# Measurement of the information system project success of the higher education institutions in Indonesia: a pilot study

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**Abstract:** This paper presents a pilot study to validate quantitatively an information system (IS) project success model. In terms of its continual research, the model was evaluated qualitatively using focus group study (FGS) conducted earlier in the research. This study was also aimed to explain an IS project success performance and its factors that affect the project implementation in the sampled institution. Despite that the findings and its recommendations can only be considered in the context of the pilot study, this research had highlighted the complementary, completeness, and comprehensiveness of the model validation through mixed-methods approach. Such findings had become the main contribution of this study, among others, that is to fill the gap in the literature of the lack of comprehensive detail of model validation through mixed-methods.

**Keywords:** IS project success; pilot study; model validation; mixed methods.

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## 1 Introduction

The Standish Group's (2013) publications have been renowned as the blower issue for researchers and practitioners to continue the information technology (IT)/IS project performance studies since 1990s. This call for continual and longitudinal research may be aimed to encourage the success level of the projects (Subiyakto and Ahlan, 2014), including in higher education (HE) sector (Hong and Songan, 2011). Several studies (e.g., Hong and Songan, 2011; Johnson, 2011; Al-Debei, 2014) indicated that the use of IT/IS in this sector is relevant for providing affordable, accessible and quality of the education. A number of studies (Subiyakto and Ahlan, 2013; Gupta and Naqvi, 2014) pointed out that the success of these projects is the first challenge for the users before they will obtain the benefits of the use. Therefore, the new possibility achievements are essential to be emerged continuously, e.g., by refining or re-developing the success model. While Petter et al. (2008) and Urbach and Müller (2012) pointed out that scholars often demonstrate the incompleteness and invalidity aspects in their model development due to the narrowed view, or too focus on single or selected dimension of the model. As such, this has then called for a more thorough research so that comprehensive model can be developed in respect of the above mentioned aspects.

This article represents a series of research work from the preliminary studies through the pilot study as the part of a doctoral research. The initial works include the conceptual framework and model developments (Subiyakto and Ahlan, 2013, 2014) and its qualitative model validation. The main aim of this pilot study was to validate the model quantitatively. In addition, this study was also aimed to explain the status of IS project success and to examine the factors that affect its performance. To meet the above objectives, a statistical method called partial least squares-structural equation modelling (PLS-SEM) with SmartPLS 2.0 was selected, and deemed to be appropriate for the study. The total responses of the respondents (n = 62) were collected from the sampled

institution. The 30 hypotheses (Figure 2) then were tested. The result demonstrated that 10 of the hypotheses were rejected after the structural model assessments.

In summary, the implementation of the mixed-methods model validation across the sequence phases was the highlighted points of the study. This may enliven discourses on this method for validating a research model. The following sections sequentially elucidate the literature review, research method, analysis results, discussion, and conclusion sections.

