

# Using PLS-SEM and Interpretative Analysis for Testing Questionnaire of The Success of Information Systems Strategic Planning Benefit Realization

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**Abstract.** The purpose of this study was to examine the ISSP (Information System Strategic Planning) questionnaire which was related to the factors that influence the success of ISSP, namely in terms of the realization of benefits, with the college population as an example of data collection. This test was carried out using PLS-SEM and interpretative analysis. PLS-SEM analysis is used to test the validity and reliability statistically of the 41 questions in the questionnaire. These statistical results are then used in interpretive analysis which will produce a justification to be taken into consideration in the better updating of the questionnaire. The results of these two analyzes have identified that 3 of the 41 questions recommended are omitted. The benefits of this study are input for other researchers in practical and methodological terms.

**Keywords:** ISSP questionnaire, PLS-SEM analysis, Interpretative analysis.

## 1 Introduction

Activity updating a questionnaire is a common activity carried out in research based on responsiveness and understanding of the respondents [1, 2]. Updating the questionnaire was carried out by testing the questionnaire [1, 3] which was important as an instrument to increase the sharpness of knowledge of an indicator in the model being tested. Questionnaire testing is done serially, namely by first using PLS-SEM analysis which is useful to assess statistical results which then need to be interpreted with interpretive analysis in order to get important recommendations [1, 4] on updating the questions in the questionnaire. The activities of these analyzes may be very familiar to expert researchers, but they are not easy for beginner researchers. Therefore, using serial PLS-SEM analysis then the interpretative analysis may still be expected [1, 2]. In addition, the interpretative analysis may have been used by researchers in various practical surveys, but the use of the second serial analysis of this data has not been clearly identified in various literature.

In this study aims to test the questionnaire factors that influence the success of ISSP related to the realization of the benefits. The initial research activities carried out were testing questionnaires with PLS-SEM analysis which would produce statistical results which then

became input into interpretive analysis whose output was in the form of justification in the form of recommendations for consideration in updating the questionnaire. The achievement of this study was guided by two research questions, namely:

SQ1: Does the questionnaire related to the factors that influence ISSP's success from the realization of benefits have good statistical results from PLS-SEM analysis?

SQ2: Have the statistical results justified the recommendations which are the interpretative results for updating the questionnaire?

The next explanation in this article is described in a number of points, namely a brief explanation of the literature, then an explanation of the models, indicators and questionnaire questions. In addition, it was continued with an explanation of the statistical results of the PLS-SEM analysis and also an explanation of the interpretative analysis that produced the justification of recommendations. The last of this article concludes with a conclusion.

## 2 Literature Review

The success of ISSP is shown in the realization of benefits in information system strategic planning [5, 6]. Studies that discuss the factors that influence the success of ISSP have long been discussed[7-9]. But it is still rare for ISSP research to focus on the realization of benefits. Realization of benefits from ISSP can be in the form of strategy alignment, planning effectiveness, capability for new opportunities, competitive advantage, and increased performance. In this study discussed the benefits realization model of ISSP (ISSPBRM) shown in Figure 1. This model consists of variables that appear in table 1 namely Product Quality, Planning System Quality, Service delivery Quality, culture, facilitator, use, satisfaction, and net benefits. Each variable has an indicator as shown in table 1. The questionnaire to be tested which appears in table 2 is actually derived from each indicator in each variable in the model.

