

Measuring the Characteristics among Critical Success Factors of PPP Infrastructure Projects

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ABSTRACT

Private-Public Partnership (PPP) is an increasingly popular choice for policymakers in implementing critical public projects through the examination of essential factors of success of PPP and establishing an empirical model of PPP in the construction project in Malaysia. The PPP implementation model was hypothesised to investigate the measurements and dimensions of technology, Organisational, and project characteristics as critical success factors of PPP implementation. A quantitative methodology was employed to validate the measurements, hypothesis testing and validate a structural model of PPP implementation. A total of 238 respondents was involved in the survey of the hypothesised PPP model. SPSS version 22 as well as Analysis of Moment Variance (AMOS) software were employed to analyse the data gathered. Path analysis and mediated regression analysis of the structural equation model succeeded in determining the mediating effect of stakeholder and procurement on the relationship among critical success factors and PPP implementation. The overall results show a significant positive interaction of Organisational, technical, and project characteristics as essential factors of success on stakeholder and procurement as a mediator on the achievement of PPP implementation. This paper highlights not only the vital success factors for PPP but also offers a fundamental contribution model achieved through the empirical model of critical success factors and PPP implementation in the construction project in Malaysia. This study succeeds in establishing and validating a structural model of the PPP implementation model. The model contributes to the body of knowledge of PPP and benefits to practitioners as primary guidance on construction and business developments.

Keywords: *Public-private partnership, Construction industry, critical success factors, Measurements, and Dimensions.*

INTRODUCTION

The PPP is a common choice for policymakers to undertake significant projects in public works. It is a technique and framework for managing project management of infrastructures (Solla et al., 2019); however, faced with the dearth of government savings and where general inefficiency is to be combated. An example of that is the local private partnership in the Russian Federation and alteration of separate legislative acts (Berezin et al., 2018). In the end, PPP has a better value for investment from public sector services (Casady et al. 2019). The recent achievements with the PPP model in Hong

Kong, Singapore, Australia, UK, and other nations have made PPP increasingly popular in Malaysia. This research focuses on the findings of the recent PPP project survey in Malaysia on variables that are considered crucial to the PPP project's success. Recent work primarily has several aims. First, it analyses the importance of the results of the variables interpreted by the respondents. Second, the study looks at discrepancies in the awareness of the significance of output factors between the private and public sectors (Ismail, 2013). The previous study additionally indicated that the PPP method is gaining acceptance worldwide. Thus, few studies attempt to examine the operational and managerial dimensions of PPP from an accounting perspective

in the context of developed nations (Cheung et al., 2012). It is, therefore, opportune to discuss this area. Critical success factors are correlated with practical implications for a company that can support an organisation's functioning and longevity.

The concept of critical success factors (CSFs) was also developed (Joreskog, 1984). (Saraph et al., 1989, Saron et al., 2013), and it is seen CSFs as 'the critical areas of managerial planning and action that need to be implemented for success. It is centered on (Pfeffer and Sutton, 2000, Rockart, 1979. Schwandt, 1999) the comprehension of corporate executives strengthened by the awareness of CSFs about their processes to reduce the price of job failure. The notion of CSF is cutting through various fields of human activities (Ansarinejad et al., 2011), where process creation is needed.

Besides (Morledge and Owen 1999a, Morledge and Owen 1999b), the notion of CSFs was

MALAYSIAN MODEL OF PRIVATE FINANCE INITIATIVE (PFI)

Ismail and Azzahra Haris (2014) and Ismail and Rashid (2007) explain Malaysia's growing position for the private sector through both privatisation and PFI (Rashid, 2014). The latter issues are shifting responsibility for funding and maintaining a package of capital expenditure and utilities to the private sector including construction, management, repair, renovation, and replacing public sector (Alfen et al., 2009). The lease payment arrangement for PFI ventures would ensure a complete return on the concessionaire's capital investment costs consisting of repayment of expenditure and investment income. The properties and services will be returned to the public sector upon the expiry of the concession agreement (Muhammad and Johar, 2018). In Malaysia, through the selling of the equity process,

developed to define obvious vulnerabilities linked to the functional implementation of Rockart's method. However, it involves bias, subjectivity, human inability to interpret complex information, changes in the environment, generalisations, and imprecise definitions and qualitative outcome measures. This cycle of CSFs has been utilised as a control measure in many sectors. As a consequence, attempts to apply this same principle to construction management have been made. Cheung (2009) used 18 variables to analyse PPP opinions on CSFs. The elements were decomposed into five classes or factors that underlie them: stable macroeconomic environment, the shared responsibility between the public and private sector, effective and transparent procurement procedure, the firm social and political context, and reasonable government control.

the PPP projects have been introduced, identifying 52 projects with a worth of RM 62.7 billion. The government has set up RM20 billion facilitation funds to encourage the private sector to invest in PPPs. The information-sharing fund fills the feasibility gap for private investment in government-prioritised areas such as infrastructure, education, tourism, and health projects (Rashid, 2014). CSF rankings for the Malaysian PPP-housing project (Abdul-Aziz and Kassim, 2011; Muhammad and Johar, 2018) analysed the impact of 15 success factors on Malaysian PPP-housing delivery. The researchers noted that the seven most important factors have a significant impact on the progress of Malaysia's PPP council estate. The factors are 'action against the errant developer,' 'consistent control,' 'house buyer demand,' 'reputable developer,' 'solid and direct agreement,' 'constant contact,' and 'profit-sharing responsibility for developers' Table 1.

TABLE 1. Ranking of CFSs of PPP council estate in Malaysia

NO	Critical success factors	Ranking	Mean	N
1	Action against errant developers	1 st	4.5	14
2	Consistent monitoring	2 nd	4.47	19
3	House buyers' demand	3 rd	4.42	17
4	Refutable developer	4 th	4.41	17
5	Robust and clear agreement	5 th	4.31	16
6	Constant communication	6 th	4.24	17
7	Developer's profit-sharing accountability	7 th	4.23	13
8	Developer's social accountability	8 th	4.13	15
9	Public sector negotiating skills	9 th	4.12	17
10	Public sector adequate negotiation staff	10 th	4.11	17
11	Compatibility between partners	11 th	4.10	19
12	Realistic projection	12 th	4.06	18
13	Competition	13 th	4.00	16
14	Ample time to evaluate the proposal	14 th	3.88	17
15	Political influence	15 th	3.33	12

RESEARCH METHODOLOGY

The research relied on the questionnaire survey produced by Li et al. (2005) that was obtained from Cheung (2009) with permission. The questionnaire contains eight factors that lead to the success of the Public-Private Partnership (PPP) programs (Table

2). In particular, the reason for introducing specific success factors to those used in previous research. Cheung (2009) and Li et al. (2005) indicated that the factors found gained the industry recognition. Table 2 summarises the PPP Crucial Success Factors in Malaysia.

