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THE EFFECT OF INFORMATION SYSTEM ON ACHIEVEMENT OF CONSTRUCTION PROJECT IN JABODETABEK REGION

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Abstract -- *The contribution of information systems on Project success become an interesting topic to investigate, especially in a construction project. The project successfully achieved when the information system was well used with appropriate communication knowledge in a construction project. However, in worker perspectives, the role of the information system in a construction project is not significant to achieve the project's success due to it indicated by the main indicator which is the finish on schedule, high quality and within budget. Therefore, this research aims to investigate the correlation and effect between IS to project success in terms of product quality and on-time finish the project. This research was conducted through a questionnaire and survey analysis. The total respondent is 105 that consists of 23 Project Manager (PM), 13 Vice PM and 69 site coordination. The data was analyzed by SPSS and Smart PLS software. The result shows that there is a significant effect of system quality to Information quality with CR value of 5.174, system quality to project success has CR value of 3.564 and information quality to project success has CR value of 2.037. It can be concluded that IS was very important to ensure the project success especially in a construction project in Jabodetabek Region.*

Keywords: *System and information quality; Construction project; Project success*

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INTRODUCTION

The modern organization has a management symmetry of numerous global projects due to the technology transformation. Project Managers need to integrate many and complex projects simultaneously with an unprecedented level of accuracy and detail specific precision [1]. Project management has a multifaceted process of implementing the initiative in terms of planning and control that need a simultaneous nerve center [2]. The globalization of project management is extremely competitive and urgently apply a real-time Information Technology (IT) and high quality of Information System (IS).

The Globalization of infrastructure in Indonesia effects on massive infrastructure development. The use of IS utilization is to maximize the achievement of the project [3]. It influences to massive building development in around of infrastructure area, due to it support the mobility of the material, society, and activity. Therefore, the building project was very critical to develop to improve the infrastructure in Indonesia. The infrastructure in Indonesia improves gradually in line with Infrastructure development planning 2015-2019. The target of basic infrastructure development is full connectivity in 2019. It showed by the development of a new road along 2,650 km and a new highway along 1,000 km, 15 airports, 24 ports, railway development along 3,258 km, and MRT in 29 cities. Those development processes will be achieved through the high quality of IS in each construction project that affects the quality of Infrastructure in Indonesia that specifically shown in Figure 1.

The quality of IS was influenced by two main factors which are system quality and information quality [4, 5, 6]. The connection between system and user measures system quality. The attribute of the system quality is equipment availability, equipment of reliability, ease to use, respond time [7] [8]. According to Nielson [9] that there are several indicators of system qualities which are navigation, ease of use, response time, and security. In addition, according to McKinney et al. [10] that the indicator

of system quality was measured by access, usability, and navigation. Meanwhile, DeLone and McLean [11] mention that the indicator of system quality was the ease of use response time, reliability, flexibility, and security.

