various services, for example request fulfillment, incident handling, and escalation to other team for incident that needs assistance from other parties [2], [4]. During incident resolution time, IT Service Desk must inform the progress to user. The incident is classified into several categories that has different Service Level Agreement (SLA).

Banking as one of the industries that provide services to public, is required to have a good and reliable IT Service Desk. Bank XYZ is one of the biggest banks in Indonesia that has tens of millions customer and dozens of applications or services. It has IT Service Desk function under Information Technology Division that specifically handles complaints or problems related to IT. It is separated from Contact Center Division that received all complaints from customer directly. IT Service Desk handles only IT problems that cannot be solved by contact center or working unit (i.e., branch). Because of its specialization, the team of IT Service Desk Bank XYZ consists of workers with IT background.

In carrying out its work, an IT Service Desk needs a system that can store and manage the information needed to resolved complaints or problems. The system not only store all information about customer's complaints, but it should also help IT Service

Desk team to accelerate its services by providing solution quickly and accurately. That is why knowledge management play important role for IT Service Desk. Currently, Bank XYZ has one application named SDKPedia as knowledge management system used in IT Service Desk. SDKPedia is used to store information about complain or incident and can be used as reference in solving problems.

Knowledge management in IT service desk can help to increase the availability of information and knowledge for the IT service desk team who must provide explanations to users [5]. Knowledge management that is well managed can improve service to users which has an impact on customer satisfaction and loyalty. It also can reduce number of calls or complaints that will also reduce operational cost of the company. The aim to create knowledge management systems (KMS), or information systems (IS) that are particularly created to enable knowledge management [6]. KMS as an application system and IS system, combines and integrates capabilities for managing both explicit and tacit knowledge that useful for organization [7]. KMS provides a system that helps an organization to learn by keeping significant and important knowledge and facilitate the employee to access information and knowledge that needed [8].

Since it was created in 2017, the use of SDKPedia in IT Service Desk Bank XYZ has never been evaluated. There has never been an exact measure of the experience of workers in the IT Service Desk in using SDKPedia as a knowledge management system that helps work in the IT Service Desk. Therefore, the objective of this study is to evaluate SDKPedia's uses as a Knowledge Management System in the IT Service Desk. To achieve this goal, research questions were made in this study: what factors influence user satisfaction and utilization in using SDKPedia in IT Service Desk Bank XYZ?

Knowledge Management

Knowledge management is defined as doing what is necessary to get most out of knowledge resource [9]. Knowledge management is the process of developing, acquiring, disseminating, and using practical knowledge to enhance an organization's performance by maintaining and sharing the accumulated knowledge related its processes, procedures, and methods [10]. Knowledge management is a crucial component of organizational strategy which can improve its performance and increase knowledge for organization [11]. Knowledge management describes a process to create, transfer, share, store the knowledge and application of knowledge, as well as the evaluation of the effects of knowledge on organizational performance [12].

Knowledge management is considered as an integrated approach that offers a variety of advantages, but its main highlights include encouraging collaboration by preserving and disseminating existing knowledge within organizations while creating opportunities for the creation of new knowledge. Additionally, it provides organizations with the resources they require to successfully apply their knowledge to accomplish their mission, vision, and objectives.

Knowledge Management System

Knowledge management system (KMS) is a system for storing and retrieving knowledge or information to advance comprehension, collaboration, and process alignment [13]. KMS serves the foundation for all collaborative activity and serves to unite communities and groups. KMS is an advanced information systems that contain online databases, information, directories, and application where users' exploration is an important consideration to be exploited [14]. KMS enables decision makers to effectively interact with the system in terms of knowledge storing, communication, and cooperation. It contains databases with system for capturing, storing, organizing, and searching the useful knowledge and information.

SDKPedia

IT Service Desk Bank XYZ has been established since 2009. Since then, information and knowledge has been stored using makeshift tools. The tools for storing information and knowledge have also changed in line with the replacement of management at the IT Service Desk. The notion to develop a system for storing and sharing knowledge and information that could be easily accessed and last for a long time didn't first surface until 2017. Due to the urgent need at that time, a tool was sought that was available open source, met the need to store, update, and share data, and was easy to customize according to the needs of IT Service Desk Bank XYZ.