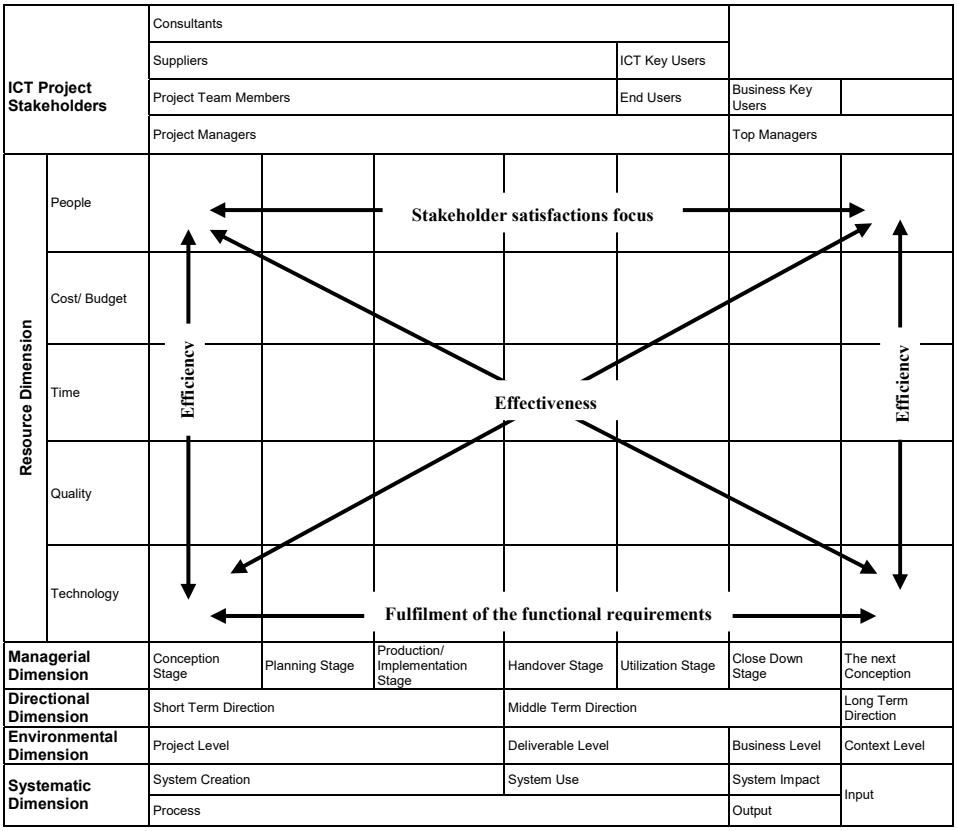
## 2 Literature review

Boynton and Zmud (1984) described that most problems of a project are related to management, organisational, human and cultural issues, not only the technical ones. Subiyakto and Ahlan (2013) presented five gaps around IT/IS project environment. There are the project implementation contradictions (Xu et al., 2010), the success definition ambiguity (Prabhakar, 2008), the multidimensional measurement needs (Westerveld, 2003; Petter et al., 2008), the stakeholder roles (Achterkamp and Vos, 2008), and the CSFs determination contradictions (Subiyakto et al., 2014). Three rationale questions regarding these gaps are "How to formulate comprehensively the definition of an IT/IS project success in respect of its project dimensions?", "How to represent the critical path between the success criteria and its critical success factors (CSFs)?", and "How to adopt the project stakeholder perceptions on the various managerial levels toward the project success?" Accordingly, a coherent framework based on a multidimensional perspective is considerable to be developed (Nour, 2012; Atlikhan et al., 2013; Vatnani and Verma, 2014). Subiyakto and Ahlan (2013) developed a conceptual framework in the IT/IS project environment by combining its four dimensions within the four success criteria in order to respond the above mentioned gaps (Figure 1).

Besides, it was covered the multidimensional aspect (Westerveld, 2003) this development was also incorporated the critical connection between the success criteria and its project dimensions (Stankovic et al., 2013). The four dimensions are the resource dimension (Atkinson, 1999; Heeks, 2002), the managerial dimension (Jugdev and Muller, 2005), the directional dimension (Remus and Wiener, 2009; McLeod and MacDonell, 2011), and the environment dimension (Howsawi et al., 2011; Kerzner, 2013). The researchers then refined via joining the systematic dimension of an IS project (Davis, 1998; DeLone and Mclane, 2003).

This modelling was conducted based on a critical study towards the prior processional and causal models (Figure 3). The researchers used 44 indicators by adopting the selected previous studies in the model. Table 1 represents the used indicators and its references. Previously, the early model had 36 relationships (Subiyakto and Ahlan, 2014), but the number then was simplified to be 30 with regard to the recommendations of the qualitative validation study. This validation was implemented using four FGS techniques (Finch and Lewis, 2003; Boateng, 2012; Wilson, 2012), i.e., interview, consultation, discussion, and seminar. The participants of the FGS were 16 scholars who are the member of an IS research group. In this study, an inductive-qualitative approach was done to validate the proposed model using the influential arguments rather than throughout continual hypothesis testing.

**Figure 1** The conceptual framework




*Source:* Adopted from Subiyakto and Ahlan (2013)

