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Partial Least Square Structural Equation Modeling: An Approach to the Influence of Project Triple Constraint on Building Projects among Malaysian Construction Industries

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Abstract: *- The main goals were to examine a series of barriers that are related to the building projects; most of which are caused by the delay on time, cost overrun and poor quality of the projects. Aside from these, the lack of improvement and unplanned different kinds of the project triple constraint, time wasted on the projects and lack of cost estimation may be sometimes overestimated or underestimated; thus, resulting in the delay of building projects or incomplete task. Organizational control theory was used to develop the theoretical framework that investigated G-7 contractors operating in Malaysian construction industries. A review of relevant literature and questionnaire were adopted in order to identify the effects of project triple constraint (time, cost and quality) on the building projects situated in Kuantan Malaysia. An aggregate sample size of 62 was collected from 166 construction industries situated in Pahang Malaysia. In addition, a structural equation modeling approach was employed to examine the direct and the moderating relationship as drawn by the hypotheses. Moreover, with quantitative research design following positivist research paradigm, the methodology was designed to focus on the research questions and the objectives. The questionnaire was designed by using closed interval measurement scale with proper care taken in designing the survey instruments. SPSS 20.0 & SmartPLS 3 for structural equation modeling was utilized in confirming the hypotheses developed for the study.*

Keywords: *Project triple constraints, Organizational Control Theory, Time Management, Quality Management, Cost management, PLS-SEM.*

1.0 Introduction

Takim and Akiyonte, (2002) reported that managing the plan performance of the projects before starting the activities implies will help the managers and employees to forecast the outcome result of the construction. Managers and workers of the project work together to clarify their activities, how it will be done and identifying the hurdle barriers of the projects in order to seek answers from the project managers (Abdelnazer, 2012). Shahid (2014) suggested that the building project is a significant discipline in the construction industry. Construction projects entail a number of risks especially those that negatively have an impact on the objects such as time, cost and quality; building project and analysis also have a significant impact on the projects construction to achieve the set goal on the projects. Moreover, Dobson (2004) outlined that projects contain several challenges facing them; however, project triple constraint mostly depends on how to perform it. Typically, the increase or decrease in project capacity determine the improved outcomes of the building project and manager, and how to prevent poor quality towards project triple constraint (Abulhakim and Adeleke 2019; Adeleke et al., 2018).

Project managers must understand and focus on the factors needed to complete the projects as well as the deliverable time, budget and level of the quality require by the stakeholders. These dimensions are to be examined by the managers to analyse and evaluate the project (Greer, 2008). The construction industry needs to evaluate the intended building

risk encounters during the activities with a focus on project triple and how to manage the gap in the building construction assessments (Zavadskas et al., 2010).

Identifying the flexibility of the constraints associated with each deliverable is important to be identified, but sometimes in the project, there is no delivered area to operate because many challenges facing the project, like time and project team failed to use appropriate or exact time; this causes a failure or delay in delivering the project (Adeleke et al., 2016). In the case whereby all the project management performs adequately in the industry, they might have done these using different strategy, tools, expert, and technique. Furthermore, project triple constraint consists of time, cost and quality; all these factors are normally measured in the establishment of any project (Norrie, 2004). Whenever there is a balance between the three constraints, it will result in the achievement of positive outcomes. The way of balancing time, cost and quality in the project management depends on the project manager in the organization. There should be adequate planning before starting any project, the strategy to employ for completion of the project and some requirements to help achieve the goal of the project. A smooth and very productive implementation will enhance the achievement of the project. There are factors related to the budget, the system financial management relates cost based on the triple constraint in the project; therefore, the cost, time and quality are the essential keys to achieving the goals of a project (Peter, 2016).

This study focuses on the effect of project triple constraint on building projects considering Kuantan construction Industries as the case study. The challenges faced during project management were evaluated and measured based on triple project constraint and how each element which are time, cost and quality in relation to the building are being managed. Baratta (2006) outlined that building projects depend on how to manage the schedule of project construction, how to manage the budget of a project, how to establish and achieve the objectives of the projects. Therefore, these factors are based on project triple constraint to identify how much capacity of the building projects are related to it (Dobson, 2004).

2.0 Literature Review

2.1 Relationship between project triple constraint and building projects on Construction Industry

Remote projects have their unique problems that are caused mainly by the remoteness of the project; thus, they lose control over communications and management Sidawi (2012). This is due to several reasons such as lack of management skills, human resources and infrastructure. A few studies were undertaken particularly in the Gulf region regarding this issue which has highlighted a few unique communications and management problems. There is a serious delay in sorting out of several project queries and problems; these can pose an adverse effect on the project's performance and process. Delays in decision making, lose control and infrequent visits to the remote site can result in wasted time, excessive costs, unfocused quality, and poor construction quality (Adeleke et al., 2015).

There is a frequent shortage of materials, this undoubtedly shows that procurement and supply of materials are not accurately planned by the SEC or its contractors. Contractors are reluctant to undertake remote projects due to unpredictable increases in the cost of the labour, materials and transportation. Moreover, the delivery of materials and equipment is constrained by road/highway regulations and bad conditions of some remote roads. With traditional methods of running a remote project by both sides (SEC and the contractors), building projects have much higher risk margins than ordinary projects. These results from an ad hoc approach and both sides do not accurately plan projects (Kettle, 2009). It is basically necessary to implement a team of project time, cost and quality; this will prevent some of the failure associated with the building projects. Industry records have indicated that between 60 and 82% of the project failed; in order to evaluate if projects objectives have been achieved, good methods of measurement are needed through the project management

(Morris, 2008). Moreover, Sarmad (2016) who compared oldest and recent project concluded that today's projects primarily focus on methods used in the project management, however, old projects concentrate on the strategy used to perform the projects. Another study had suggested that most of the problems facing the building construction projects are due to poor management based on time, cost and quality of the projects (Tom Kendrick, 2015). A triple constraint can enhance the improvement of the building project. In the case of uncertainty, projects face different challenges such as the insufficient budget that can result in mismanagement funding, a time limit that can lead to incomplete or draft of the task and poor quality.

The constraint of the projects are various systems in terms of cost, time and quality which are called project triple constraint. It is important to know balance variables in order to complete projects and enjoy community benefit advantage. This is the main target mostly projects seek for and consequence construction industries (Samaha, 2007). The unsuccessful outcome from projects is mostly due to delay on-time deliverables area intended, high over cost and inadequate system (Gelbard and Pliskin, 2002). Not only have these, lack of analysis and design sometimes resulted in problems as previously suggested (Nienaber, 2003).

