THE EXTENT OF MANAGEMENT CAPABILITY, RELATIONSHIP CAPABILITY, AND COMPETITIVE ADVANTAGE INFLUENCE ON BUMIPUTERA CONTRACTORS' PROJECT PERFORMANCE

By

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ABSTRACT

Considering the major problems faced by the Malaysian construction industry in managing resources and understanding clients' needs, as well as the methodological and theoretical gaps in previous studies, this research attempts to investigate the extent of management capability, relationship capability and competitive advantage influence on Bumiputera construction project performance. This research utilised the resource-based view theory to determine the relationship between the construction companies' capabilities and their project performance. Survey questionnaires were sent to 1,600 construction companies' project managers listed on the CIDB's Malaysian Construction Industry Directory. Out of the 1,600 questionnaires sent, 420 were received. However, only 385 were usable which produced a response rate of 24 per cent. Management capability, relationship capability and competitive advantage were found to have significant positive influence on construction project performance. Thus, construction project performance is influenced by all the three components. The management must also ensure that all important elements of management and relationship capabilities such as competence, cooperation, project management methodology, comprehension and communication are practiced in their organisations. Further information is provided in the study.

Keyword: Construction, project performance, management capability, marketing capability, competitive advantage.

ABSTRAK

Berdasarkan permasalahan utama yang dihadapi oleh syarikat pembinaan di Malaysia berkaitan pengurusan sumber dan memahami kehendak pelanggan, serta jurang dari segi kaedah dan teori dalam kajian terdahulu, kajian ini dijalankan bagi mengkaji sejauh manakah pengaruh keupayaan pengurusan, keupayaan hubungan dan kelebihan daya saing terhadap prestasi projek syarikat-syarikat pembinaan Bumiputera di Malaysia. Kajian ini menggunakan teori pandangan berasaskan sumber (resource-based view) bagi menentukan hubungan antara keupayaan syarikat pembinaan dan prestasi projek. Soalan tinjauan dihantar kepada pengurus projek daripada sampel 1,600 buah syarikat yang tersenarai dalam direktori syarikat pembinaan CIDB. Daripada 1,600 soalan tinjauan yang dihantar, 420 jawapan diterima, namun hanya 385 daripadanya boleh digunakan. Ini menghasilkan kadar jawapan sebanyak 24 peratus. Keupayaan pengurusan, keupayaan hubungan dan kelebihan daya saing didapati mempunyai pengaruh positif yang signifikan terhadap prestasi projek. Justeru, prestasi projek adalah dipengaruhi oleh ketiga-tiga faktor. Pihak pengurusan mesti memastikan agar kesemua elemen penting seperti kecekapan, kerjasama, kaedah pengurusan projek, pemahaman dan komunikasi turut diamalkan dalam organisasi. Maklumat lanjut dibincangkan dalam kajian ini.

Kata kunci: pembinaan, prestasi projek, keupayaan pengurusan, keupayaan pemasaran, kelebihan daya saing.

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LIST OF ABBREVIATIONS

Abb.	Full Lists
APM	Association for Project Management
BNM	Bank Negara Malaysia
CIDB	Construction Industry Development Board
CII	Construction Industry Institute
CIMP	Construction Industry Master Plan
CSF	Critical Success Factors
DV	Dependent Variable
GDP	Gross Domestic Product
ICT	Information Communication Technology
ISO	International Organization for Standardization
IT	Information Technology
IV	Independent Variable
KMO	Kaiser-Meyer-Ollkin
KPI	Key Performance Indicators
MARA	Majlis Amanah Rakyat
MCI	Malaysian Construction Industry
MHLG	Ministry of Housings and Local Government
MIM	Malaysian Institute of Management
NST	New Strait Times
PKK	Pusat Khidmat Kontraktor
PM	Project Management
PMBoK	Project Management Body of Knowledge
PMI	Project Management Institute
PPMS	Project Performance Monitoring System
PRINCE2	Projects IN Controlled Environments
QMS	Quality Management System
RBV	Resource Based View
SPA	Sales and Purchase Agreement
SPSS	Statistical Package of Social Sciences
UAE	United Arab Emirates

LIST OF ABBREVIATIONS

UK	United Kingdom
US	United State
UUM	Universiti Utara Malaysia
VIF	Variance Inflation Factor
WWW	World Wide Web

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CHAPTER 1

INTRODUCTION

1.0 Introduction

This chapter provides an overview of the study background, problem statement, the research objectives, research questions and definition of terms used. Subsequently the discussion on the significance of this study is deliberated. Lastly, a summary of an organisation of remaining chapters was included towards the end of the chapter.

This study examined the extent of contractors' capabilities influence on projects performance in Malaysian Construction Industry (MCI) because construction industry seems to face a number of failures that are enough to stir negative perceptions among the buyers and publics. The important capabilities that have an impact on the construction project performance were identified via literature review. This study hereby needs to be conducted to determine the relevant factors that managers of construction firm should focus on to improve their project performance and ultimately the overall performance of MCI.

1.1 Background of Study

1.1.1 Importance of Construction Industry

Malaysian Construction Industry (MCI) is in general categorised into two major areas namely general construction and special trade works. General construction includes residential construction, non-residential construction and civil engineering construction. Special trade works area includes the "activities of metal works, electrical works, plumbing, sewerage and sanitary work, refrigeration and air-

conditioning work, painting work, carpentry, tiling and flooring work, and glass work" (Ibrahim, Matthew, Ahmed, & Imtiaz, 2010).

This study on the project performance determinants will provide a better understanding of Malaysian construction industry performance. Malaysia's construction project performance is important since it has a significant role to play in the economy as the building and construction activities support various industries such as manufacturing, mining, transportation and facilities; and services such as health, education and tourism.

The construction industry in Malaysia like in other countries is seen as the economic growth engine and can reflect the national economic situation. The presence of a lot of construction activities indicates that the national economy is growing whereas a reduction in construction means the national economy is depressed. Construction industry provides job opportunity to 1.02 million out of the 28 million Malaysian populations and it has a multiplier effect to other sector such as manufacturing, professional services and financial services (Construction Industry Master Plan, 2007). The position of construction industry in the economy can be measured with regards to its size and contribution to the economic activity. The contribution of the construction industry to the Gross Domestic Product (GDP) is the total value for all organisations from the aspect of purchasing of materials and services from other organisations.

Construction industry involves various segments, products, and plays a crucial role in the country's welfare, comprising development, office buildings, industrial plants,

country's infrastructure and public facilities (Rasli & Mohd, 2008). Malaysian Government has realised the importance of building up the construction sector to benefit other sectors by initiating some mega projects to drive the economy to a greater level. Malaysia has spent over US $15 billion on infrastructure projects such as the Petronas Twin Towers, Kuala Lumpur International Airport (KLIA), Putrajaya and Multimedia Super Corridor (MSC). KLIA which cost $2.4 billion was built and it resembles a cluster of Arabian tents. Petronas Twin Towers which costs $2.9 billion and also known as Kuala Lumpur City Centre (KLCC) with the soaring lines of New York's Chrysler building are also among the world's tallest twin skyscrapers. Putrajaya, the new location for governmental administration and central offices was built at a cost of $5.3 billion and at distance of 30 kilometres from Kuala Lumpur to relieve the overcrowding at the city centre. Multimedia Super Corridor (MSC) in Cyberjaya is another great project which transformed a 15 by 40 kilometre area stretching south from Kuala Lumpur into Asia's version of Silicon Valley.

The business environment in which the construction industry operated throughout the world have also continues to experience rapid changes (Enshassi, Mohammed, & Abushaban, 2009). However, construction industry history worldwide tells the story of projects that were not completed on time (time overruns or delays) and exceeded budgets (cost overruns).

1.1.2 History of Project Failures

The problem of project delay and cost overrun occurs in the construction industry of many developing countries. Several studies conducted in developing countries such as Saudi Arabia, Vietnam, Pakistan, Nigeria as well as Malaysia had established that many the projects carried out in these countries experienced failure in terms significant construction time and cost overruns. Assaf and Al-Hejji (2006) study results indicated that about 70 percent of the projects in Saudi Arabia experienced time overruns and "only 30 percent of construction projects were completed within the scheduled completion dates and that the average time overrun was between 10 percent and 30 percent". Amu and Adesanya (2011) found that out of 3,407 civil engineering projects handled in Southwestern Nigeria, "only 24 were completed on time, 1571 were delayed and 1812 abandoned". Omoregie and Radford (2006) findings shows that "the cost of projects in Nigeria escalated by 14 percent (the minimum average percentage) and the period of projects in Nigeria escalated by 188 percent (the minimum average percentage)". Azhar, Farooqui, and Ahmed, (2008) also highlighted that minimum cost overrun in Pakistan was reported as 10 percent of the estimated cost. Common impact of delays and cost overruns are project failure, profit margin reduction, and citizen losing their faith on government funded projects (Le-Hoai, Lee, & Lee, 2008).

High number of construction business failures occurred worldwide. The total number of construction company that has failed in the United States for the eight-year period starting from 1990 to 1997 is over 80,000 (Peterson, 2005). This issue is not only encountered by small and new construction companies, but also faced by the large and matured construction companies in Japan and Germany. Two biggest Japanese

construction companies, Sato Kogy Company and Nissan Construction were filed for bankruptcy in 2002 (Belson, 2002). Similarly, in Germany, the second-largest construction company, Philipp Holzmann, was also filed for bankruptcy in 2002 although they had been in business for over 150 years (Behrens, 2002).

Malaysia as one of the rapid developing country in South-East Asia also encountered the problems of construction industry project failure. Despite huge investment and expenditure in construction, this industry is experiencing many challenges such as delay in completing the project on time, expenditure exceeding the budget, construction defects and reliance on foreign workers (CIDB, 2007). Some of the damaging major incidents relating to the Malaysian construction industry are as follows:

- 11 December 1993 - 48 people were killed when a block of the Highland Towers collapsed at Taman Hillview, Ulu Klang, Selangor.
- 15 May 1999 - A landslide near Bukit Antarabangsa, Ulu Klang, Selangor. Most of the Bukit Antarabangsa civilians were trapped.
- December 2003 - A rockfall in the New Klang Valley Expressway (NKVE) near the Bukit Lanjan interchange caused the expressway to be closed for more than six (6) months.
- Cracks on the Kepong Flyover of the Middle Ring Road II (MRR2) which leads to three (3) occasions of closure in 2004, 2006 and 2008.
- Monorail project was scheduled to run in time for the Commonwealth Game in 1998 but was only commissioned in 2003.

- Failure of computer lab project in Sabah implementation as only two (2) of the 300 labs were ready in December 2010 despite six (6) month extension and RM 98.9 million of the RM113.73 million (86 percent) spent.
- 21 May 2011 - 15 children and a caretaker of an orphanage were killed in a landslide caused by heavy rains at the Children's Hidayah Madrasah Al-Taqwa orphanage in Semungkis, Hulu Langat, Selangor.

1.1.3 MCI Poor Performance Reports

Construction industry in Malaysia has experienced uninteresting financial performance in terms of growth over the period of 2001 to 2010 as shown in Table 1.1. Compared to all other industry, the output of construction industry is also relatively small (3%) unlike the manufacturing (26 to 29%) and services industry (47 to 56%) in Malaysia. This is also relatively low compared to other Asian countries such as Indonesia, Vietnam and Singapore (ASIACONSTRUCT, 2011). The contribution of construction sector to GDP in Indonesia is 9.9% in 2009 and 10.3% in 2010. Vietnam construction industry contributed 6.7% of GDP in 2009 and 7.03% of the GDP in 2010. Singapore construction industry contribution is slightly higher than Malaysia at 4.2% of GDP in 2009 and 3.8% of the GDP in 2010.

Table 1.1
Contribution of Various Sectors to Gross Domestic Products

Period	Agriculture	Mining and Quarrying	Manufacturing	Construction	Services
2000	8.3%	10.2%	29.9%	3.8%	47.7%
2001	8.3%	10.0%	28.5%	3.9%	49.4%
2002	8.1%	10.0%	28.3%	3.8%	49.9%
2003	8.1%	10.0%	29.1%	3.7%	49.1%
2004	8.0%	9.7%	29.9%	3.4%	49.0%
2005	7.8%	9.2%	29.9%	3.2%	49.9%
2006	7.7%	8.6%	30.1%	3.0%	50.6%
2007	7.3%	8.2%	29.1%	3.0%	52.3%
2008	7.3%	7.7%	28.1%	3.0%	53.9%
2009	7.5%	7.3%	25.8%	3.2%	56.2%
2010	7.1%	6.8%	26.9%	3.2%	56.0%

Source: Monthly Statistical Bulletin July 2011, Bank Negara Malaysia (BNM)

The rate of construction firm's failure in Malaysia is also high based on the statistics of Construction Industry Development Board Malaysia (CIDB) as shown in Table 1.2, 11,321 construction companies were classified as dormant and non-active from January 2006 to August 2008. Interestingly, Selangor and Wilayah Persekutuan where a lot of construction projects took place are also the top two states with the highest number of dormant and non-active construction companies.

Table 1.2 demonstrates that the dormant and non-active Malaysian construction companies occur at all levels of company sizes. Small scale companies are registered as grade G1 contractors under the CIDB grade of registration and this is entry level grade. This grading determines their tendering capacity that is G1 (Not exceeding 200,000), G2 (Not exceeding 500,000), G3 (Not exceeding 1 Million), G4 (Not exceeding 3 Million), G5 (Not exceeding 5 Million), G6 (Not exceeding 10 Million) and (G7 No Limit). Category G1 to G3 are considered small size, G4 to G5 are

medium size and G6 to G7 are large construction company (CIDB, 2012). The highest number of dormant and non-active construction companies with regards to size occurs in the smaller scaled category namely G1 category (5,929), followed by G3 (2,205) and G2 (1,529) category compared to the bigger size category G6 (182).