**Figure 2** The research model (see online version for colours)

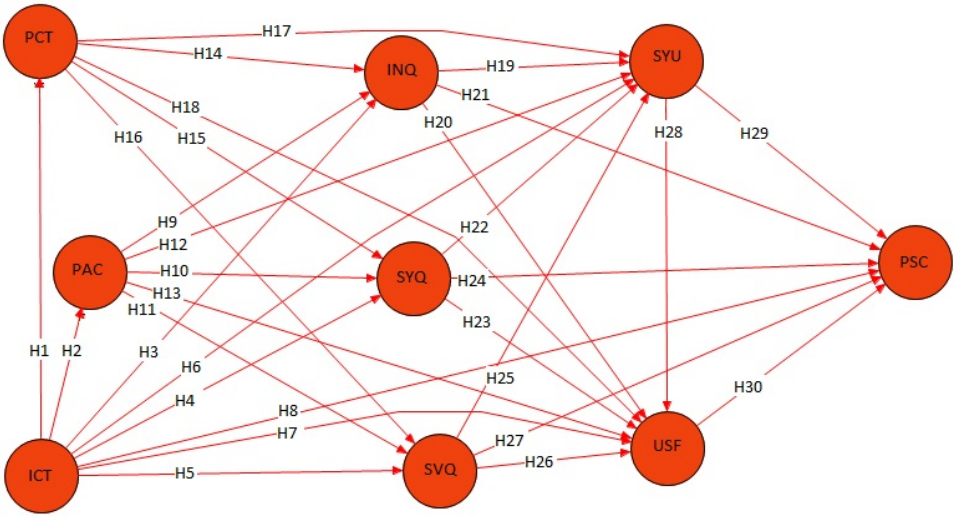


**Figure 3** The critical study of the processional and causal model

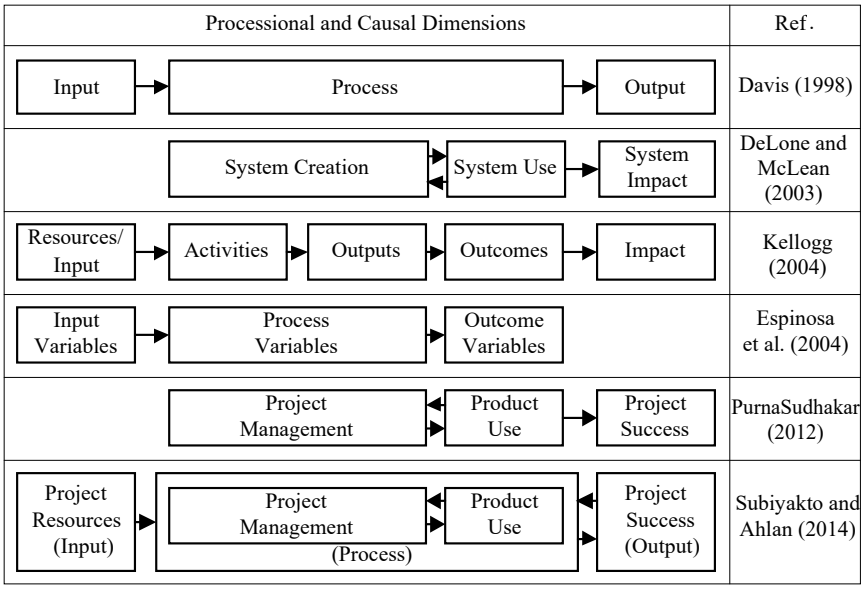



**Table 1** References of the indicators

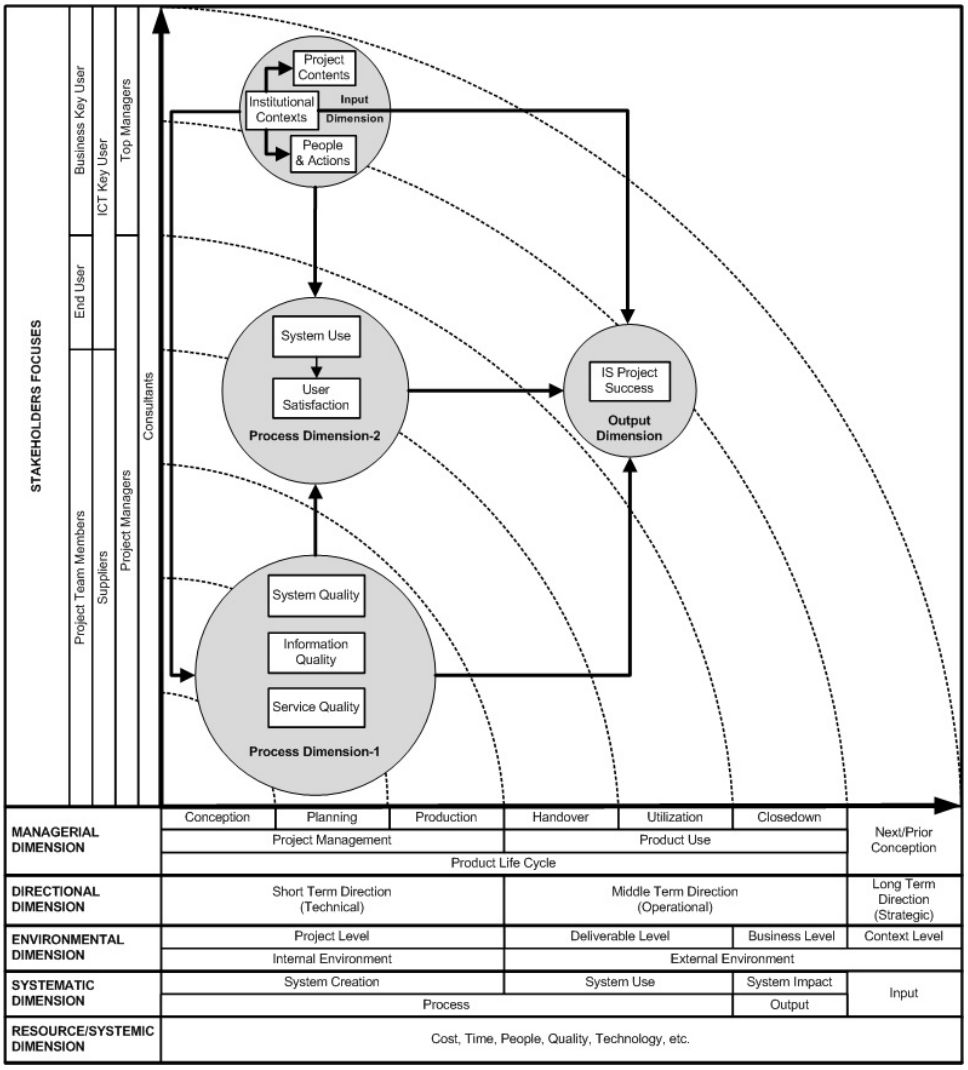
| *Code* | *Indicators* | *References* |
|---|---|---|
| PCT1 | Project size | McLeod and MacDonell (2011), McLeod et al. (2012) and Parthasarathy (2012) |
| PCT2 | Project complexity | |
| PCT3 | Resources availability | |
| PCT4 | Technology development | |
| PCT5 | Data quality | |
| PAC1 | Professionalism | McLeod and MacDonell (2011), Randeree and Faramawy (2011) and Liu et al. (2011) |
| PAC2 | Integrity | |
| PAC3 | Norms | |
| PAC4 | Clarity of the project structure | |
| PAC5 | Conflict management | |
| ICT1 | Organisational cultures | McLeod and MacDonell (2011), Nasir and Sahibuddin (2011), PurnaSudhakar (2012) and Hussein and Klakegg (2014) |
| ICT2 | Organisational policies | |
| ICT3 | Organisational experiences | |
| ICT4 | Legacies sys. and infrastructure | |
| ICT5 | External context | |
| INQ1 | Accuracy | DeLone and McLean (2003) and Petter et al. (2008) |
| INQ2 | Timeliness | |
| INQ3 | Completeness | |
| INQ4 | Relevance | |
| INQ5 | Consistency | |

**Table 1** References of the indicators (continued)

| *Code* | *Indicators* | *References* |
|---|---|---|
| SYQ1 | Ease-of-use | DeLone and McLean (2003) and Petter et al. (2008) |
| SYQ2 | Maintainability | |
| SYQ3 | Response time | |
| SYQ4 | Functionality | |
| SYQ5 | Reliability | |
| SYQ6 | Flexibility | |
| SVQ1 | Assurance | DeLone and McLean (2003), Ghapanchi and Aurum (2011) and Xu et al. (2014) |
| SVQ2 | Empathy | |
| SVQ3 | Responsiveness | |
| SVQ4 | Flexibility | |
| SVQ5 | Interpersonal quality | |
| SVQ6 | Security | |
| SYU1 | Nature of use | DeLone and McLean (2003) and Petter et al. (2008) |
| SYU2 | Extent of use | |
| SYU3 | Intensity of use | |
| USF1 | Adequacy | DeLone and McLean (2003), Petter et al. (2008), Seddon and Kiev (2007) and Gable et al. (2008) |
| USF2 | Effectiveness | |
| USF3 | Efficiency | |
| USF4 | Overall satisfaction | |
| PSC1 | Resources savings | Jugdev and Muller (2005), Gable et al. (2008), McLeod et al. (2012), Ghapanchi and Aurum (2012) and Goyal (2012) |
| PSC2 | Managerial effectiveness | |
| PSC3 | Productivity improvement | |
| PSC4 | Customer satisfaction | |
| PSC5 | Competitive advantage | |