Using a ready-to-use platform available open source, SDKPedia was built. SDKPedia was built as a place to store information and knowledge that every worker in the IT Service Desk has. Information and knowledge stored in

SDKPedia can be accessed by all workers in the IT Service Desk and can also be updated or even deleted if the information is no longer relevant. The existence of SDKPedia helps workers at IT Service Desk Bank XYZ to get the information they need to carry out their daily work more quickly.

Delone and McLean Success Model

Delone and McLean proposed an assessment criterion for measuring the IS success in 1992, as an attempt to address the ambiguity in defining IS success due to its complex and interdisciplinary nature [15]. This model is based on the socio-technical approach and includes the technological and human components of using the system. There are six criteria for measuring the performance of IS, including system quality, information quality, service quality, intention to use, user satisfaction, and net benefit [16]. System quality, information quality, and service quality are main dimensions specifically used to evaluate the system, where intention to use and user satisfaction are thus impacted by these aspects [17]. Figure 1 show the relationship between the criteria of Delone and McLean Information System success model.

System quality denotes the desired information system's characteristics, which might be reflected in overall system performance and assist users in their needs [15] [16]. It includes the accessibility and adaptability of the system, taking into consideration its usability and accessibility [18]. The required qualities of the system output are indicated by the information quality and measures how much of the data is valid, accurate, and full, as well as how much of it the user can understand [15] [16]. Service quality indicates the level assistance that received by system users from the IT support team and information systems organization, where the organization will give user the services they were promised. Intention to use describe how users intend to utilize the system [19]. Net benefits show how the IS to contribute and give impact to the success of individuals, groups, and organizations.

Knowledge Management System Measurement Research

There are several research that focus on evaluates and measure the successful of knowledge management system. Research by Sensuse et al. [16] evaluate the ELISA chatbot's benefits to the firm as a knowledge application using the Delone and McLean model with SEM-PLS algorithm to process and analyze the data. The results demonstrate that information quality, service quality, and intention to use all have an impact on ELISA user satisfaction. By understanding the correlation between variables such as user desire to use, user satisfaction, and net benefit, this study is intended to improve the ELISA application and provide a recommendation for IT managers.

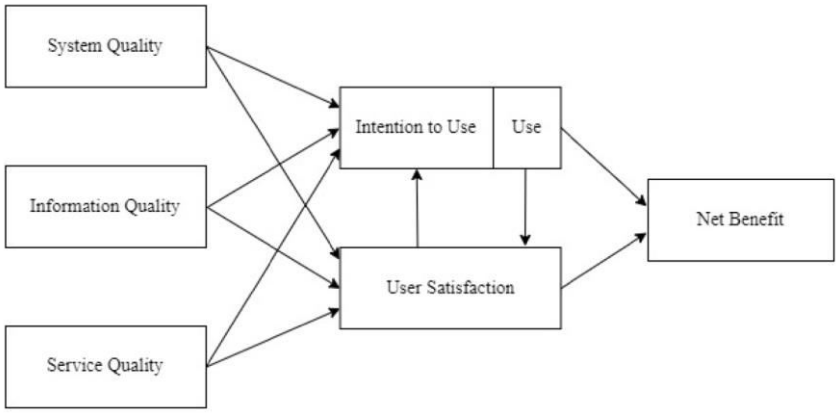

Figure 1. Delone and Mclean Information System Model [15]

The Republic of Indonesia's Ministry of Finance (MOF) has successfully implemented knowledge management. Research by Kristian Ibrahim et al. [20] evaluate Knowledge Learning Center (KLC), a website system for supporting the process of knowledge sharing and knowledge storing related to state finance. This study using Delone and Mclean model with SEM-PLS algorithm to analyze the correlation between indicators and latent variables. It was discovered that leadership strongly influences the quality of the knowledge content, and that the perceived utility and user satisfaction of the KMS are significantly influenced by the knowledge content quality variable; perceived usefulness of KMS variables significantly influence user satisfaction, KMS use for sharing and retrieval; use satisfaction variable

significantly influence KMS use for sharing and retrieval.

Research by Syahrizal et al. [8] evaluate the implementation of Knowledge Management System at Bappeda Sumsel called Online Disposition Website using Delone and Mclean model with SEM-PLS algorithm. During 2016, less than 1% of disposition letters were generated and the system has not been fully utilized. This research focuses on identifying the variables that affect KMS implementation of Online Disposition Website. Found that system quality and service quality positively impact to KMS use; where knowledge quality, service and KMS use positively impact to user satisfaction; KMS use and user satisfaction positively impact to net benefit.