Table 1.2
Statistics for Dormant and Non-Active Construction Firms in Malaysia (January 2006–August 2008) by Category/Size

State	G1	G2	G3	G4	G5	G6	G7	Total	Percentage
Johor	614	197	230	31	36	8	16	1,132	10.00%
Kedah	415	78	99	18	32	13	19	674	5.95%
Kelantan	600	75	134	26	54	15	37	941	8.31%
Labuan	25	3	5	1	1	0	1	36	0.32%
Melaka	193	49	61	7	11	6	10	337	2.98%
Negeri Sembilan	541	85	88	10	7	5	7	743	6.56%
Pahang	301	66	91	26	14	3	10	511	4.51%
Perak	455	138	149	23	36	11	16	828	7.31%
Perlis	172	25	19	6	6	2	5	235	2.08%
Pulau Pinang	280	98	113	12	19	4	23	549	4.85%
Sabah	662	155	185	33	45	15	43	1,138	10.05%
Sarawak	204	60	62	24	16	5	30	401	3.54%
Selangor	895	259	404	68	90	35	94	1,845	16.30%
Terengganu	155	37	103	27	32	7	22	383	3.38%
Wilayah Persekutuan	417	204	462	78	159	53	195	1,568	13.85%
	5,929	**1529**	**2205**	**390**	**558**	**182**	**528**	**11,321**	

Source: CIDB (August 2008)

Smaller scale constructions project also suffered from poor performance risks and exposures. Ministry of Housings and Local Government (MHLG) statistics on the housing project by the private sector up to 30th June 2011 shows that there were 47 late projects and 246 sick projects (Table 1.3). Late projects are those that experienced construction delays where the gap between actual works at the site compared to the Sales and Purchase Agreement (SPA) ranges from 10% to 30%. Sick projects defined are those that experienced construction delays where the gap between actual works at the site compared to the Sales and Purchase Agreement (SPA) are

over 30% or failed to complete within the period stipulated in the agreement. The states that were badly affected were Selangor (35.84%) followed by Johor (14.68%) and Wilayah Persekutuan (7.51%).

Table 1.3
Overall Statistics on Problematic Private Housing Projects (Delay and Sick) Until 30 Jun 2011

State	No of Late Projects	No of Sick Project	Total	Percentage
Perlis	-	-	0	0.00%
Kedah	1	17	18	6.14%
Pulau Pinang	1	13	14	4.78%
Perak	-	7	7	2.39%
Selangor	17	88	105	35.84%
Wilayah Persekutuan	8	14	22	7.51%
Negeri Sembilan	4	9	13	4.44%
Melaka	1	7	8	2.73%
Johor	4	39	43	14.68%
Pahang	8	15	23	7.85%
Terengganu	-	14	14	4.78%
Kelantan	3	23	26	8.87%
Total	**47**	**246**	**293**	

Source: Ministry of Housings and Local Government (2011)

1.1.4 Previous Study Findings

Most of the construction projects are facing chronic construction problems. One of the common problems is project delay which leads to cost overruns, disputes, arbitration and total abandonment (Sambasivan & Soon, 2007). Cost and time overrun is a critical issue in Malaysian construction industry. Ali and Kamaruzzaman (2010) found that "most of construction projects in Malaysia are affected by cost overrun" that is the majority of respondents' involvement in cost overruns is between 5 to 10 times. Their research finding shows that "construction industry suffered the problem of cost overrun in projects" due to "poor estimation of the original project cost and underestimation of the construction cost". Endut, Akintoye, and Kelly (2009) sent

survey questionnaires in early 2005 to 150 quantity surveyor consultants in Malaysia as part of a PhD research schedule for time and cost overrun in of construction projects. They reported that only 46.8% of public sector and 37.2% of private sector projects were found completed within the stipulated budget while only 20.5% of the public projects 33.35% of the private sector projects were completed within the time.

Large construction projects in Malaysia faced time overrun during construction as identified by Memon, Rahman, Abdullah, Asmi, & Azis (2011) in their study. Thirty identified projects are mainly the construction work awarded by the government agency that is MARA, which is distributed around Malaysia. "Out of 30 projects, 17 (56.67%) projects were caused by 1-100 days time overrun, 5 (16.67%) projects in between 101 to 200 days, 5 (16.67%) projects 201 to 300 days whereas 3 (10%) projects were delayed for the time period above 300 days. Over 90% of the large MARA construction projects experience delay resulting significant amount of time and cost overrun" (Abdullah, Abdul Azis, & Abdul Rahman, 2009). Abdul Rahman *et al.* (2006) noted "45.9 percent delays in the completion dates during the construction stage. These delays are known to cause losses to the client or developer and to the entire industry because construction has an important influence on the economy".

Construction projects need to be managed effectively and efficiently in order to accelerate Vision 2020. The vision was tabled during the 6th Malaysia Plan by the with the objective of transforming Malaysia into a developed country in all aspects of life and to become a high income nation by the year 2020. Furthermore, under the 10th Malaysian Plan, RM230 billion have been allocated for construction development (Abu Mansor, 2010). Therefore, it is important to measure the

performance of the projects and the contractor's capabilities in order to determine the way forward.

1.2 Problem Statement

Considering the situations in Malaysia, construction industry has a potential for growth towards achieving Vision 2020 with the government increase attention on this sector. Nevertheless, MCI faces challenges in terms of project performance regardless of the project size. Construction industry in Malaysia is very risky and competitive as it encounters the problem such as not getting sufficient cooperation that often results in low project performance (Rasli & Mohd, 2008). The major problems encountered in the Malaysian construction industry are caused by poor communication which has resulted to construction delays and cost overruns (ASIACONSTRUCT, 2009). As such, common factors affecting project delay and cost overrun in Malaysia are related to managing limited resources and these resources need to be adequately utilised via management and relationship capabilities.

While there have been studies on construction project performance, little attention has been paid on applying performance based theory such as resource based view theory and theory on growth of the firm to this sector. These theories have been tested on other industries such as technology, financial, banking, IT and agricultural but has yet to be extensively examined in construction industry. There is one study found in Malaysia utilising resource based view theory on small and medium contracting enterprises (SMCE) firm performance by Jaafar and Abdul-Aziz (2005). They found positive relationship between management capability and stressed on capabilities relating to finance, project, marketing and relationships. However, their study is

limited to small and medium contractors and there is no subsequent study performed after that. This current study could reconfirm and revalidate their findings using the latest data and covering a wider range of respondents by incorporating large construction firm. Barney (1991) utilizing the resource based view theory suggested that companies possessing necessary "capabilities will achieve competitive advantage, which in turn will improve performance". Grant (2002) suggested that "for the firm to create competitive advantage, individual resources must first work together to establish organisational capabilities". Companies must utilise the resources possessed via the organisational capabilities to enable them to achieve a short term competitive advantage which will lead to superior long-term performance. Construction companies also need to adequately interact and understand the client's need via relationship capability to sufficiently allocate their resources and completes the project on time.

Studies on project performance in construction industries in various part of the world have identified the Critical Success Factors (CSF) affecting project performance (Adnan, Rahmat, Mazali, & Jusoff, 2008; Arain, 2007; Blismas, Sher, Thorpe, & Baldwin, 2004; Chileshe & Haupt, 2005; Doloi & Lim, 2007; Frodell, Josephson, & Lindahl, 2008; Nguyen, Ogunlana, & Lan, 2004; Phua & Rowlinson, 2004; Rohaniyati, 2009; Saqib, Farooqui, & Lodi, 2008; Toor & Ogunlana, 2008). The studies were conducted in Malaysia, Pakistan; South Africa, Australia, Sweden, Vietnam, Hong Kong, Brunei and Thailand. However, these studies did not measure the project performance and examine the extent of the factors influence. Most of the factors identified are related to the contractors' management and relationship capabilities. Nevertheless, these studies did not measure the project performance with

regards to timely completion or meeting the budget neither investigating the effect of the factors on the project performance.

Meanwhile the studies conducted in Malaysia with regards to construction project management focused mainly on identifying factors affecting construction project delay and cost overrun. This is performed by grouping the common factors via factor analysis. Five studies identified the common factors affecting project delays (Abdul-Rahman, Berawi, Berawi, Mohamed, Othman, & Yahya, 2006; Abdul-Rahman, Takim, & Min, 2009; Alaghbari, Kadir, Salim, & Ernawati, 2007; Ali, Smith, Pitt, & Choon, 2010; Murali & Soona, 2007;) and two (2) studies identified the common factors affecting cost overrun (Memon, Rahman, Abdullah, Asmi, & Azis, 2011; Memon, Rahman, Abdullah, Asmi, & Azis, 2010).

Among the factors highlighted by previous studies were experience and capability of construction managers and skilled labourers (Abdul-Rahman, Berawi, Berawi, Mohamed, Othman, and Yahya (2006); contractor's experience (Murali & Soona, 2007); contractor's financial management (Abdul-Rahman, Takim, & Min, 2009); coordination problems between contractor and owner (Alaghbari, Kadir, Salim, & Ernawati, 2007) contractors' financial difficulties, construction mistakes and defective works (Ali, Smith, Pitt, & Choon, 2010) contractor's experience, inadequate planning and scheduling, poor site management and supervision (Memon, Rahman, Abdullah, Asmi, & Azis (2011); contractor's poor site management, supervision, contractor's experience, contractor's incorrect planning and scheduling (Memon, Rahman, Abdullah, Asmi, & Azis (2010). Overall, these studies suggested that there is a lack of management and relationship capabilities which has resulted in project delay and

cost overrun. However, to the researcher knowledge, there is a gap in terms of study relating to the extent of the factors influence on the project performance.

Only one study found that measured the effect of IT capability on construction project performance in Malaysia by Rasli, Tat, Mohd, and Asmi (2011). The study found positive relationship between IT and project performance. Nevertheless, the study did not mention any theory utilised, using the sample of construction consultants rather than the contractor and the relationship was measured using correlation analysis. The current study further extended Rasli et. al (2011) research by including IT as one of the management capability variable which was tested together with relationship capability variable via multiple regression analysis.

Other studies had focused on the macro level that is the factors affecting financial performance, overall performance and growth of the Malaysian construction companies. Ab-Halim, Jaafar, Osman, and Akbar, (2010) examined the financial performance of Bumiputera contractor's and found that the poor financial performance is due to insufficient cash capital to finance the construction work, low profit margin from construction projects and highly dependent on debt capital to finance the construction costs. Gaith, Khalim, and Ismail (2009) studied contractors grade 3 to 5 in Klang Valley and found that IT usage has a positive impact on overall firm performance. Effective organization structure, use of new technology and automation, commitment to customers' satisfaction, market specialization; good company management are important factors contributing to the growth of Malaysian construction companies (Bakar, Razak, Yusof, & Karim, 2011). These also suggested that the importance of management and relationship capabilities towards achieving

superior financial, growth and overall performance. The current study complements the previous studies by examining the micro level in terms of project performance as construction companies are project based.

Considering the major problems faced by the Malaysian construction industry in managing resources and understanding clients need, as well as methodological (previous study only identified common success factors or factors affecting delays and cost overruns) and theoretical gaps (lack of application of performance related theory in previous research conducted), this study attempt to investigate the extent of the management and relationship capability factors effect on the construction project performance in Malaysia.

1.3 Research Questions

The study explores the following questions in order to address the following research problem statement:

1. What is the extent of contractor's management capability influence on construction project performance?
2. What is the extent of contractor's relationship capability influence on construction project performance?
3. What is the extent of competitive advantage influence on project performance?

1.4 Research Objective

The objectives of this study are as follows:

1. To investigate the extent of management capability influence on the construction project performance.
2. To examine the extent of relationship capability influence on the construction project performance.

3. To examine the extent of competitive advantage influence on the project performance

1.5 Scope of Study

Construction industry is the service sector chosen for this study due to its importance and contribution to the nations's economy. The study was targeting Bumiputera contractor's in Malaysia. This is for the reason that their capabilities and performance is vital for the achievement of Vision 2020. Only Bumiputera contractor's were focused in this study.

1.6 Significance of Study

This study is important from the theoretical and practical perspective of various factors affecting project performance. The results reported in this research may be useful to both managers and academics in Malaysia, by contributing relevant empirical data about project performance in one of the industry that is construction industry in Malaysia.

1.6.1 Theoretical Significance

This research utilised the resource based view theory to examine the extent of the influence of the construction company's capabilities on their project performance. Strategic resources must be in place in order to achieve superior performance (Andersen, 2011) and resources must first be utilised via the organisational capabilities (Grant, 2002). Andersen (2011) suggested that for resources to generate superior performance, two important capabilities must be fulfilled namely management and relationship capability since these capabilities ensure the adequate utilisation of resources possessed via proper planning and sufficient understanding of

the client's need. "Resources and capabilities which are different among firms create competitive advantages and ultimately improve performance" (Newbert, 2008). Theory of resource-based view of the firm suggested that "competitive advantage is driven by the firm's use of strategic resources" that is their assets and capabilities. The current study utilised the theory of resource based view of the firm in trying to justify whether management capability, relationship capabilities and competitive advantage influenced the firm's project performance which in the long run will then lead to superior financial performance.

Application of this theory on construction industry is important because most of the previous study on critical project success factor did not include the theoretical aspect or specifically mentioned the theory employed to support their studies except for one study in Malaysia by Jaafar and Abdul-Aziz (2005) and one study in China by Chew, Yan, and Cheah (2008). The author believes that this is ***another*** attempt to test this theory on the Malaysian construction industry in order to prove the practicality and generalisability of the theory.

This study is important to academician since it provides relevant empirical data about Bumiputera contractors project performance in the Malaysian construction industry. This study categorized the major capabilities into two main categories namely relationship and management capabilities.

1.6.2 Methodological Significance

One of the main differences between the methodology employed in this study and previous study was that the previous study only stops at critical project success factor

and did not examine the relationship between project performance and factors identified. Previous study categorised the factors identified into common categories while this study only includes the factors that are related to the theory employed that is the resource based view theory. There are also studies on the measures of project performance but the measures was not utilised to capture any empirical data. This study had utilised the measures identified and developed from earlier studies to examine the extent of construction project performance in Malaysia. This study extends the previous study methodology by including the correlation analysis and multiple regression analysis to statistically test the relationship between project performance and capabilities.

1.6.3 Managerial Significance

This research is aimed at the measuring of influence of the capability factors on the project performance. Therefore, this study will provide a platform for a construction industry to be more focused on the management and relationship capabilities in a construction project to improve their performance since other capabilities have been mentioned more often in various studies (Ab-Halim, Jaafar, Osman, & Akbar, 2010; Nitithamyong & Tan, 2007; Onosakponome, Yahya, Rani, & Shaikh, 2011). It is also important to investigate the construction industry's relationship capability as industry in the olden days does not have a dedicated customer relationship function or team compared to the current industry scenario.

Construction Industry Development Board (CIDB) has developed a strategic roadmap known as the Construction Industry Master Plan (CIMP) for the construction industry of Malaysia (2006-2015). The master plan serves as a guide for the development of

the Malaysian construction industry (CIDB, 2007). Seven strategic thrusts have been developed under the CIMP and one of the thrusts is to develop capabilities in the construction industry. The current study informs the managers of construction companies, on the management and relationship capability factors that they should focus on to improve the project success rate. Examining the capability effect on project performance could provide the managers with information on the strength or weakness of each factors impact on project performance. Furthermore, quantifying and knowing the impact of the factors via the statistical analysis, could provide them with the information on the benefits of improving each of the factors on project performance. This information will provide the managers with some insight and knowledge in developing their management and relationship capabilities in managing project activity that is in the area where they should invest and put more resources.