Many projects are being carried out using a complete project triple constraint with lack of training skills and infrastructure, this is caused by failing to recognize the importance of three dimensions with projects building and other types of the construction industry (Robertson, 2012). Some construction industries aim to assess the triple constraint to improve the success of the construction industry. The project constraints for building projects are the major decision making because it focuses on the area of measurement in projects which include time, cost and quality (Dobson, 2001). Some projects are incomplete or failed because the manager failed to consider the project constraint based on inadequate measurement of the variable dimension in developing, monitoring, managing, and controlling the projects (Pretorius, 2001).

The quality of work in the construction industry is mostly related to the improvement of project based on project triples such as time, cost and quality. Before evaluating the performance of a job, the system breaks down should be understood because it depends on the project quality (Stellman, 2012). Time of the project is another constraint. The exact time needed to complete a project should be evaluated in the construction industry, estimated time of completion and destination time to achieve the projects. Industries always engage with follow up scheduling projects as systematic and planning operations projects set up (Steyn, 2006). Project cost is the last elements when establishing a project. Cost should be estimated to cover the whole project.

The project quality in the construction industry is required to be evaluated, analysed and developed. Project management quality is the main target and priority of any construction industry in order to reduce cost, monitor and control activities of the projects; these determine the success and measure the quality project performance (Sorin, 2013). The project management ensures the effectiveness of project triple constraint which are time, cost and quality. Quality control of the projects is a major important factor for determining the effective performance of the building projects in the construction industry. It requires maintenances in order to improve the quality control of the construction industry (Mane, 2015). Construction quality plan helps contractor facilitate work and shorten the achievement time of success in the project building.

This study focused on the critical occurrence of every project in the building construction is facing. The factors and causes of time delay were examined. Moreover, the effect of project triple constraint which includes time, cost and quality on the building constructions are discussed; this is a gap over the previous studies that only concentrated on projects delay, the delivery time of the project, cost budgeting, and quality of the work (Egal, 2012). Furthermore, the project cost in the context of this study is about risk cost which implies that non-sufficient cost for completing a project (this is

called project risk). Therefore, a successful project requires a complete budget (PMBOK, 2005). Moreover, project quality based on previous studies focused on work breakdown, organized job, and objectives of the organization; however, this study focuses on all these objectives and evaluates every step in the organization (NIbyoza, 2015).

As the effective project triple constraint increases the quality of building projects, this study recognizes measurement to assess the risk of the project especially construction organization and focus on the balance between the three elements of the projects triple constraint and how to match every element of the building projects. In addition, previous studies did not focus on the relationship between all the constraints but focus on building and quality (Doloi, 2012). It is difficult to measure project construction accurately without considering the triple constraint variables that indicate how each department takes a risk and manage it during the projects' activities; that is why this study focuses on the effects of project triple constraint on the building project. Basically, this study outlines the important measure of cost, time and quality in relation to the potential risk. A study by Ali and Kamaruzzman, (2010) on cost performance on building construction in Klang Valey, Malaysia outlined the elementary factors and concluded that most problems facing Malaysia construction projects are due to cost budget. In this regard, this study focused on three variables which are time, cost, and quality because every model employs these variables for risk management (Zou and Lee, (2008).

2.1 Conceptual Framework

The Conceptual Framework gives a description of how the variable relates to each other. The variable different here is the independent-dependent and moderator. Independent variable affects and determines the effect of another variable with the relationship. project triple constraint (Time, Cost, and Quality), In this Research dependent variable is Building Project on construction Industry, so this variable connect Project triple constraint as mentioned some scholars, articles, thereby time project is effect building project if not completed on time, Cost project is starting project without budget not consistent and also quality is evaluation of the projects, if project isn't evaluation is unproductive construction, as shown in Fig. 1.

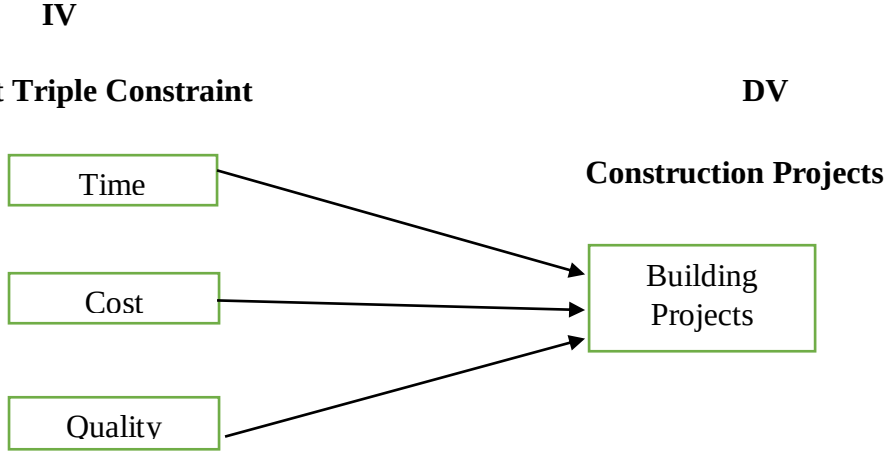


Fig. 1. Conceptual Framework

3.0 Hypothesis Development

Hypotheses are imaginations to predict variable by verification or disapproval of the relationship between independent and dependent variables. Moreover, hypotheses explain the expected correlation between the variables used in the study (Shalin, 2001). Hypotheses are statements that clearly define whether the investigation guess will be accepted or rejected; it is a measurement tool that determines whether the variables work well or not. Therefore, a hypothesis explains the research problem and predict the outcome of the research (Ajith, 2001). Additionally, hypotheses development is related to testable, verification and prediction but some variables require confirmation, it also facilitates logic theory to estimate the wrong idea used in a study (Syede, 2016). The assumption

is based on good judgment and the best prediction that connect the research objectives. In order to check whether the hypothesis is accurate or not, it must show a good prediction of the statement with logic and knowledgeable work.

3.1 Research Hypothesis

H1: There is a significant relationship between time and building projects among Kuantan construction industry.

H2: There is a significant relationship between cost and building projects among Kuantan construction industry.

H3: There is a significant relationship between quality and building projects among Kuantan construction industry.

4.0 Organizational Control Theory

There are many different theories to control organization, every organization applied some perspective that concerns its organization. Stephen mentioned two approaches that control organization which are normative and rational control systems; the theory was based on workers' treat especially during the work. However, management systems deal with top management. The normative control system is related to the behaviour of a person and location of the work whereby the employers need to focus on job motivation, understanding the employees' behaviours and focus on the happiness of their workers (Adeleke et al., 2016). Furthermore, rational control system entails the training of workers, implementation of incentives and setting job objectives; this theory emphasizes well on organized work and good training on jobs in order to achieve productive employees (Robby, 2015).