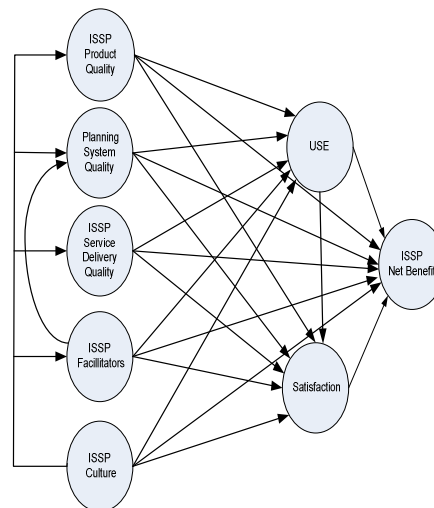


Figure 1. ISSPBRM

**Table 1.** Variables and Indicators of ISSPBRM

<b>Variables</b>	<b>Indicators</b>	<b>References</b>
ISSP Product Quality	Plans, IS/IT strategies, IS Demand Statement, Application Portfolio Availability, Roadmap	[10] [11] [12] [13] [14]
Planning System Quality	Flow, Formality, Comprehensiveness, Focus, Intensity, Participation, Horizon, BP-ISP Integration, Rational-Adaption	[15] [16] [17] [18] [19] [20] [21] [22] [8]
ISSP Service Delivery Quality	Reliability, Responsiveness, Assurance, Empathy, Service Recovery, Systematization of Service Delivery	[23] [24] [25] [26]
ISSP Facilitators	Top management participation and support, Active communication and knowledge-sharing between business and IT sectors, Consideration of internal and external environments, Appropriate resource allocation for undertaking ISSP exercise, Performing organizational learning	[27] [28]
ISSP Culture	Leadership, Strategy, Adaptability, Coordination, Relationship	[29] [30] [31] [17]
Use	Amount of use, Frequency of use, appropriateness of use, nature of use, the extent of use, The purpose of use.	[32] [33] [34] [35] [36] [6] [37] [1] [38] [39]
Satisfaction	Support provided to ISSP user, Fulfillment of ISSP user needs, A Useful Format of ISSP Product, Preciseness Information	[35] [36] [12] [2] [1, 40]
ISSP Net Benefit	Alignment, Effectiveness Flexibility, Competitive- advantage, Improved- performance, and Capability	[41] [42] [43] [36] [44] [13]

**Table 2.** Code and Questionnaire

<b>Code</b>	<b>Questionnaire</b>
IPQ1	Higher Education institutions have information system planning.
IPQ2	Higher Education institutions have an information system strategy /information technology strategy.
IPQ3	Higher Education institutions have links with application portfolios (notes on applications) as ISSP products.
IPQ4	Higher Education institutions have documents about information system requirements or information technology needs.
IPQ5	Higher Education institutions have the availability of an ISSP roadmap.
PSQ1	Higher Education institutions have the authority factor in planning strategic planning.
PSQ2	Planner (Planner) from ISSP in planning ISSP has an element of formality in strategic planning, where the planning process is constructed and structured

<b>Code</b>	<b>Questionnaire</b>
	with written, scheduled, and supported procedures by other documents, as well as making documentation resulting from the planning process.
PSQ3	The ISSP Planner has all the strategic alternatives.
PSQ4	The ISSP Planner has elements of efficiency and control of their planning process.
PSQ5	The ISSP planner has proof of the frequency and number of meetings in determining resources directed in planning commitments.
PSQ6	ISSP planners have documents about various individuals involved in strategic planning.
PSQ7	The ISSP planner has a document period of time considered in strategic planning.
PSQ8	ISSP Planner has a document about the existence of integration of BP-ISP (Business Planning - Information Strategic Planning) in their planning.
PSQ9	The ISSP Planner has a Rational-Adaptation document in their planning.
SDQ1	Higher Education institutions should have ISSP reliability /reliability documents.
SDQ2	Higher Education institutions should have documents on responses to ISSP.
SDQ3	Higher education institutions should have documents on collateral elements in the ISSP.
SDQ4	Higher education institutions should have an empathy document on ISSP.
SDQ5	Higher Education institutions should have ISSP service recovery documents.
SDQ6	Higher Education institutions should have documents about the ISSP service delivery system.
IFC1	Higher Education institutions should have documents on participation and support from Top Management in ISSP.
IFC2	Higher Education institutions should have documents on active communication and knowledge sharing between the business and IT sectors in the ISSP.
IFC3	Higher education institutions should have documents of consideration from the internal and external environment in the ISSP.
IFC4	Higher Education institutions should have suitable resource allocation documents to deal with ISSP implementation.
IFC5	Higher Education institutions should have documents on organizational learning within the ISSP.
CUL1	ISSP should document the clarity of the influence of strategic direction in leadership abilities.
CUL2	ISSP should have relationship factors with organizations that have clarity about strategic direction.
CUL3	ISSP should have factors related to the organization's ability to maintain contact with and responsive to change.
CUL4	ISSP should have factors related to system alignment or adjustment in organizations both horizontally and vertically.
CUL5	ISSP should have factors related to the ability of humans and their teams within the organization to work together.
USE1	The use of ISSP should have factors related to the number of uses of ISSP.
USE2	The use of the ISSP should have a relationship with the frequency of using ISSP.
USE3	The use of ISSP has factors related to compatibility in the use of ISSP.
USE4	The use of ISSP should have factors related to the naturalness of using ISSP.
USE5	The use of ISSP has factors associated with expanding the use of ISSP.
USE6	The use of ISSP should have factors related to the purpose of using ISSP.