Management capability is important since it reflects the ability to manage the construction company limited resources (especially financial resources) via proper planning and monitoring control. Relationship capability demonstrates the ability to understand and comprehend construction client needs which will minimize project delays and cost overrun that normally occurs due to double handling and reworks. Relationship capability also helps project management via frequent interaction and communication with clients in order to create and maintain close relationship with clients. Both capabilities were simultaneously examined in terms of project management practices in order to help practitioners and researcher identify critical factors related to the construction industry in Malaysia.

1.7 Definitions of Terms/Concepts

Management Capabilities – the ability of the manager to make use of the strategic resource possessed by the organisation (Andersen, 2011). Management capabilities are the ability of the managers of the construction companies to utilise the resources that they possessed via competence project team, obtaining cooperation and commitment from all parties involved in achieving project objectives, utilizing the proper methodology and decision making tools or systems in managing the project.

Relationship Capabilities - the ability to learn customer needs and position its product successfully (Zahra, Ireland, & Hitt, 2000). Relationship capabilities are construction companies' ability to interact and understand the customers need via comprehension and communication abilities involved in project performance in order to generate the desired performance from the available resources**.**

Project Performance - an organisation's "capability to satisfy expectations on cost, time, quality, functionality and achieving business objectives" (Liu, 2009) Project performance is the achievement of the construction company in meeting the project objectives relating to budget performance (within budget or cost), schedule (timely completion), client satisfaction, functionality (according to specification), quality and safety.

Competitive Advantage – "Implementation of a strategy that facilitates the reduction of cost, the exploitation of market opportunities, and/or neutralization of competitive threats" (Barney, 1991). Competitive advantage is the advantage which the construction company possesses, generated from the utilisation of its strategic

resources via the organisational capabilities such as cost, innovation and price advantage.

1.8 Organisation of the Thesis

The organisation of this study follows the standard thesis format and the content of this document is structured into five chapters.

Chapter 1 furnishes the background of the study, problem statement, research questions, research objectives, research significance, definition of key terms and organisation of the study. Chapter 2 provides a literature review and a summary of previous research that relate to this study. The review presented in this chapter includes a discussion on previous literature relating project performance and strategic resources factors that influences project performance especially in the construction industry. Chapter 3 explains the research model and methodology utilized in the study. This chapter describes the hypothesis development, research design, sample and data collection, research instrument, operational definition, measurement of the variables and method of data analysis. Chapter 4 presents an analysis and interpretation of the results of the study. This chapter will discuss unsolicited as well as requested responses to the survey form and an interpretation of the statistical findings. Lastly, Chapter 5 summarises and discusses the major findings, implications and limitations of the study including a statement as to the conclusions reached. Additionally, recommendations for further research are also included in this chapter.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter reviews relevant literature regarding project performance; underlying theory and previous literature on management and relationship capabilities that influences the project performance are also discussed. It also discusses the underlying theory, hypothesis development and research framework.

The current study focused on the influence of management capability, relationship capability and competitive advantage on project performance of the Malaysian Construction Industry (MCI). Significant factors which influenced the construction project performance were identified via literature review. Based on the literatures, questionnaires were formulated to gather the necessary data and the survey questionnaires were sent to project managers of construction companies. Motivation behind the current study is to determine the relevant factors that managers of construction companies should focus on to improve the construction project performance and overall performance of Malaysian Construction Industry (MCI).

2.1 Firm's Performance

The Oxford English Dictionary (OED) defined performance as "the quality of execution of such an action, operation, or process; the competence or effectiveness of a person or thing in performing an action; especially the capabilities, productivity, or success of a machine, product, or person when measured against a standard". Firm performance is a subset of performance from business perspective and it is defined as the extent of the firm's financial and other objectives achievement through execution

of tactics, marketing strategies and management (Hafeez, Chaudhry, Siddiqui, & Rehman, 2011). It is important to study and measure construction firm performance as it plays an important role in the economy and construction activities hence, support many other industries such as manufacturing, mining, transportation and facilities; and services such as health, education and tourism (Ahmad, 2009).

Yang, Yeung, Chan, Chiang, and Chan, (2010) found that performance measurement studies in construction can be divided into three levels that is project, organisational and stakeholder levels based on their literature review of construction industry performance measure studies from 1998 to 2009. Lin and Shen (2007) examined construction performance measures used by studies from 1998 to 2004 and they noted that total number of papers conducted at project performance level take the largest proportion that is 68 percent of the total.

Basheka and Tumutegyereize (2010) confirmed that there are a number of key indicators for measuring the construction firms' performance in Uganda. A deeper analysis of their results suggests that the factors which should be considered for performance measurement of contractors in Uganda should have a set of quality, cost, capacity, ethical and environmental related performance indicators.

Key performance indicator in the current study is focused only at the project level rather than at company level. The current study utilise project performance measure as the measure of the construction firm performance since construction industry is a project oriented industry that has a definite starting and ending point (Isik, Arditi, Dikmen, & Birgonul 2009 and Zwikael, 2009) and thus, project performance has a

relationship with construction firm's business performance since it is one of the main income generation activities.

2.1.1 Project Performance

Oxford English Dictionary defined project as an individual or collaborative enterprise that is carefully planned and designed to achieve a particular aim. Project Management Book of Knowledge (PMBOK) by the Project Management Institute (PMI) divided project into five (5) process group namely initiating, planning, executing, controlling and closing (PMI, 2012). Initiation phase is the process in which it is decided if there is a need for a particular project and the decision whether the project will commence and can be completed as per the timeline. During the planning phases, the scope of the project is developed, including documenting the actions necessary to define, prepare, integrate, and coordinate all subsidiary plans into a project management plan. This is followed by the execution process in which the necessary actions are performed in order to accomplish the goals that were set in the planning stage. Next is the monitoring and controlling process where the actions performed in the execution stage are supervised, in order to ensure the project is successful in meeting the predetermined goals. Finally, the close process in which the finished product or service is presented, indicating successful completion of the project (PMI, 2012).

Each project will typically involve various stakeholders such as the project manager, client, user, construction firm, project team members. According to Takim (2009), stakeholders are defined "as being those who can influence the activities/final results of the project, whose lives or environment are positively or negatively affected by the

project, and who receive direct and indirect benefit from it" p. 168). Project manager is the individual responsible for managing the entire project. User is the individual or organisation that will utilise the project's product or services. Client is the project sponsor which could be either individual or group that provides the financial resources, in cash or in kind, for the project. Construction firm is the enterprise employing the employees that are directly involved in performing the project work. A project team member is the group that is performing the work of the project (Takim, 2009).

Construction project performance is defined as the contractor's capability to fulfil the expectations on cost, time, quality, functionality and meeting the business objectives (Liu, 2009). The construction industry's major business objective is to undertake projects in constructing new buildings or refurbishing existing ones for different group of clients. According to Navon (2005) project performance compares between the desired and the actual project performances, which then used to update the historical database and control current projects. This is important since it facilitate better planning of future projects in terms of costs, schedules, resource allocation (Navon, 2005). When there is deviation found, the management of the construction company analyses the reasons for it. This could be due to unrealistic target setting during the planning stage, actual construction and also a combination of both especially when there are frequent changes in the design due to additional requirements. Normally client tends to change their design and requirements and this is allowed in construction industry.

There are several ways to measure the performance of construction projects. Typical construction project performance measure comprises of three (3) items namely time, cost and quality (Kagioglou, Cooper, & Aouad, 2001). The three (3) criteria of time, cost, and quality have been used for evaluation of the performance and construction projects success for a long time (Chan, Scott, & Lam, 2002).

Cost is one of the criteria for construction projects performance which includes the initial capital cost, the operation cost and maintenance costs. Cost is one of the main concern during the project management life cycle and can be regarded as one of the most important parameters of a project and the driving force of project success (Azhar, Farooqui, & Ahmed, 2008). Cost overrun is simply as the difference between actual project cost incurred and its cost limit (budgeted amount). This situation happens when the actual project cost project exceeds the budgeted amount. The cost limit of a project is the maximum expenditure that the client is prepared to incur on a completed building project (Jackson & Steven, 2001).

Second criteria is the project time, with the objective to match the resources of equipment, materials and labour with project work tasks over time. Good timing or scheduling can eliminate problems due to production bottlenecks, facilitate the timely procurement of necessary materials, ensure the completion of a project as per scheduled and poor scheduling can result in the waste of labourers and equipment. Time overrun can be defined as late completion of works as compared to the planned schedule or contract schedule. It occurs when the progress of a contract falls behind its scheduled program. It may be caused by any party to the contract and may be a direct result of one or more circumstances (Memon et al., 2012). Delay in contract has

negative outcomes on both contractor and owner either in the form extra cost or revenues lost and this will lead to the controversial issue on the responsibility to handle delays, which may lead to conflicts that often end up in courts (Abbas, 2006)

The third criteria is the project quality, which is regarded as one of the significant concern to project managers and owners. Specification of quality requirements in the design and contract documentation becomes extremely important with the attention to conformance as the measure of quality during the construction process (Rasli & Mohd, 2008). A simple definition of quality is meeting the customer's expectations or compliance with customer's specification. One of the most significant measure of performance on any construction project is the compliance with quality specifications. Poor quality can result to productivity loss; additional cost in form of repair and rework, reputation loss, resulting in market share losses and ultimately being put out of business (Jha & Iyer, 2006).

Project performance measurement should not only be limited to the three traditional criteria or triangle that consists of cost, time, and quality (Pheng & Chuan, 2006). Other measures or criteria for example, end products and project management can also be utilised. Enshassi, Mohammed, and Abushaban (2009) studied the factors affecting the performance of construction projects in the Gaza Strip, provided a useful categorisation of critical performance measures for construction projects. Their categorisation suggested to include cost, time, quality, productivity, client satisfaction, regular and community satisfaction, people, health and safety, innovation and learning as well as environmental.

Ugwu and Haupt (2007) established and confirmed seven Key Performance Indicators (KPI) to appraise the sustainability of infrastructure projects in a developing country namely South Africa. The major indicators proposed were society, economy, environment, resource utilisation, health and safety and project management and administration. Nine other key performance indicators (KPIs) were suggested by Luu, Kim, and Huynh (2007) that can be utilised to measure project performance, evaluating potential construction company and their capacity by requiring them to provide these figures. The nine KPIs are identified as construction cost performance, construction time performance, customer satisfaction on services, customer satisfaction on products, Quality Management System (QMS), project team performance, change management, material management, labour safety management.

According to Nguyen, Ogunlana, and Lan (2004) which studied construction industry in Vietnam, success criteria are the measures which judged the success or failure of a project or business. Projects are considered to be successful if they obtain better results in terms of the cost, schedule, quality, safety, and satisfaction of participants (Nguyen, Ogunlana, & Lan, 2004). Topical and Stroh (2001) claimed that the project can be considered successful in the long-term if the expectations of the clients are achieved. A construction project is commonly acknowledged as successful when it is completed on time, within budget, and in accordance with specifications and to stakeholders' satisfaction (Nguyen, Ogunlana, & Lan, 2004). Functionality, profitability to contractors, absence of claims and court proceedings and fitness for purpose of occupiers have been used as measures of project success (Takim & Akintoye, 2002).

Ali and Rahmat (2010) studied the criteria utilised to measure project performance of construction projects managed by the International Organization for Standardization (ISO) certified construction company in Malaysia. Their study which examines 30 managers employed by ISO certified contactors highlighted that functionality and clients' satisfaction are two of the most important criteria to measure the construction project performance, whereas time and cost were the least important. Takim and Adnan (2008) study of four project stakeholders in Malaysia found that project success is represented by five (5) measures of project effectiveness that is: Learning and Exploitation; Client Satisfaction; Stakeholder Objectives; Operational Assurance and User Satisfaction.

Several other measures of project success were also introduced by various researchers. Heerkens (2002) suggested project success can be measured on four levels. The first level is meeting project targets, which refers to the original objectives of cost, schedule, quality, and functionality. The second level is project efficiency which is about the way that the project was managed. The third level is customer or user utility, which refers to the extent that the project fulfils its mission of solving a problem, exploiting an opportunity, or otherwise satisfying a need. Finally, the fourth level is improvement, which refers to the wider lessons learnt from the project, which is an area too often neglected in terms of judging the success or otherwise of a project (Forsberg, Mooz, & Cotterman, 2000).

According to Shenhar, Milosevic, Dvir, and Thamhain (2007) there are four dimensions of project success. (i) Meeting time schedule and (ii) budget conformance is short term project success goal while (iii) functionality is medium term project

success goals. (iv) Company performance with regards to profitability is the long term goal of project success. Similarly, Al-Tmeemy, Abdul-Rahman, and Harun (2011) also had established future criteria for success of building projects in Malaysia. Project success criteria includes project management success, product success and market success. Project management success consists of meeting time, budget and quality requirements. Product success includes meeting customer satisfaction and functionality requirements. Finally market success is the success with regards to revenue, market share and reputation of the construction company.

Chan and Chan (2004) established the consolidated framework for measuring success of construction projects. This helps to establish alternative methodology to measure the success of the construction industry. They introduced the concept of Key Performance Indicators (KPI) to the framework of success criteria. The KPIs were divided into two categories that are measured via objective and subjective measures. Project success indicators according to them are cost, quality, time, commercial value, environmental performance, user expectation or satisfaction, health and safety.

Based on the above literatures, five (5) common items used in the various studies for measuring project performance includes cost, time, quality, safety and functionality. Cost variance is a significant factor to measure project performance since it reflects how much the project is over or under budget. This measure of project performance was utilised by Andi and Minato (2003) to examine the effect of design defect in Japan's construction industry. Time variance is one of the techniques for assessing project performance in construction projects (Salter & Torbett, 2003). Quality in the construction industry is defined as the totality of features required by a product or

services to satisfy a given need and fitness for purpose (Parfitt & Sanvido, 1993). Safety definition is the degrees to which the general conditions promote the completion of a project without major accidents or injuries (Bubshait & Almohawis, 1994). Finally, functionality is considered as a measure which occurs at the post construction stage when the project is completed and delivered to service (Chan, 2001).

The current study utilised the five (5) common measures of project performance namely budget performance (within budget or cost), schedule performance (timely completion), functionality (according to specification), quality and safety. The two most important measures are budget performance and schedule performance since it also indirectly measures time and cost overrun. Functionality, quality and safety are equally important because there is no point completing the project on time and within budget if it does not work as intended and not safe for consumption. Other measures such as client satisfaction was excluded in the current study since the study sample is only limited to construction companies listed in the CIDB directories and the focus is on the perspective of project managers.