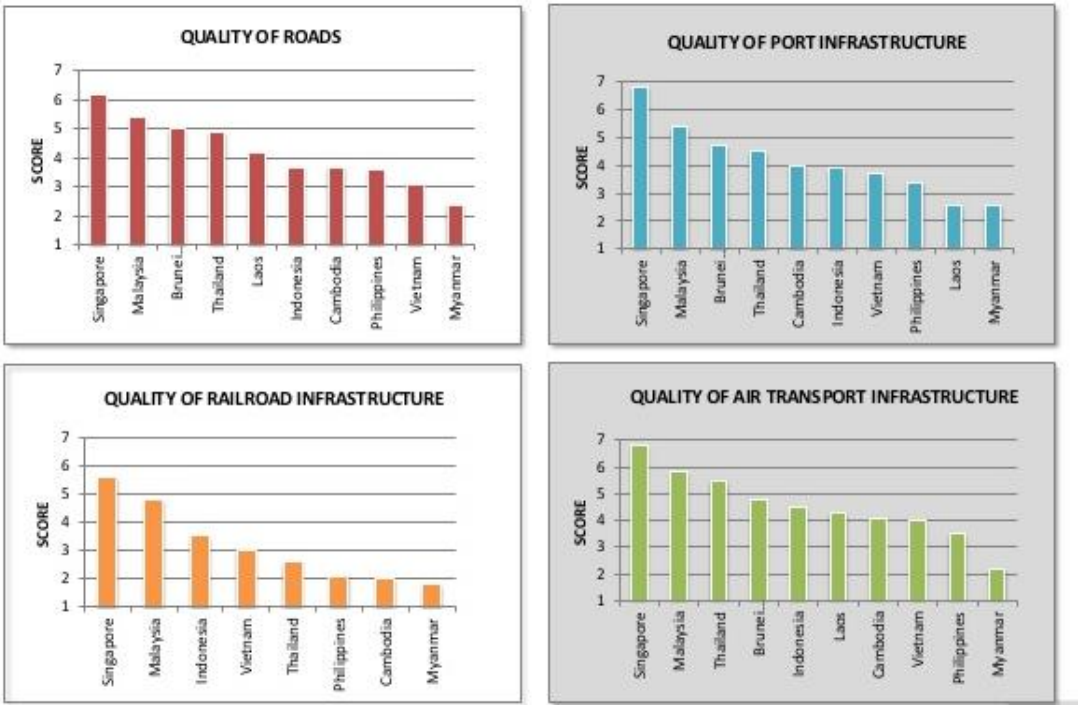

Figure 1. The progress of Infrastructure in Indonesia

Information quality was related to system use, user satisfaction, dan net benefits [11] [12]. There are several indicators in information quality such as accuracy, relevance, on time, completeness and project achievement [13][14]. Previous researches have been investigated the effect of system and information quality on user satisfaction and project achievement. They found that that system and information quality had a significant effect on user satisfaction and project achievement [15] [16].

The concept of this research based on three theory which are Theory Reaction Action (TRA), Theory of Planned Behavior (TPB), and Theory Acceptance Model (TAM). TRA based on the human attitude that they do anything to utilize all the information. TPB is extended from TRA that perceived behavioral control. Meanwhile, TAM is used to investigate the usability of IS by the user and user satisfaction. TRA, TPB and TAM theory are shown in Figure 2, Figure 3 and Figure 4. According to Davis [17], the effective information system when it optimal used based on various criteria such as actual use, daily use, frequency of use, nature of use, navigation patterns, number of site visits, number of transactions.

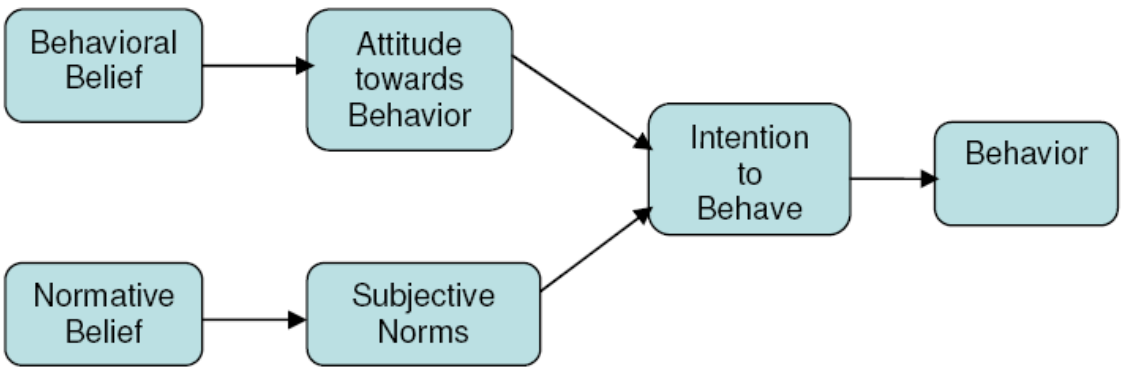

Figure 2. Theory of TRA [18]