Code	Questionnaire
SAT1	Higher Education institutions should have ISSP satisfaction documents that can be assessed with the degree of support provided to ISSP users.
SAT2	Higher Education institutions should have ISSP satisfaction documents that can be assessed in terms of meeting the needs of ISSP users.
SAT3	Higher Education institutions should have documents with important formats in ISSP products.
SAT4	Higher Education institutions should have documents about precise information in ISSP.
BEN	ISSP has a net benefit that contains success factors such as good alignment between planning and information systems, effectiveness, flexibility, competitive advantage, increased performance, and capability.

### 3 Research Methods

The following in Figure 2 shows the stages of the study which consist of 5 stages of research. The first stage of P1 is the Assessment Planning, a stage that emphasizes the planning activities of the assessment of the questionnaire to be tested. The results of this stage are the assessment plan.

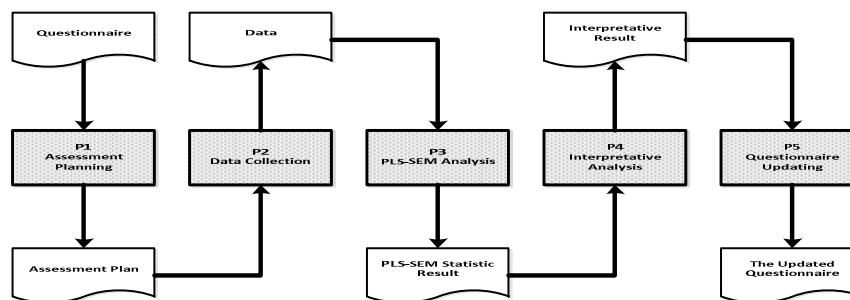


Figure 2. Stages of research

The second stage P2 emphasizes the collection of selected data based on the results of the assessment plan document. Data tested 41 questionnaire questions as many as 33 respondents. Data is collected using Google Form which is distributed to 80 respondents via the WhatsApp application. The respondents' data collected were then recorded with Microsoft Excel. Data from the second stage is then used as input in the third activity of P3, namely PLS-SEM analysis which produces statistical information about the test indicators, reliability and validity [45-49]. Stage P4 conducts interpretative analysis activities that produce important justifications related to testing the questionnaire[50-52]. Stage P5 is a questionnaire renewal activity to get a better questionnaire than the previous questionnaire[53].

## 4 Results and Discussion

### 4.1 Information Related to Demography

Respondent population characteristics related to filling in questionnaires are shown in table 3, which consists of education, job level, ISSP Planner, The length of ownership of ISSP and Territory.

**Table 3.** Respondent's Demographics

Characteristics	Group	Number of Respondents	Percentage
Education	Ph.D.	4	12
	Master	29	88
	Bachelor	0	0
	Diploma	0	0
Job Level	Top Management	10	30.30
	Middle to low Management	12	36.36
	Lecturer	11	33.33
	IT Staff	0	0
ISSP Planner	Yes	11	33.33
	No	22	66.67
The length of ownership of ISSP	< 2 years	11	33.33
	2– 5 years	9	27.27
	5– 10 years	9	27.27
	>10 years	4	12.12
Territory	Jakarta	19	57.57
	Tangerang	1	3.03
	Yogyakarta	1	3.03
	Makassar	2	6.06
	Bandung	1	3.03
	Sumedang	3	9.09
	Kuningan	5	15.15
	Rokan Hulu	1	3.03