Besides, the qualitative validation was aimed to explore how the people perceive, feel, or view (Halkier, 2010; O'Neill, 2012; Arshad et al., 2013; Manian et al., 2014), the involvement of the participants was to ensure the data quality, especially related to their specific characteristics as the key informants (Frenk et al., 2011; Homburg et al., 2012; Beringer et al., 2013). The result revealed eight overarching themes in respect of the validity of the model and feasibility of the research implementation (Morgan, 2010; Wilson, 2012). The researchers then concluded this validation stage within four validation points, i.e., the clarity of the modelling process, the use of the theoretical bases, the reasonableness of the research method, and the availability of the research resources. Based on the learned points of this validation study, the scholars then revised the first model through simplifying the number of the relationship in the model with the six path deletions. Another refinement action, the scholars also reformulated the conceptual framework by accommodating the processional and causal model of the DeLone and McLean's (2003) model as the fifth dimension of the framework. In the graphical illustration, Figure 4 shows the integration of the model within the conceptual framework.

**Figure 4** The integration of the model within the conceptual framework

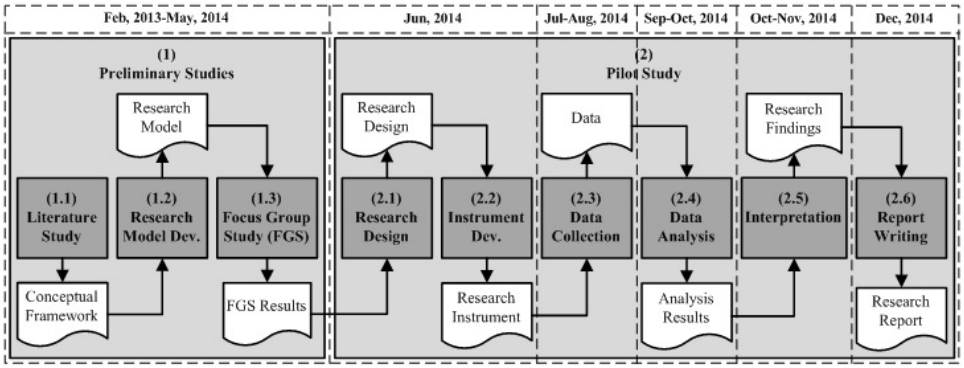



## 3 Research method

### *3.1 Research procedure*

Figure 5 shows the two main stages of the study, i.e., the preliminary studies and the pilot study. The preparatory works were aimed to develop the conceptual framework (Subiyakto and Ahlan, 2013) and the research model (Subiyakto and Ahlan, 2014), and to validate qualitatively the model. Specifically, this pilot study was carried out based on the recommendations of these prior studies for validating quantitatively the developed model.

**Figure 5** The research procedure




## *3.2 Population, sample and data collection procedure*

The population of this pilot study was the internal project stakeholders of the IS project in a higher education institution in Indonesia, i.e., top managers, business unit managers, IT unit managers, IT project managers, and project team members. These selected stakeholder types were chose referring the key informant aspects (Homburg et al., 2012; O'Neill, 2012; Beringer et al., 2013). 267 data were achieved from the institution and the purposive sampling technique based on the project experience ownership then was applied for selecting 130 (49%) respondents. Majority respondents (91.9%) were the university graduates and have experienced for fewer than ten years in the project works. The highest percentage of their job positions was as the project team members (58.1%). In the data collecting procedure, the electronic questionnaire version was sent into 90 e-mail addresses and its paper-based version into 40 certain participants with response rate around 48% (n = 62).

## *3.3 Research instruments and data analysis*

The instrument of this study was survey questionnaire using five-point Likert scale ranging from 'strongly disagree' to 'strongly agree' (Kaptein et al., 2010). Besides, the items were adopted and adapted from the previous studies (Table 1), this instrument was also assessed by involving five academicians who had skills, knowledge, and experience in the IS research fields and applying an unidimensionality procedure (Afthanorhan, 2013) to ensure its validity and reliability.

In the data analysis stage, the descriptive analysis was conducted to produce the demographic information to respond the first research objective and clarify the subsequent inferential findings. Meanwhile, the inferential mode was carried out using PLS-SEM with SmartPLS 2.0 to assess the measurement and structural models. The statistics software was used because of its powerful exploration and prediction with the small sample size (Henseler et al., 2009; Urbach and Ahlemann, 2010; Hair et al., 2011, 2012; Wong, 2013). The measurement model assessments consisted of the indicator reliability, internal consistency reliability, convergent validity, and discriminant validity evaluations to examine the outer model. In addition, the structural model assessments consisted of the path coefficient ($\beta$), coefficient of determination ($R^2$), t-test, effect size

($f^2$), predictive relevance ($Q^2$), and relative impact ($q^2$) examinations to evaluate the inner model.

## 4 The analysis results

### *4.1 The result of the descriptive analysis*

As can be seen in Table 2, the result of this analysis described that 41.9% of the respondents stated the projects were implemented for fulfilling the operational requirements, 71% of them described their institution had the IS strategic planning, 43.5% of these people declared the projects were conducted by the internal party, and with the internal funding (38.7%). Afterward, most respondents (80.7%) explained the percentage of the project success was large than 50%, even 33.9% of them stated that the success level was more than 75%.