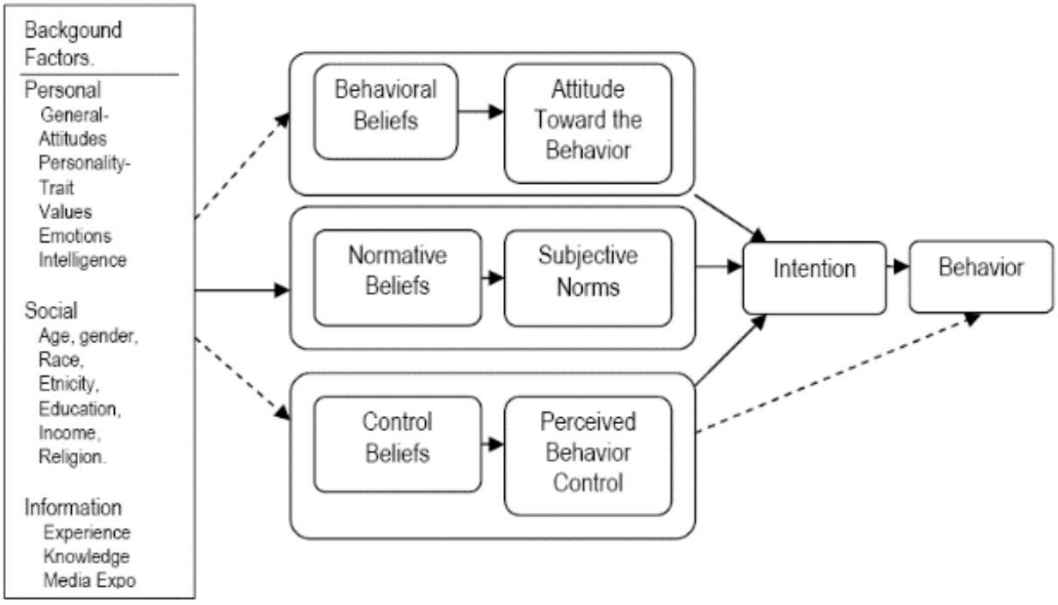

Figure 3. Theory of TPB [19]

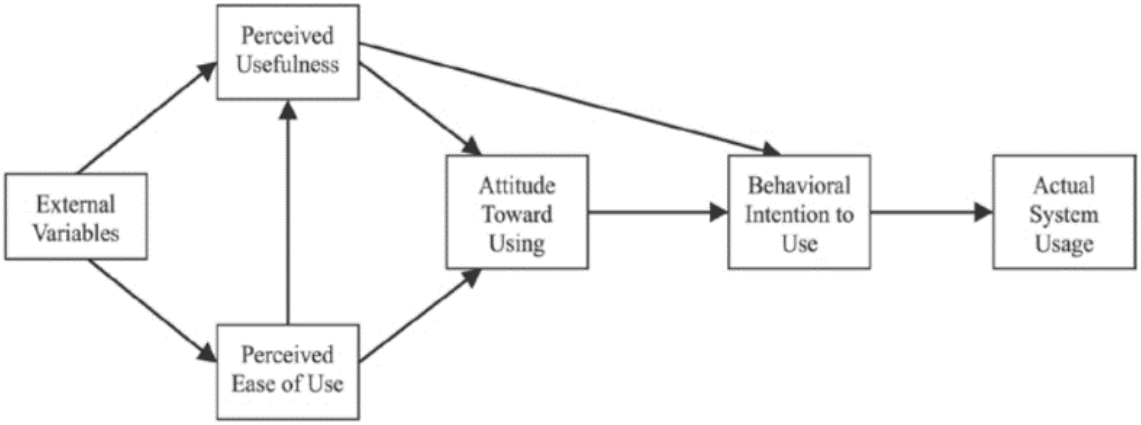

Figure 4. Theory of TAM [17]