TABLE 2. List of critical success factors in PPP

No	Critical Success Factors	Source
1	Organisational	(Hodge and Greve, 2005, Khanom, 2010, Wettenhall, 2007)
2	Training	(Cenkier, 2011)
3	Top Management	(Azadegan et al., 2013)
4	Cost and Project	(Azadegan et al., 2013, Ismail, 2013, Ismail and Azzahra Haris, 2014, Ismail and Rashid, 2007, Ismail et al., 2009).
5	Time and Project	(Garland, 2009)
6	Technology	(Schwandt, 1999)
7	Stakeholder	(Al-Shareem et al., 2015, Kurniawan et al., 2014, Ogunsanmi, 2013)
8	Procurement	(Famakin, 2014, Trangkanont and Charoengam, 2014)

RESEARCH DESIGN

The research design is deemed highly significant in both data collection and analysis stages with a plan for achieving the objectives of the investigation (Oppenheim, 2000). The research design ought to contain clear goals obtained from the research questions. It should also identify the sources from which the researcher intends to collect data. The following series of rational decisions are involved in creating the research design: identifying the aim of the research whether it is preparatory, hypothesis testing or descriptive; identifying the type of investigation; deciding the extent of intervention by the researcher; identifying the study setting; deciding on measurement and measures; deciding on data analysis; data collection methods, time horizon; sampling design; and identifying the analysis unit. This study utilises a quantitative approach using the questionnaire for an investigation of the relationship among dimensions of PPP implementation. However, that provides an understanding of the current construction factors affecting the stakeholder and procurement as mediating variables among the sample under study. After the investigation has identified both the existence and characteristics of the elements, it determines the positive attributes that contribute to the successful implementation of PPP in the Malaysian construction industry.

QUANTITATIVE RESEARCH FRAMEWORK AND HYPOTHESIS

The survey and questionnaires have been widely used to measure the relationship between PPP factors, stakeholder, procurement, and the effect of PPP implementation. This survey data can be collected using various methods that are compiled in either a single fashion or in combinations. Considering all the theoretical underpinnings required for this research, the researcher has decided to use a survey method to effectively extrapolate information and analyse it against a given hypothesis based on PPP. Figure 1 and Table 3 present the research framework and hypothesis.

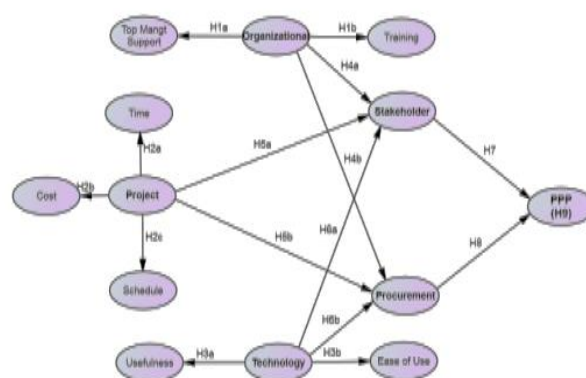


FIGURE 1. Research framework and hypothesis

TABLE 3. Research Hypothesis Pathway

Hypothesis	Statement	Pathway
Hy.1	Top management support and training confirm valid and significant measurements of an Organisational factor of PPP.	Positive
Hy.1a	Top management support confirms as a significant dimension of an Organisational factor.	Positive
Hy.1b	Training confirms as a significant dimension of an Organisational factor.	Positive
Hy.2	Time, cost, and schedule confirm valid and significant measurements of project factor of PPP.	Positive
Hy.2a	Time confirms as a significant dimension of the project factor.	Positive
Hy.2b	Cost confirms as a significant dimension of project factor.	Positive
Hy.2c	Schedule confirm as a significant dimension of the project factor.	Positive
Hy.3	Perceived usefulness and perceived ease of use confirm the as valid and significant measurement of a technological factor of PPP.	Positive
Hy.3a	Perceived usefulness confirms as a significant dimension of technological factor	Positive
Hy.3b	Perceived ease of use confirms as a significant dimension of technological factor	Positive
Hy.4a	Organisational factor has a direct positive significant influence on stakeholder.	Positive
Hy.4b	Organisational factor has a direct positive significant influence on procurement.	Positive
Hy.5a	The project factor has a direct positive significant influence on stakeholders.	Positive
Hy.5b	The project factor has a direct positive significant influence on procurement.	Positive
Hy.6a	The technology factor has a direct positive significant influence on stakeholders.	Positive
Hy.6b	The technology factor has a direct positive significant influence on procurement.	Positive
Hy.7	Stakeholder has a direct positive significant influence on PPP implementation.	Positive
Hy.8	Procurement has a direct positive significant influence on PPP implementation.	Positive
Hy.9	Organisational, project, and technological factors, mediated by stakeholder and procurement, have a significant interaction on PPP implementation in the valid structural PPP model.	Positive

FINDING AND DISCUSSION

In this section, the profiles analytic approach was utilised to study the mass of quantitative data, which was recorded over a period. In an attempt to provide meaning, order, and structure to the information, the investigators tried giving a thorough discussion of the analysis process. The data analysis assimilated the emergent themes and the reality of the phenomena investigated. This investigation is geared towards establishing the idea that data capture's form is essential via text. Most information was turned into a document which then served as the primary model for the interpretation of the object (Schwandt, 1999). As highlighted in the preceding section, the information was organised via various approaches in the final analysis. This version of information serves as the integral component of a procedure that involves the simultaneous and sequential recording and study of data (Creswell, 2002). Following that, all documented sources have undergone expansion on the data analysis approaches. This study applies to SPSS, Amos™ 22, and theory approach by Charmaz (2006) and Tosolini et al. (2014).

Instead of constructing a method, the goal was to provide a viable interpretation of the outcomes. The next sections describe the detailed steps of data analysis. The package connects the information to the specified model and generates results including parameter projections and overall model fit statistics. According to Byrne (2013) and

Byrne (2016), the analysis's input is a covariance matrix of measured variables including survey item scores. However, occasionally the models of covariance and means or patterns of correlations are utilised. In practice, SEM programmes with the necessary information provided by the data analyst transform this information into means and covariance to be used. As shown in Figure 2, the simple methodology in running an SEM analysis by Ferdinand (2002). The results feature the model's overall indices, standard errors, test statistics, and parameter projections for each free variable in the model. The SEM possesses some good merits to configure PPP and models of critical success factors (Ferdinand, 2002).

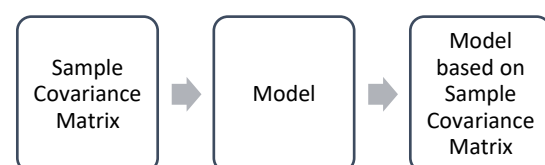


FIGURE 2. SEM Procedure (Byrne, 2001)

The model includes relationships among the measured variables. These relationships are then expressed as restrictions on the entire set of possible relationships in Figure 3.

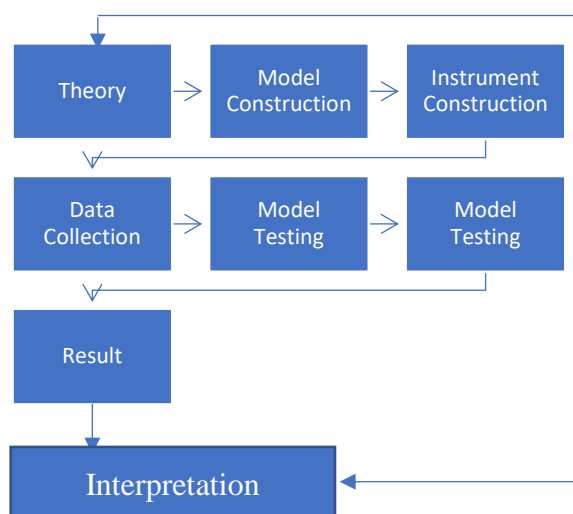


FIGURE 3. Flowchart of Covariance the Model

The overall model fits indices and parameter estimates, standard errors, and test statistics for each free parameter in the model. SEM design of PPP and vital success factor models have many attractive merits (Ferdinand, 2002).