**Table 2** The IS project profile

| *Measures* | *Items* | *%* |
|---|---|---|
| Development goals | Operational requirements | 41.9 |
| | Managerial requirements | 16.1 |
| | Strategic requirements | 17.7 |
| | Operational and managerial req. | 6.5 |
| | Operational and strategic req. | 8.1 |
| | Operational, managerial and strategic req. | 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 |
| Funding | 100% internal funding | 30.6 |
| | 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 result of the inferential analysis*

Table 3, Table 4, and Figure 6 represent graphically the two main results of this analysis.

**Table 3** Results of the measurement model assessments

| *Items* | *OL* | *Cross loadings* | | | | | | | | | *AVE* | *CR* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *ICT* | *INQ* | *PAC* | *PCT* | *PSC* | *SVQ* | *SYQ* | *SYU* | *USF* | | |
| ICT1* | | | | | | | | | | | 0.509 | 0.756 |
| ICT2 | 0.699 | 0.699 | 0.240 | 0.628 | 0.302 | 0.421 | 0.370 | 0.297 | 0.267 | 0.260 | | |
| ICT3 | 0.785 | 0.785 | 0.359 | 0.371 | 0.287 | 0.482 | 0.561 | 0.443 | 0.281 | 0.447 | | |
| ICT4* | | | | | | | | | | | | |
| ICT5 | 0.650 | 0.650 | 0.447 | 0.351 | 0.163 | 0.439 | 0.471 | 0.426 | 0.383 | 0.488 | | |
| INQ1 | 0.894 | 0.529 | 0.894 | 0.474 | 0.344 | 0.584 | 0.708 | 0.687 | 0.566 | 0.711 | 0.731 | 0.931 |
| INQ2 | 0.850 | 0.412 | 0.850 | 0.274 | 0.393 | 0.557 | 0.711 | 0.704 | 0.621 | 0.664 | | |
| INQ3 | 0.902 | 0.399 | 0.902 | 0.293 | 0.254 | 0.461 | 0.655 | 0.721 | 0.431 | 0.629 | | |
| INQ4 | 0.832 | 0.396 | 0.832 | 0.321 | 0.302 | 0.534 | 0.602 | 0.696 | 0.345 | 0.652 | | |
| INQ5 | 0.791 | 0.357 | 0.791 | 0.251 | 0.099 | 0.448 | 0.523 | 0.697 | 0.376 | 0.554 | | |
| PAC1 | 0.870 | 0.521 | 0.330 | 0.870 | 0.454 | 0.567 | 0.448 | 0.408 | 0.189 | 0.287 | 0.620 | 0.890 |
| PAC2 | 0.773 | 0.441 | 0.152 | 0.773 | 0.308 | 0.427 | 0.194 | 0.185 | –0.022 | 0.118 | | |
| PAC3 | 0.822 | 0.491 | 0.384 | 0.822 | 0.370 | 0.555 | 0.361 | 0.434 | 0.196 | 0.373 | | |
| PAC4 | 0.714 | 0.502 | 0.304 | 0.714 | 0.280 | 0.338 | 0.380 | 0.229 | 0.170 | 0.353 | | |
| PAC5 | 0.750 | 0.473 | 0.276 | 0.750 | 0.197 | 0.287 | 0.341 | 0.239 | 0.103 | 0.186 | | |
| PCT1* | | | | | | | | | | | 0.591 | 0.738 |
| PCT2* | | | | | | | | | | | | |
| PCT3 | 0.632 | 0.243 | 0.138 | 0.357 | 0.632 | 0.316 | 0.297 | 0.103 | 0.211 | 0.217 | | |
| PCT4* | | | | | | | | | | | | |
| PCT5 | 0.885 | 0.296 | 0.344 | 0.315 | 0.885 | 0.386 | 0.371 | 0.426 | 0.357 | 0.140 | | |
| PSC1 | 0.831 | 0.529 | 0.574 | 0.479 | 0.344 | 0.831 | 0.673 | 0.637 | 0.503 | 0.567 | 0.672 | 0.891 |
| PSC2 | 0.795 | 0.482 | 0.423 | 0.625 | 0.379 | 0.795 | 0.480 | 0.523 | 0.220 | 0.447 | | |
| PSC3 | 0.822 | 0.555 | 0.446 | 0.487 | 0.351 | 0.822 | 0.517 | 0.482 | 0.411 | 0.551 | | |
| PSC4 | 0.830 | 0.500 | 0.538 | 0.291 | 0.419 | 0.830 | 0.658 | 0.597 | 0.423 | 0.597 | | |
| PSC5* | | | | | | | | | | | | |
| SVQ1 | 0.823 | 0.554 | 0.641 | 0.528 | 0.393 | 0.582 | 0.823 | 0.631 | 0.417 | 0.569 | 0.681 | 0.914 |
| SVQ2 | 0.866 | 0.616 | 0.693 | 0.361 | 0.386 | 0.672 | 0.866 | 0.681 | 0.488 | 0.597 | | |
| SVQ3 | 0.776 | 0.446 | 0.633 | 0.214 | 0.292 | 0.626 | 0.776 | 0.746 | 0.560 | 0.715 | | |
| SVQ4 | 0.847 | 0.481 | 0.550 | 0.302 | 0.314 | 0.464 | 0.847 | 0.603 | 0.485 | 0.613 | | |
| SVQ5 | 0.810 | 0.627 | 0.588 | 0.475 | 0.402 | 0.596 | 0.810 | 0.547 | 0.418 | 0.655 | | |
| SVQ6 | | | | | | | | | | | | |