Organizational control theory has a significant influence on the organization both the internal and external factors of project triple constraint and how to manage risk facing the projects especially spotlight external factors that might cause failed projects (Datuk, 2014). In an organization, both in and out organizational factors should be focused especially the external organization control theory in relation to the system of communication for the interaction between employers and top management (Jamil and Adeleke et al., 2018; Fazlina, 2017). In addition, the project triple constraint is one of internal factors or elements that influence the organizational cost, time and quality within the organizational control theory.

5.0 Methodology

This research method is based on structural equation modelling (SEM), and the research model was ascertained through the SmartPLS 3.0 software (Ringle, Wende, & Becker, 2015). PLS-SEM seems an appropriate method to assess the results in the current research because its algorithm permits the unrestricted computation of cause-effect relationship models that employ both reflective and formative measurement models (Diamantopoulos & Siguaw, 2006), therefore, the reflective approach was employed in this research. This study also focused on the G7 contractors operating in Kuantan Malaysia construction industries that specialise in building construction project (Adeleke et al., 2016).

5.1 Scale of the Questionnaire

Kulatunga and Udayangani, (2006) stated that Likert scales are proper and widely used in the attitudinal measurement. The Likert scale is commonly used to measure activities, with a scale ranging from very low to very high. In this paper, we map the scale point to 0.1, and 0.5 interval scale in order to quantify the risk attitudes of contractors in construction projects, in which the scale correspondingly represents respondents' attitudes from (0.1) very low that this factor has dramatic influence to (0.5) very high that this factor has dramatic influence. In this study, the selection of an odd scale particularly the 5-point scale is appropriate because it will increase the reliability of the data as well as lessen social desirability bias (Krosnick, J.A, 1991).

6.0 Response Rate

A total number of 62 questionnaires were distributed to the staff that represent Kuantan Construction Company. After the distribution of the 62 questionnaires, they were returned with 100% response rate and this indicates that there is no any missing questionnaire and all the necessary

information were provided by the 62 staff in the construction company.

Table 1: This table indicates questionnaires

Items	Numbers
Number of questionnaires respond	62
Number of questionnaires distributed by manual	62
Number of Sample	62
Response Rate	100 %

6.1 Distribution of frequency analysis

Descriptive analysis was applied to measure job position, working experience, age, company existences, type of project, number of employees, and full-time employee. Therefore, all the respondent profile of these questionnaires was used as part of frequency analysis.

6.2 Respondent Profile

Table 1 indicate further information about the respondent demographics and profile that were analysed by statistical descriptive frequency using an applied software called IBM SPSS version 22. This data was obtained from the construction industries in Kuantan in order to get enough information about this research. Therefore, the employees working in Kuantan construction industries were selected as the respondent to answer every research question given in the questionnaires. The respondents have a different type of jobs position such as project manager, contractor, civil engineering, designers, and others.

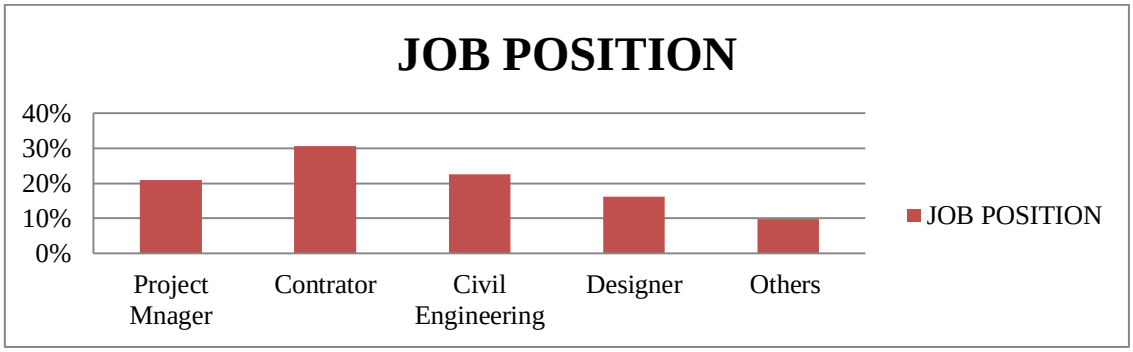


Figure 2. Job of position

The graph above shows the job position of the selected employee in the construction industry. The graph above illustrates that more than 30% of the respondents are contractors, followed by the Civil Engineering (22 %), Project managers (21 %), Designers (16 %) and other respondents (10 %). The contractors formed the largest job position while Civil engineering represents the second largest while other respondents formed the least job positions in the Construction Company.

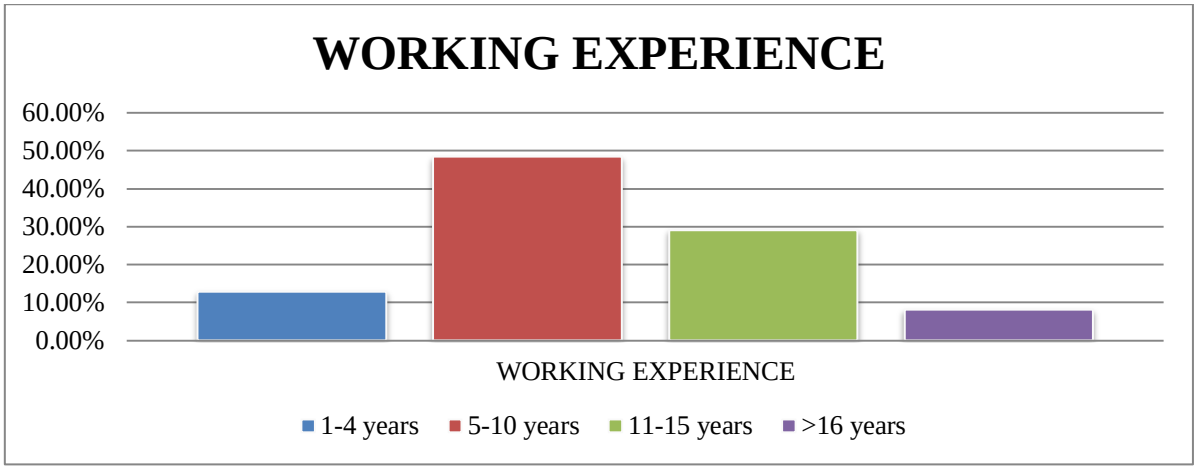


Figure 3. Working Experience

The graph above shows the percentage of working experience of the respondents in Kuantan Construction Industries over the 16 years. About 48% of the respondents have the working experience between 5-10 years, 29% of them have working experience ranging from 11-15 years, about 11% represents the minimum working experience between 1-4 years and about 8% of the respondents have working experience that was less than 16 years. These results also show that most of the experienced respondent in the Kuantan Constriction Companies would have more than 5 years of working experience. More so, the highest experienced staff in the Kuantan Construction Companies would have more than 13 years of working experience and the minimum working experience workers would have not less than three years.