SUMMARY OF PRELIMINARY RESULTS

Following the data analysis of actual data collection from 285 respondents, the multiple-item measures underwent a series of reliability and validity checks. The tests were all valid, internally consistent, unidimensional, and reliable. An oblique rotation (Direct Oblimin) procedure with PCA was utilised to generate the measures' dimensionality. The steps were all found to exhibit outstanding reliability with coefficient alpha within the range of 0.60 – 0.90. This particular range is within the scope of an acceptable level of 0.60. All the measures were unidimensional and passed a factor analysis with exceptional loadings (Sekaran and Bougie, 2016). All the rules were unidimensional, reliable, and valid. Their performance was also excellent and following the outcomes from the pilot test and pre-test.

CONFIRMATORY FACTOR ANALYSIS OF MEASUREMENTS

The measurement of the hypothesised in the structural model was confirmed via Structural

Equation Modelling. SEM is a statistical method that is capable of assimilating the structural model and measurement model or CFA into simultaneous statistical investigations (Byrne, 2013). SEM is especially vital in hypothesis testing and inferential data analysis, in which the pattern of inter-relationships between the constructs is assigned a priori and based on established theory (Byrne, 2002). It possessed the ability to model links among criterion parameters and multiple predictors as well as run statistical investigations on a priori theoretical assumptions against practical information via CFA (Sentosa and Mat, 2012). In this particular investigation, the measurements are compared with the hypothesis in the structural model using CFA.

CFA OF TOP MANAGEMENT SUPPORT (ORGANISATIONAL DIMENSIONS)

The confirmatory factor analysis (CFA) of the five items of (TSM) Top Management Support is presented in Table 4. Moreover, the result confirms that all five items are validated Figure 4. The estimation of factor loading for Management number one: "Top management provides sufficient resources for the implementation of public-private partnerships." is 0.690, which shows this item is validated. The significant level 0.000 proves that it is substantial. Management number two: "Top management provides stable funding for the implementation of public-private partnerships." is validated at the estimation of 0.881, and it is also significant. Management number three: "Top management regards the implementation of public, private partnerships as a high priority." It has an estimation of 0.819 and a significance level of 0.000, which confirms it is both validated and significant. Management number four: "Top management provides constructive feedback on the appropriateness of the implementation of public, private partnership" is verified at the level of 0.952, and it is also significant. Moreover, for the last item, Management number five, "Top management encourages the staff to participate in the implementation of public-private partnerships," the factor loading is 0.866, which confirms its validity, and due to its significance level 0.0000, it is also found significant.

TABLE 4: CFA Top Management Support

			Estimate	SE.	CR.	P
TMS1	<---	Management	0.690	0.100	11.770	0.000
TMS2	<---	Management	0.881	0.090	14.333	0.000
TMS3	<---	Management	0.819	0.110	11.777	0.000
TMS4	<---	Management	0.952	0.108	13.340	0.000
TMS5	<---	Management	0.866	0.111	12.397	0.000

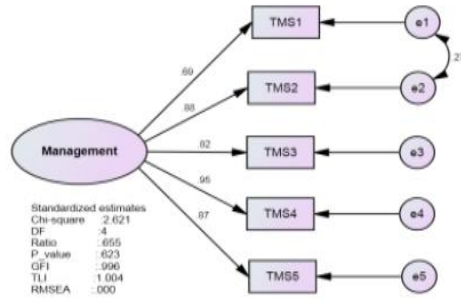


FIGURE 4. CFA of Top Management Support

Table 5 represents the goodness of the fit indexes of the Top Management Support. The ratio is less than 2 and having a value of 0.655 shows that the model is fit. The P-value is with a ratio of more than 0.05 and at 0.623 value, and GFI is more than 0.9. The value was 0.996, TLI with a ratio of more than 0.9 and a value of 1.004. Finally, RMSEA’s critical rate of less than 0.08, and the importance of 0.000 altogether confirms that the model of top management support is fit and significant.

TABLE 5. Goodness of Fit Index of CFA Top Management

Index	Critical Ratio	Value
Chi-Square		2.621
DF		4
Ratio	< 2	0.655
P-Value	> 0.05	0.623
GFI	> 0.9	0.996
TLI	> 0.9	1.004
RMSEA	< 0.08	0.000

CFA TRAINING (ORGANISATIONAL DIMENSIONS)

Table 6 shows the Confirmatory Factor Analysis (CFA) of the Training items. All the factors have been validated and significant in Figure 5. Item one, our Company provides internal training on public-private partnership activities, and it has a factor loading of 0.823 and a significant level of 0.000; hence, it is validated and significant. Item two: “Our Company provides clarity of staff role and objectives before training regarding public,

private partnership activities.” has the factor loading 0.823 and significance level of 0.000, which makes it both validated and significant. Moreover, the third item: “Our Company provides adequate course material during the training of public-private partnership activities.” has an estimation of 0.770 and a significance level of 0.000. This item is also both significant and validated. Item four: “Overall, I am satisfied with training sessions regarding public-private partnership activities” has factor loading of 0.791 and 0.000 level of significance, which again makes it both significant and validate.

TABLE 6. CFA Training

			Estimate	SE.	CR.	P
Training1	←-	Training	0.823	0.078	13.750	0.000
Training2	←-	Training	0.823	0.073	13.741	0.000
Training3	←-	Training	0.770	0.076	12.725	0.000
Training4	←-	Training	0.791	0.071	13.144	0.000

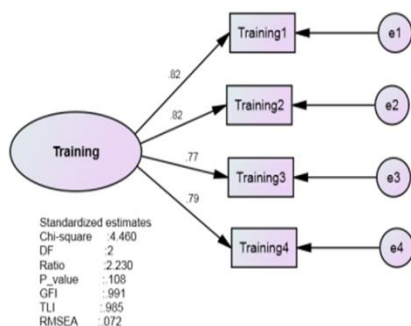


FIGURE 5. CFA Training

Table 7 highlights the goodness of the training suit indexes. The ratio is less than two, and the 2.230-value indicates that the model is close appropriate. The P-value with a ratio greater than 0.05 and a value of 0.108, GFI, more significant than 0.9 at the value was 0.991, TLI with a ratio greater than 0.9 and a value of 0.985. Finally, RMSEA’s critical ratio of less than 0.08 and the importance of 0.072 altogether confirm that the model of training is fit and significant.

