

Influences of the Input Factors towards the Success of an Information System Project

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Abstract

This study tried out three input factors which theoretically affect the success of information system (IS) project. These factors were adopted from the McLeod and MacDonell's (M&M's) project framework and then examined using survey toward the internal project stakeholder in a sampled institution. A stratified sampling was carried out based on the project experience ownership and then sent both online and paper-based questionnaires to 130 selected respondents. A number of 62 (48%) valid responses were analysed using a partial least squares-structural equation modelling (PLS-SEM) software. The significances of path coefficients, the acceptances of hypotheses, the predictors relevances, and the moderate coefficient determination of the IS project's success variable present the proposed model approval for the subsequent studies.

Keywords: IS Project, M&M's Project Framework, Input Factors, Project Stakeholders, PLS-SEM

1. Introduction

Systematically, IS project is a micro environment of the business system [1],[2]. Similar to this systematic-environmental description, [3] also elucidated their concept within four environmental levels of a project, e.g., process, deliverable, business, and context levels. Accordingly, [4] proposed their project framework, based on their meta-analysis study about influencing factors of the software system project outcomes during 1996-2006. Furthermore, [5] adopted and combined that framework with the DeLone and McLean's success model [6] to represent the processional and causal model of an IS project in term of its input-process-output (IPO) logic [7],[8]. These literatures described that several researches [9]-[10] focused on the influences of the environment contexts towards the IS project performance. Like the above scholars, [11],[12] indicated that the most complicated IS project problems are related to managerial, organizational, and cultural issues. Those factors are inherited from the particular context where the projects are carried out [13]. This means that the problems are not only about the technical ones, e.g., the triangle aspects [14]. Despite the fact that an IS project was performed well and it may technically consider "successful," the project might also reputed to be "futile" due to contextual indifferences [8]. It was reasonable if [15] who cited [10] emphasized that the project success factors are not universal for all projects. Therefore, it is essential for studying factors of each IS project in regard to its specific-environmental contexts.

In terms of the IPO logic of a project, this study was performed to elucidate the success level of an IS project and to evaluate its input effects which affect the performance in the sampled institution. The empirical data were collected by survey involving the selected internal project stakeholders. PLS-SEM with SmartPLS 2.0 then was used to examine the data. The result of this study represented that the three input factors explain moderately the IS project success variable. In this study, the term of IS, information technology (IT), and information and communication technology (ICT) projects were interchangeably used in respect of the deployment of the business processes and its services [16]. Furthermore, the following sections sequentially display the research model and its hypotheses, the research method, its analysis results, and the discussions. The final section is the conclusion of the article which it also explains the limitations of the study and suggestions for the future studies.

2. Research Model and Hypotheses

In this study, three factors of the M&M's project framework [4], i.e., project contents (PCT), people and actions (PAC), and institutional contexts (ICT) were adopted in the proposed model (Figure 1) to measure an IS project success (PCS). The adoption was applied considering the focus of the study, i.e., the input influences in the IPO logic of an IS project model [5],[7],[8]. The similar rationale was also used in respect of the exclusion of the development process factor (4). This factor was excluded because the researchers assumed as the processional factors of the IPO model [5],[7],[8]. The rationale of this modelling was based on the Belout and Gauvreau's [17] description that most of research models were modelled based on the previous models or theories.