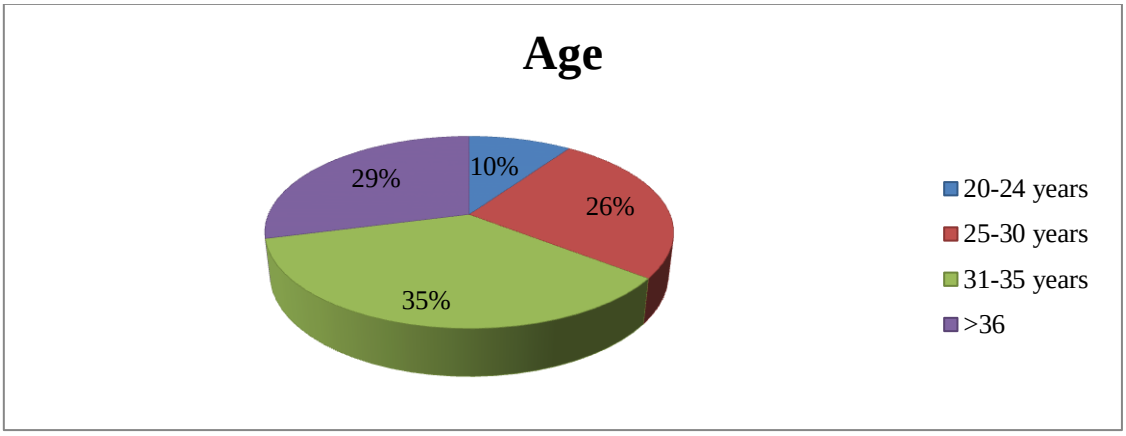


Figure 4. Age of respondents

The graph above shows the age of respondents working in different construction companies in Kuantan. 35% of respondents in the different construction companies in Kuantan have the age ranging between 31-35 years, 29% of the respondent's age was greater than 36 years, 26% of the respondent's age was seen between 25-30 years, and 10% of the respondent's age was between 20-24 years. About 35% of the respondent's age (31-35 years) was the highest while 10% of the respondent's age (20-24 years) was seen as the lowest age of an employee working different type of construction companies in Kuanta

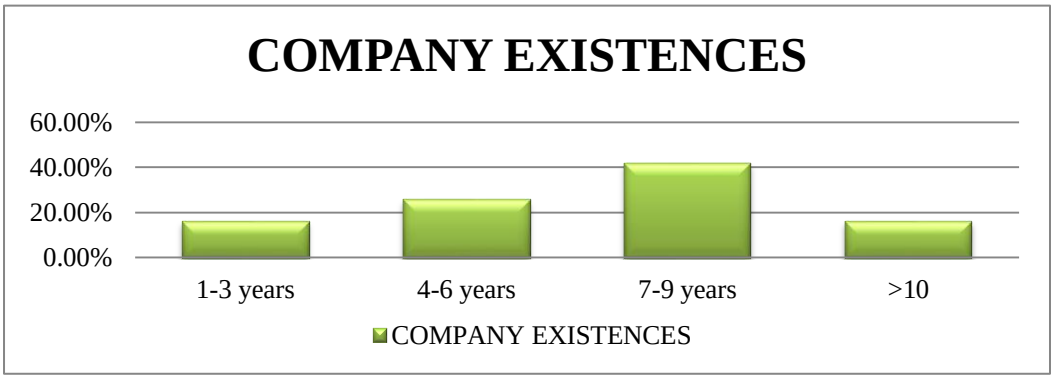


Figure 5. Company Existences

The graph above illustrates the existences of different construction companies located in Kuantan for more than 10 years. This result shows that more than 40% of these companies have between 7-9 years of existence. About 26% of the construction companies have between 4 to 6 years of existences while 16% of the companies have 1-3 years and more than 10 years of existence. Overall, the highest number of companies that exists between 7 to 9 years remain around 42% whereas the lowest number of company's existence has the

same number of 16% of existence exist between 1-3 years and more than 10 years.

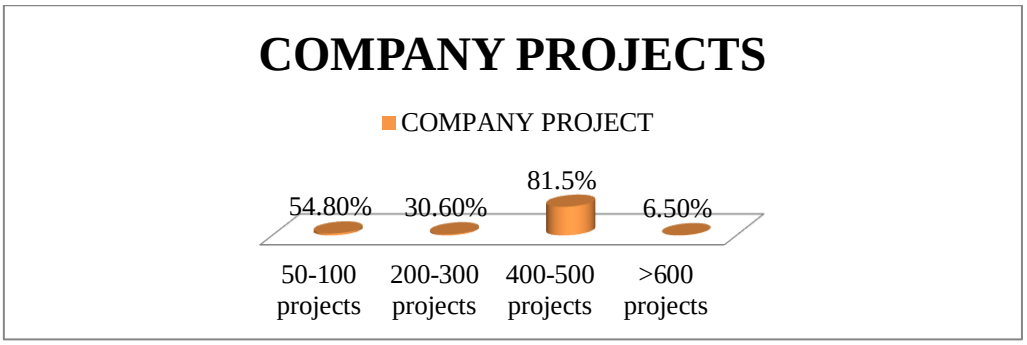
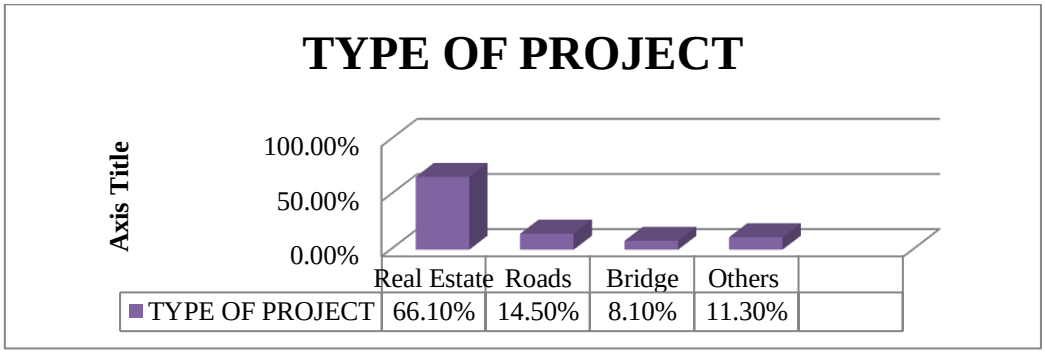


Figure 6. Company Projects

The graph above shows the results of projects operated by different construction industries in Kuantan. It also shows that all the construction companies do not have the same running projects while some may have many projects than the other. About 81.5% of Projects (400-500) were mostly performed by different construction companies in Kuantan. About 54.80% of the average projects (50-100) were done by different construction companies. Mostly, about 30.6% of middle average Project Companies performed about 200-300 projects which while less than 600 projects which were 6.5% were performed by the construction companies.