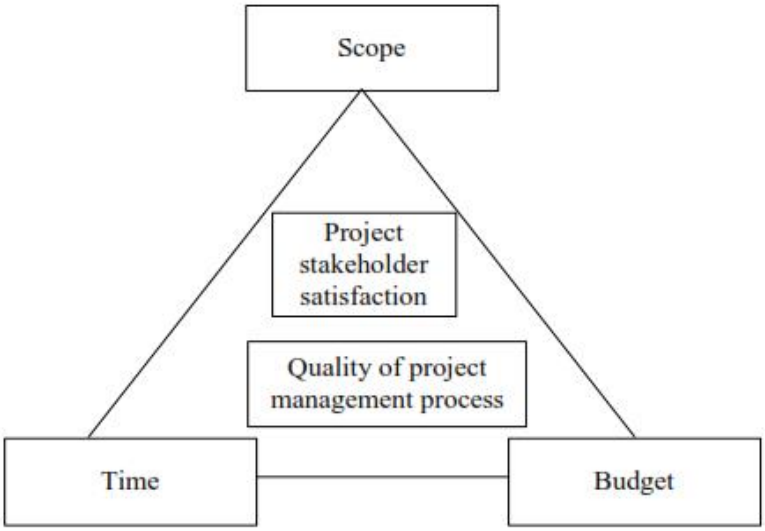

Figure 5. Triangle Iron [20]

Westhuizen & Fitzgerald [20] define that the project achievement was measured by three principal factors assigned in Triangle Iron in Figure 5 which are scope, time and budget. Scope means that the infrastructure built was met the specification and quality in terms of design, material and product lifetime. Time means that the infrastructure project finished on time. The budget means that the infrastructure project meets the budget provided [21] [22].

There are several research objects in an investigation of system and information quality such as software project [20, 23, 24], ERP, A/E/C Industry [25], RETPIS services [26] and Mobile Banking Individual Performance [27]. Therefore, the connectivity between the system and information quality to project achievement challenging measure especially in a construction project in Jabodetabek Region.

METHOD

Research Variable

This research was started by developing a research model that consists of three major variables which are system quality, information quality, and project achievement, as shown in Figure 6. Each variable was consisting of several indicators, as listed in Table 1.

Table 1. Research Variable

No.	Variable	Indicator
1.	System quality (X)	*Navigation* (X_1)
		Reliability (X_2)
		Portability (X_3)
		Respond Time (X_4)
2	Information quality (Y_1)	Accuracy (Y_{11})
		Relevancy (Y_{12})
		Completeness (Y_{13})
		Up to date (Y_{14})
6.	Project success (Y_2)	Quality of product (Y_{21})
		On-time (Y_{22})

Table 1 shows that system quality was consists of 4 indicators, such as navigation, reliability, portability and response time. Information quality was consisting of several indicators such as accuracy, relevance, completeness and up to date. Meanwhile, project achievement only consists of two indicators which are the quality of the product and on time to finish the project.

Research Model

The research model was consisting of the one independent variable (system quality) and two dependent variables (information quality and project success) where the model is shown in Figure 6.

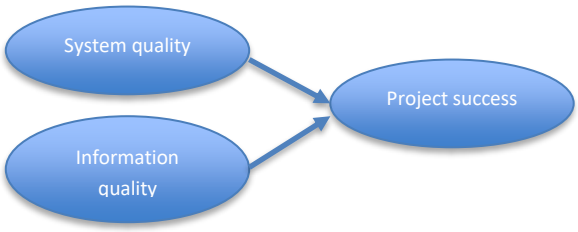

Figure 6. Research Model

The three variables need to signed as X, Y_1, and Y_2 to clustering the dependent and independent variables. The model was developed to investigate the relationship between variables. Three relations need to investigate this research which are the relation between system quality on information quality, system quality on project success and information quality on project success.

Population and sample

This research was conducted in Jabodetabek Region. It was selected due to this province has many construction companies as compared to other provinces with the largest number of employees. The research object was government and private construction companies in Jabodetabek Region. The respondent of this research was dividing into three levels which are Project Manager (PM), Vice PM and Site coordinator, as listed in Table 2.