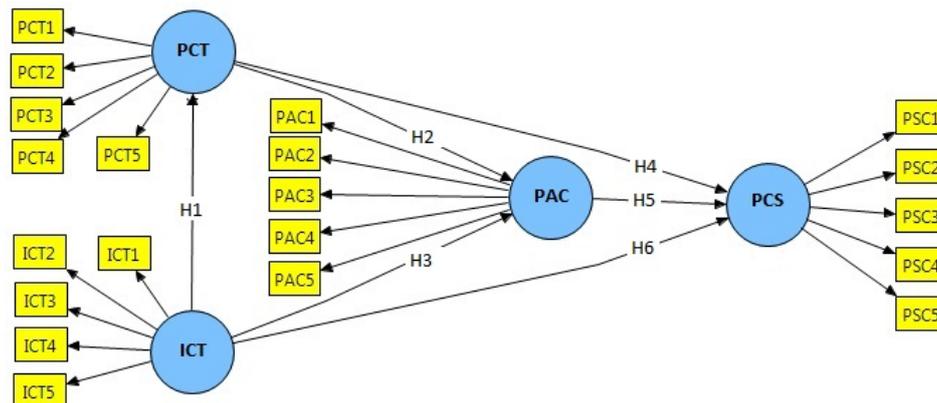


Figure 1. The proposed research model

Retrospectively, some researchers [18]-[20] described that the success definition of a project was extended from the technical perspectives to the strategic ones [19] considering the stakeholder perceptions. Therefore, the researchers formulated resources savings (PSC1), managerial effectiveness (PCS2), productivity improvement (PSC3), customer satisfaction (PCS4), and competitive advantage (PSC5) as the PCS indicators [5],[11],[18]-[22]. Meanwhile, many scholars [4],[5],[8],[9],[11],[18],[19] indicated that PCT is one of the input factors of the PCS. This variable is related to the characteristics of the technology, interrelationship, process, and structure used in the project which materially affects the project outcome. [23] indicated that the managerial capability of the variable has consequences toward the project success. Accordingly, we used project size (PCT1), project complexity (PCT2), resource availability (PCT3), technology development (PCT4), data quality (PCT5) [4],[5],[11],[19] as the PCT indicators and hypothesize that PCT affect significantly PAC (H2) and PCS (H4).

In addition, PCS was affected by PAC in regard to the characteristics of the project agents and their actions in both individual and organizational levels [4],[11],[24],[25]. Thus, it was reasonable to use professionalism (PAC1), integrity (PAC2), norms (PAC3), clarity of the project structure (PAC4), conflict management (PAC5) [4],[11],[24],[25] as the PAC indicators and hypothesize that PAC affect significantly PCS (H5). Lastly, a number of scholars [12],[26]-[28] described that PCS was also influenced by the contextual factors of the project. Similar to [12] who cited [10], they mentioned that the project success factors are not universal for all projects and very context-dependent [18]. Despite the project management was performed well and the project could be considered "successful," it was also probable to be the futile project. It is because of the neglect of its contextual factors [9]. The alignment between a project and its business objectives influences the perceive success [4],[15],[29],[30]. Therefore, the researchers used organizational cultures (ICT1), organizational policies (ICT2), organizational experiences (ICT3), legacy system and infrastructure (ICT4), and external context (ICT5) [4],[5],[15],[19],[26]-[30] as the ICT indicators. The researchers hypothesized that ICT affect significantly PCT (H1), PAC (H3), and PSC (H6).

3. Research Method

This empirical study was methodologically performed in eight stages during ten months in 2014 (Figure 2).