The graph above demonstrates different types of projects in the Kuantan construction industries. About 66.10% of these projects were real Estate, about 14.50% were road projects, 8.10% were Bridge projects and 11.30% were other projects. Overall, real estate projects remain the highest while other projects remain the lowest construction projects that were being constructed by the Kuantan construction companies.

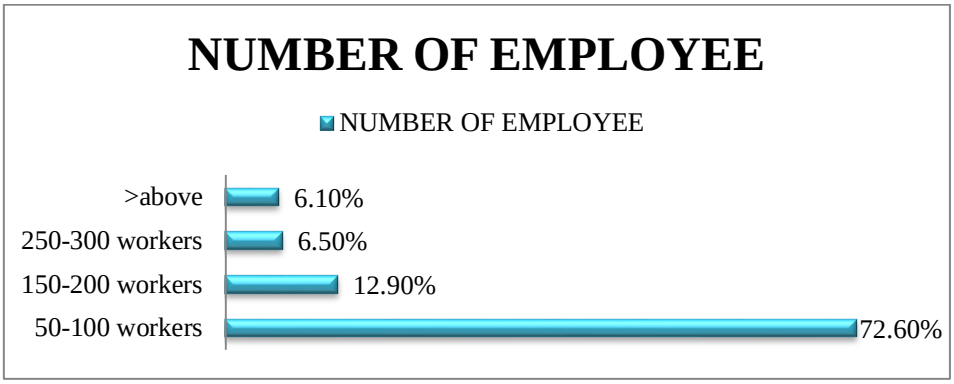
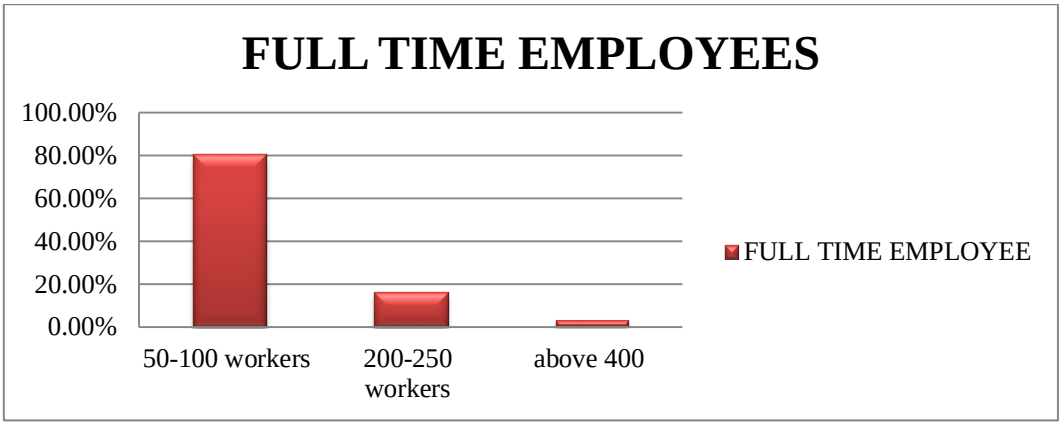


Figure 8 Number of Employee

This graph above shows the number of employees working in different construction industries in Kuantan. These results show about 72.60% of the construction companies have average workers of 50 to 100. About 12.90% of construction industries possessed around 150-200 employees, 6.5% of the

construction companies have up to 250-300 workers, and 6.10% of the Kuantan construction companies have more than 300 workers. Hence, most of these companies that possessed between 50-100 staffs could have a negative influence on the construction projects. Likewise, few companies with more 300 workers could give a negative impact on the projects.



The graph above describes the percentage of workers with full-time employment in the Kuantan construction industries. This result shows that 80% of the workers with full-time employment working in the construction companies in Kuantan were up to 50 to100. Thus, these results could pose a negative effect on the construction projects in Kuantan.

7.0 Assessment of Measurement Model (Outer Model)

This study uses the partial least square (PLS) to analysis data collection that concerns the hypothesis testing, the basic structural model that defined the measurement of a construct such as validity and reliability of this study, and main investigation of this analysis as a direct effect on other variables (Hair el, 2014). The partial least square (PLS) is a software modelling that has been designed to test the theatrical and empirical data particularly for the behavioural and the social sciences. Lowry and Gaskin, (2014) test theory and its development PLS approach was suggested to be often more suitable. PLS path models have two sets model including the measurement model (outer model) and structural model (inner model). The measurement model specifies the relationship between a construct and its observed indicators (manifest variable) while the structural model specifies the relationship between the construct (Henseler et al., 2016). Smart PLS was applied to this study that consists of the independent variable called project triple constraint (time, cost and quality) and dependent variable (building projects) to know about relationship the between the hypothesis testing models (Hassan, et al, 2019).

Figure 10. Measurement of model (outer model) based on PLS Algorithm

7.1 Construct reliability and validity

There are different criteria scholar normally use to assess the reliability and validity of the construct such as Cronbach's alpha coefficient of 0.6 indicating average reliability and Cronbach's alpha coefficient of 0.7 indicating the highest level of reliability consistent of the items. Therefore, Cronbach's scale restricted at acceptable 0.7 is the most standardized and highly reliable (Skeran, 2010). Composite reliability (CR) is a measure of internal consistency. It should be higher than 0.7 which is the minimum standard recognized consistence construct items for this study. It has also been suggested that the value that is more than 0.1 could demonstrate high internal consistency (Hair ital., 2014).