The demographic information of the respondents showed a positive side in the study even though there was little to be improved. Education from respondents is spread at the Masters and Ph.D. levels, which will provide a level of confidence in the results of the study. This level of trust is also enlarged by the even distribution of the job level, which is about 30 percent for top management, middle to low management and lecturers. The population in this job level consists of ISSP Planner respondents which show 50 percent of the respondents who are not ISSP Planners, namely ISSP users, and ISSP Experts. Regarding the characteristics of the length of ownership of ISSP, it has been seen that around 70 percent indicate > 2 years and the rest is still around 30 percent indicating <2 years. However, there is a slight weakness of the respondent population, namely Territory characteristics due to the limited distribution of questionnaires to areas that are not on target. Related to territory characteristics shows that the largest distribution of respondent populations still exists in two provinces, namely Jakarta, around 57 percent and West Java, around 27 percent, the rest spread to Yogyakarta, Riau and Makassar provinces.

Although there are weaknesses in the demographic information of respondents regarding the territory, information regarding the demographic characteristics of respondents may be

consistent with the reality of the factors that influence the success of ISSP. On the basis of estimation aspects[54], where consistency can still be used to estimate research findings. It can be believed that consistency provides a representation of the real conditions of an object of research so that it can predict predictions regarding validity and reliability. So there is no doubt to recommend examining this research sample for research.

## 4.2 PLS-SEM Analysis

PLS-SEM analysis activities in this study produce statistical values to check the reliability of indicators, consistency of reliability, convergent validity, and discriminant validity[45-49].

Reliability testing of indicators using outer loading and cross loading is shown in table 4, which shows that the indicators of IFC1, PSQ1 and USE4 have values less than 0.7 (visible on shaded table cells), so that this indicator can be removed. However, because this research is an early stage of the measurement scale, these three indicators, which are between 0.5 and 0.6, can be considered sufficient [55] and need not be eliminated.

**Table 4.** Reliability Indicator Testing Results

Variables	Indicators	Outer Loadings	Cross Loadings							
			BEN	CUL	IFC	IPQ	PSQ	SAT	SDQ	USE
BEN	BEN	1.000	1.000	0.598	0.644	0.503	0.597	0.561	0.537	0.677
CUL	CUL1	0.814	0.562	0.814	0.781	0.381	0.492	0.449	0.703	0.572
	CUL2	0.913	0.544	0.913	0.703	0.312	0.530	0.513	0.685	0.549
	CUL3	0.873	0.490	0.873	0.588	0.270	0.417	0.486	0.573	0.511
	CUL4	0.931	0.576	0.931	0.665	0.401	0.497	0.583	0.666	0.511
	CUL5	0.867	0.455	0.867	0.650	0.397	0.532	0.742	0.781	0.637
IFC	IFC1	0.591	0.325	0.423	0.591	0.343	0.445	0.339	0.599	0.300
	IFC2	0.887	0.467	0.643	0.887	0.454	0.518	0.619	0.611	0.628
	IFC3	0.791	0.607	0.555	0.791	0.365	0.421	0.531	0.593	0.604
	IFC4	0.855	0.551	0.585	0.855	0.362	0.384	0.380	0.594	0.487
	IFC5	0.889	0.612	0.837	0.889	0.429	0.614	0.702	0.762	0.724
IPQ	IPQ1	0.900	0.370	0.357	0.380	0.900	0.591	0.534	0.278	0.409
	IPQ2	0.837	0.406	0.338	0.394	0.837	0.562	0.495	0.332	0.440
	IPQ3	0.834	0.501	0.476	0.507	0.834	0.623	0.680	0.465	0.398
	IPQ4	0.784	0.520	0.170	0.403	0.784	0.610	0.448	0.284	0.354
	IPQ5	0.868	0.292	0.312	0.315	0.868	0.546	0.499	0.303	0.209
PSQ	PSQ1	0.562	0.374	0.341	0.382	0.641	0.562	0.429	0.259	0.335
	PSQ2	0.705	0.608	0.539	0.600	0.599	0.705	0.497	0.579	0.562
	PSQ3	0.796	0.497	0.418	0.422	0.578	0.796	0.566	0.405	0.388
	PSQ4	0.738	0.455	0.512	0.425	0.568	0.738	0.661	0.546	0.542
	PSQ5	0.842	0.398	0.332	0.403	0.414	0.842	0.413	0.395	0.458
	PSQ6	0.777	0.381	0.451	0.567	0.551	0.777	0.528	0.493	0.628
	PSQ7	0.881	0.416	0.449	0.500	0.600	0.881	0.610	0.441	0.489
	PSQ8	0.793	0.380	0.359	0.293	0.458	0.793	0.455	0.324	0.366
	PSQ9	0.869	0.599	0.464	0.481	0.446	0.869	0.513	0.455	0.454
SAT	SAT1	0.878	0.616	0.616	0.626	0.560	0.691	0.878	0.662	0.610
	SAT2	0.910	0.483	0.642	0.574	0.619	0.612	0.910	0.587	0.612
	SAT3	0.918	0.490	0.582	0.549	0.567	0.620	0.918	0.662	0.661
	SAT4	0.726	0.311	0.314	0.516	0.451	0.375	0.726	0.472	0.655