After considering all the various measures of project performance, the current study then proceeds to the review of performance related theory and determinant factors affecting project performance in construction industry.

2.2 Theoretical Underpinning

There are various theories that explain and predict the differentials in the performance of the firm. Two of these theories are such as transaction cost theory (Williamson, 1975) and agency theory (Jensen & Meckling, 1976) which primarily suggest the coordination of economic activity for performance improvement. Transaction cost theory discusses on whether it is cheaper to buy or make the product or services that it needs. Agency theory suggested that the separation of agent (manager) and principal (owner) in order to improve the firm performance especially in family based business. However, these theories is less suitable for the current study as it do not explicitly explain the differentials in performance between firms and not much is said about the sources of differences in efficiency between firms (Stoelhorst & Raaij, 2004). This is addressed in the other theory such as the Resource Based View (RBV). The current study utilised the resource-based view theory which is a way of viewing the firm and was made popular by Hamel and Prahalad in the book titled Competing for the Future in 1994. This view in general conceptualizes firm as a group of resources. The resources and how they are integrated, make one firms unique from another and in turn allows them to deliver products and services in the market.

Over the last 20 years, relationship between company's resources and performance has been a key area of interest in research on strategic management and research on theory of the resource-based view of the firm (Barney, 1991; Peteraf, 1993; Wernerfelt, 1984). The theory has also become a major theoretical framework in modern strategic management research. The theory of the Resource-Based View (RBV) of the firm examines the concept of rent, which is a return to the firm on its resources (Penrose, 1959). Rent is achieved when a firm combines its resources and

unique competencies and capabilities to receive a return on those resources (Penrose, 1959).

According to Fahy (2000) resources can be grouped into capabilities and assets. Capabilities can be in form of individual for example customer care, individual learning, coordination skills, in form of group such as customer orientation, group learning, interpersonal skills or in form of corporative capabilities namely market orientation, organisational learning, portfolio management, innovation, planning processes. Assets can be in form of tangible for example land, plant and machines, people as well as intangible such as procedures and systems, knowledge, brands and reputation.

Resources can be defined as any attribute for example tangible or intangible, physical or human, intellectual or relational that can be deployed by a company enabling it to produce, efficiently and/or effectively, a market offering that has value for some market segment(s) (Hunt, 2000). Barney (1986) lists all assets, capabilities, organisational processes, firm attributes, information, knowledge as example of resources. Resources that the resource-based view theory assesses can be either tangible or intangible resources under the company controls which can be used to produce or implement strategies (Barney & Hesterly, 2006). Intangible resources can include skills, human assets, information and organisational assets, and relational and reputational assets (Knott, 2009). Intangible resources are regarded as more crucial and vital in achieving competitive advantage position due to their hard-to-copy nature compared to tangible resources. The current study examines the intangible resource aspect with regards to their management and relationship capabilities.

Resource Based View theory (RBV) derives from Penrose's (1995-1999) theory of the firm. It is the firm's unique bundle of resources that is different from competitor firms that are potentially valuable and contribute to a firm's competitive advantage (Alvarez & Busenitz, 2001). Within this theory, firms are considered to be bundles of resources (Alvarez & Busenitz, 2001; Eisenhardt & Martin, 2000) which have varying impacts on competitive advantage. Barney (1991) identified the key characteristics for a resource to be strategically important as follows:

• Valuable – There is no point having a resource if it does not deliver value to the firm.

• Rare – Resources that are owned by a large number of firms cannot confer competitive advantage, as they cannot deliver a unique strategy in comparison with competing firms.

• Inimitable – Resources can only be sources of sustained competitive advantage if firms that do not possess these resources cannot obtain them.

• Non-substitutable – There must be no strategically equivalent valuable resources that are themselves neither rare nor inimitable.

Strategic resources for example resources that are valuable, rare, inimitable, and non-substitutable help firms achieve competitive advantage (Eisenhardt & Martin, 2000). The theory stresses on the idea of costly-to-copy attributes of the company as sources of business returns and the means to achieve competitive advantage and superior performance (Hamel & Prahalad, 1996). Barney (1991) suggested that companies possessing strategic resources and capabilities will achieve competitive advantage,

which subsequently will enhance their performance. Grant (2002) suggested that individual resources need to work together to develop organisational capabilities so that the company can achieve competitive advantage.

Many unpredictable factors affects the construction projects in the new construction era and under this uncertain environment, utilising information technology or systems to boost project performance is one of the major sources that can help to sustain competitive advantage is (Rasli & Mohd, 2008). Thus, firms which possess strategic resources must utilise the strategic resources via the organisational capabilities and competitive advantage and this will lead to superior long-term performance, as displayed in Figure 2.1 below.

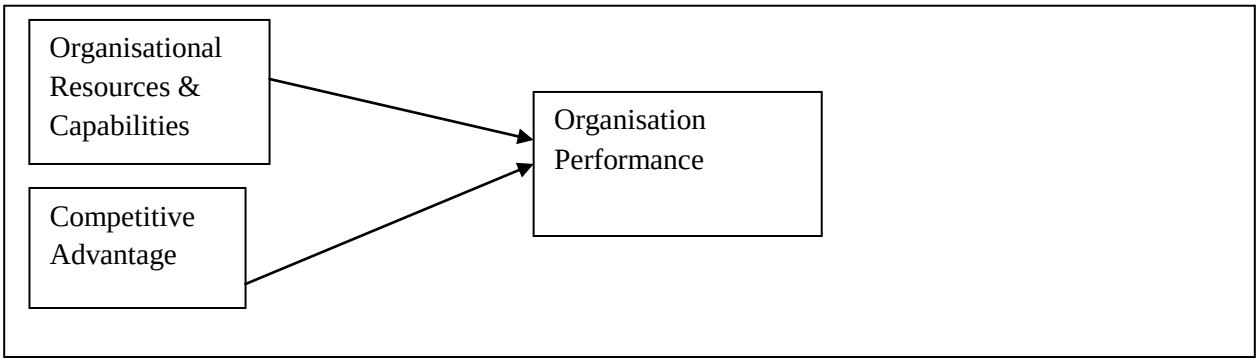

Figure 2.1
Resource Based View Theory
Source: Grant (2002)

2.3 Determinant Factors of Project Performance in Construction Industry

Many factors can have an effect or influence the project performance in the construction industry. Empirical studies on critical success factors of construction project performance were performed in various part of the world such as Brunei, Malaysia, Thailand, Vietnam, Hong Kong, Sweden, South Africa, Pakistan and

Australia. Generally these studies findings are related to two (2) main capabilities namely management capability and relationship capability. Nevertheless, these studies identified the factors via factor analysis grouping and did not investigate the extent of the capability and its effect on project performance.

Management capability related factors identified were slow decision making, contractor's inadequate planning, managing financing and payment of completed work, managing subcontractor performance and insufficient contractor experience (Rohaniyati, 2009); risk management (Adnan, Rahmat, Mazali, & Jusoff, 2008); competence and commitment (Toor & Ogunlana, 2008 and Nguyen, Ogunlana, & Lan 2004); user's participation, commitment to the project, high standard of quality, consideration among the construction workforce and team working (Frodell, Josephson, & Lindahl, 2008); planning influences (Blismas, Sher, Thorpe, & Baldwin, 2004); strategic and the managerial sub-systems (Arain, 2007); project planning and control, project personnel (Toor & Ogunlana, 2008a); project manager related factors, procurement related factors (Saqib, Farooqui, & Lodi, 2008); detailed planning in project budget and cost control, project time planning and schedule control, establishment of project quality control, ability to perform the required tasks, availability of comprehensive project information and specification, competency of key personnel, individual's experience in the construction industry, allowance for project contingencies, detailed project work breakdown structure, clear and well defined project milestones (Doloi & Lim, 2007); cooperation (Phua & Rowlinson, 2004).

Relationship capability related factors identified were communication and managing change orders (Rohaniyati, 2009); comprehension, comfort and communication (Toor & Ogunlana, 2008 and Nguyen, Ogunlana, & Lan 2004); involvement of client (Toor & Ogunlana, 2008a); (Saqib, Farooqui, & Lodi, 2008); individual or personnel

communication (Doloi & Lim, 2007), forming a Customer Relationship Management (CRM) team to obtain customers' feedback (Pakseresht & Asgari, 2012), customer relationship networking and government relationship (Chew, Yan, & Cheah, 2008), interactive processes in terms of communicating updates and information on changes and problems (Elattar, 2009), addressing customer complaints and reaction to customer's needs (Zulkarnain, Zawawi, Rahman, & Mustafa, 2011), assessing the stakeholders' needs and communicating with stakeholders properly and frequently (Yang, Shen, Ho, Drew, & Chan, 2009).

Table 2.1 provided the details of the above studies conducted on project critical success factor related to the construction factor industry. Since the current study utilised the theory of the Resource Based View (RBV) of the firm, the factors which are related to strategic resource factors were selected and they were grouped under management capability and relationship capability. Subsequently, the current study reviews the literature related to project performance with regards to time and cost overrun to confirm whether management capability and relationship capability are still relevant.

Table 2.1

Summary of Previous Research on Critical Success Factor in Construction Project

No.	Authors	Respondent Used	Location	Variables /Elements	Relevant Key Results
1	Rohaniyati (2009)	30 owners, 25 contractors and 20 engineers	Brunei	Project success factors	Seven most important causes of project delay are: • Lack of communication • Slow decision making • Change orders • Inadequate planning by contractor • Finance and payment of completed work • Subcontractor performance • Inadequate contractor experience
2	Adnan, Rahmat, Mazali, and Jusoff (2008)	Forty (40) organisations (comprising consultants, contractors and clients) involved in construction works	Malaysia	Project success factors: • Risk Management • Partnering	Risk management process and partnering are critical to the success of the project.
3	Toor and Ogunlana (2008)	Project managers, deputy project managers and line managers	Thailand	Project success factors • Comprehension, • Competence, • Commitment, • Communication,	Factor analysis was used to examine the underlying relationships of success factors which resulted in formulation of four factor groupings which were together called critical COMs
4	Nguyen, Ogunlana, and Lan (2004)	109 respondents from 42 construction-related organisations.	Vietnam	Project success factors • Comfort • Competence • Commitment • Communication	Success factors can be grouped under four categories, titled as the four COMs namely: • Comfort • Competence • Commitment • Communication

No.	Authors	Respondent Used	Location	Variables /Elements	Relevant Key Results
5	Phua and Rowlinson (2004)	29 interviews, 398 quantitative responses and 6 follow-up interviews from construction firms	Hong Kong	• Cooperation • Micro project environment • Contractual characteristics • Site conditions • Political • Economic stability	The regression model displays that cooperation and contractual characteristics were the only variables that influence project success.
6	Frodell, Josephson, and Lindahl (2008)	Semi-structured interviews with 23 experienced individuals within professional client organisations.	Sweden	• Project success factors • Performance	The most important success factors have been identified as: • User's participation • Commitment to the project • High standard of quality • Consideration among the construction workforce • Team working
7	Blismas, Sher, Thorpe, and Baldwin (2004)	-	-	• Project delivery factors	Ten main factors influencing project delivery were identified within the research. These were grouped under four headings namely: • Environmental influences, • Client influences, • Third-party influences • Planning influences
8	Chileshe and Haupt (2005)	58 empirical observations from within the South African construction related Organisations	South Africa	Skills and attributes: • Strategic factor • Project control • Technical • Commercial • Organisation	The research identifies six factors which are critical for the effectiveness of construction project management (CPM). The results indicate that the correlation between the hard and soft skills is necessary for the effective implementation of construction

No.	Authors	Respondent Used	Location	Variables /Elements	Relevant Key Results
				• People	project management.
9	Arain (2007)	189 professionals who were involved in the building projects in Pakistan	Pakistan	• Strategic • Structural • Technical • Managerial sub-systems.	Ten (10) critical success factors were identified and these 10 most important critical success factors fit within 4 main sub-systems of any construction project, namely the strategic, structural technical, and the managerial sub-systems.
10	Toor and Ogunlana (2008a)	76 questionnaire surveys and 35 interviews	Thailand	• Project planning and control • Project personnel, • Involvement of client	Factors related to project planning and control, project personnel, and involvement of client were perceived to be critical for the success of large-scale construction projects in Thailand
11	Saqib, Farooqui, and Lodi (2008)	Representatives from 37 major contracting organisations working in major cities of Pakistan	Pakistan	• Contractor-Related Factors • Project Manager Related Factors • Procurement Related Factors • Design Team-Related Factors • Project Management Factors	This study has chosen top five (5) critical success factor (CSF) categories.
12	Doloi and Lim (2007)	52 construction firms in Victoria, Australia	Australia	• Detailed planning in project budget and cost control • Project time planning and schedule control • Individual or personnel (including support and communication) • Establishment of project quality control • Ability to perform the required tasks • Availability of comprehensive project information & specification	This study identified 12 critical factors affecting construction project performance.

No.	Authors	Respondent Used	Location	Variables /Elements	Relevant Key Results
				• Competency of key personnel • Close relationship between project time and cost management • Project complexity (design complexity and construction complexity) • Individual's experience in the construction industry • Allow for project contingencies • Detailed project work breakdown structure and project milestones are clear and well defined	

Previous research on time and cost overrun as per Table 2.2 also highlighted almost similar key results. These studies were performed in Malaysia, Nigeria, Australia, South Africa, United Kingdom, Ghana, Gaza Strip, Pakistan, Vietnam, Ethiopia, Egypt, Indonesia and Kuwait. Similar to the studies on critical success factors, the factors affecting cost and time overrun are also related to the two main capabilities. Nevertheless, these studies did not measure the extent of the relationship between the factors and project performance.