TABLE 7. Goodness of Fit Index of CFA Training

Index	Critical Ratio	Value
Chi-Square		4.460
DF		2
Ratio	< 2	2.230
P-Value	> 0.05	0.108
GFI	> 0.9	0.991
TLI	> 0.9	0.985
RMSEA	< 0.08	0.072

CFA TECHNOLOGY SUPPORT

Table 8 shows the Confirmatory Factor Analysis (CFA) of the four items of Support. The result confirms that all four items are validated in Figure 6. The factor loading for item one: “Our Company provides guides from the technical centre for public-private partnership activities “is 0.799 at the significance level 0.000, which shows the first item is validated and is significant. The estimate for the second item: “Our Company assigns a specific

person (or group) for assistance with difficulties encountered public-private partnership activities.” is 0.709, and P is 0.000, which means this item is also validated and significant. For the third item: “Our company provides specialised and customised instructions concerning popular and useful public-private partnership activities.” the factor loading is (0.706), and P is 0.000, which makes this item validated and significant as well. Item number four: “Overall, I am satisfied with the performance of the technical centre regarding public-private partnership activities.” has an estimate of (0.552) and the P shows 0.000, which confirms this item to be validated and significant.

TABLE 8. CFA Support

			Estimate	SE.	CR.	P
Support1	<---	Support	0.799	0.100	9.500	0.000
Support2	<---	Support	0.709	0.097	9.498	0.000
Support3	<---	Support	0.706	0.096	9.476	0.000
Support4	<---	Support	0.552	0.102	7.620	0.000

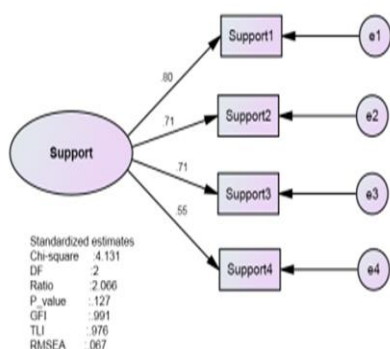


FIGURE 6. CFA Model of Technology Support

Table 9 shows the goodness of the Fit indexes of Support. The ratio is less than 2, and the value being 2.066 confirms that the model is fit. Also, the P-Value ratio more than 0.05, along with the Value 0.127, GFI more than 0.9, and its Value 0.991, TLI being more than 0.9 with the Value 0.976, and finally RMSEA being less than 0.08 with the Value 0.067 confirm that the model is fit and significant.

TABLE 9. Goodness of Fit Index of CFA Support

Index	Critical Ratio	Value
Chi-Square		4.131
DF		2
Ratio	< 2	2.066
P-Value	> 0.05	0.127
GFI	> 0.9	0.991
TLI	> 0.9	0.976
RMSEA	< 0.08	0.067

CFA USEFULNESS (TECHNOLOGY FACTORS)

Table 10 shows the Confirmatory Factor Analysis (CFA) of the four items of Perceived Usefulness Figure 7. The result confirms that the four items out of five are validated and significant. The factor loading for item one: “I feel using technology improves the quality of work of public-private partnership implementation” is 0.800, with P being 0.000, which makes the first item validated and

significant. Item two: “I feel using technology gives me greater control of public-private partnership implementation.” at the estimate of 0.703, and a significance level of 0.000 was validated and significant as well. Item three: “I feel technology enables me to do my job more quickly.” with a factor loading of 0.683, and the P 0.000 was confirmed to be validated and significant. Furthermore, item four: “I feel using technology enhances my effectiveness of public-private partnerships implementation.” with the factor loading of 0.676 and the P 0.000 was found validated and significant as well. One item was removed.

TABLE 10. CFA Usefulness

			Estimate	SE.	CR.	P
Usefulness1	<---	Usefulness	0.800	0.105	9.762	0.000
Usefulness2	<---	Usefulness	0.703	0.099	9.758	0.000
Usefulness3	<---	Usefulness	0.683	0.099	9.531	0.000
Usefulness4	<---	Usefulness	0.676	0.101	9.447	0.000

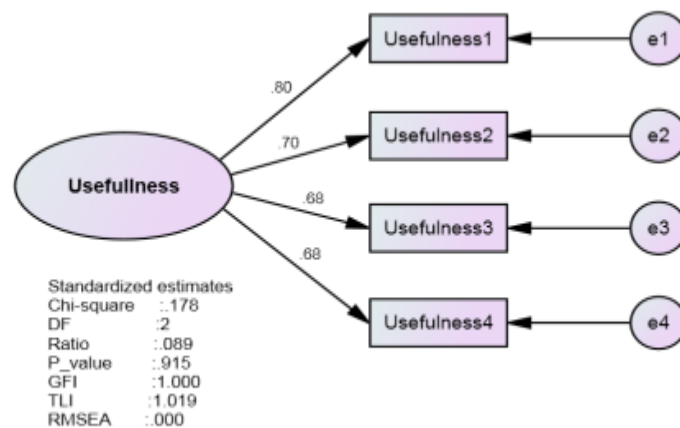


FIGURE 7. CFA Model of Usefulness

Table 11 shows the goodness of the fit indexes of Perceived Usefulness. The ratio is less than two and the value 0.089 demonstrates that the model is fit. The P-value with ratio more than 0.05 and value of 0.915, GFI with ratio more than 0.9 and value 1.000,

TLI with ratio more than 0.9 and the Value of 1.019 and RMSEA with the ratio of less than 0.08 and value of 0.000 confirm that model is fit with significant.

TABLE 11. Goodness of Fit Index of CFA Usefulness

Index	Critical Ratio	Value
Chi-Square		0.178
DF		2
Ratio	< 2	0.089
P-Value	> 0.05	0.915
GFI	> 0.9	1.000
TLI	> 0.9	1.019
RMSEA	< 0.08	0.000

CFA SCHEDULE (PROJECT CHARACTERISTIC DIMENSIONS)

Table 12 shows the Confirmatory Factor Analysis (CFA) of the five items of schedule. The result confirms that all five items are validated in **Figure 8**. The factor loading for item one: “the PPP project schedules were strictly adhered to” stands at 0.834 with the P 0.000, which confirms the validation and significance of the first item. For item two: “overtime is better at meeting PPP project cost,” the factor loading 0.811 and the P0.000 show that it is both validated and significant as well.

The factor loading for the third item: “PPP project rarely deviates from settle plans” is 0.865, with the P being 0.000, which confirms the significance and validation of the item. For the fourth item: the PPP project relaxes deadlines to meet schedules fully, the factor loading is 0.802, and the P is 0.000 proving it to be validated and significant. Finally, the factor loading is 0.778 for the last item “Overall project schedule performance was met based on baseline goals, targets, or expectations.” The significance level shows that this item is both validated and significant as well.