Average variances extracted (AVE) can be defined as a measure of the amount of variance construct that should be higher than 0.5. AVE includes the variance of indicators captured by the construct relative to the total amount of variances, including variances due to measurement error. An AVE of less than 0.5 is considered as insufficient and more variances are due to errors and indicators (Vinzi ital., 2010). To be sure of the exploratory power of any model, it is important to check the R square

value in the structural model. When R square is 0.631 it means four independent variables can explain 63% variances of dependent variables (Taofeeq et al, 2019). development PLS approach was suggested to be often more suitable. PLS path models have two sets model including the measurement model (outer model) and structural model (inner model). The measurement model specifies the relationship between a construct and its observed indicators (manifest variable) while the structural model specifies the relationship between the construct (Henseler et al., 2016). Smart PLS was applied to this study that consists of the independent variable called project triple constraint (time, cost and quality) and dependent variable (building projects) to know about relationship the between the hypothesis testing models (Hassan, et al, 2019).

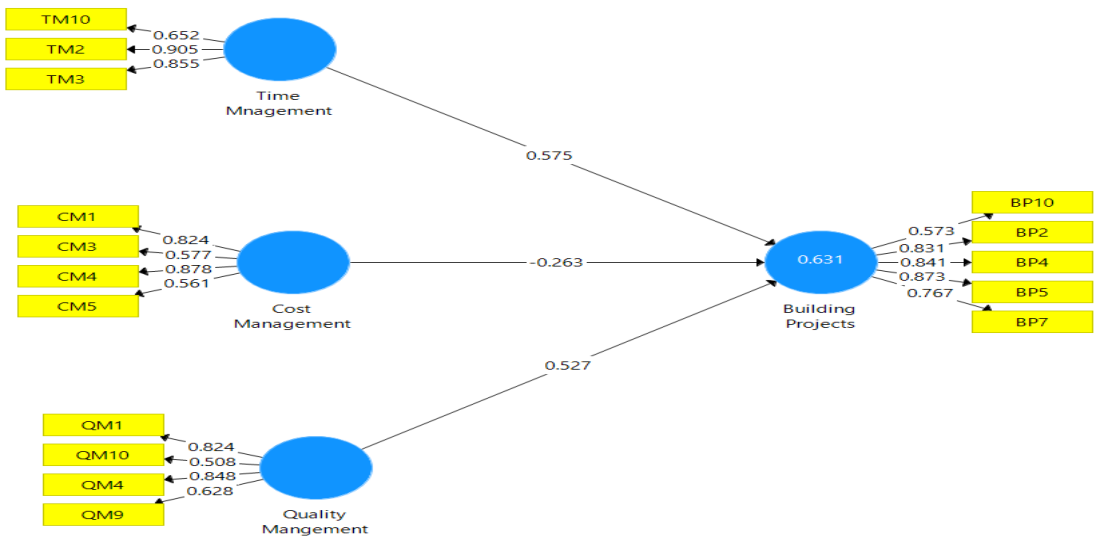


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Table 2. Construct reliability and validity (n=62)

Items	Construct	Factor loading	CR	AVE	Cronbach's alpha
TM10		0.652			
TM2	Time management	0.905			
TM3		0.855	0.850	0.658	0.751

CM1		0.824			
CM3		0.577			
CM4	Cost management	0.878			
CM5		0.561	0.809	0.525	0.740
QM1		0.824			
QM10	Quality management	0.508			
QM4		0.848			
QM9		0.628	0.802	0.513	0.719
BP10		0.573			
BP2		0.831			
BP4	Building projects	0.841	0.887	0.615	0.836
BP5		0.873			
BP7		0.767			

Composite reliability (CR) = (square of the summation of the factor loadings) / (square of the summation of the factor loadings) + (square of the summation of the error variances). Average variances extracted (AVE) = (summation of the square of the factor loadings) / (summation of the factor loadings) + (summation of the error variances).

Table 2 shows variable with different measures and each item used suitable criteria to meet their reliability and validity properties. Cronbach's alpha building projects 0.836 was the highest score that indicates high internal consistency that is very suitable for this research, followed by the second cost management (0.740), Cronbach's quality management (0.719) and time management (0.751). The composite reliability of building projects was 0.887 indicating the highest reliability variable, acceptable value and more consistent. The cost management (0.809), high quality management (0.751), Average variance extracted (AVE) of building projects was 0.615 indicating a high variance reliability of this item, cost management (0.525) was high since the minimum acceptable variance was 0.5, quality management (0.513) and time management (0.658).

7.2 Discriminant Validity

Discriminant validity is defined as the dissimilarity in measurement tools of different constructs. A necessary condition for discriminant validity is that the shared variances between the latent variable and its indicators should be larger than the variances shared with other latent variables (Vinzi et al., 2010).

Table 3 Discriminant validity

Items	Building projects	Cost management	Quality management	Time management
BP10	0.573	0.485	0.380	0.430
BP2	0.831	0.233	0.671	0.407
BP4	0.841	0.171	0.570	0.383
BP5	0.873	0.207	0.584	0.378
BP7	0.767	0.457	0.531	0.578
CM1	0.311	0.824	0.261	0.643
CM3	0.080	0.577	0.104	0.444
CM4	0.423	0.878	0.494	0.689
CM5	0.109	0.561	-0.004	0.429
QM1	0.609	0.496	0.824	0.493
QM10	0.209	0.094	0.508	0.113
QM4	0.687	0.242	0.848	0.436
QM9	0.281	0.235	0.628	0.200
TM10	0.250	0.648	0.252	0.652
TM2	0.595	0.724	0.417	0.905
TM3	0.587	0.590	0.489	0.855

Table 3 shows dissimilarity in different items in which each indicator load was at the highest on the construct that was needed to be measured and each cross-loading was higher than 0.5 according to the latent variable.

Table 4. Discriminant Validity Results Based on Fornell-Larker Criterion

Construct	BP	CM	QM	TM
Building Projects	**0.784**			
Cost Management	0.400	**0.724**		
Cost Management	0.707	0.405	**0.716**	
Time Management	0.632	0.780	0.487	**0.811**

The second method of discriminant validity was assessed using properties suggested by fornell-larcker (Fornell and Larcker, 1981). The square root of AVE should be higher than the correlation coefficient of the construct with every other construct of the model. Diagonals indicate the more square root of AVE while other represents the correlation.

7.3 Collinearity Statistics (VIF)

Multicollinearity is a problem that occurs with regression analysis when there is a high correlation of at least one independent variable with a combination of the other independent variables(Taofeeq et al, 2019). Collinearity is a special case when two or more variables are exactly correlated. In addition, multicollinearity is measured when there is a relationship between variables, but it depends on the target of the predicted construct specific dependent variable and independent variables. Multicollinearity was measured by variance inflation factors (VIF) and tolerance if VIF value exceeds 5 or by tolerance less than 0.2 then, there is a problem with multicollinearity (Hair et al., 2010).