METHOD

Hypotheses Development

This study using Delone and McLean IS assessment criteria to evaluate the SDKPedia used at Bank XYZ. It will adapt the relationship between the SDKPedia's three key Delone and McLean model criteria are system quality, information quality, and service quality; and users' intentions to utilize the KMS and their satisfaction with it. User satisfaction and intention to use have an impact on the organization's net benefit.

Table 1. Questionnaire Item List

Construct	Item	Question	Source
System Quality	SQ1	SDK Pedia is easy to use	[6] [16]
	SQ2	SDKPedia can be accesed 24 hours in 7 days	[16]
	SQ3	SDKPedia provides a fast response time	[6]
Information Quality	IQ1	SDKPedia provides information I need	[16][21]
	IQ2	SDKPedia provides the complete and relevant information	[16]
	IQ3	SDKPedia gives the information that easy to understand	[6]
Service Quality	SV1	There is user manual or help function in SDKPedia that can be used if there are problems using SDKPedia	[21]
	SV2	There is technical support team (either internal or external) that can provide help when you encounter problem using SDKPedia	[16]
	SV3	The technical support team (either internal or external) can be accessed at any time	[6] [21]
Intention to Use	IU1	I often use SDKPedia in carrying out my daily work	[16]
	IU2	I use SDKPedia to store and share information or knowledge that I have	[6]
	IU3	I am willing to keep using SDKPedia in my daily work	[16]
	US1	I am satisfied using SDKPedia to store and obtain information or knowledge needed in carrying out my daily work	[6]
	US2	I am satisfied with the efficiency gained by using SDKPedia	[6]
	US3	I am satisfied with the effectiveness obtained by using SDKPedia	[6]
	US4	Overall, I am satisfied to use SDKPedia	[6]
Net Benefit	NB1	SDKPedia increase my performance in the company	[16]
	NB2	SDKPedia reduce time to solve incidents/problems	[16]
	NB3	SDKPedia helps me to get new information or knowledge	[6]
	NB4	SDKPedia helps me store or document the	[6]

information or knowledge I need

Based on Delone and McLean Information System success assessment criteria and literature research, below the hypotheses developed for this study.

H1: System quality is significantly impacted to intention to use.
H2: Information quality is significantly impacted to intention to use.
H3: Service quality is significantly impacted to intention to use.
H4: System quality is significantly impacted to user satisfaction.
H5: Information quality is significantly impacted to user satisfaction.
H6: Service quality is significantly impacted to user satisfaction.
H7: Intention to use is significantly impacted to user satisfaction.
H8: Intention to use is significantly impacted to net benefit.
H9: User satisfaction is significantly impacted to net benefit.

Data Collection and Processing

The data for this study was obtained using questionnaire via Google form that was sent to 40 IT Service Desk Bank XYZ workers online. The questionnaire is structured to get the required informationof hypotheses developed at this study. The questionnaire was designed refer to study literature that relevant to this study to evaluate of SDKPedia with 5-point Likert-scale (firmly disagree equals 1, and strongly agree means 5). Table 1 are list of question for the questionnaire used at this study.

The data collected as the result of questionnaire will be processed and analysed using Partial Least Square Structural Equation Modelling (PLS-SEM) algorithm and processed using smartPLS 3.2.9 software. PLS-SEM is a structural modelling approach that is widely used in applied research, which is often found in research of information systems, knowledge management, business strategic and marketing [22]. PLS-SEM used in predictive research to test theoretical frameworks, that investigate many constructs and the relationships between these constructs. For this PLS-SEM, there are two phases for the measurement, first is to validate the result models and second is to test the structural hypotheses [23]. PLS-SEM can be used for analyzing differences or contrast relationships between identified variables [24]. PLS-SEM is an approach technique for analyzing statistical data with a small sample size, does not involve normality, is able to work without distribution assumptions with nominal factors and scale intervals [25]. PLS-SEM aims to get predictions from a predetermined model and also the theories used.

RESULT AND DISCUSSION

Questionnaires were distributed to 40 workers at the IT Service Desk, but only 31 people filled out the survey. Nine workers were monitoring operators in IT Service Desk who did not use SDKPedia in their daily work. Respondent demographics can be seen in Table 2.