Some of the factors identified are related to managing the limited resources with regards to material, financial and human resources. This shows that management capability is still relevant in addressing the concern on project performance. The factors identified were financial resource management, project management and contract administration issues (Memon, Abdul Rahman, & Azis, 2012); lack of experience in contract works and incomplete drawings (Kasimu, 2012); timeliness of decision making (Jian, Xiao-Hua, & Timothy, 2011); inadequate planning before project takeoff, inadequate tools and equipment (Ameh & Osegbu, 2011); (Baloyi & Bekker, 2011); inaccurate evaluation of project time or duration, complexities and non-performance of subcontractors (Olawale & Sun, 2010); contractors underestimation of the project cost, complexity and time as well as poor supervision, poor professional management and poor site management (Fugar & Agyakwah-Baah, 2010); poor project or site management, poor cost control, delays between design and procurement phases, incorrect or inappropriate methods in cost estimation, managing additional work, improper planning, (Azhar, Farooqui, & Ahmed, 2008); slowness and incompetence (Le-Hoai, Lee, & Lee, 2008); poor planning and coordination, (Nega, 2008); non-utilisation of professional construction or contractual management (Abd El-Razek, Bassioni, & Mobarak, 2008); (Harisaweni, 2007); owners' lack of

experience in the construction business and contractor-related problems (Koushki, Al-Rashid & Kartam, 2005)

Other factors such as design problem and changes imply that relationship capability aspect in understanding the client requirement is also crucial for the success of the project. The relationship capability related factors affecting cost and time overruns were design issues (Memon, Abdul Rahman, & Azis, 2012); problems with design (Jian, Xiao-Hua, & Timothy, 2011); delay in delivery of material (Ameh & Osegbu, 2011); projects design-related factors (Baloyi & Bekker, 2011); projects design-related factors (Olawale & Sun, 2010); delays in materials delivery to the site (Enshassi, Al-Najjar, & Kumaraswamy, 2009); Azhar, Farooqui, & Ahmed (2008). (Le-Hoai, Lee, & Lee, 2008); change orders due to enhancement required by clients (Nega, 2008); design changes by owner or the agent during construction (Abd El-Razek, Bassioni, & Mobarak, 2008); material delivery problems and frequent design changes (Harisaweni, 2007); and changing orders (Koushki, Al-Rashid & Kartam, 2005)

Table 2.2

Summary of Previous Research on Time and Cost Overruns in Construction Project

No.	Authors	Respondent Used	Location	Variables /Elements	Relevant Key Results
1	Memon, Abdul Rahman, & Azis (2012)	140 personnel involved in construction industry	Southern and central part of peninsular Malaysia.	Time and Cost Overrun	Major contributors of this poor performance include design and documentation issues, financial resource management, project management and contract administration issues
2	Kasimu (2012)	Unknown	Nigeria	Cost overrun	Top five major causes of cost overruns are: materials price fluctuation; insufficient time; lack of experience in contract works and incomplete drawings
3	Jian, Xiao-Hua, & Timothy (2011)	A group of industry professionals in South Australia	Australia	Time and Cost Overrun	Timeliness of decision making is ranked as the top factor contributing towards delays. Problems with design is perceived as most influential to the cost overruns
4	Ameh & Osegbu (2011)	43 technical and management staff of some medium and large construction firms	Lagos, Nigeria	Time Overrun	Major causes of time overrun are inadequate funds for the project, inadequate planning before project takeoff, inadequate tools and equipment and delay in delivery of material.

No.	Authors	Respondent Used	Location	Variables /Elements	Relevant Key Results
5	Baloyi & Bekker (2011)	Consultants (24), contractors (20) and clients (16) involved in the ten 2010 World Cup construction sites	South Africa	Time and Cost Overrun	Single largest contributor to cost overruns is the increase in material cost. Late payments and projects design-related factors caused the time delays.
6	Olawale and Sun (2010)	250 construction project organisations in the UK, which was followed by face-to-face interviews with 15 experienced practitioners	United Kingdom	Time and Cost Overrun	Top five leading inhibiting factors are design changes, risks/uncertainties, inaccurate evaluation of project time/duration, complexities and non-performance of subcontractors
7	Fugar and Agyakwah-Baah (2010)	39 contractors, 37 clients and 54 consultants	Ghana	Delay (Time Overrun)	The most important factors causing delay in Ghana are: • Underestimation of the cost of project • Underestimation of complexity of project • Underestimation of time for completion of projects by contractors • Poor supervision • Poor professional management • Poor site management

No.	Authors	Respondent Used	Location	Variables /Elements	Relevant Key Results
8	Enshassi, Al-Najjar, & Kumaraswamy, (2009)	66 contractors, 27 consultants, and 31 owners	Gaza Strip	Delay and Cost Overruns	Four main causes of time delays included strikes and border closures, material-related factors, lack of materials in markets, and delays in materials delivery to the site. Three main causes for cost overruns included price fluctuations of construction materials, contractor delays in material and equipment delivery and inflation.
9	Azhar, Farooqui, & Ahmed (2008).	25 construction firms personnel	Pakistan	Cost Overrun	Top ten cost overrun factors found were: fluctuation in prices of raw materials, unstable cost of manufactured materials, high cost of machineries, lowest bidding procurement procedures, poor project (site) management/ poor cost control, delays between design and procurement phases, incorrect/ inappropriate methods of cost estimation, additional work, improper planning, and unsupportive government policies.

No.	Authors	Respondent Used	Location	Variables /Elements	Relevant Key Results
10	Le-Hoai, Lee, & Lee (2008)	87 Vietnamese construction experts.	Vietnam	Delay and Cost Overruns	7 factors identified namely Slowness and constraint; Incompetence; Design; Market and Estimate; Financial capability; Government; and Worker.
11	Nega (2008)	42 questionnaires from clients, consultants and contractors	Ethiopia	Cost Overruns	Most important causes of cost overrun were found to be inflation or increase in the cost of construction materials, poor planning and coordination, change orders due to enhancement required by clients, excess quantity during construction.
12	Abd El-Razek, Bassioni, & Mobarak, (2008)	29 contractors, 23 consultants, and 22 owners	Egypt	Time overrun	Most important causes are financing by contractor during construction, delays in contractor's payment by owner, design changes by owner or his agent during construction, partial payments during construction, and non-utilisation of professional construction or contractual management.

No.	Authors	Respondent Used	Location	Variables /Elements	Relevant Key Results
13	Harisaweni, (2007)	Contractors and consultants in class B and M respectively	Padang and Pekanbaru, Indonesia	Time and cost overruns	Major causes of project time and cost overrun ranges from lack of labour, lack of equipment to material delivery problems and frequent design changes.
14	Koushki, Al-rashid and Kartam (2005)	450 randomly selected private residential project owners and developers in 27 representative districts in metropolitan Kuwait	Kuwait	Time and cost overruns	Three main causes of time-delays included changing orders, owners' financial constraints and owners' lack of experience in the construction business. Three main causes of cost overruns were identified as contractor-related problems, material-related problems and owners' financial constraints.

After identifying the factors related to critical success of the project and factors that are affecting time and cost overrun, it can be concluded that management and relationship capabilities is still a valid concern. Management capability related issues were identified with regards to contractor's site management related factors, financial management related factors, project management and human resource related factors. Relationship capability related concerns were identified relating to understanding and communication of design changes, communication on material delivery and coordination related issues.

Each factor under management and relationship capabilities is discussed thoroughly in the subsequent section.

2.4 Management Capability

Management capability is chosen as one of the main factors since management is the coordination of all resources through the process of planning, organising, leading and controlling in order to attain process objectives (Abiola, 2000). Previous studies have defined management capability and managerial capability with regards to managing resources and creating strategic vision. Andersen (2011) suggested that management capability is the managerial ability to make use of the strategic resource since the possession of a resource or a capability of some kind does not necessarily mean that the resource is actually utilized. Managerial capability is basically possessing the ability to create a strategic vision and identity for the company, communicate these throughout the organization, and encourage the workforce to achieve them (Lopez-Cabrales, Vale, & Herrero, 2006).

According to Malaysian Institute of Management (MIM, 2012) management capability results from an individual's competency that embraces sound processes, practices and structure. This will then leads to the improvement in management capability of an organisation, which directly influences the country's capability for long term economic and growth performance. It is important to understand that management capability is much more than management competencies. While competencies are general descriptions of the abilities necessary to perform successfully in a particular job or position, capability is the degree to which management uses its skills, abilities and competencies to achieve results. Management capability is displayed in the business or organisational performance, and it is the result of management leadership and competency of the key management practices which result to sustainable business performance and business growth**.**

Construction firm needs to manage their resources to satisfy their clients' requirement. The contractor's management capability is important to improve the project performance and the construction company needs to develop their managerial capability to deliver construction projects on time as per schedule (Ajibade, 2006). Isik, Arditi, Dikmen, and Birgonul (2010) examined the influence of resources and capabilities on construction company performance by surveying 73 Turkish contractors. They defined company's resources and capabilities as its tangible and intangible assets that include the company's financial resources, technical competencies, leadership characteristics, experience, image in the industry, research and development capabilities, and innovation tendencies. These resources and

capabilities have an important and direct impact on the construction company performance.

Aje, Odusami, and Ogunsemi (2009) investigated the effect of construction company's management capability on time and cost performance of selected building projects. They found that contractor's management capability has significant impact on cost and time performance of building projects**.** Furthermore, construction firm's performance is vital to construction project success as it is the construction company translate the designs to the practical reality (Aje, Odusami, & Ogunsemi, 2009). Poor management may lead to poor follow-up of progress, incorrect distribution of works, non-commitment of site employees and poor monitoring of project (Enshassi et al., 2009).

Wong and Holt (2003) highlighted that among the items that should be included as part of construction firm's management capability are as follows:

- Type of control and monitoring procedures
- Ability of the contractor to deal with unanticipated problems, that is risk management, provision of trained/skilled supervisors for the proposed project
- Contractors' information technology knowledge, e.g. project management software and electronic document management system

Management capability aspects that ensure resource utilisation examined in the current study are competence, cooperation, commitment, methodology and systems. These factors were chosen because they represent various crucial aspects of

managerial capability required by the construction firm in managing their project where tangible resources are limited.

2.4.1 Competence

Competent is chosen as one of the management capability factors as construction project normally involves the decision making by project team members and project managers. Kaliba, Muya, and Mumba (2009) suggested that construction firms should ensure that they have the right personnel with appropriate qualifications to manage their projects efficiently. Project performance will be further improved if the project manager has sufficient experience and qualifications related to project management or construction management. Furthermore, the qualification and experience of the project team members are also crucial for the project success.

Competence comprises of competent project manager, competent team members, and awarding bids to the right designers/contractors (Toor & Ogunlana, 2008a) since projects are very much controlled by the people involved in performing project related task and activities. Competency of project team is another critical factor that has been frequently mentioned in research studies (Belout & Gauvreau, 2004). Kuen, Zailani, and Fernando (2009) results also demonstrated empirically that project personnel competency is a critical factor influencing the project success.

Dealing with common risk and uncertain circumstances in construction projects will be made easier when the project team members are competent (Toor & Ogunlana, 2008a). Competency of the project team also enables sufficient project comprehension when all project members have the individual expertise in their

respective areas. Project team members that are competent also reduces the loopholes in the project plans preparation and implementation. Project team capability and proficiency were also highlighted as a significant success factor (Nguyen, Ogunlana, & Lan, 2004). Successful accomplishment of project goals requires a competent team that possesses the expertise, knowledge, experience and proficiency.

Competency of the project manager has also been repeatedly highlighted in most research studies on the subject (Nguyen *et al*., 2004, Jha & Iyer, 2006). Obviously the most important factor in the overall composition of the team is the project manager or project leader who plays a vital role in overall project management. A project manager is the key person at the site who, within a set of guidelines kept in place by the top management, allocates resources and makes policy decisions at site level (Jha & Iyer, 2006). He or she manages the team together with synergy, and directs the team toward project goals and makes sure that the team is performing according to expectations. Sometimes the project manager involvement at the site activities can lift the morale of team members and they will start working with full zeal and enthusiasm to achieve the desired quality level (Jha & Iyer, 2006). Researchers have also stressed on capabilities with regards to project manager leadership that can significantly affect the project results (Odusami, 2002; Toor & Ofori, 2006; Toor & Ogunlana, 2006). Project manager needs to be knowledgeable, experienced and well versed with overall project chemistry (Westerveld, 2003) as this will increase the likelihood of project success with regards to on time completion (Dulaimi, 2005). El-Sabaa (2001) examined the skills and career path of an effective project manager in Egypt and concluded that human skills, which

involve the ability to communicate efficiently and to maintain a harmonious working group were the most essential project manager's skills. Anantatmula (2010: p.14) suggested that "a competent project manager is able to carefully define roles and responsibilities of project team members". Malach-Pines, Dvir & Sadech (2009: p.284) highlighted that project manager should possess both technical skills (subject matter expert and in-depth knowledge of structures) and "soft" skills, (team management, emotional intelligence, transformational leadership and conflict management).

Chan, Ho, and Tam (2001) specifically stressed the competencies of construction firms and clients. Competence factor is also related to awarding of tenders to competent designers and construction firms and thus, it is about selecting competent project partners. Every large construction project has its own distinct features, requirements and specialties, which are understood by few designers and contractors who have prior experience. Moreover, they should have enough capability, manpower, technology and sources to achieve the project objectives.

Large projects have involves huge investment, strategic business importance and several risks. Thus, there is little room for experiments in this type of projects. Finding the right people to perform project jobs, under budget with quality and according to specifications, is very crucial (Nguyen, Ogunlana, & Lan, 2004). Particularly in case of design-build projects, availability of design-builders (Songer & Molenaar, 1997), construction firm's experience in design-build (Ng & Mo, 1997), and contractor's competencies (Chan, Ho, & Tam, 2001) have been highlighted in the previous studies. Toor and Ogunlana (2008) examined the

difficulties encountered by large-scale construction projects and found that designs and designers-related issues listed as one the top 20 problems identified. Therefore, in case of traditional procurement system, in which design is partly or completely divorced from construction, role of designer is important for a complete and comprehensive design (Skipper & Bell, 2006).

Pourrostam and Ismail (2011) conducted a study of methods for minimising construction delays from a developing country perspective. They found that the most effective methods of minimising delay in construction projects were competent project manager, awarding tenders to the right designer/construction firm, and the use of experienced subcontractors and suppliers. Le-Hoai et al. (2008) and Omoregie and Radford (2006) also highlighted incompetent subcontractor as one of the cost overrun factors. These results can be used as a guideline for successful handling of construction projects in developing countries.

Several literatures were found relating to competency effect on project performance in Malaysia. Onosakponome, Yahya, Rani, and Shaikh, (2011) studied 58 participants that work with construction companies in East Malaysia and found that availability of personnel with high experience and qualification was among the critical factors that affect construction project performance and this could lead to better performance of time, cost and quality, productivity and safety of construction projects. Murali and Soona (2007) studied the causes and effects of delays in the Malaysian construction industry. They conducted a survey via questionnaire to seek the causes and effects of delay from the perspectives of the construction firms, clients, and consultants. A total of 150 respondents participated in their survey. They

found that inadequate construction firm experience is among the most important causes of delay. Memon *et al*. (2011) found that lack of experience, inadequate planning & scheduling, poor site management & supervision and mistakes during construction were most common and significant factors causing cost overrun in Malaysian construction industry as perceived by experts. These reflected the weakness and incompetency of construction firms (Long, Young, & Jun, 2008).

