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...
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Information quality was related to system use, user satisfaction, and 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 investigated the effect of system and information quality on user satisfaction and project achievement. They found that system and information quality had a significant effect on user satisfaction and project achievement [15] [16].

The concept of this research is based on three theories 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 1. The progress of Infrastructure in Indonesia

Figure 2. Theory of TRA [18]
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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 measurement 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    | Navigation (X₁)            |
|     |                   | Reliability (X₂)           |
|     |                   | Portability (X₃)           |
|     |                   | Respond Time (X₄)          |
| 2.  | Information quality (Y₁) | Accuracy (Y₁₁)  |
|     |                   | Relevancy (Y₁₂)            |
|     |                   | Completeness (Y₁₃)         |
|     |                   | Up to date (Y₁₄)           |
| 6.  | Project success   | Quality of product (Y₂₁)   |
|     |                   | On-time (Y₂₀)              |

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.

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, Evencio Margonda Apartement, GDC Jatiwarna Emerald Tower, Rehab. Gd. Sekolah Paket 3 JakBar, Apartement Royal Sentul Park, Simpang Susun Balaraja Timur, Pembg. Jalan Tol Dalam Kota Jakarta, Rusun Paspampres, Rusun Tingkat Tinggi Ps. Jumat, Pembangunan TOD Tanjung Barat,
Pembangunan UIII, Fabrikasi 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.

| Indicator | Correlation | P-Value | Valid status |
|-----------|-------------|---------|--------------|
| X1        | 0.787       | .000    | Valid        |
| X2        | 0.855       | .000    | Valid        |
| X3        | 0.785       | .000    | Valid        |
| X4        | 0.765       | .000    | Valid        |

**Table 3. Validity analysis of System quality (X)**

| Indicator | Correlation | P-Value | Valid status |
|-----------|-------------|---------|--------------|
| Y1        | 0.700       | .000    | Valid        |
| Y2        | 0.698       | .000    | Valid        |
| Y3        | 0.625       | .000    | Valid        |
| Y4        | 0.660       | .000    | Valid        |

**Table 4. Validity analysis of information quality (Y1)**

| Indicator | Correlation | P-Value | Valid status |
|-----------|-------------|---------|--------------|
| Y1        | 0.885       | .000    | Valid        |
| Y2        | 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.

| Variable   | Cronbach’s alpha | Reliability status |
|------------|------------------|--------------------|
| X1         | 0.798            | Reliable           |
| Y1         | 0.755            | Reliable           |
| Y2         | 0.885            | Reliable           |

| Variable   | X   | Y1 | Y2 |
|------------|-----|----|----|
| X1         | 0.712| 0.438| 0.519|
| Y1         | 0.438| 0.740| 0.510|
| Y2         | 0.519| 0.510| 0.770|

**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   | Y1 | Y2 |
|----------|-----|----|----|
| X1       | 0.798|    |    |
| Y1       | 0.755|    |    |
| Y2       | 0.885|    |    |

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.

**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)**

| Indicator | Loading Factor |
|-----------|----------------|
| X1        | 0.835          |
| X2        | 0.726          |
| X3        | 0.751          |
| X4        | 0.852          |

Table 8 shows the contribution of the indicators of System quality variable has a high loading factor where the X1, X2, X3 and X4 have a contribution in X for 83.5%, 72.6%, 75.1% and 85.2%, respectively.

X1 = 0.835 X 
X2 = 0.726 X 
X3 = 0.751 X 
X4 = 0.852 X 

The contribution of the indicators of information quality variable has high loading factor where the Y11, Y12, Y13 and Y14 has contribution in Y1 for 73%, 78.7%, 54% and 59.4%, respectively, as listed in Table 9.
The analysis also formulated the direct effect of system quality on project success as well as information quality. The coefficient of system 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 Y1, X to Y2 and Y1 to Y2.

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

\[ Y_1 = 0.438X \]  \hspace{1cm} (1)
\[ Y_2 = 0.393X + 0.218Y_1 \]  \hspace{1cm} (2)

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