Variables	Indicators	Outer Loadings	Cross Loadings							
			BEN	CUL	IFC	IPQ	PSQ	SAT	SDQ	USE
SDQ	SDQ1	0.785	0.424	0.772	0.773	0.586	0.464	0.657	0.785	0.569
	SDQ2	0.815	0.467	0.556	0.731	0.371	0.407	0.487	0.815	0.535
	SDQ3	0.923	0.616	0.719	0.720	0.321	0.533	0.635	0.923	0.554
	SDQ4	0.815	0.381	0.610	0.626	0.182	0.448	0.601	0.815	0.550
	SDQ5	0.823	0.303	0.598	0.449	0.206	0.500	0.547	0.823	0.375
	SDQ6	0.901	0.490	0.665	0.616	0.333	0.460	0.582	0.901	0.460
USE	USE1	0.875	0.488	0.505	0.535	0.330	0.460	0.558	0.397	0.875
	USE2	0.849	0.455	0.592	0.614	0.418	0.550	0.674	0.465	0.849
	USE3	0.920	0.703	0.620	0.653	0.396	0.558	0.720	0.610	0.920
	USE4	0.576	0.261	0.322	0.327	0.265	0.373	0.342	0.444	0.576
	USE5	0.829	0.649	0.521	0.592	0.277	0.501	0.613	0.513	0.829
	USE6	0.871	0.666	0.536	0.686	0.470	0.590	0.639	0.573	0.871

Table 5 shows composite reliability and AVE data. Internal consistency reliability testing shows that composite reliability is above 0.7 in each construct, which means that all constructs can be relied on as a whole. Testing for convergent validity shows that the AVE value for each construct exceeds 0.5. In table 6 shows that discriminant validity testing has sufficient value according to the Fornell-Larcker Criterion rule for all indicators so that no indicator is omitted.

**Table 5.** Construct Reliability and Validity

	Composite Reliability	AVE (Average Variance Extracted)
BEN	1.000	1.000
CUL	0.945	0.775
IFC	0.904	0.657
IPQ	0.926	0.714
PSQ	0.932	0.607
SAT	0.919	0.742
SDQ	0.937	0.714
USE	0.928	0.685

**Table 6.** Results of Fornell-Larcker Criterion

	BEN	CUL	IFC	IPQ	PSQ	SAT	SDQ	USE
BEN	1.000							
CUL	0.598	0.880						
IFC	0.644	0.773	0.810					
IPQ	0.503	0.404	0.484	0.845				
PSQ	0.597	0.564	0.595	0.698	0.779			
SAT	0.561	0.636	0.659	0.641	0.678	0.861		
SDQ	0.537	0.781	0.781	0.403	0.573	0.697	0.845	
USE	0.677	0.635	0.704	0.438	0.617	0.732	0.606	0.828