Studies on construction in Malaysia also recommended that construction firms hire skilled workers, experienced project managers, subcontractors and suppliers to improve their project success. Abdul-Rahman, Berawi, Berawi, Mohamed, Othman, and Yahya (2006) examined the delay mitigation in the Malaysian construction industry. They highlighted the importance of having more experienced and capable construction managers and skilled labourers to enable the industry to develop at a faster rate either nationally or internationally. Similarly, Memon, Rahman, and Azis (2012) conducted a qualitative study using semi-structured interviews with experienced personnel involved in managing construction project to identify mitigation measure to improve time performance. They recommended that construction companies hire skilled workers to achieve good progress, avoid poor quality of work, reduce rectification and double handling to improve time performance. Use of experienced subcontractors and suppliers are also suggested to improve the cost performance.

Literatures were also found relating to the competency effect on project performance in the Arabian countries. Al-Kharashi and Skitmore (2009) studied on causes of delays in Saudi Arabian public sector construction projects via a survey sample of 86

clients, contractors and consultants working in the Saudi construction industry. They found that one of the influencing causes for delay is the lack of qualified and experienced personnel-attributed to the considerable amount of large, innovative, construction projects and associated current undersupply of manpower in the industry. Abd El-Razek, Bassioni, and Mobarak (2008) studied the causes of delay in building construction projects in Egypt. They identified the main causes of delay in construction projects in Egypt from the point of view of contractors, consultants, and owners. The results indicated non-utilisation of professional construction or contractual management as one of the most important causes of delay. Faridi and El-Sayegh (2006) examined the significant factors causing delays in the United Arab Emirates (UAE) construction industry identified shortage of skills of manpower, poor supervision and poor site management, unsuitable leadership as some of the major causes of delays in construction projects in the UAE.

Research in other developing countries such as Zambia and Pakistan also identified similar causes of poor project performance. Kaliba, Muya, and Mumba. (2009) studied major causes of cost overruns in Zambias road construction projects and found that staffing problems, poor supervision, poor coordination on site were highlighted as main contributing factors which lead to delays in road construction projects. Azhar, Farooqui, and Ahmed (2008) studied cost overrun factors of Pakistan construction industry and factors found were poor project (site) management, poor cost control, improper planning.

Based on the previous study and literatures reviewed, competence is important for the success of the construction project in developing countries such as Malaysia,

Pakistan, Zambia and Arabian countries. It is also relevant not only for large projects but also for all types of construction be it road or building construction. Competence consists of practical experience as well as academic education which help to reduce time and cost overrun by managing the risk. It is also essential at all levels that is from the lowest level that is the skilled labour until the highest level that is the project director.

2.4.2 Cooperation

Besides having competence project members, cooperation is also critical to the project performance. It is like the game of football, even with all the skillful players, the team will not win the game if the players do not cooperate and pass the ball among each others.

Cooperation is a loosely defined term in the construction management literature (Anvuur & Kumaraswamy, 2006). Researchers tend defined cooperation as having the same meaning as collaboration (Bresnen & Marshall, 2000). Oxford Dictionary of English (Oxford University Press, 2003) definition of cooperation is the action…of working together to the same end and collaboration is the action of working with someone to produce something. The two definitions clearly shows that collaboration is not synonymous with cooperation (Anvuur & Kumaraswamy, 2006).

Cooperation is critical to construction, as well as to other project-based industries due to its uncertainty, interdependence and complexity (Dubois & Gadde 2002). Project complexity can be defined as a single or a combination of factors that affect the standard response/actions taken to achieve the project outcomes (Wood &

Ashton 2009). Construction projects may not be straight forward as it involves complex and uncertain situations which can sometimes present a challenge to control the project time and cost effectively (Olawale & Sun, 2010). Material and transportation costs are also subject to price fluctuation and this is an example of uncertainty. Interdependent is also an issue in construction because it involves government agency such as local council and authorities' approval.

Over the last decade numerous research and industry reports have highlighted the importance of cooperation to construction project success (Anvuur & Kumaraswamy, 2006). Phua and Rowlinson (2004) studied on how important is cooperation to construction project success via empirical data obtained from 29 interviews, 398 quantitative response and six follow-up interviews from construction firms in Hong Kong. They found that cooperation between construction companies, cooperation between construction companies and clients and cooperation between the colleagues in the construction companies are important to the construction project success.

Cooperation relates to the project team and their ability to work together towards achieving a common project goal. A project team is essential in a construction project (Pheng & Chuan, 2006). Greenberg and Baron (2000) defined it as a group where members are concerned primarily with using the parent organization's resources to create its result. The authors suggested that working in a team is demanding and not everyone may be ready and unwillingness to cooperate was noted as one of the main reasons of failed teams. A team can be defined as a small number of people with complementary skills, who are committed to a common purpose,

performance goals, and approach for which they hold themselves mutually accountable. (Katzenbach & Smith, 2003)

Construction project team is normally cross-functional, comprising members of organisations with different interests. Construction project teams are a loose grouping of interested parties brought together for a specific construction project (Emmit & Gorse, 2007). Pheng and Chuan (2006) suggested that successful project completion depends to a large extent upon members being able to work together effectively as a project team. Thus, high levels of coordination and cooperation are required (Pesämaa, Eriksson, & Hair, 2009). Project performance is also threatened if client and contractor do not cooperate adequately to meet the various challenges in a construction project. When the project team members cannot work together in a team, schedules will slip, costs will overrun, output quality will diminish, and, in extreme cases, the projects will fail. Azmy (2012) revealed that team effectiveness is important in construction project teams and project performance. The team effectiveness factors identified (Team Goals and Objectives, Team leadership, Team Relationship, Team Roles and Responsibilities, Team Communication, and Trust and Values) have an impact on the performance of the construction project.

Generally, it can be concluded that cooperation is also an important element for achieving successful project implementation since it helps the team to work together and focus towards achieving common project objectives. Project team typically comprises individual of various backgrounds and different interest. Therefore, it is vital to ensure that they are able to work together in harmony. This will ultimately

contribute towards improving the budget performance and project schedule adherence.

2.4.3 Commitment

Competent and cooperative project team members still require the commitment from the project sponsor and commitment to the project plan in order to meet the project objectives. Commitment comprises effective project planning and control, clearly defined goals and priorities of all stakeholders (Toor & Ogunlana, 2008). Commitment, in general terms, refers to dedication and interest of all related parties in the project; especially, the sponsorship of top management (Toor, Ofori, & Das, 2007), commitment of project sponsor (Fortune & White, 2006), project team involvement (Chan, Ho, & Tam, 2001), commitment of project manager (Chua, Kog, & Loh, 1999), commitment to planning and control (Li, Akintoye, Edwards, & Hardcastle, 2005).

Commitment is important at all levels from top to bottom. Commitment from top management with regards to support is important to achieve the desired project performance. The top management's has the right in setting all the policy related matters and control resources. They also arrange for training of human resources involved in the project and they have a big role to play in identifying the project manager (Jha & Iyer, 2006). Commitment of project participant, better coordination and project manager's competence are the three most important pillars for project success (Jha & Iyer, 2007).

Effective project planning and control is perhaps the most frequently mentioned success factor in the literature (Pinto & Slevin, 1988) and it covers several other aspects such as goal setting, legal and contractual risk management, procurement management and change management. Project planning and control mechanisms are devised in the initial project stage (or comprehension stage). Thus, all project participants needs to be highly committed throughout the various project stages (Chua, Kog, & Loh, 1999). Uher and Loosemore (2004) listed the composition of construction project team or project participants as follows:-

- Clients
- Project Manager
- Financier
- Legal Consultant
- Design Leader (Architect or Structural Engineer)
- Other Design Consultants
- Main Contractor
- Subcontractors
- Cost Consultant
- Other Consultants (depending on project needs)
- An end user of the completed project (where appropriate)

However, the above list is subject to the project type and size. Different types and sizes will comprised of different composition of project team. The project team composition typically will include owner, project manager, architect, engineers, contractors and subcontractors.

Since construction project involves many different parties, it is important to set clear, realistic, and measurable project goals to ensure commitment by all that are involved in the project. Definition of goals and project priorities by all project participants has been regarded as imprtant to project success (Westerveld, 2003). Both factors under imply a need for commitment which is widely proclaimed to be the cornerstone of organizational and project success (Gale & Luo, 2005; Nguyen, Ogunlana, & Lan, 2004). Clear definition of project goals is one of effective project planning and control mechanism for successful project completion. Unless the project team knows where they heading to and what performance standards are expected from them, it is difficult to attain the desired results. Therefore, setting very clear, realistic, identifiable, and most of all, measurable goals by all project participants is vital (Lim & Mohamed, 1999).

Pourrostam and Ismail (2011) conducted a study of methods for minimising construction delays from a developing country perspective. They found that the availability of resources is among the effective methods of minimizing delay in construction projects and this result can be used as a guideline for project success in handling construction projects in other developing countries. Therefore, proper planning and scheduling activities ensures that required resources are committed and made available when needed.

Empirical studies have indicated that resources commitment via planning and scheduling activities is crucial to increase the chances of project success and minimise project failure. Toor and Ogunlana (2008) examined the problems causing delays in major construction projects in Thailand and questionnaire surveys and

interviews were conducted on a major construction project in Thailand to explore the most significant problems causing construction delays. Issues such as planning and scheduling deficiencies and lack of resources were highlighted during the interviews. Inadequate planning and scheduling was also identified as factors that contributes toward cost overrun by Ameh et al. (2010), Enshassi et al. (2009), Azhar et al. (2008), Harisweni (2007), Frimpong et al. (2003), and Memon et al. (2010). Thorough and careful planning prior to implementation and subsequently a thorough control during actual construction phase is also vital especially for large construction projects (Toor, & Ogunlana, 2008a). There are both social and economic expectations out of large projects; late completion can harm the expected results, result in enormous loss of resources, and scratch the credibility of project itself (Arain & Low, 2005). Once it has been done with appropriate project planning, control, and goal setting, accomplishing the project objectives is rather easier (Toor, & Ogunlana, 2008a). Inadequate planning means that the project can end up behind schedule and with unexpected delays (Clarke, 1999).

Memon, Rahman, and Azis (2012) conducted a qualitative study using semi-structured interviews with experienced personnel involved in managing construction projects. They also suggested committed leadership and management as a mitigation measure to improve time performance. Frodell, Josephson, and Lindahl (2008) examined Swedish professional clients and their organisations in the construction industry and found that commitment to the project is one of the important success factors. Nguyen, Ogunlana, and Lan (2004) surveyed 109 respondents from 42 construction-related organisations in Vietnam and identified commitment as one of

the four COM factors that affect the project success in construction industry. The other 3 COMS were comfort, competence and communication.

It can be concluded that commitment plays a crucial role toward successful project performance. Commitment is essential at all levels and at all various project stages to ensure availability of resources when required for timely completion of the project and for conformance with the budget. Furthermore, lack of commitment can lead to delays and cost overrun in the construction project.

2.4.4 Project Management Methodology

Apart from the three COM variables of the management capability that is competence, cooperation and commitment, project management methodology serves as a guideline on good project management practice. Construction project typically faces the constraint of limited tangible resources such as financial and human resources. As such, proper project management methodology must be put in place in order to effectively allocate the resources required in the project to meet the project goal and be able to complete the project on time and within budget. According to Gollenbeck-Sunke and Schultmann (2010) in project-based production environments, the success of a project strongly depends on the quality of project planning especially with regards to resource allocation.

A methodology is a structured approach for delivering a project, and consists of a set of processes, with each process having clearly defined resources and activities (Turner, 2000). Most successful project managers recognise that key to project success can be found in the methodology which they apply in managing their

projects. One of formal definition for methodology is a body of practices, procedures, and rules used by those who work in a discipline or engage in an inquiry. Consistent project management methodology established is important for long-term success of any organisation. This methodology furnishes the crucial guidebook for new project managers and the key to repeatable success for senior project managers.

A project management methodology will set out what an organisation regards as best practice; improve inter-organisational communication; and minimise duplication of effort by having common resources, documentation and training (Clarke, 1999). Payne and Turner (1999) in their study concluded project management practices can vary significantly from one project to another. Nevertheless, Kerzner (2001) deems that the best way to increase the likelihood of an organisation having a continuous stream of successfully managed projects is to develop a good project management methodology in-house that is flexible enough to support all projects.

Some organisations adapt their project management methodology from external standards such as the Project Management Body of Knowledge (PMBoK) as project life cycles and management structures are different in every organization (Zielinski, 2005). UK-based Chartered Institute of Building published a code of practice for Project Management (PM) and the Association for Project Management has its APM Body of Knowledge. US based Project Management Institute (PMI) has its guide to PM body of knowledge. Two most commonly known methodologies are the Project Management Body of Knowledge (PMBoK) developed by the Project Management Institute (PMI) and Projects IN Controlled Environments (PRINCE2) developed by the Office of Government Commerce in the UK (McManus & Wood-Harper, 2002).

Quantity or amount of time and effort needed to develop a methodology will vary from company to company depending upon factors such as the size and nature of projects, competitive pressures and the number of functional boundaries to be crossed (Kerzner, 2001). The lack of use of a project management methodology can contribute to poor overall performance of projects and lack of organisation in a project (Abbasi & Al-Mharmah, 2000). The benefits to the organisation of using a project management methodology include: effective management and planning of the project; the controlling of budgets and resources (Zmud, 1980); and the provision of a consistent method of reporting across all projects, allowing staff to move between projects without having to relearn the management approach. A common language is needed so that all team members can understand each other (Clarke, 1999). The use of project management methodologies also helps to manage change effectively by providing appropriate tools and techniques (Kerzner, 2001). Although the time required to implement and maintain project management methodologies, the many advantages can outweigh the disadvantages, especially when increases in customer satisfaction are taken into account (Naughton & Kavanagh, 2005).

Ling, Pheng, Qing, and Hua (2007) examined Project Management (PM) practices adopted by Singaporean construction firms. Their study examined the level of the project performance in China and identifies PM practices that led to better performance; and recommended key PM practices that could be adopted by foreign construction firms in China to improve project performance. Ling *et al*. (2007) suggested the most important of practices relating to scope management are controlling the quality of the contract document, quality of response to perceived variations and extent of changes to the contract. Foreign firms were suggested to

adopt some of the project management practices highlighted to help them to achieve better project performance in China.

Similarly Olateju, Abdul-Azeez, and Alamutu (2011) study revealed that application of PM tools and techniques helps to achieve specified project objectives that are within budget limits and specific time via optimum use of resources. Memon, Rahman, and Azis (2012) conducted a qualitative study using semi-structured interviews with experienced personnel involved in managing construction projects. They suggested the use of appropriate construction methods to improve cost performance.