TABLE 12. CFA Schedule

			Estimate	SE.	CR.	P
Schedule1	<---	Schedule	0.834	0.072	14.620	0.000
Schedule2	<---	Schedule	0.811	0.068	14.616	0.000
Schedule3	<---	Schedule	0.865	0.065	16.048	0.000
Schedule4	<---	Schedule	0.802	0.068	14.380	0.000
Schedule5	<---	Schedule	0.778	0.070	13.749	0.000

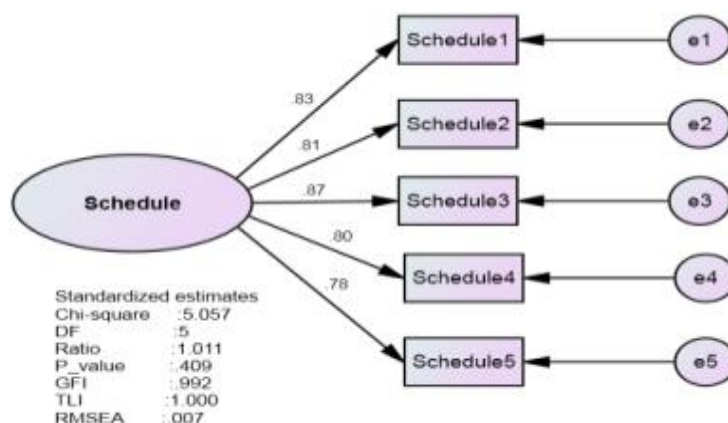


FIGURE 8. CFA Schedule

CFA COST (PROJECT CHARACTERISTIC DIMENSIONS)

Table 13 shows the Confirmatory Factor Analysis (CFA) of the six items of cost. The result confirms that all six items are validated in Figure 9. The

factor loading for item one: “Our Company insists on meeting PPP project cost” is 0.581, with the P being 0.000, which makes the item significant and validated. For item two: “Our company over time is getting better at meeting cost” the factor loading is

0.584 and the significance is 0.000, which confirms the validation and importance of it. The loading factor of item three: “Our Company takes corrective

action to control PPP project costs,” is 0.513, and the P is 0.000, which confirms its significance and validation.

TABLE 13. CFA Cost

			Estimate	SE.	CR.	P
Cost1	<---	Cost	0.581	0.165	6.442	0.000
Cost2	<---	Cost	0.584	0.167	6.439	0.000
Cost3	<---	Cost	0.513	0.166	5.895	0.000
Cost4	<---	Cost	0.554	0.173	6.224	0.000
Cost5	<---	Cost	0.603	0.170	6.568	0.000
Cost6	<---	Cost	0.659	0.187	6.907	0.000

Furthermore, the fourth item: “Our company evaluates suppliers/subcontractors of PPP projects based on how well they meet the agreed budget,” the factor loading is 0.554, with the P being 0.000 to confirm that this item is also validated and significant. The factor loading for item five: “Our company minimises the PPP project cost taking

precedence over other objectives” stands at 0.603 with the P 0.000, which confirms the validation and significance of the first item. In addition, for the last item: “Overall PPP project cost performance was met based on baseline goals, targets, or expectations,” the factor loading 0.659 and the P 0.000 show that it is both validated and significant.

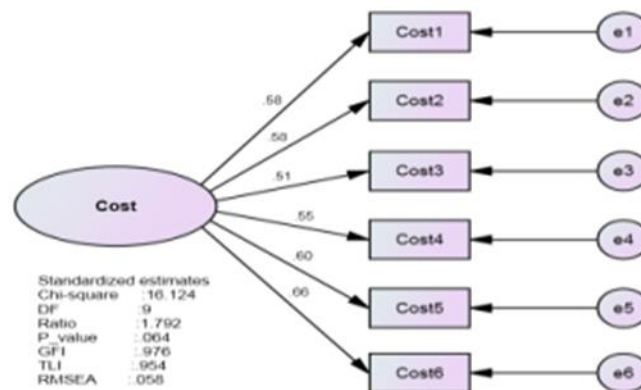


FIGURE 9. CFA Cost

Table 14 shows the goodness of the Fit indexes of cost. The ratio is less than two, and the value at 1.792 indicates that the model is fit. The P-value with ratio of more than 0.05 and at value 0.064, with GFI more than 0.9 at the value of 0.976, TLI with ratio of more

than 0.9 and the value of 0.954, and finally RMSEA’s critical ratio is less than 0.08 and the value of 0.058 confirms this model to be significant and fit.

TABLE 14. Goodness of Fit Index of CFA Cost

Index	Critical Ratio	Value
Chi-Square		16.124
DF		9
Ratio	< 2	1.792
P-Value	> 0.05	0.064
GFI	> 0.9	0.976
TLI	> 0.9	0.954
RMSEA	< 0.08	0.058

CFA TIME (PROJECT CHARACTERISTIC DIMENSIONS)

Table 15 shows the Confirmatory Factor Analysis (CFA) of the four items of Time to Use. The result

confirms that all four items are validated in Figure 10. The factor loading for item one, “Our company evaluates suppliers/subcontractors based on how well they meet schedules,” is 0.658, with P being 0.000, which confirms the validation and significance of this item. The factor loading for item two: “Our Company minimises the PPP project cost

taking precedence over other objectives” is 0.739 and the P being 0.000, again confirming that this item is validated and significant. Item three: “Our Company makes additional resources available to meet PPP project milestones and deadlines” have factor loading of 0.568, and the P is 0.000 making it validated and significant. Moreover, for the last item: “Our company takes corrective action to control progress against the PPP projects,” the factor loading is 0.689, and the P is 0.000 confirming it to be validated and significant.

TABLE 15. CFA Time

			Estimate	SE.	CR.	P
Time1	<---	Time	0.658	0.120	7.840	0.000
Time2	<---	Time	0.739	0.127	8.036	0.000
Time3	<---	Time	0.568	0.105	6.881	0.000
Time4	<---	Time	0.689	0.124	7.845	0.000

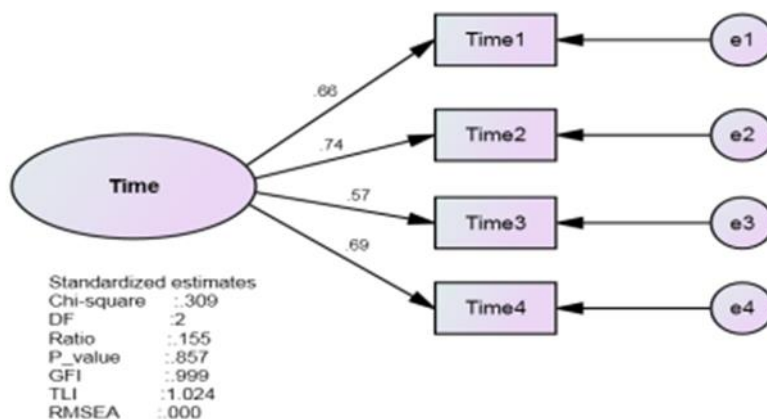


FIGURE 10. CFA Time

Table 16 shows the goodness of the Fit indexes of time. The ratio is less than 2, and the value is 0.155, which shows that the model is fit. Furthermore, the P-value with a ratio more than 0.05 and value of 0.857, the GFI with ratio of more than 0.9 and value more than 0.999, TLI with a ratio of more than 0.9 and value of 1.024, and RMSEA with a ratio less

than 0.08 and value of 0.000 confirm the model to be significant and fit.

TABLE 16. Goodness of Fit Index of CFA Time

Index	Critical Ratio	Value
Chi-Square		0.309
DF		2
Ratio	< 2	0.155
P-Value	➤ 0.05	0.857
GFI	➤ 0.9	0.999
TLI	➤ 0.9	1.024
RMSEA	< 0.08	0.000

CFA PROCUREMENT (MEDIATING VARIABLE)

Table 17 shows the Confirmatory Factor Analysis (CFA) of the six items of procurement, out of twelve Figure 11. The result confirms that only six of the items are validated and significant. Item one: “Briefing is a process, which should have a clear goal and objectives” was deleted. Item two,” An experienced person is needed to develop a brief.” was removed. Item three, “A brief needs to make clear what the end-user requirements were eliminated. Item four, “During the briefing, the process of devising a brief need to be agreed by the key parties,” was removed. Item five, “The public sector should lead throughout the briefing process, “was deleted.