Respondent demographics are based on the years of service of the respondent at Bank XYZ. This is because the longer the respondent has worked at Bank XYZ, the more experience the respondent has in using knowledge management. SDKPedia was created in 2017, this means that respondents with less than 5 years of experience only have experience using SDKPedia as a knowledge management system in their daily work. Whereas workers who have worked for more than 5 years have experienced conditions where the IT Service Desk does not yet have a proper knowledge management system, so that it can provide a more objective evaluation of SDKPedia. Thus, the results of the evaluation of SDKPedia represent an objective assessment of respondents who have only used SDKPedia, as well as respondents who have used knowledge management systems other than SDKPedia.

Table 2. Respondents Demography

Years in IT Service Desk	Number of Respondents
< 5 years	13
5 – 10 years	14
>10 years	4
Total	**31**

The result of PLS-SEM algorithm with Delone and McLean Model show at Figure 2, which indicates the weighting calculation of each indicator and latent variable based on hypotheses proposed before.

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Coefficient of Determination

To measure how well the statistical model can predict observed outcome, coefficient of determination (denoted R^2) is used. The coefficient of determination is divided into three categories, substantial, moderate, and weak. Substantial is if R2 equals 0,75, moderate is if R2 equals 0,5, and weak is if R2 equals 0,25 [26]. From the table 3, R square values for Intention to use is 0,531.

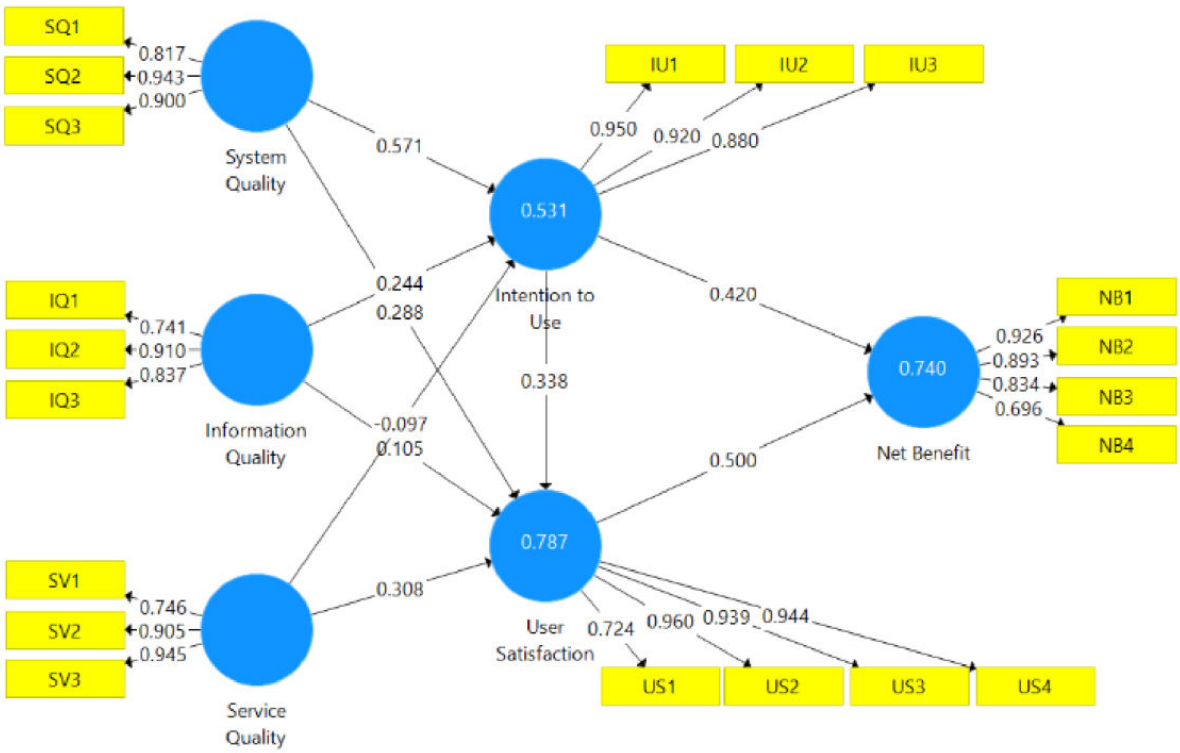

Figure 2. Algorithm result based on McLean & Delone Model

Table 3. Coefficient of Determination

	Coefficient of Determination
Intention to Use	0.531
User Satisfaction	0.787
Net Benefit	0.740

This indicates that three mains of latent variable are system quality, information quality and service quality explain 53,1% of the variance of Intension of Use. Intension of Use then together with the other latent variables (SQ, IQ, and SV) determine the coefficient of determination of User Satisfaction. R square values of user satisfaction is 0,787. This indicates that the four latent variables explain 78,8% of the variance of user satisfaction. Intension to use and user satisfaction was then used to determine the coefficient of determination of Net Benefits resulted to 0,740 or 74%. Summary of R square values can be seen in Table 3.