The above studies suggested that methodology has a positive impact on success of the construction project performance. Project management methodology is basically a compilation of best project management practices that has been documented for reference by project managers. It helps to ensure proper planning and sufficient allocation of limited resources possessed by construction companies. This in the end contributes toward ensuring achievement of project objectives and reducing time and cost overrun.

2.4.5 IT Systems

Besides having a proper project management methodology as a guideline, an IT system which consists of hardware and software can also assist in capturing important information for decision making purpose. Decision-making process is important as it happens at every stage of a construction project. At almost every stage, decision-making is necessary. Often, these decisions can, or will, affect the

other tasks that will take place. Project managers and the team members involved in the project needs to have a general understanding of other related or similar past projects to effectively make a decision (Construction Industry Institute, 1994).

Empirical studies have also indicated that timeliness, slow and delay in decision making contributes toward time and cost overrun. Rohaniyati (2009) surveyed owners, contractors and engineers in Brunei and noted that slow decision making as one of the seven major significant factor causing project delay. Jian, Xiao-Hua, & Timothy (2011) surveyed a group of industry professionals in South Australia and also noted that timeliness of decision making is ranked as the top factor contributing towards delays. Delay in decision making was also noted by Enshassi et al. (2009), Frimpong et al. (2003) and Memon et al. (2010) as one of the cost overruns contributing factors. Enshassi et al. (2009), Le-Hoai et al. (2008) and Frimpong et al. (2003) highlighted on slow information flow between parties involved in the project as one of the reasons for cost overrun. This highlights the significance of possessing and utilizing a good information system to capture all the database and documentation for better and prompt decision-making during various project phases.

Project management tools play an important role in order to effectively manage a project. Strategic resources tools are defined as interactive computer-based systems, which help decision-makers utilise data and model to solve unstructured problems (Robbins, 1991). Project managers ought to equip themselves with the proper tools to effectively manage initiatives that they are responsible for. Tool furnishes the stakeholders, (depending on their user access right) the most current and latest information for them to effectively manage the construction project. It also present a

detailed overview of the project status allowing management to track progress (Andersen, Christensen, & Howard, 2005; Attaran & Attaran, 2002).

Computer-aided models are developed to help capture uncertainties and interactions among project variables which influence decisions and both internal and external expert knowledge have been integrated into the decision-making process (Alarcon & Bastias, 2000; Wilson, 2001). According to Cheung, Suen, and Cheung (2004) the use of the a Web-based construction Project Performance Monitoring System (PPMS) can help senior project management, project directors, project managers, etc., in monitoring and assessing project performance. PPMS aim to support project managers in controlling construction project and the use of the World Wide Web (WWW) and database technology helps to automate the monitoring process.

The objective of project control in construction industry is to ensure that projects are timely completed, within budget and achievement of project objectives (Olawale & Sun, 2010). Examples of software that can support project control objectives are such as Microsoft Project, Asta Power Project, Primavera, Microsoft Excel, Project Costing System (PCS), Construction Industry Software (COINS), and WinQS. Olawale and Sun (2010) in their study found that Microsoft Project is used by 35% contractors and 57% consultants; Asta Power Project by 44% contractors and 19% consultants; and Primavera by 15% contractors and 19% consultants. Lee, Thomas, and Tucker (2005) as well as Iyer and Jha (2005) identified lack of appropriate software as one of the project time and cost factors that hampers project performance. Inadequate monitoring and control was identified as one of construction project cost overrun factors by Azhar et al. (2008), Harisweni (2007)

and Frimpong *et al*. (2003). This indicated the significance of having a proper project software as a project control and monitoring mechanism.

Brewer and Runeson (2009) examined what really influences decision makers when considering whether or not to adopt an Information Technology (IT) innovation in construction firms. They found that the adoption of innovative IT-driven business practices of the firm is determined in large part by the attitude of the decision maker, which changes over time, in response to technological push and cultural pull (Brewer & Runeson, 2009). Doloi and Lim (2007) studied 52 construction firms in Victoria, Australia and identified the utilisation of planning tools such as planning software in maintaining project milestones and detailed project work breakdown structure as one of critical factors affecting construction project performance. Comprehensive knowledge and understanding of performance are vital for achieving managerial goals, efficient decision making in design, specification and construction, at various project-level interfaces, using appropriate decision-support tools (Ugwu & Haupt, 2007).

According to Latif, Abidin, and Trigunarsyah (2008) lack of documentation on project lessons learned, not optimum in adopting information technology, and a long process in making decisions contributed to poor project monitoring and control process which lead to construction projects not achieving project cost objectives. Therefore, documentation of lessons learned and corrective actions in a decision support system can assist project team in identifying various project risks. Memon, Rahman, and Azis (2012) conducted a qualitative study using semi-structured interviews with experienced personnel involved in managing construction projects.

They suggested construction firm utilise up to date technology to improve cost performance. Project-based industries, especially the construction industry, are under growing pressure to compete in new ways (Egbu, 2004). Tatum (1991) highlighted similar concerns:

> *At the bottom line, construction firms need to innovate to win projects and to improve the financial results of these projects. They must innovate to compete. Development and effective use of new technology can provide important competitive advantages for construction firms*.

Based on the findings on IT systems, most of the studies and literatures reviewed have shown that it has a positive impact on project success. IT systems serve as an informational tool for the project managers that allow online updates, tracking and monitoring of the project progress, as well as capturing lesson learnt from previous history of project success or project failure. By having IT system, quick and prompt decision can be made to avoid or reduce time and cost overrun. Therefore it is important that this factor be incorporated as part of management capability since it also allows for the managers to properly plan their limited resources.

2.5 Relationship Capability

Besides possessing management capability that deals with managing limited resources, construction company should also focus on comprehension of the client's requirement via effective interaction and communication to minimise rework due to misunderstanding or miscommunication. Relationship capability is the marketing aspect of the construction company that deals with managing client relationship and managing their expectations.

Relationship capability criteria must be satisfied to generate superior performance of the resources possessed (Andersén, 2011). This capability relates to the understanding of the needs of the market place and its clients. One of its definition is the integrative processes designed to apply collective knowledge and resources of the firm to market-related needs of the business, enabling the business to add value to its goods and services, adapt to market conditions, take advantage of market opportunities and meet competitive threats (Guenzi & Troilo, 2006). Relationship capability is an important source of competitive advantage for firms (Fahy, 2000) which could improve financial and market performance (Tsai & Shih, 2004).

According to Polat (2010), construction companies challenge is to achieve business continuity and they should largely create and/or keep customers to continue and survive with the construction business. As such, they have to find ways to beat their rivals and explore new and/or less-crowded areas that may provide more jobs and higher profits. Relationship may help construction companies to differentiate themselves from their competitors and thereby create competitive advantage (Polat & Donmez, 2010).

Effective utilisation of relationship practices promises several benefits to construction companies, which include increase in sales, increase in profits, increase in customer satisfaction, entrance to new markets, creation of new markets, improvement of customer loyalty, improvement of reputation, improvement of total quality, development of products/services, development of company image, etc. (Dikmen, Birgonul, & Ozcenk, 2005). Despite these benefits, it is commonly acknowledged that relationship principles have not been adequately adopted and

fully implemented in the construction industry (Harris, McCaffer, & Edum-Fotwe, 2006). Due to lack of focus on marketing, construction companies have a tendency to assign limited resources for relationship activities, that is the financial and human resources (Arditi, Polat, & Makinde, 2008). Relationship capabilities aspect that was selected in the current study is communication and comprehension, since it relates to the ability to understand client's need and managing client relationship with the construction firm to ensure superior project performance.

2.5.1 Communication

Communication is selected as one of the relationship capability factors since it helps the construction companies to manage the customer relationship throughout the duration of the project projects. Communication within project-based industry such as construction is a challenging task since the interaction process occurs among unfamiliar groups of people working together for certain periods of time before disbanding to work on other project assignment (Dainty, Moore, & Murray, 2006).

Inefficient communication is one of the factors that could lead to material shortage. An article on How to Stop Losing Money on Inefficient Communication by Dunkelberger (2009) emphasised that business success or failure is related to communication ability and miscommunication between contractors and supplier could result to late or early material delivery. Early delivery could affect the materials quality due to storage and expiry of the items. Late delivery will delay the work performed at the site. Several empirical studies found that one of the major causes to project time and cost overrun is material delivery problems (Ameh & Osegbu, 2011; Enshassi, Al-Najjar, & Kumaraswamy, 2009; Harisaweni, 2007; Kasimu, 2012;). Late delivery of materials was identified by Frimpong et al. (2003)

and Moura et al. (2007) as one of factors of construction project cost overrun. These problems could be avoided or mitigated if there is constant interactions and communication between the various project stakeholders.

Communication comprises regular client consultation and responsiveness of client and these two are complimentary in nature and directly related to client who is the end-user in most cases (Toor & Ogunlana, 2008a). Regular client consultation is to be regularly carried out by various stakeholders such as consultants, designers, and contractors (Toor & Ogunlana, 2008a). On the other hand, client must be responsive when consulted by any of the other concerned parties (Toor & Ogunlana, 2008a). Communication is very important to client, contractors and other parties involved in the construction project (Chua, Kog, & Loh, 1999; Egbu, 1999; Nguyen, Ogunlana, & Lan, 2004; Pinto & Slevin, 1988). If all stakeholders in the project clearly communicate mutual needs, issues, problems, and suggestions; it is likely that not many confrontations will occur (Toor & Ogunlana, 2008a). The client, who is owner of the project and knows exactly what the requirements of final product, should be permanently involved in all discussions with other parties related to the project (Toor & Ogunlana, 2008a). At the same time, the client should be responsive to the needs of concerned parties so that delays can be avoided (Toor & Ogunlana, 2008a). All parties including client should be well aware of the prevailing situation of the project (Toor & Ogunlana, 2008a).

Communication is an interaction which involves two ways interaction. On one hand, all the parties involved should communicate properly with the client to clear any uncertainty regarding their needs and requirements (Phua, 2004). Similarly, the

client should be responsive to the needs of project participants (Sanvido, Grobler, Guvenis, & Coyle, 1992). Arain and Low (2005) suggested the that client responsiveness comprises of clarity about what they are being asked; quick in their response; clarity on the decisions made; well aware of the consequences of the decisions; finally decisions are clearly communicated to the related parties as well as responsiveness in fulfilling the financial and other requirements of concerned parties.

Lapses in communication can lead to conflict at construction sites which will incur additional costs and delays the project (Toor & Ogunlana, 2008a). Issues or problems that exist among various project participants can be settled harmoniously if communication is well managed (Toor & Ogunlana, 2008a). Researchers have regarded effective and efficient communication an important factor in producing better project results (Toor & Ogunlana, 2008a). This area is considered as a key area that is important to appreciate in the briefing process (Blyth & Worthington, 2001), a vital factor for feedback (Fortune & White, 2006), a promising area for improvement in project management practices (Cooke-Davies, 2002), and an issue which can solve many of the problems on project before they occur (Clarke, 1999). Communication can also reduce non-productive efforts, avoid duplication of work, help in eliminating mistakes, and likelihood of project success (Clarke, 1999). Researchers found that lack of communication is one of the critical problems resulting in failures, delays, cost overruns, and conflicts in the projects (Fortune & White, 2006; Toor & Ogunlana, 2006). Therefore, effective communication can lead to several positive results while lack of communication can lead to some negative outcomes of the project.

Khoshgoftar, Bakar, and Osman (2010) examined the causes of delays in Iranian construction projects via survey questionnaires to gather data on the causes of delay from the viewpoints of clients, consultants, and contractors. They found that lack of communication among various parties as one of the key reasons for construction project delay. Murali and Soona (2007) studied the causes and effects of delays in Malaysian construction industry. Questionnaire survey was sent to collect data on the causes and effects of delay from the viewpoints of the consultants, clients and construction companies. The total number of respondents participated in their survey is 150. Lack of communication among various parties involved is identified as one of the most important factors causing the delay. Tumi, Omran, and Pakir (2009) examined factors causing delays in Libyan construction industry and lack of effective communication was noted as one of the significant factors contributing to delays in construction projects in Benghazi city.

Memon, Rahman, and Azis (2012) conducted a qualitative study using semi-structured interviews with experienced personnel involved in managing construction projects. According to their study, poor communication is often observed a major issue on construction site which many times cause variations in work and rework which generate huge amount of construction waste and schedule delay. They suggested that clear and complete message be sent to worker to ensure effective communication as a mitigation measure to improve time performance. Frequent progress meeting, clear information and communication channels should also be conducted to improve cost performance.

Based on the previous study and literatures reviewed, communication is an important aspect of relationship capability that influences project performance. Communication is a two way activity and it ensures client needs and feedbacks are captured by the contractors. This activity is crucial to avoid rework or misunderstanding at the later project stage. Lack of communication is one of the factors commonly found in construction project failures globally.

2.5.2 Comprehension

Apart from capturing the client needs via communication, it is also crucial to understand the client correctly and comprehensively. Comprehension is selected as the second relationship capability factor as it helps the construction companies to manage the customer expectation throughout the duration of the projects. Comprehension is simply the power of understanding. According Toor and Ogunlana (2008a), comprehension requires the utilisation of data and facts to support actions at all levels of decision-making, knowing what client really wants, client acceptance of plans and clear prioritisation of project goals by the client. Comprehension of project goals and moving step by step while doing the most important things first according to appropriate sequence leads to success in construction projects. This component clearly underscores a clear understanding of the whole project by all stakeholders with a special emphasis on the client (Toor & Ogunlana, 2008).

Comprehension by Toor and Ogunlana (2008) have similar characteristics with goals and objectives by Fortune and While (2006) and project characteristics by Chua, Kog, and Loh (1999). This factor is also comparable to end-users' needs by Chan,

Ho, and Tam (2001). Comprehension requires a knowledge-based approach in managing project to ensure that project goals, stakeholder's priorities, client demands and all related parties interests are recognised and included in the project plans.

Reasonable project comprehension project requires the client to play a major role by clearly providing their requirements (Songer & Molenaar, 1997) and then accept the adequate solutions which are sorted after considering all factors together (Morris, 1986). According to Nitithamyong and Tan (2007), client must clarify the project's needs and requirements and ensure that such requirements are well understood by all team members. Comprehension at the beginning is also critical because its implications are long-term and it influences the project during all stages of development and function (Toor & Ogunlana, 2008a). Decisions made during conception stage cannot be undone without incurring a major cost. Hence, comprehension of the project rightly deserves to be the most important factor for success of project at later stages (Toor & Ogunlana, 2008a).