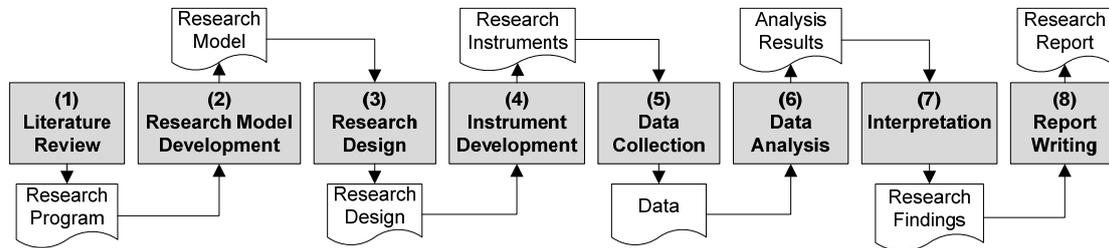


Figure 2. The research procedures

The Instrument was a questionnaire, including the invitation letter, its research introduction, and the question pages (i.e., three participant profile, six project profile, and 20 main questions). Specifically, the measurement of the main question was designed using the five-point Likert scale ranging from “strongly disagree” (1) to “strongly agree” (5) [31]. In order to ensure validity and reliability of the instrument, the researchers adopted the selected items of the previous studies [4]-[6],[19], conducted a pre-test examination to receive empirical feedback from five IS academicians [32],[33], and conducted the unidimensionality procedure [34],[35] with five deletions (PCT1, PCT2, PCT4, ICT1, and ICT5). Meanwhile, the data collection was involved the internal IS project stakeholders, i.e., top users, business key users, IT key users, project managers, and project team members in the sampled institution. The justification of this involvement was based on the significance of the key informant roles [32],[33],[36]. The scholars obtained the data from the IT unit in the sampled institution, including names, positions, telephones, and emails (N=257). A purpose sampling then was applied based on the project experience ownership. The questionnaire distribution was conducted via email and direct visitations towards 130 (49%) respondents who experienced in the IS projects. The result of this data collection was, the researchers collected 62 (48%) valid responses, including 40 (31%) online and 23 (17%) paper-based answers. The majorities of the participants (91.9%) were the bachelor graduates and above with the highest percentage of the education levels was the master graduates (56.5%). Most participants (91.9%) experienced during under 10 years and most of them (40.3%) experienced during 5-10 years in the IS project works. Meanwhile, the highest percentage of the participants (58.1%) is the project team members.

In addition, the data analysis was statistically carried out using MS. Excel 2007 to represent the demographic data and SPSS version 20 to prepare PLS-SEM analysis. Afterwards, SmartPLS 2.0 was used in the inferential data analysis. This PLS-SEM software was applied regarding its vast potential in SEM method [37]-[41]. It was related to the objectives of the exploration and prediction with the relative-small sample size (n=62). In this inferential analysis, the researchers performed the measurement model assessments to evaluate reliability and validity of the outer model and the structural model assessments to represent the path and explanatory power of the inner model [37]-[41]. The measurement model assessments included the indicator reliability, internal consistency reliability, convergent validity, and discriminant validity assessments. Meanwhile, the structural model assessments were applied through path coefficient (β), coefficient of determination (R^2), t -test, effect size (f^2), predictive relevance (Q^2) and relative impact (q^2) assessments [37]-[41].

4. Analysis Results

4.1. The Demographical Information of the IS Project

Table 1 illustrates that most of the participants (41.9%) indicated that the development goals of the IS project were to fulfil operational requirements. The institution had the IS strategic plan as it was stated by majority participants (71%). Most of the participants (43.5%) indicated that the IS projects were performed by internal party. In the project funding points, the highest

percentage of the participants (38.7%) answered that the projects were funded by internal funding. Moreover, majority participants (80.7%) answered that percentage of the project success level is more than 50% and 33.9% of the participants stated that this percentage was more than 75%.

Table 1. IS project profiles

Measures	Items	%
Development goals	Operational requirements	41.9
	Managerial requirements	16.1
	Strategic requirements	17.7
	Operational and managerial requirements	6.5
	Operational & strategic requirements	8.1
	Operational, managerial & strategic requirements	9.7
Ownership of IS strategic plan	Available	71.0
	Not available	6.5
	Unknown	22.6
IS development strategy	100% buying	3.2
	Majority buying	27.4
	50-50	21.0
	Majority internal development	43.5
	100% internal development	4.8
	100% internal funding	30.6
Funding	Majority internal funding	38.7
	50-50	12.9
	Majority external funding	12.9
	100% external funding	4.8
Success Level	< 25 %	6.5
	25-50 %	12.9
	50-75 %	46.8
	> 75 %	33.9

4.2. The Measurement Model Assessments

Table 2 and Figure 3 show the assessment results. First, indicator reliability was evaluated by assessing every correlation between the items to the variable [35],[37]-[41]. The item reliability was evaluated using three loading assessments. (1) The items with loadings under 0.4 were deleted [35]. (2) Loadings 0.4 to 0.7 were considered to be used if it will have increased the composite reliability (CR) and the cross loading value must higher than the others. (3) Loadings above 0.7 were used [37-40]. The result was the authors deleted five items (PCT1, PCT2, PCT4, ICT1, and ICT5) because their non-standard loadings. Second, internal consistency reliability was evaluated using CR with values above 0.7 [41]. CR was preferred rather than Cronbach's alpha (CA) because CR takes into account that indicators have different loadings [38],[43] whereas CA tends to severely underestimate referring its assumptions in term of the internal consistency reliability [43]. Third, convergent validity was evaluated using the average variance extracted (AVE) with the acceptable threshold of 0.5 [37]-[41]. Fourth, discriminant validity was assessed through analysis of cross-loading [34] using the square root of the AVE in line with its definition that is the extent to which a given variable is different from the others [37]-[41]. In short, the result of these outer model evaluations statistically demonstrated that the outer model has good psychometric properties. Sequentially, this demonstration recommended to be continued into the structural model assessments [33]-[36] respectively.