Table 5. Multicollinearity based on outer VIF values

Items	VIF
BP1	1.191
BP2	2.442
BP4	2.697
BP5	2.991
BP7	1.834
CM1	1.584
CM3	1.399
CM5	1.405
QM1	1.501
QM10	1.776
QM4	1.462
QM9	1.946
TM10	1.475
TM2	2.047
TM3	1.565

The table above indicates there is no problem between the collinearity and variables if the value of 1 shows that the predictor is not correlated with other variables as VIF.

8.0 Assessment of Structural Model (Inner Model)

The structural model indicates the relationship between the constructs based on hypothesis test of the independent and dependent variable. Therefore, these assessments have demonstrated the Project triple constraint (time, cost and quality) and building projects in order to evaluate the hypothesis relationship between construct. In addition, r square for the independent variable was 0.631 which represent 63% indicating that 3 independent variables were needed to explain 63% variance of the dependent variable.

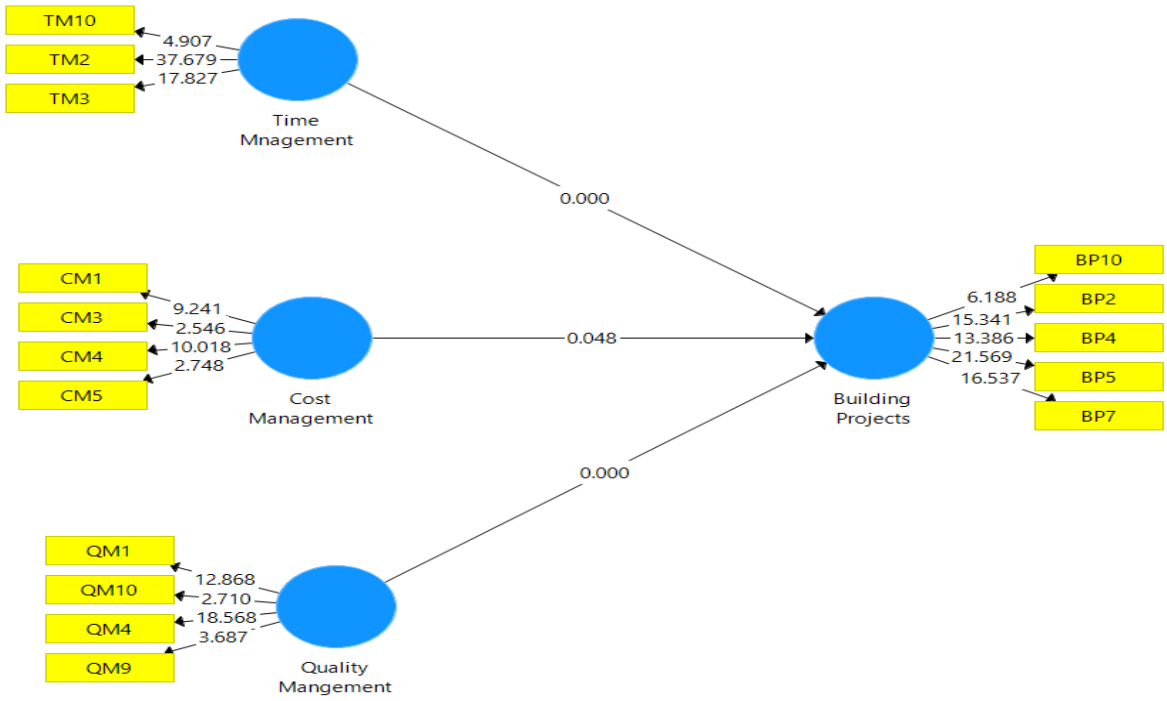

Figure 11. Structural measurements (Inner model)

8.1 Hypothesis Testing

Hypothesis testing was used to test the construct of the independent variable (project triple constraint) and dependent variable (building projects) relationships. Among all the hypothesis that support positive relationship, only three independent variables have strong correlation indicating that if T-statistics >1.92 value at 2 tail level was significant and at 0.05 it was at 95% confidence level.

Table 6. Results of Hypotheses Testing

Hypothesis	Relationship	Standard deviation	T-statistics	p-value	Supported
H1	CM>BP	0.132	1.995	0.023	Significant
H2	QM>BP	0.088	5.997	0.000	Significant
H3	TM>BP	0.152	3.789	0.000	Significant

Table 6. indicates if T statistics, >1.96 (2 tail) significant at 0.05 at 95% confidence level. The results of this analysis show that all the hypothesis relationships were supported since T-statistics was greater than 1.92 value showing significant statistics. These following results were obtained including the Cost management of standard deviation (0.132), T-statistics (1.995), P value (0.023), Quality management of standard deviation (0.088), T-statistics (5.997), and p-value (0.000) and Time management of standard deviation (0.152), T-statistics (3.789) and p-value (0.000).

Table 7: Direct effect IV-DV

8.2 Effect Size

The capacity of the effect size between the independent variable and dependent variable indicated F-square analysis based on the criteria used to evaluate all the constructs for this study. For each of the effect in the path model, one can evaluate the effort size by using f-square (Cohen, 1988).

$$\text{Effect size: } f^2 = \frac{R^{2Included} - R^{2Exlcuded}}{1 - R^{2Included}}$$

R^2	Included	Excluded	F-square	Effect size
Time management	0.631	0.510	0.316	Large
Cost management	0.631	0.507	0.073	Small
Quality management	0.631	0.497	0.566	Large

1. 26(4), 387-393

To interpret the impact of f 2 at the structural level, it has been suggested that effect is large when f2 is more than 0.35, medium when f2 is less than 0.15, and small when f2 is more than 0.03 (Cohen, 1988). Based on the table showing above, it indicates that time and quality management has a large effect on building, while cost management shows a small effect on the building projects.

H1: There is a significant relationship between cost management and building projects among Kuantan construction Industry.

As indicated in Table 6 the results of cost management and building management have shown that there is a positive correlation when the T-statistics 1.995 indicated a significant level specific correlation between the independent variable (cost management) and dependent variable (building projects). This implies a positive relationship between two factors or variables if the cost management increases, the building projects in Kuantan will also increase. Thus, the level of building projects construction industries depends on the level of cost management.

H1: There is a significant relationship between Cost management and building projects among

Kuantan construction Industry

H1: There is a significant relationship between Cost management and building projects among

Kuantan construction Industry

H2: There is a significant relationship between quality management and building projects among Kuantan construction Industry.