Furthermore, item six, “Briefing should be allocated with adequate time,” was also deleted. The factor loading for item seven, “A consensus of the brief amongst the various” is 0.523, and the P is

0.000, which makes the item validated and significant. Item eight, “A consensus of the brief amongst the various stakeholders needs to be developed during the briefing process,” has the factor loading 0.742 and the P is 0.000, which means that it is both validated and significant. The estimate for item nine: “The key parties should agree on the priority of decision to be made in briefing” is 0.803 at the significance level 0.000, which confirms it to be validated and significant. Item ten: “A schedule should be set for completing the brief” has an estimate of 0.824 and P equal to 0.000, which makes it validated and significant. Item eleven, “Flexibility in briefs should be provided to cater for possible changes,” has an estimate of 0.816, therefore, approved, and P 0.000 makes it meaningful. Moreover, for the last item: “Decisions made should be recorded in detail,” the evaluation at 0.848 and P at 0.000 show the validation and significance of the item.

TABLE 17. CFA Procurement

			Estimate	SE.	CR.	P
Procurement7	<---	Procurement	.532	0.165	7.970	0.000
Procurement8	<---	Procurement	.742	.170	7.978	0.000
Procurement9	<---	Procurement	.803	.184	8.303	0.000
Procurement10	<---	Procurement	.824	.183	8.407	0.000
Procurement11	<---	Procurement	.816	.186	8.369	0.000
Procurement12	<---	Procurement	.848	.190	8.515	0.000

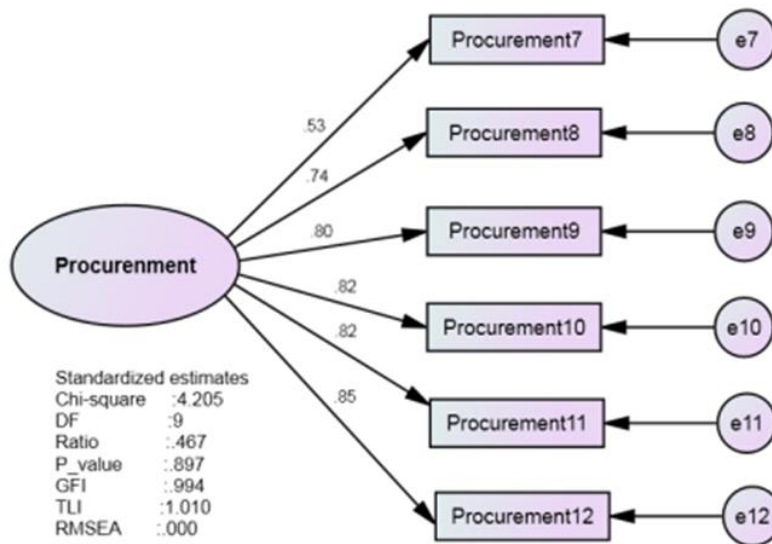


FIGURE 11. CFA Procurement

Table 18 represents the goodness of the Fit indexes of procurement. The ratio being less than two and having the value is 0.467 show that the model is fit.

The P-value with ratio of more than 0.05 and at 0.897 value, GFI more than 0.9 at the value 0.994, TLI with ratio more than 0.9, and the value 1.010 and

RMSEA being less than 0.08 and 0.000 confirm the model to be both fit and significant.

TABLE 18. Goodness of Fit Index of CFA Procurement

Index	Critical Ratio	Value
Chi-Square		4.205
DF		9
Ratio	< 2	0.467
P-Value	> 0.05	0.897
GFI	> 0.9	0.994
TLI	> 0.9	1.010
RMSEA	< 0.08	0.000

CFA STAKEHOLDER (MEDIATING VARIABLE)

Table 19 shows the Confirmatory Factor Analysis (CFA) of the 14 items of stakeholders. The result confirms that out of 14 items, only 8 of them are validated and significant. Thus, six items were removed. Item one: "The client should have related experience of briefing" was removed. Item two "The client needs a clear management organisation structure for a briefing," was removed. Finally, item six, "Good facilitation of briefing should be given to stakeholders," was also removed. The factor loading for item seven: "Briefing team needs proper participant selection" is 0.788, which shows this item is validated, and the significant level 0.000 proves that it is substantial. Item eight: "Roles of stakeholders should be clarified" is validated at the

estimation 0.760, and it is also significant. Item nine: "Briefing needs sufficient consultation with stakeholders" has an estimate of 0.735 and a significance level of 0.000, which confirms it is both validated and significant. Item ten: "Stakeholders' experience of attending briefing should be considered" is validated at level 0.783, and it is significant. Item eleven requires different stakeholders that need to be balanced" with factor loading 0.697 and Significance level 0.000 is both validated and significant. Item twelve, "Knowledge of consultants should be considered," has factor loading 0.768 and P 0.000, which show that it is approved and signed. Item thirteen, "Knowledge of statutory and concession period control of the project is needed in a briefing," is validated at 0.787 and significant as P is 0.000. Furthermore, in the end, item fourteen, "Team commitment should be clear," having factor loading 0.801 and P 0.000 is both valid and significant.

TABLE 19. CFA Stakeholders

			Estimate	SE.	CR.	P
Stakeholders7	<---	Stakeholders	0.788	0.075	12.565	0.000
Stakeholders8	<---	Stakeholders	0.760	0.080	12.569	0.000
Stakeholders9	<---	Stakeholders	0.735	0.084	12.058	0.000
Stakeholders10	<---	Stakeholders	0.783	0.083	13.051	0.000
Stakeholders11	<---	Stakeholders	0.697	0.081	11.312	0.000
Stakeholders12	<---	Stakeholders	0.768	0.086	12.744	0.000
Stakeholders13	<---	Stakeholders	0.787	0.079	13.130	0.000
Stakeholders14	<---	Stakeholders	0.801	0.086	13.441	0.000

Table 20 represents the goodness of the Fit indexes of stakeholders. The ratio of less than two and the value 0.356 show that the model is fit. The P-value with a ratio of more than 0.05 and at 0.996 value, GFI more than 0.9 at the value was 0.992, TLI with

ratio more than 0.9 and value of 1.017, and finally RMSEA's critical ratio less than 0.08 and the value of 0.000 altogether confirm that the model of stakeholder is significant and fit Figure 12.