Note: *: deleted

**Table 3** Results of the measurement model assessments (continued)

| *Items* | *OL* | *Cross loadings* | | | | | | | | *AVE* | *CR* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *ICT* | *INQ* | *PAC* | *PCT* | *PSC* | *SVQ* | *SYQ* | *SYU* | *USF* | | |
| SYQ1 | 0.877 | 0.459 | 0.690 | 0.386 | 0.371 | 0.610 | 0.608 | 0.877 | 0.478 | 0.636 | 0.714 | 0.926 |
| SYQ2* | | | | | | | | | | | | |
| SYQ3 | 0.819 | 0.365 | 0.658 | 0.195 | 0.319 | 0.529 | 0.648 | 0.819 | 0.639 | 0.678 | | |
| SYQ4 | 0.805 | 0.454 | 0.685 | 0.364 | 0.352 | 0.578 | 0.607 | 0.805 | 0.488 | 0.557 | | |
| SYQ5 | 0.866 | 0.600 | 0.757 | 0.361 | 0.276 | 0.586 | 0.760 | 0.866 | 0.577 | 0.711 | | |
| SYQ6 | 0.854 | 0.440 | 0.657 | 0.385 | 0.320 | 0.603 | 0.662 | 0.854 | 0.473 | 0.668 | | |
| SYU1 | 0.820 | 0.368 | 0.391 | 0.178 | 0.235 | 0.394 | 0.364 | 0.412 | 0.820 | 0.397 | 0.688 | 0.868 |
| SYU2 | 0.892 | 0.372 | 0.569 | 0.040 | 0.366 | 0.445 | 0.586 | 0.646 | 0.892 | 0.540 | | |
| SYU3 | 0.771 | 0.356 | 0.399 | 0.279 | 0.338 | 0.358 | 0.450 | 0.473 | 0.771 | 0.414 | | |
| USF1* | | | | | | | | | | | 0.837 | 0.939 |
| USF2 | 0.935 | 0.475 | 0.669 | 0.255 | 0.130 | 0.587 | 0.697 | 0.660 | 0.493 | 0.935 | | |
| USF3 | 0.939 | 0.472 | 0.705 | 0.279 | 0.183 | 0.564 | 0.674 | 0.698 | 0.490 | 0.939 | | |
| USF4 | 0.870 | 0.602 | 0.697 | 0.429 | 0.267 | 0.662 | 0.725 | 0.753 | 0.527 | 0.870 | | |

Note: *: deleted

**Table 4** The discriminant validity assessment

| | *ICT* | *INQ* | *PAC* | *PCT* | *PSC* | *SVQ* | *SYQ* | *SYU* | *USF* |
|---|---|---|---|---|---|---|---|---|---|
| ICT | **0.713** | | | | | | | | |
| INQ | 0.496 | **0.855** | | | | | | | |
| PAC | 0.620 | 0.384 | **0.788** | | | | | | |
| PCT | 0.350 | 0.338 | 0.419 | **0.769** | | | | | |
| PSC | 0.630 | 0.610 | 0.564 | 0.455 | **0.820** | | | | |
| SVQ | 0.663 | 0.756 | 0.455 | 0.434 | 0.718 | **0.825** | | | |
| SYQ | 0.552 | 0.817 | 0.400 | 0.386 | 0.688 | 0.780 | **0.845** | | |
| SYU | 0.438 | 0.559 | 0.181 | 0.383 | 0.484 | 0.576 | 0.631 | **0.829** | |
| USF | 0.568 | 0.756 | 0.355 | 0.214 | 0.664 | 0.766 | 0.772 | 0.552 | **0.915** |

### *4.2.1 The result of the measurement model assessments*

The underlined information of these assessments described statistically that the outer model indicates a good psychometric properties with nine indicator rejections (ICT1, PCT1, PCT2, ICT4, PSC5, SVQ6, SYQ2, USF1, and PCT4). It was meant the assessments can be continued into the structural model assessments.

- *Indicator reliability* was evaluated by checking the relationships between the item indicators and their variables using threshold value of the item loadings (0.6), composite reliability (CR) of the variables (0.7) and comparison of the item cross loadings among the variables. The eight indicators (ICT1, PCT1, PCT2, ICT4, PSC5, SVQ6, SYQ2, and USF1) then were rejected based on the three parameters above.

- *Internal consistency realibility* was examined using CR with threshold values of 0.7 and above. The researchers preferred to use CR rather than Cronbach's alpha (CA) considering the CR assumption about the dissimilarity loadings of the indicators in the certain variable. Statistically, CR values of the variables reached the threshold value.
- *Convergent validity* was assessed with the average variance extracted (AVE) value by the limit value of 0.5 or above. According to this assessment, PCT4 then was rejected because its rejections affected the AVE value of its variable (PCT).
- *Discriminant validity* was tested through analysing the cross-loading procedure using the square root of the AVE to identify which a given variable is different from the others. Comparison of the AVEs was higher than their cross-loading values (Table 4).

### *4.2.2 The result of the structural model assessments*

The outcomes of these assessments revealed a similar tendency, whereas 10 of 30 $\beta$s were statistically in insignificant affects with rejections of their hypotheses; $f^2$ and $q^2$ of the paths were also in small influences (Figure 6 and Table 5).