Path Coefficient

In general, a latent variable is said to be significant if it has a path coefficient of more than 0.2 [16]. Table 4 shows the result of path coefficient to observe the significance of the relationship between latent variables and to test the hypotheses proposed. The summary of path coefficient can be seen in Table 6. The intention to use gets the strongest effect from system quality which has path coefficient value is 0.571, not effected by service quality which has the coefficient value is -0.097. While information quality does not have a significant affect and not predict user satisfaction and service quality does not predict intention to use. The user satisfaction gets the strongest effect from intention to use and the lowest effect form information quality.

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Table 4. Path Coefficient

	SQ	IQ	SV	IU	US	NB
System Quality				0.571	0.288	
Information Quality				0.244	0.105	
Service Quality				-0.097	0.308	
Intention to Use					0.338	0.420
User Satisfaction						0.500
Net Benefit						

Outer Loading

The outer loadings, for a well-fitting reflective model should be above 0.70 as the threshold value [27]. Table 5 shows the result of outer loading that indicate the relationship between the indicators and latent variables. Only one indicator that has value below 0.7, which the outer loading for variable NB4 is 0.696, shows the correlation between NB4 and latent variable Net benefit did not reach the threshold value. For other indicators, the outer loading has value above 0.70.

Table 5. Outer Loading

	SQ	IQ	SV	IU	US	NB
SQ1	0.817					
SQ2	0.943					
SQ3	0.900					
IQ1		0.741				
IQ2		0.910				
IQ3		0.837				
SV1			0.746			
SV2			0.905			
SV3			0.945			
IU1				0.950		
IU2				0.920		
IU3				0.880		
US1					0.724	
US2					0.960	
US3					0.939	
US4					0.944	
NB1						0.926
NB2						0.893
NB3						0.834
NB4						0.696

It is necessary to measure the reliability factor and the validity of the structural model to validate the survey results that have been conducted. Reliability is measured from the reliability of indicators and internal consistency reliability. While convergent validity and discriminant validity can be used to measure validity. The component used to assess the reliability of an indicator is called composite reliability. The value of composite reliability greater than 0.6 that will accept and it show the variable meet the criteria. A summary of these indicators can be seen from table 6.

Discriminant Validity

The measuring model has two validity and reliability assessments that are determined by investigating internal consistencies, convergent and discriminant validity [23]. According to the Fornell-Larcker theory, discriminant validity describes as the square root value of each latent variable's AVE, with its value greater than the correlation coefficients between the latent variables [16][22].

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Table 6. Summary of Reflective Outer Model

Latent Variable	Indicator	Loading	Indicator Realibility	Composite Realiability	AVE
System Quality	SQ1	0.817	0.667		
	SQ2	0.943	0.889	0.918	0.789
	SQ3	0.900	0.810		
Information Quality	IQ1	0.741	0.549		
	IQ2	0.910	0.828	0.870	0.692
	IQ3	0.837	0.701		
Service Quality	SV1	0.746	0.557		
	SV2	0.905	0.819	0.902	0.756
	SV3	0.945	0.893		
Intention to Use	IU1	0.950	0.903		
	IU2	0.920	0.846	0.941	0.841
	IU3	0.880	0.774		
User Satisfaction	US1	0.724	0.524		
	US2	0.960	0.922	0.942	0.805
	US3	0.939	0.882		
	US4	0.944	0.891		
Net Benefit	NB1	0.926	0.857		
	NB2	0.893	0.797	0.906	0.709
	NB3	0.834	0.696		
	NB4	0.696	0.484		

T Statistic of Path Coefficient

The path coefficient will be significant if the T statistic is greater than 1.96 when using a T-test with a significance level of 5% [22]. Bootstrapping method used for calculating and test the significance to produce the T-statistic. Table 8 below shows the result of T statistic and p values using 500 subsamples of Bootstrapping for inner model of hypotheses proposed. We get four hypotheses rejected from the Bootstrapping calculation. The relationship between system quality and information quality to user satisfaction, as well as the correlation between information quality and service quality to intention to use.