TABLE 20. Goodness of Fit Index of CFA Stakeholders

Index	Critical Ratio	Value
Chi-Square		7.123
DF		20
Ratio	< 2	0.356
P-Value	➤ 0.05	0.996
GFI	➤ 0.9	0.992
TLI	➤ 0.9	1.017
RMSEA	< 0.08	0.000

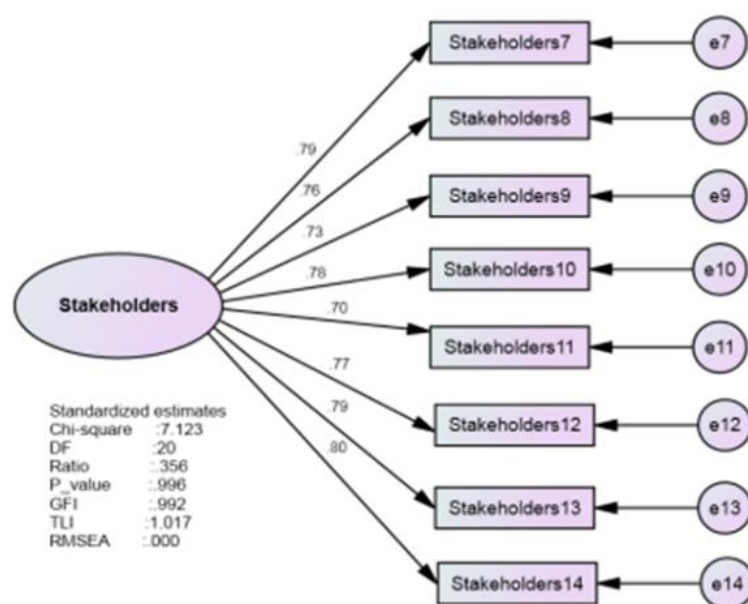


FIGURE 12. CFA Stakeholders

CFA PPP IMPLEMENTATION (DEPENDENT VARIABLE)

Table 21 represents the goodness of the Fit indexes of PPP Implementation. The ratio of less than two and the value 1.339 show that the model is fit. The P-value with a ratio of more than 0.05 and at 0.182 value, GFI more than 0.9 at the value 0.984, TLI with ratio more than 0.9 and value of 0.985, and finally RMSEA's critical ratio less than 0.08 and the

value of 0.041 altogether confirm that the model of PPP Implementation is significant and fit in Figure 13. Table 22 also approved an extensive factor loading of PPP implementation measurements with all estimate values more than 0.5 and P-Value for 0.000. this study confirmed, there is six valid and significant measurement of PPP implementation in the setting of the construction project.

TABLE 21. Goodness of Fit Index of CFA Success of PPP Implementation

Index	Critical Ratio	Value
Chi-Square		12.588
DF		9
Ratio	< 2	1.399
P-Value	➤ 0.05	0.182
GFI	➤ 0.9	0.984
TLI	➤ 0.9	0.985
RMSEA	< 0.08	0.041

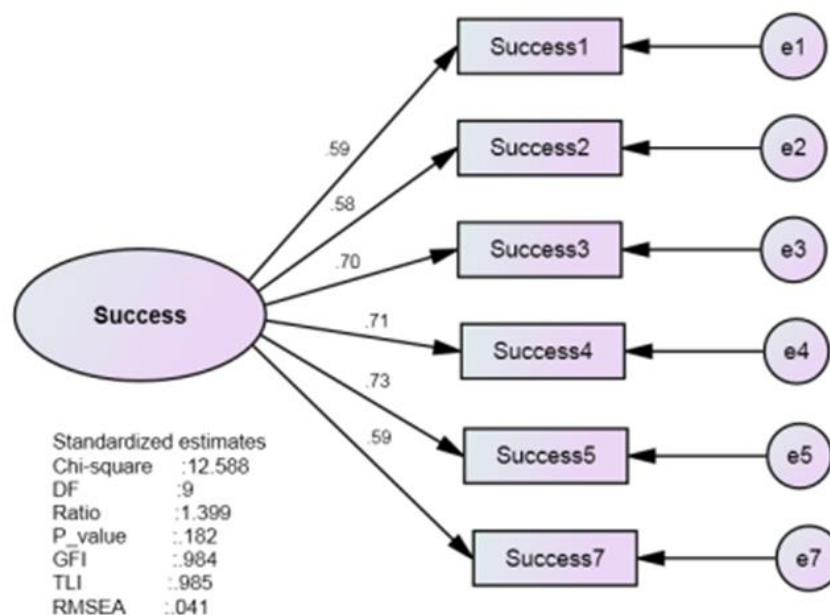


FIGURE 13. CFA Model of Success

TABLE 22. CFA Success of PPP Implementation

			Estimate	SE.	CR.	P
Success1	<---	Success	0.587	0.145	6.950	0.000
Success2	<---	Success	0.583	0.142	6.953	0.000
Success3	<---	Success	0.695	0.144	7.819	0.000
Success4	<---	Success	0.710	0.147	7.914	0.000
Success5	<---	Success	0.733	0.095	8.060	0.000
Success7	<---	Success	0.591	0.095	7.017	0.000

STRUCTURAL MODEL ANALYSIS AND RESULTS OF HYPOTHESIS TESTING

A confirmatory evaluation of construct validity was offered for the measurement model, which defines and checks the relationships between the metric measures and their underlying constructs (Bentler, 1990). Only the direct causal interaction between the latent constructs, as posited by the theory (Anderson, 1988), was conducted. The confirmatory analysis of each dimension was also conducted to confirm the items. The next procedure was drawing the 2nd order of the technology, organisational and project characteristics, which is the fundamental contribution of this study. To examine waiting time satisfaction is a mediating variable on the relationship between PPP success factors and PPP implementation, the indirect effect analysis was employed. The standardised factor loadings allow the researcher to arrange the order of entry of variables based on causal priority and is a useful tool for assessing interaction effects (Byrne B. M.,

2001). This procedure enables partitioning of the unique variance explained by the interaction term above and beyond those accounted by the main effects. In this study, all hypothesised relationships were supported based on the SEM results. The path estimates for the hypothesis testing in the model show that all two hypothesised relationships were positively related to customer satisfaction (H1 and H2). The empirical results for each hypothesis achieved the objectives of this study. The hypothesis testing was accomplished by examining the completely standardised parameter estimates, the critical ratio, and probability level. The two-tailed test of significance was used to determine the importance of each path coefficient shown in **Table 23**. The result indicates that the direct relationship and indirect relationship hypotheses were consistent with expectations and statistically significant in the path direction. The findings of the latent constructs of exogenous and mediating variables of the model are significantly related to the customer satisfaction shown in Table 24. Explicitly, all hypotheses are

supported. The SEM indicates that the two hypothesised paths in the theoretical model are at a significant level ($P < 0.05$) shown in Table 25. This

study confirmed a fundamental model of PPP implementation in the construction industry setting is achieved in Figure 14.