Table 2. The measurement model assessments

Variables	Items	OL	Item CL				AVE	RV of the Variable				CR	
			ICT	PAC	PCT	PSC		ICT	PAC	PCT	PSC		
ICT	ICT2	0,875	0,875	0,636	0,303	0,456	0,603	0,777				0,819	
	ICT3	0,742	0,742	0,363	0,274	0,467							
	ICT4	0,703	0,703	0,226	0,198	0,379							
PAC	PAC1	0,884	0,506	0,884	0,447	0,555	0,623	0,565	0,789	0,891			
	PAC2	0,818	0,458	0,818	0,305	0,424							
	PAC3	0,834	0,473	0,834	0,372	0,576							
	PAC4	0,665	0,373	0,665	0,339	0,372							
	PAC5	0,725	0,405	0,725	0,204	0,331							
PCT	PCT3	0,770	0,275	0,345	0,770	0,329	0,599	0,339	0,433	0,774		0,750	
	PCT5	0,778	0,251	0,325	0,778	0,379							
PSC	PSC1	0,810	0,437	0,470	0,344	0,810	0,594	0,559	0,587	0,458	0,771		0,879
	PSC2	0,804	0,475	0,644	0,363	0,804							
	PSC3	0,794	0,385	0,489	0,359	0,794							
	PSC4	0,826	0,490	0,298	0,420	0,826							
	PSC5	0,598	0,357	0,284	0,272	0,598							

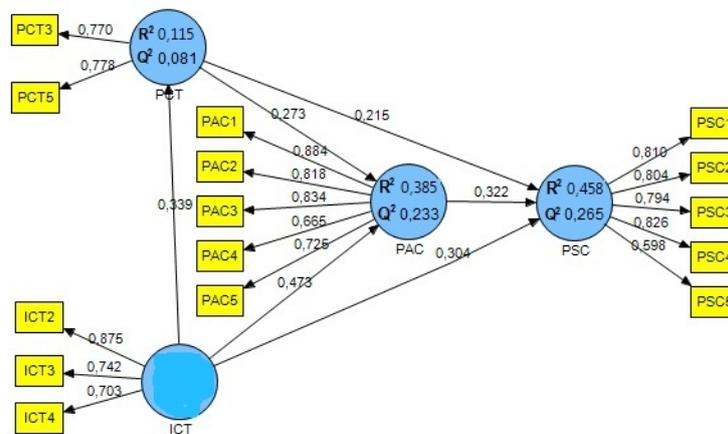


Figure 3. Results of the SmartPLS analysis

4.3. The Structural Model Assessments

These assessments were carried out through six assessment stages and the results were presented graphically in Figure 3 and Table 3. First, β was evaluated with the above value of 0.1 to determine the path impact within the model [37]-[41]. The results presented statistically that the six paths were significant. Second, R^2 was evaluated to describe variance of the target endogenous variable [37]-[41] with values approximately 0.670 substantial, around 0.333 moderate, and about 0.190 and lower weak. The results presented that R^2 of PCT (0.115) was weak, which it was meant that ICT weakly explained 11.5% of the PCT variance, PCT and ICT together moderately expressed 38.5% of the PAC variance, and ICT, PCT, and PAC together also moderately described 45.8% of the PSC variance. Third, t -test was evaluated via bootstrapping procedure using two-tailed test with a significance level of 5%, whereas the hypotheses will be accepted if the t -test is larger than t -values (1.96) [39]-[40]. The results indicated that overall hypotheses were accepted.