### 4.3 Interpretative Analysis

Table 7 shows the recommendations for each indicator based on PLS-SEM analysis and interpretative analysis. PLS-SEM analysis is based on the results of the statistics described

previously which indicate that the approve for indicators that are in accordance with the model measurement rules relates to the reliability and validity of the indicators. There is another indication that is enough to be approved for indicators such as IFC1, PSQ1, and USE4 because the value is almost enough in the model measurement rules. The existence of interpretative analysis appears based on the results of the examination on PLS-SEM analysis. This analysis starts with an interpretive evaluation based on the response and cognition of the respondents. The results of this analysis indicate that all indicators indicate justification and recommend justify to be approved and updated the question. Specifically, recommendations, namely updated the question, are given for indicators such as IFC1, PSQ1, and USE4 because perhaps the current questions are not easily understood by respondents.

**Table 7.** Justifications and Recommendations

<b>Indicators</b>	<b>PLS-SEM Analysis</b>	<b>Interpretative Analysis</b>	<b>Recommendations</b>
BEN	Approved	Justified	Justify to be approved
CUL1	Approved	Justified	Justify to be approved
CUL2	Approved	Justified	Justify to be approved
CUL3	Approved	Justified	Justify to be approved
CUL4	Approved	Justified	Justify to be approved
CUL5	Approved	Justified	Justify to be approved
IFC1	Enough to be approved	Justified	Updated the question
IFC2	Approved	Justified	Justify to be approved
IFC3	Approved	Justified	Justify to be approved
IFC4	Approved	Justified	Justify to be approved
IFC5	Approved	Justified	Justify to be approved
IPQ1	Approved	Justified	Justify to be approved
IPQ2	Approved	Justified	Justify to be approved
IPQ3	Approved	Justified	Justify to be approved
IPQ4	Approved	Justified	Justify to be approved
IPQ5	Approved	Justified	Justify to be approved
PSQ1	Enough to be approved	Justified	Updated the question
PSQ2	Approved	Justified	Justify to be approved
PSQ3	Approved	Justified	Justify to be approved
PSQ4	Approved	Justified	Justify to be approved
PSQ5	Approved	Justified	Justify to be approved
PSQ6	Approved	Justified	Justify to be approved
PSQ7	Approved	Justified	Justify to be approved
PSQ8	Approved	Justified	Justify to be approved
PSQ9	Approved	Justified	Justify to be approved
SAT1	Approved	Justified	Justify to be approved
SAT2	Approved	Justified	Justify to be approved
SAT3	Approved	Justified	Justify to be approved
SAT4	Approved	Justified	Justify to be approved
SDQ1	Approved	Justified	Justify to be approved
SDQ2	Approved	Justified	Justify to be approved
SDQ3	Approved	Justified	Justify to be approved
SDQ4	Approved	Justified	Justify to be approved
SDQ5	Approved	Justified	Justify to be approved
SDQ6	Approved	Justified	Justify to be approved

Indicators	PLS-SEM Analysis	Interpretative Analysis	Recommendations
USE1	Approved	Justified	Justify to be approved
USE2	Approved	Justified	Justify to be approved
USE3	Approved	Justified	Justify to be approved
USE4	Enough to be approved	Justified	Updated the question
USE5	Approved	Justified	Justify to be approved
USE6	Approved	Justified	Justify to be approved

## 5 Conclusions

Research related to the testing of questionnaires is currently likely still attractive to information system researchers because it is an important part of the development of survey instruments. In addition, variations in the testing of the questionnaire are still very limited, so that the presence of research may still be very expected regarding testing the questionnaire. Therefore it is still possible to continue to carry out this research.

The testing of the questionnaire in this study aims to examine the reliability and validity of the indicators in the ISSPBRM, by applying PLS-SEM analysis and sequential interpretative analysis to obtain recommendations related to the questionnaire. The test results show that there are 3 questions (related to indicators of IFC1, PSQ1, and USE4) of the 41 questions in the questionnaire that need to be updated.

The findings in this study cannot be generalized to other parties because the testing of the questionnaire is only limited to the object of the questionnaire and the sample examined in this study alone. This finding might provide practical input for researchers in similar work both in utilizing recommendations for updating questionnaires.

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