TABLE 23. CFA Generated Model for Variables

			Estimate	SE.	CR.	P
Procurement	<---	Characteristic	0.182	0.050	22.456	0.000
Stakeholders	<---	Characteristic	0.210	0.057	7.793	0.000
Procurement	<---	Organizational	0.077	0.087	16.846	0.000
Stakeholders	<---	Organizational	0.089	0.123	18.784	0.000
Procurement	<---	Technology	0.515	0.140	9.396	0.000
Stakeholders	<---	Technology	0.596	0.077	5.362	0.000
Schedule	<---	Characteristic	0.160	0.156	14.356	0.000
Cost	<---	Characteristic	0.155	0.036	15.340	0.000
Time	<---	Characteristic	0.214	0.049	15.130	0.000
TMS	<---	Organizational	0.054	0.058	22.440	0.000
Training	<---	Organizational	0.058	0.093	18.770	0.000
Support	<---	Technology	0.482	0.145	5.350	0.000
Usefulness	<---	Technology	0.634	0.157	9.385	0.000
PPP	<---	Stakeholders	0.424	0.138	22.467	0.000
PPP	<---	Procurement	0.491	0.192	16.840	0.000

TABLE 24. CFA Generated Model - Measurements

			Estimate	SE.	CR.	P
Training1	<---	Training	0.822	0.134	12.670	0.000
Training2	<---	Training	0.822	0.073	13.698	0.000
Training3	<---	Training	0.770	0.077	12.687	0.000
Training4	<---	Training	0.791	0.071	13.106	0.000
TMS2	<---	TMS	0.882	0.120	13.114	0.000
TMS3	<---	TMS	0.820	0.060	16.835	0.000
TMS4	<---	TMS	0.949	0.049	22.458	0.000
TMS5	<---	TMS	0.867	0.057	18.778	0.000
Support4	<---	Support	0.629	0.068	22.439	0.000
Support3	<---	Support	0.724	0.115	8.941	0.000
Support2	<---	Support	0.730	0.116	8.995	0.000
Support1	<---	Support	0.783	0.115	9.390	0.000
Usefulness4	<---	Usefulness	0.565	0.110	9.382	0.000
Usefulness3	<---	Usefulness	0.665	0.155	7.780	0.000
Usefulness2	<---	Usefulness	0.686	0.157	7.943	0.000
Usefulness1	<---	Usefulness	0.798	0.152	8.583	0.000
Time4	<---	Time	0.699	0.109	8.575	0.000
Time3	<---	Time	0.570	0.102	7.158	0.000
Time2	<---	Time	0.743	0.123	8.437	0.000
Time1	<---	Time	0.659	0.126	7.995	0.000
Cost6	<---	Cost	0.716	0.152	7.980	0.000
Cost5	<---	Cost	0.657	0.162	5.394	0.000
Cost4	<---	Cost	0.526	0.136	5.365	0.000
Schedule4	<---	Schedule	0.797	0.147	5.360	0.000
Schedule3	<---	Schedule	0.864	0.072	14.879	0.000
Schedule2	<---	Schedule	0.809	0.074	13.686	0.000
Schedule1	<---	Schedule	0.831	0.072	14.183	0.000

Continue ...

Continued

Schedule5	<---	Schedule	0.775	0.076	12.955	0.000
Procurement8	<---	Procurement	0.608	0.066	12.960	0.000
Procurement9	<---	Procurement	0.813	0.128	12.210	0.000
Procurement10	<---	Procurement	0.823	0.126	12.374	0.000
Procurement11	<---	Procurement	0.831	0.129	12.486	0.000
Procurement7	<---	Procurement	0.560	0.127	8.334	0.000
Stakeholders8	<---	Stakeholders	0.701	0.030	11.740	0.000
Stakeholders9	<---	Stakeholders	0.736	0.099	11.731	0.000
Stakeholders10	<---	Stakeholders	0.785	0.099	12.639	0.000
Stakeholders11	<---	Stakeholders	0.699	0.095	11.054	0.000
Stakeholders7	<---	Stakeholders	0.787	0.090	12.691	0.000
Procurement12	<---	Procurement	0.854	0.129	12.833	0.000
Stakeholders12	<---	Stakeholders	0.768	0.102	12.324	0.000
Stakeholders13	<---	Stakeholders	0.779	0.094	12.542	0.000
Stakeholders14	<---	Stakeholders	0.803	0.102	12.982	0.000

TABLE 25. Goodness of Fit Index of CFA Generated Model

Index	Critical Ratio	Value
Chi-Square		2718.625
DF		1172
Ratio	< 2	2.320
P-Value	> 0.05	0.000
GFI	> 0.9	0.732
TLI	> 0.9	0.776
RMSEA	< 0.08	0.075

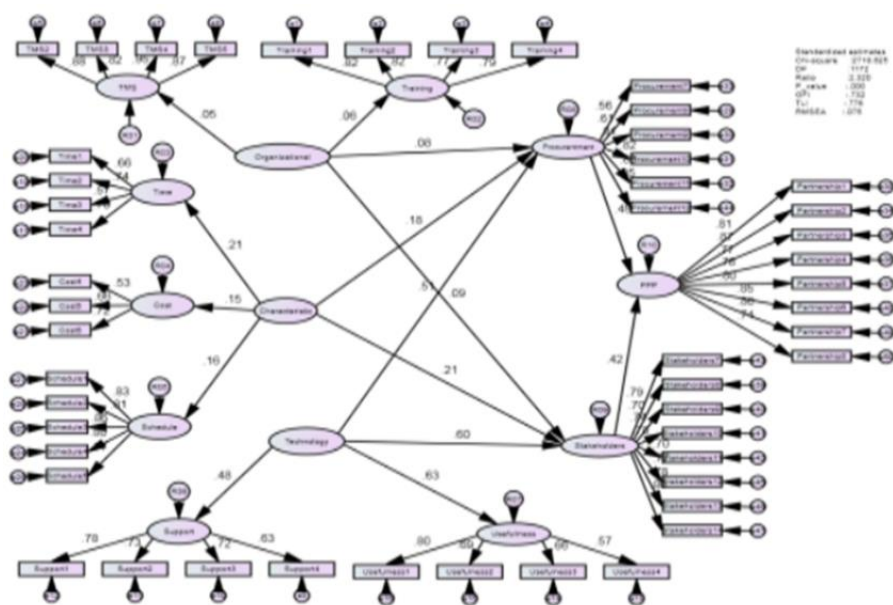


FIGURE 14. Generated Model of PPP Implementation

CONCLUSION

In this investigation, the hypothesised model was examined and confirmed using the Root-Mean Squared Error of Approximation (RMSEA). The RMSEA highlights the extent to which residuals in the model are dissimilar to zero. Models with RMSEA between 0.05 and 0.08 have a generous fit

to data. In contrast, models with RMSEA of fewer than 0.05 are considered as having a good fit. Besides, it was accepted that RMSEA values greater than 0.10 show a poor fit of the model to data, while RMSEA between 0.08 and 0.10 shows a mediocre fit.

The enormous level of factor-loading interactions that occur between all model variables

is a confirmation of the mediating impact of stakeholder and procurement on the link between PPP implementation, Organisational and project characteristics, and technology. Hypothesis testing and path analysis reflect the total of the indirect and direct impact of variable interactions and highlight the goodness of model fit of the model that was hypothesised. As hypothesised, there is a definite link between PPP implementation, stakeholder and procurement with the results of SEM in evaluating the validity of empirical relationships between constructs of PPP success factors. The dimensions of technology, Organisational and project characteristics were positively related to stakeholder and procurement. The procurement and stakeholder were confirmed as a medium on the link between PPP's implementation and success factors via a path and direct-indirect analysis, acquisition and stakeholder. As such, the current study's aims were reached. The following chapter further explores the impact of the results on practise, study's limitations and ideas for future research.

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DECLARATION OF COMPETING INTEREST

None

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