As demonstrated the results table 6 justified that there is a relationship between quality management and building projects, as evidence that criteria T-statistics 5.997 since greater than the value of 1.92 this showed that there is a significance between two variables independent variable (quality management) and dependent variable (building projects). This means if increase quality management or improvement and increase building projects in Kuantan.

H3: There is a significant relationship between Time management and building projects among Kuantan construction Industry.

As it was indicated in Table 6, time management has a significant relationship with the building projects. It has been shown when T-statistic was 3.789, it indicates there was more correlation between two variables since a significant level of T-statistic was greater than 1.92. Therefore, if there is an effective increase in the time management of an organization, the building projects would also be increased.

9.0 Discussion

The first objectives investigated the effect of cost management on building projects in Kuantan construction industries Malaysia. This finding indicated that cost management has a significant effect on building projects based on the hypothesis testing that demonstrated it because most respondents supported that cost management is very important on the building projects in terms of cost estimation and activities. These results showed that cost management (p=0.023) at 0.05 level 2-tail and T-statistics greater than 1.995 was significant and shown a positive correlation between cost management and building projects. The F-square which is less than 0.03 indicated the level of effects between cost management and building projects. In addition, when Cronbach's alpha showed 0.740, it means there were high reliability and internal consistency within the variable cost management. These results contradicted the Rugenyi & Bwisa (2016) claim that shows there was no significant effect between the cost management constraint and construction industries in Nairobi (p=.381). Therefore, this finding also concurs with Omondi (2017) claim who found that cost management has

a significant effect on construction projects at a level of p = .825.

The second objectives examined the effect of quality management on building projects in Kuantan construction industries Malaysia. This finding indicated that quality management has a significant effect on building projects as presented in Table 6 when P = value 0.000 and T-statistics 5.997 which is greater than 1.96, most of the respondents supported that quality management is very important on building projects in terms of quality control projects. The size of the effect between quality management and building projects was shown at a medium level of 0.316 F-square which is greater than 0.15. This result agrees with Tan and Hamzah (2011) claims that studied the effects of quality management in construction projects and their results show that there was a significant influence of quality management on the building projects in Malaysia (p=0.719). This finding indicated the state of quality management related building projects and the need to improve and maintain quality management.

The third objective investigated the effect of time management on building projects in Kuantan construction industries, Malaysia. This study clearly presented that the time management has a significant effect on building projects in Kuantan construction industries in Malaysia, according to the Table 6 the results indicated that time management T-statistics 3.789 and P-value 0.000 was at a significant level since it was greater than T-statistics >1.96 and this also indicated that time management has a strong relationship between the building projects, and this stressed that time management is a very important factors that affect construction industries especially building projects. This finding agreed with Catanio, Armstrong, and Tucker (2013) claims who investigated further on time management and obtained that there is a significant effect of the time management on building projects in Kuantan constructions industries Malaysia (P=.789). Therefore, this finding indicated that time management has a greater relationship with the building projects.

Lastly, this finding indicated that the project triple constraint (time, cost and quality) have a strong relationship on the building projects. Looking at the effects and correlation, it all showed there is a significance with different capacity size effect. Thus, this study has shown justification and evidence that demonstrated previous studies on what they got it, and all the research evidence indicates a significant independent variable towards dependent the variable.

This finding investigated the relationship between the project triple constraint (cost, time and quality) and building projects in Kuantan construction industries in Malaysia. The main purpose was to examine the effects and relationship between time management, cost management, quality management towards building projects. These findings consist of two types of demographic respondents called profile of industry and objectives of the research. However, independent variables are the project triple constraints while the dependent variables are the building projects, and this remains one of the specific parts of the construction industries building projects. This research was analysed with two software IBM SPSS latest version 22 and Smart PLS latest version 3.2.4, each software applied specific parts such as SPSS which was used to determine the demographic respondents and descriptive statistics while Smart PLS was applied to Hypothesis testing means to determine the relationship among variables and size of the effect. A total number of 62 questionnaires were distributed to the staff that represents Kuantan Construction Company. Therefore, after the distribution 62 questionnaires were returned which contributed 100 % responses rate. The respondents are in different kind jobs positions including the project manager, contractor, civil engineering, designers, and others.

This study uses partial least square (PLS) to analysis data collection that concerns hypothesis testing and the basic structural model that defined the measurement of a construct such as validity and reliability of the study. The main purpose of this analysis is to determine the hypothesis testing of a direct effect on other variables. The value R square

0.631 that means 63 % indicated that the relationship between three elements has a very strong time, cost and quality towards building projects. The Cronbach's alpha time management (0.751) cost management (0.740) quality management (0.719) and building projects (0.836) all indicated that the variables have a high-value standard that was acceptable and significant to this study. Discriminant validity results based on Fornell-Larker criterion illustrated diagonal side square root of correlation while another non-diagonal side also indicated their correlation. Therefore, these results presented a good standard completed criteria needed to do PLS. However, this finding indicated that the project triple constraint (time, cost, and quality) have a positive relationship on the building projects since all the results were supported significantly by statistics which indicate a big relationship between the independent variables and dependent variables. Hence, all the hypothesized testing was significant since $p<0.05$ which show that a significant statistical test supported this study.

10.0 Implication of the Study

This study examined the significance of project triple constraint on construction industries in Kuantan Malaysia. As previously mentioned, there is a lot of problems facing construction industries in Kuantan, most especially factors related to the completion of the projects such as time, cost and quality that is known as the project triple constraint which always determine the achievement of the building projects. Time management is a crucial factor that affects building projects, especially in Kuantan construction industries due to delay on the project's time and lack of time management. Thus, this has defined this study because it shows a significant effect on building projects. This study would show a huge impact on the future research benefits particularly in the construction industries in Kuantan because the specific priority has been made on how to manage the quality and cost management in order to achieve many projects that have encountered project failure in the time past. Henceforth, this study has shown a strong positive relationship of the project triple constraint (time, cost, and quality) on building projects that would be of benefit to the researchers' developer and government to improve infrastructures of their country.

11.0 Conclusion

This study suggested that there is a need for further studies on the influence of project triple constraint (time, cost and quality) on construction industries as a determinant for building projects. Moreover, the study on the effect project triple constraint on building projects should be carried out across all the construction industries in Malaysia, because this study is only restricted to construction companies in Kuantan. This could enable us to understand the challenges facing by other construction companies and also give a room to examine other ongoing projects such as roads, bridge, real estate, and so on across different construction industries in Malaysia because the project triple constraint does not only affect the building projects but may also influence other types of construction industries.

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