- *B* was evaluated with threshold value of 0.1 or above to identify significance of the path influences in the model. The result presented that 10 of 30 paths have statistically the significant affects.
- $R^2$ was examined using the threshold values (approximately 0.670 substantial, around 0.333 moderate, about 0.190 and lower weak) to explain variances of the target endogenous variable. Figure 6 represents that ICT, INQ, SYQ, SVQ, SYU, and USF explained strongly (60%) variance of PSC.
- t-test was tested via bootstrapping method using two-tailed test (1.96) with significance level of 5%. The result presents 10 of 30 hypotheses were accepted in this examination.
- $f^2$ was assessed to predict influence of each variable toward another with threshold values of around 0.02 small, 0.15 medium, or 0.35 large influences. Table 5 represents only two paths with the large affects. The following formula was used in this assessment:

$$f^2 = \frac{R^2_{included} - R^2_{excluded}}{1 - R^2_{excluded}}.$$

- $Q^2$ was evaluated using blindfolding method to represent predictive relevance of the target endogenous variable with threshold value of above zero. Figure 7 shows overall $Q^2$ were predictive relevance.
- $q^2$ was tested via blindfolding method to measure relative impact of the predictive relevance using threshold values 0.02, 0.15, or 0.35 for small, medium or large effect size. Table 5 shows that only USF → PSC with the large effect size, ICT → PAC and ICT → SVQ with the medium effect size, and the rests (27) paths with the small effect sizes. The formula below was applied for achieving the result:

$$q^2 = \frac{Q^2_{included} - Q^2_{excluded}}{1 - Q^2_{excluded}}.$$

**Figure 6** Results of the SmartPLS analysis (see online version for colours)

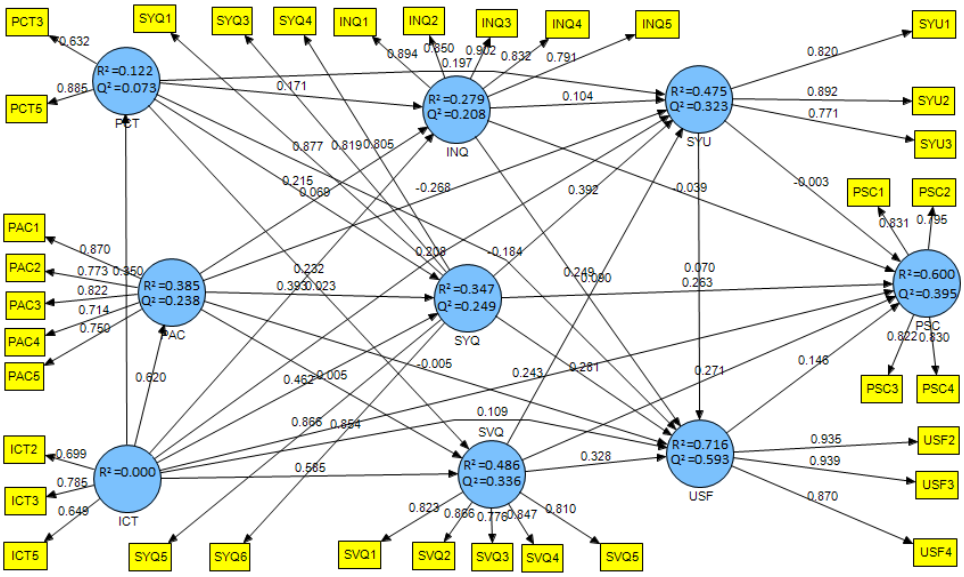



**Table 5** The structural model assessments

| *Hypothesis* | | $\beta$ | *t-test* | $R^2$-*ex* | $f^2$ | $Q^2$-*ex* | $q^2$ | *Analysis* | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *No.* | *Path* | | | | | | | $\beta$ | *t-test* | $f^2$ | $q^2$ |
| H1 | ICT → PCT | 0.350 | 2.507 | 0.000 | 0.139 | 0.000 | 0.079 | Sign | A | S | S |
| H2 | ICT → PAC | 0.620 | 6.491 | 0.000 | 0.626 | 0.000 | 0.312 | Sign | A | L | M |
| H3 | ICT → INQ | 0.393 | 2.335 | 0.191 | 0.122 | 0.114 | 0.118 | Sign | A | S | S |
| H4 | ICT → SYQ | 0.462 | 3.362 | 0.226 | 0.185 | 0.140 | 0.145 | Sign | A | M | S |
| H5 | ICT → SVQ | 0.585 | 4.432 | 0.284 | 0.393 | 0.202 | 0.201 | Sign | A | L | M |
| H6 | ICT → SYU | 0.208 | 1.083 | 0.456 | 0.036 | 0.290 | 0.049 | Sign | R | S | S |
| H7 | ICT → USF | 0.109 | 0.982 | 0.713 | 0.011 | 0.584 | 0.023 | Sign | R | S | S |
| H8 | ICT → PSC | 0.243 | 1.729 | 0.572 | 0.070 | 0.368 | 0.044 | Sign | A | S | S |
| H9 | PAC → INQ | 0.069 | 0.351 | 0.283 | –0.006 | 0.209 | –0.002 | Insign | R | S | S |
| H10 | PAC → SYQ | 0.023 | 0.116 | 0.353 | –0.009 | 0.249 | –0.001 | Insign | R | S | S |
| H11 | PAC → SVQ | –0.005 | 0.036 | 0.494 | –0.016 | 0.306 | 0.044 | Insign | R | S | S |
| H12 | PAC → SYU | –0.268 | 1.622 | 0.432 | 0.082 | 0.290 | 0.049 | Insign | R | S | S |
| H13 | PAC → USF | –0.006 | 0.042 | 0.716 | 0.000 | 0.579 | 0.035 | Insign | R | S | S |
| H14 | PCT → INQ | 0.171 | 1.269 | 0.257 | 0.031 | 0.188 | 0.025 | Sign | R | S | S |
| H15 | PCT → SYQ | 0.215 | 1.447 | 0.312 | 0.054 | 0.219 | 0.039 | Sign | R | S | S |
| H16 | PCT → SVQ | 0.232 | 2.155 | 0.444 | 0.082 | 0.303 | 0.049 | Sign | A | S | S |

Notes: S: small; M: medium; L: large; A: accepted; R: rejected.