Table 2. Respondent of this research

No.	Position	No. Respondents
1.	PM	23
2.	Vice PM	13
3.	Site coordinator	69
	Total	105

This research was collected in some construction project that used similar information system technology which called by EVA, GL-PRO, E-counting and OPECS software. All software was used to monitor and evaluate the progress of construction project development. There is some construction project that includes in this research, such as Mabes Polri Sisi Barat, Monaco Bay, Lippo Thamrin Office Tower, Springwood Residence, PLTD Senayan, Evenciio Margonda Apartement, GDC Jatiwarna Emerald Tower, Rehab. Gd. Sekolah Paket 3 JakBar, Apartement Royal Sentul Park, Simpang Susun Balaraja Timur, Pembgn. Jalan Tol Dalam Kota Jakarta, Rusun Paspampres, Rusun Tingkat Tinggi Ps. Jumat, Pembangunan TOD Tanjung Barat,

Pembangunan UIII, Pabrikasi Baja Cikande, Tol Kuningan Tangerang, Embarcadero Park Bintaro, Proyek Kemang Office, Station & Depo MRT Lebak Bulus, Gd. Studio TV Universitas Mercu Buana, Gd. Kantor Pusat PT. Paragon Technology and Innovation, Factory Project MM2100, Mori Building dan Warehouse Project.

Data analysis

The data of this research was collected through a questionnaire and survey. The questionnaire was transferred to respective respondents via online or direct into a construction site. The data collection was conducted in 2.5 months. The data were analyzed by using SPSS 2.1 in order to investigate the validity, reliability, frequency, discriminant validity, correlation and smart PLS 3 software in order to investigate the direct effect and indirect effect of each variable.

RESULTS AND DISCUSSION

Validity analysis

The validity analysis was conducted on dependent and independent variables as listed in Table 3, Table 4 and Table 5. The valid status determined by the correlation value where the minimum correlation value is 0.3 and the P-value below 0.05.

Table 3. Validity analysis of System quality (X)

Indicator	Correlation	P-Value	Valid status
X_1	0.787	.000	Valid
X_2	0.855	.000	Valid
X_3	0.785	.000	Valid
X_4	0.765	.000	Valid

Table 4. Validity analysis of information quality (Y_1)

Indicator	Correlation	P-Value	Valid status
Y_{11}	0.700	.000	Valid
Y_{12}	0.698	.000	Valid
Y_{13}	0.625	.000	Valid
Y_{14}	0.660	.000	Valid

Table 5. Validity analysis of Project success (Y_2)

Indicator	Correlation	P-Value	Valid status
Y_{21}	0.885	.000	Valid
Y_{22}	0.905	.000	Valid

The tables show that all indicators in the three variables have been valid because the correlation value of all indicators was higher than 0.3 and P-value less than 0.05. A correlation value of system quality in a range of 0.765 to 0.855, information quality in 0.625 to 0.700 and project success in 0.885 to 0.905.

Table 6. Reliability of research variables

Variable	Cronbach's alpha	Reliability status
System quality (X)	0,798	Reliable
information quality (Y_1)	0,755	Reliable
Project success (Y_5)	0,885	Reliable

Reliability analysis shows that all variables have Cronbach's alpha higher than 0.6. It means that all variables have reliable such as listed in Table 6.

Discriminant Validity

Discriminant validity was conducted to measure the dimension between variables, as listed in Table 7. This discriminant validity was approved when it higher than Average Variance Extracted (AVE) value which is 0.5. The data shows that the value of discriminant validity is higher than 0.5.

Table 7. Discriminant validity of research variables

Variable	X	Y_1	Y_2
X	**0,712**	0,438	0,519
Y_1	0,438	**0,740**	0,510
Y_2	0,519	0,510	**0,770**

Contribution of indicator to variable

Contribution of indicator to variable identified by loading factor value. Where the minimum loading factor is 0.5. It means that when the loading factor of the indicator is higher than 0.5, that indicator has a high contribution to the variable.