System quality indicated the performance of SDKPedia application, such as the easiness to use and access, also the respond time. Information quality related to the information that provided by SDKPedia, which the information can meet the user needs, the completeness and relevant of information, and also the information provide is easy to understand. Service quality related to the service provided by SDKPedia, such as user manual or help function, technical suported that can be accessed any time, if the users face a problem when using SDKPedia.

Intention to use describes the willingness of SDKPedia users to use SDKPedia repeatedly and whether users use SDKPedia to help them make decisions. User satisfaction describes whether users are satisfied with the aspects contained in SDKPedia, such as efficiency, effectiveness, and whether SDKPedia has met user needs. Net benefits are related and show the benefits that will be obtained by using SKDPedia. These advantages may take the shape of improved performance, accelerated task completion, and efficient knowledge management.

Service quality has more significant impact to user than system quality. While system quality had an impact only to use intention, but service quality and intention to use had an impact to user satisfaction. Net benefit is influenced by intention to use and user satisfaction.

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Table 7. Discriminant Validity

	IQ	IU	NB	SV	SQ	US
Information Quality	0.832					
Intention to Use	0.665	**0.917**				
Net Benefit	0.772	0.794	**0.842**			
Service Quality	0.702	0.427	0.497	**0.870**		
System Quality	0.857	0.720	0.786	0.618	**0.888**	
User Satisfaction	0.793	0.747	0.814	0.705	0.812	**0.897**

Table 8. T-Statistic of Path Coefficient (Inner Model)

Hypotheses	Path	T Statistic (|O/STDEV|)	P Values	Assessment
H1	SQ -> IU	2.438	0.015	Accepted
H2	IQ -> IU	0.899	0.369	Rejected
H3	SV -> IU	0.518	0.605	Rejected
H4	SQ -> US	1.332	0.183	Rejected
H5	IQ -> US	0.518	0.605	Rejected
H6	SV -> US	2.153	0.032	Accepted
H7	IU -> US	2.532	0.012	Accepted
H8	IU -> NB	2.605	0.009	Accepted
H9	US -> NB	3.287	0.001	Accepted

CONCLUSION

The objective of this study is to evaluate SDKPedia as KMS used in IT Service Desk Bank XYZ. Evaluation was carried out based on Delone and McLean assessment criteria. Survey is distributed to IT Service Desk worker and 31 valid feedback is used in this study. Factors that contribute to SDKPedia's net benefits are identified using the PLS method.

Service quality is the only exogen latent variable that affected intension of use. However, neither intention to use nor user satisfaction were significantly impacted by the other two exogenous latent variables, information quality or system quality. User satisfaction is significantly impacted by the intention to use. User satisfaction and intention to use both significantly affect net benefits.

Considering the findings of this study, several improvements can be made by the IT Service Desk manager to make the quality of SDKPedia better. The points that need more attention are system quality and information quality. Useability is one factor that influences system quality. Since SDKPedia developed using ready-to-use applications that are available for free with a minimum of features and customization, then it can be considered to do reengineering of SDKPedia, so it can be easier to use and has a complete search feature.

On the information quality variable, the indicators that are assessed indicate the quality of the information stored in SDKPedia. One of them is related to the completeness of the information available in SDKPedia. The completeness of this information is closely related to the awareness of workers in the IT Service Desk to actively contribute to record any information or knowledge they have. Therefore, management at the IT Service Desk can develop a strategy that focuses on increasing worker awareness to record information or knowledge on SDKPedia. For example, by creating an event with prizes for the most contributors of SDKPedia.

This study has implications for academic and practical practices. For academic practices, this enriches references for evaluating knowledge management implementation in an organization or company. This can help the next similar study or research that discussed knowledge management evaluation. For practical practices, this study can be used as input to managers at IT Service Desk Bank XYZ to improve the quality of SDKPedia as knowledge management that is used to help with daily work.

In conducting the evaluation, this study specifically used the Delone and McLean assessment criteria to assess the technical aspect of SDKPedia, and not assess the social approach, the socio-technical aspects were not considered in this study. So that it cannot be discussed the relationship between technical aspects and socio-technical aspects to form a

good knowledge management system. This is the limitation of the study. In the future, it is necessary to conduct evaluation using other criteria and to conduct not only technical aspect evaluation but also socia-technical, so that recommendations for improvement for knowledge management used in IT Service Desk Bank XYZ can be more comprehensive.

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