Fourth, f^2 was evaluated to examine the predictive variable effects in the structural model [37]-[41] with values of about 0.02 low, 0.15 medium, or 0.35 large effects. The results showed that ICT→PAC presented the largest effect, PCT→PSC presented the lowest effect, and the four rest paths presented the medium effects. Fifth, Q^2 was evaluated via blindfolding procedure to give evidence that the proposed model has predictive relevance with threshold values above zero [37]-[41]. Figure 3 presents that the model has predictive relevance. Sixth, q^2 was also evaluated via blindfolding procedure to measure the predictive relevance's relative impact with threshold values 0.02, 0.15, or 0.35 for small, medium or large effect size [39]-[40]. In brief, despite all of the hypotheses statistically accepted, but it was only ICT→PAC which has the large effect and the medium predictive relevance.

Table 3. The Structural model assessments

H	Paths	β	t-test	f^2	q^2	Remarks			
						β	t-test *	f^2	q^2
H1	ICT→PCT	0.339	5,283	0,130	0,088	Significant	Accepted	Medium	small
H2	PCT→PAC	0.273	4,864	0,106	0,051	Significant	Accepted	Medium	small
H3	ICT→PAC	0.473	11,774	0,315	0,178	Significant	Accepted	Large	medium
H4	PCT→PSC	0.215	3,827	0,059	0,030	Significant	Accepted	Low	small
H5	PAC→PSC	0.304	3,710	0,114	0,029	Significant	Accepted	Medium	small
H6	ICT→PSC	0.322	3,942	0,094	0,079	Significant	Accepted	Medium	small

5. Discussions

In this section, two discussion points are related to the demographic information and the inferential measurement results.

First, it is reasonable that majority participants (80.7%) presented the project success percentage was more than 50% and around 33.9% of the participants even mentioned that the success percentage was more than 75%. It is because the IS project may have carried out based on availability of the IS strategic plan as stated by about 71% of the participants, the gradual project implementation as presented by the development goal attainment focusing on the operational into strategic requirements, and the internal party involved as presented by almost 70% of the participants. In short, the state and attainment of the IS project success were in line with the previous IS project success studies, e.g., [2] and [18] who elucidated that the IS project success related to both the project management and product utilization successes.

Second, although the overall outer model statistically demonstrated good psychometric properties, the five rejection indicators were needed to be notice for being inconsistent with the selected prior literatures [4],[8],[9],[18],[19]. In this study, this might unsupported by the developed instrument, the collected data or the trend of the IS project implementation in the sampled institution. In addition, based on the structural model assessments, we also notice two highlight points. (1) However, the estimated values of ICT→PCT presented significantly, the hypothesis was accepted, and the Q^2 were predictive relevance, but R^2 of the PCT was explained weakly (11,5%) by ICT. The significance, acceptance, and relevance of the path are consistent with the basis literatures used. However, the weak explanation should properly become an attention, related to the developed instrument and the collected data in the study or this might be the tendency of the IS project implementation in the sampled institution. (2) Similar to the significance, acceptance, and relevance of the path, the low f^2 of the PCT→PSC is also suitable to be noticed. This might unsupported by the developed instrument, the collected data and the analysis or portrait of the project implementation trends whereas PCT did not influence PSC.

6. Limitations

There are three inherent limitations of this study. First, the collected data of the survey were obtained from the sampled institution. Therefore, the findings should not be generalized for the other institutions. It is because data from the other institutions may be different from what were found and discussed in this study. Second, the questionnaire items were adopted and adapted from the selected literatures, thus the other studies which use different items may produce the different findings. Third, this study involved the selected respondents who most of them are the project team members in almost 60%. Accordingly, the other proportions of the respondents may differently present the findings. In brief, the subsequent researches can take this study findings and reconsidering the limitations.

7. Conclusion

The contextual effects of an IS project performance have been interested for researchers and practitioners referring to its environmental aspects since many years ago. Meanwhile, several studies presented that the project success factors are not universal for all projects. Accordingly, this exploratory study was conducted to respond this issue in order to investigate the project success state and to examine the contextual influences of input factors. The proposed method was developed by adopting selected literatures. SmartPLS 2.0 was used

regarding to its vast potential in SEM method with the relative sample size ($n=62$) for assessing the measurement and structural model. Despite this study have several limitations, the results of the measurement and structural model assessments are potential parameters that may be a consideration point for the next studies, especially the moderate R^2 of PCS that presents the model acceptability

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