Table 8. Contribution of indicators in System quality (X)

Variable	Indicator	Loading Factor
System quality (X)	(X_1)	0,835
	(X_2)	0,726
	(X_3)	0,751
	(X_4)	0,852

Table 8 shows the contribution of the indicators of System quality variable has a high loading factor where the X_1, X_2, X_3 and X_4 have a contribution in X for 83.5%, 72.6%, 75.1% and 85.2%, respectively.

X_1 = 0,835 X **X_3 = 0,751 X**
X_2 = 0,726 X **X_4 = 0,852 X**

The contribution of the indicators of information quality variable has high loading factor where the Y_{11}, Y_{12}, Y_{13} and Y_{14} has contribution in Y_1 for 73%, 78.7%, 54% and 59.4%, respectively, as listed in Table 9.

Table 9. Contribution of indicators in Information quality (Y_1)

Variable	Indicator	Loading Factor
Information Quality (Y_1)	(Y_{11})	0,730
	(Y_{12})	0,787
	(Y_{13})	0,540
	(Y_{14})	0,594

Y_{11} = 0,730 Y_1 **Y_{13} = 0,540 Y_1**
Y_{12} = 0,787 Y_1 **Y_{14} = 0,594 Y_1**

Table 10. Contribution of indicators in Project success (Y_2)

Variable	Indicator	Loading Factor
Project Success (Y_2)	(Y_{21})	0,817
	(Y_{22})	0,851

Table 10 listed the contribution of the indicators of the project success variable has a high loading factor where the Y_{21} and Y_{22} have a contribution in Y_2 for 81.7% and 85.1%, respectively.

Y_{21} = 0,817 Y_5 **Y_{22} = 0,851 Y_5**

Direct Effect analysis

Direct effect analysis was conducted in order to investigate the relationship between variables either significant or not significant. The significant analysis was determined by the Critical Ratio (CR). When CR value ≥ t-table (t=2.00, alpha=5%) it means that the variable has a significant relation to other variables. The result of the direct analysis of three variables is listed in Table 11.

Table 11 shows that the CR value of the relation between variables is higher than the t-table. Relation of X to Y_1 has a CR value of 5.174, X to Y_2 has a CR value of 3.564 and Y_1 to Y_2 has a CR value of 2.037. It means that all relation was significant.

Table 11. Direct effect analysis of research variable

No.	Relation between variable	Estimate	CR	Information
1.	(X) → (Y_1)	0,438	5.174	Significant
2.	(X) → (Y2)	0,393	3.564	Significant
3.	(Y_1) → (Y_2)	0,218	2.037	Significant

Direct-Indirect effect analysis

This analysis purposed to investigate the direct-indirect effect of each variable as listed in Table 12. This analysis also formulated the equation to determine the endogen variable that influenced by the exogeny variable.

Table 12 Direct-indirect effect analysis of research variable

No.	Exogeny	Medium	Endogen	*Tstat*	Direct	Indirect
1.	System Quality (X)	-	Information Quality (Y_1)	5.174	0.438*	-
2.	System Quality (X)	Y_1,	Project success (Y_2)	2.892	0.393*	0.004*
3.	Information Quality (Y_1)	X	Project success (Y_2)	2.446	0.218*	0.015*

Two equations can be formulated through the direct-indirect effect analysis which are:

$$Y_1=0.438X \quad (1)$$
$$Y_2=0.393X + 0.218Y_1 \quad (2)$$

The coefficient of the direct effect of system quality on information quality of 0.438. It means that there is a positive relationship between variables where system quality increased as information quality increased as well. The coefficient of a direct effect of system and information quality on project success of 0.393 and 0.218, respectively. It means that there is a positive relationship between variables where system and information quality increased as project success increased as well.

The implication of several direct and indirect effects is significant. This means that system quality has a significant effect on system quality and project success as well as information quality has a significant effect of projecting success as well.

CONCLUSION

The effect of the system and information quality on project success has been successfully achieved. The result shows that there is a high correlation of each variable, a significant relationship between variables. It can be concluded that a significant effect of X fulfills three hypotheses of this research to Y_1, X to Y_2 and Y_1 to Y_2.

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