**Table 5** The structural model assessments (continued)

| *Hypothesis* | | $\beta$ | *t-test* | $R^2$-*ex* | $f^2$ | $Q^2$-*ex* | $q^2$ | *Analysis* | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *No.* | *Path* | | | | | | | $\beta$ | *t-test* | $f^2$ | $q^2$ |
| H17 | PCT → SYU | 0.197 | 1.612 | 0.445 | 0.057 | 0.299 | 0.035 | Sign | R | S | S |
| H18 | PCT → USF | –0.184 | 1.569 | 0.693 | 0.081 | 0.593 | 0.000 | Insign | R | S | S |
| H19 | INQ → SYU | 0.104 | 0.471 | 0.473 | 0.004 | 0.317 | 0.009 | Sign | R | S | S |
| H20 | INQ → USF | 0.249 | 1.797 | 0.696 | 0.070 | 0.552 | 0.101 | Sign | A | S | S |
| H21 | INQ → PSC | –0.039 | 0.214 | 0.600 | 0.000 | 0.400 | –0.009 | Insign | R | S | S |
| H22 | SYQ → SYU | 0.392 | 1.678 | 0.434 | 0.078 | 0.291 | 0.047 | Sign | A | S | S |
| H23 | SYQ → USF | 0.281 | 1.496 | 0.693 | 0.081 | 0.551 | 0.104 | Sign | R | S | S |
| H24 | SYQ → PSC | 0.263 | 1.253 | 0.585 | 0.038 | 0.376 | 0.030 | Sign | R | S | S |
| H25 | SVQ → SYU | 0.090 | 0.354 | 0.472 | 0.006 | 0.318 | 0.007 | Insign | R | S | S |
| H26 | SVQ → USF | 0.328 | 1.712 | 0.689 | 0.095 | 0.544 | 0.122 | Sign | A | S | S |
| H27 | SVQ → PSC | 0.271 | 1.616 | 0.580 | 0.050 | 0.388 | 0.011 | Sign | R | S | S |
| H28 | SYU → PSC | –0.003 | 0.024 | 0.601 | –0.003 | 0.395 | –0.001 | Insign | R | S | S |
| H29 | SYU → USF | 0.070 | 0.522 | 0.713 | 0.011 | 0.585 | 0.020 | Insign | R | S | S |
| H30 | USF → PSC | 0.146 | 0.776 | 0.595 | 0.013 | 0.393 | 0.393 | Sign | R | S | L |

Notes: S: small; M: medium; L: large; A: accepted; R: rejected.

## 5 Discussion

First, the underlined point of the descriptive analysis is that the IS project success level was at more than 50%, as it was described by the majority respondents (80.7%). Even, 33.9% of these internal stakeholders declared that the level was over than 75%. This is not a surprise phenomenon referring its implementation that was carried out within the IS strategic plan as it was explained by 71% of the responses. It is consistent with the previous project success theories (Wateridge, 1998; Jugdev and Muller, 2005) which indicated the project management performance and the product use affect the project success.

Second, in spite of the measurement model assessments represented statistically the good psychometric properties, but the nine rejections are needed to be considered. Besides, this may have not supported by the developed instrument and the collected data considering the information bias possibility (Malone et al., 2014), it might have also been trending the project implementation in the sampled institution. Therefore, it is recommended to focus and minimise this issue in the next study by increasing the sample size and analysing a systematic error.

Third, the similar tendency was found across the results of the four structural model assessments ($\beta$, t-test, $f^2$, $q^2$). The ten of the 30 paths had statistically insignificant effects in $\beta$ assessment and rejected in t-test examination, small predictive influences ($f^2$) and small relative impact of the predictive relevance ($q^2$), especially related to PAC and SYU variables.

In the PAC cases, there are inconsistencies with the processional and causal concepts of the McLeod and McDonell's (2011) framework as the bases of the model development. In addition, the SYU cases are inconsistent with the used IS success model (DeLone and McLean, 2003) It is not surprising to notice that why the majority respondents (80.7%) mentioned the project success level in only more than 50%. It is because the SYU issues may have affected the project success (Wateridge, 1998; Jugdev and Muller, 2005). This inconsistence may have dealt with the model development or the practical trend of the project implementation in the sampled institution.

## 6 Conclusions

The study demonstrates the continual research work from the preliminary studies until the pilot study. The preparatory works were carried out to develop the conceptual framework and model, and to validate qualitatively the model. Specifically, this pilot study explained the status of the IS project performance and its factors that influence the project success in the sampled institution. Besides, the findings can be considered quantitatively for refining the model; the serial validation also elucidates the highlight points of the mixed-methods, e.g., complementary, completeness, and comprehensiveness of the validation method.

In addition, despite the efforts were conducted to guard against it, there are two underlined limitations were inherent within this study. First, the findings should not be generalised into the other institution because the data is only from the sampled institution. The other data may be irrelevant from what was presented and discussed herein. Second, despite the involvement of the project stakeholder types was to get comprehensiveness of the study results in respect of the key informant aspects, the involvement might also be different from somewhat on certain issues presented in the instruments. Therefore, it was out of control for the possibility of such happening in this study.

Furthermore, there are two main learned points of the study. First, the project success status could be one of the practical consideration points for the policy-makers of the sampled institution regarding the availability of the strategic planning and the SYU issues in order to ensure performances of the upcoming projects. Second, the use of PAC could be rejected regarding its path insignificances, the hypotheses rejections, and the small size of its relative impacts and predictive relevancies in the future studies. Thus, the subsequent studies can adopt the findings, especially by reconsidering the study limitations.

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