Pourrostam and Ismail (2011) conducted a study of methods for minimising construction delays from a developing country perspective. They found that proper and complete design at the right time, clear objective and scope are among the most effective methods of minimising delay in construction projects. According to them, the result can be used as a guideline to manage construction projects successfully in Iran and other developing countries. Memon, Abdul-Rahman, and Azis (2012) also revealed that design issues are very dominant in Malaysian construction which significantly affected time and cost performance of construction projects. According

to them, frequent design changes are commonly practiced which is major inhibiting factors in achieving successful completion of projects. They also recommended construction companies focus on client's need.

Generally, it can be concluded that comprehension is also an important element for achieving successful project implementation since it helps the construction firm to understand the clients need correctly. Clients' requirements have to be comprehensively captured at the early stage of the project to avoid misunderstanding or conflict at the later stage. This will reduce the amount of rework, time and cost overrun incurred by the construction firm.

2.6 Competitive Advantage

Apart from possessing the management and relationship capabilities, construction firm also needs to ensure that they are competitive and able to endure any challenges in the competitive construction industry. According to the Market Watch Malaysia, the Malaysian construction market is very competitive with local companies taking the lead. As such, the competitive advantage factor is also included in the current study as one of the variables that influence the performance.

There are various definitions of competitive advantage, however generally it is about their advantage or what makes them unique or different from their competitor in the market. Competitive advantage is the extent to which an organisation is able to create a defensible position over its competitors (Chen, Leu, & Chiou, 2006). It is also defined as the implementation of a strategy that facilitates the reduction of cost, the exploitation of market opportunities, and/or neutralisation of competitive threats

(Barney, 1991). Competitive advantage is simply defines as how companies go to market with the goal of optimizing their market spend to achieve even better results for both short-term and long-term objectives (Safarnia, Akbari, & Abbasi, 2011).

Competitive advantage is one of concept in management that has been well accepted in the modern literature of management these days. This is mainly due to the rapid changes that organisation encounters today, business environment complexity, globalisation impact and unstructured markets, consumer needs that are ever changing, competition, information technology and communications revolution, and global trade liberation (Al-Rousan & Qawasmeh, 2009). According to Newbert (2008), a firm must identify and implement resource-based strategies to create economic value. First, they have to make the most on the mixture of valuable resource and capabilities better than their competitor to produce product or service with unique features, more benefits and at a lower cost compared to their competitors. As these resources and capabilities indirectly affect companies performance, in order to generate benefits from these mixtures, companies must first gain a competitive advantage developed from its utilization.

There are two paths to competitive advantage strategy that is differentiation and innovation. Differentiation is value as perceived by customers which either see specific attractive elements in the offering or feels that all their needs are being met in the best way by the competitor's offering (Henderson, 2011). A firm can differentiate itself in various ways, such as offering innovative features, launching effective promotion, providing superior service, developing a strong brand name (Li & Zhou, 2010). Innovativeness is one of the fundamental instruments of growth

strategies for firms to enter new markets, to increase the existing market share and to provide the firm with a competitive advantage (Günday *et al*., 2011). Innovation–performance relationship is context dependent and factors such as the type of innovation, the cultural context, and age of the firm affect the impact of innovation on organizational performance to a large extent (Rosenbusch *et al*., 2011). There is a positive relationship between innovation and performance found in the literature (Jiménez-Jiménez and Sanz-Valle, 2011; Thornhill, 2006; Weerawardena *et al*., 2006; Schulz & Jobe, 2001). Amonini *et al*. (2010) suggested that professional service firms look for ways to differentiate themselves by providing better service quality and greater value, developing brands with strong reputations and developing long-term relationships in order to achieve competitive advantage and superior performance.

There are many literatures which relate competitive advantages to superior performance. A firm is said to have a competitive advantage when it is implementing a value creating strategy not simultaneously being implemented by any current or potential player (Barney 1991). Successfully implemented strategies will lift a firm to superior performance by facilitating the firm with competitive advantage to outperform current or potential players (Passemard & Calantone, 2000). A business strategy of a firm manipulates the various resources over which it has direct control and these resources have the ability to generate competitive advantage (Reed & Fillippi, 1990). Superior performance outcomes and superiority in production resources reflects competitive advantage (Day & Wesley, 1988). As such, competitive advantage is the ability to stay ahead of present or potential competitor. Thus superior performance achieved via competitive advantage will ensure

leadership in the market. It also furnishes the thoughts that resources held by a company and the business strategy will have a deep impact to generate competitive advantage. Powell (2001) views business strategy as the tool that controls the resources and creates competitive advantage. Consequently, business strategy alone may not be adequate unless it have sufficient control over resources that has the ability to create competitive advantage. Therefore, competitive advantage is a key factor influencing superior performance and it helps to ensure business survival and achievement of prominent place in the market.

Raduan, Jegak, Haslinda, and Alimin (2009) conducted a review of the relevant literature and identified the links between management theory, strategic management theory and competitive advantage from the resource based view theory of the firm. They concluded that resource based view of the firm's competitive advantage is one of the main strategic management theories which is applicable to justify organisational performance. This theory is also a part of the bigger management theory family which has progressed to suit the organization managerial needs and also the business environments that they operate in. They also suggested that examining organisational competitive advantage from the resource based view allows the organisation to gauge the magnitude of importance placed upon its internal firm resources and capabilities in particular towards attaining a competitive advantage level. They concluded that there is a positive relationship between unique edge and organisational success as competitive advantage is able to explain significant variance on the performance of the organisation.

Barney (1991) recommended that companies possessing strategic resources and capabilities will achieve competitive advantage, which will subsequently enhance their performance. Grant (2002) suggested that individual resources must first work together to establish organisational capabilities for the companies to create competitive advantage. Thus, companies which possess strategic resources must first utilise the strategic resources via the organisational capabilities to enable them to achieve short term competitive advantage which in the long run will lead to superior long-term performance.

Similarly, Sirmon, Hitt, and Ireland (2007) proposed that competitive advantage plays a significant mediating role in the relationship between organisational capabilities and performance. However, only limited number of empirical studies found on the mediating effect of competitive advantage in the relationship between capabilities and performance. Tuan and Yoshi (2010) survey of 102 companies under the supporting industries in Vietnam found that: 1) organizational capabilities are related to the competitive advantage; 2) competitive advantage is related to performance; and 3) competitive advantage mediates the relationship between organizational capabilities and performance.

Kamukama, Ahiauzu, and Ntayi (2011) examined the mediating effect of competitive advantage in the relationship between intellectual capital (organisation resources) and financial performance of Uganda's microfinance institutions. Their main objective was to establish the role of competitive advantage in the relationship between intellectual capital and firm performance. It was found that competitive advantage is a significant mediator in the relationship between intellectual capital

and financial performance. Competitive advantages mediate and strengthen the relationship between the two variables by 22.4 percent.

Lopez-Gamero, Molina-Azorın, and Claver-Cortes (2009) tested whether the resource-based view of the firm mediates the positive relationships of proactive environmental management (organisation capability) and improved environmental performance with competitive advantage, which also has consequences for financial performance. Their findings proved that competitive advantage perform as a mediatng variables in the positive relationship between proactive environmental management and financial performance.

According to Rose, Abdullah, and Ismad (2010), organisation resources include physical resources, financial resources, experiential resources as well as human resources. Physical resources include the plant, machinery, equipment, production technology and capacity. Financial resources comprise cash-in-hand, bank deposits and/or savings and financial capital (stocks and shares). Experiential resources are product reputation, manufacturing experience and brand-name. Human resources are top and middle management, administrative as well as production employees. These resources have positively contributed towards organisational competitive advantage and in the long run resulted in superior companies's performance. Human resources are deemed to be more critical and important in achieving competitive advantage position because of their valuable nature, as well as hard-to-copy nature compared to physical and financial resources. The current study examines the human resource aspect with regards to their management and relationship capabilities.

Competitive advantage in this research is treated as independent variables and it is measured via the execution of three strategies that is cost-leadership quality, and innovation as utilised by Tuan and Yoshi (2010). Cost strategy is measured with regards to emphasis on cost reductions via process innovation in business operation system, through investment in machinery, and by improving productivity as well as the employees operations. Quality strategy is reflected by focusing on product quality, strict quality control, meeting customer needs and addressing their product requirements (Tuan & Yoshi, 2010). Innovation strategy is measured as the degree to which a firm strives to introduce new products first, stresses production process innovation and engages in novel marketing (Tuan & Yoshi, 2010).

2.7 Theoretical Framework

Based on above arguments, the research model as seen in Figure 2.1 is based on past literature. The resource based view theory has capabilities and competitive advantage as the independent variables and this is the basis to determine performance with regards to project performance as dependent variable.

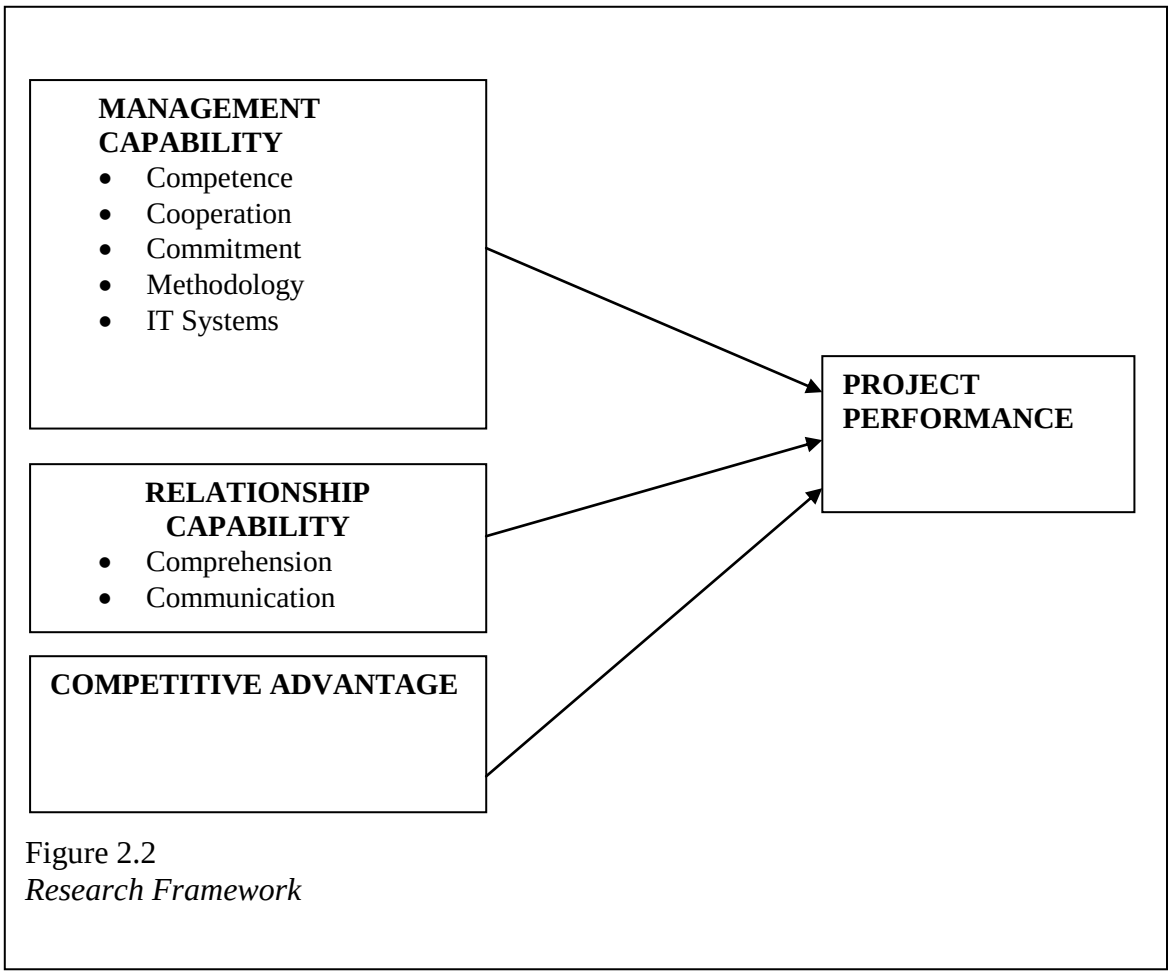

Figure 2.2
Research Framework

This research framework applied the RBV theory, which states that in order to have superior performance, strategic resources must be in place (Andersen, 2011) and resources must first be utilised via the organisational capabilities (Grant, 2002). According to Andersen (2011) management capability and relationship capability criteria must be fulfilled for resources to generate superior performance.

Management capability affects the project performance especially with regards to competence project team and cooperation from all the parties involved in the project. Commitment must be obtained in order to ensure that resources are properly allocated to achieve superior performance. The use of methodology and systems could also help in analysing the project management issue in order to achieve superior performance.

Relationship capability affects the project performance via comprehension of client needs and interaction with the client via communication. According to the Fortune and White (2006), the success of a project depends on support from senior management (commitment), competent project manager (competence), strong/detailed plan kept up to date (methodology), realistic schedule (comprehension), good leadership (competence), correct choice or past experience of project management tools (systems).

The current study only utilised two (2) capabilities since most of the factors affecting construction project performance are generally related to the managerial ability in managing their limited resources (management capability) as well as learning and understanding the clients' requirement (relationship capability).

Competitive advantage is what makes the construction company unique and different from their competitors. This is important since they are operating in a competitive industry and in an environment where tangible resources are limited. As such, they have to focus on the intangible resources which are hard to copy (inimitable) by the competitor in order to gain competitive advantage position. With competitive advantage strategy implementation via cost leadership, innovation strategy and quality differentiation, the construction company would be able to improve their project performance with regards to timely completion and meeting the monetary budget.

2.8 Hypothesis

The research hypotheses address management and relationship capabilities factors such as comprehension, communication, competence, cooperation, commitment, methodology and systems as well as competitive advantage in relation to the construction project performance in Malaysia.

2.8.1 Competence and Project Performance

Competency is about people and project competency involves competent people such as competent team members, competent project manager and awarding the tenders to competent construction company (Toor & Ogunlana, 2008). Project personnel competency is a critical factor influencing the project success (Kuen, Zailani, & Fernando, 2009). Choosing competent people for a project is an important success factor such as the selection of project manager and project team member since they are the key persons that execute the project tasks. Competent project team ensures that no loopholes are left in the groundwork, in addition to the implementation of the project plans (Toor & Ogunlana, 2008).

The role of project manager in overall project management is crucial since he or she coaches the team toward achieving the goals of the project, binds the team together and ensure that the team delivers as per the project expectations. The project managers leadership capabilities can significantly affect the project success. There is a high chance that the project will be successfully completed when the project manager is knowledgeable, experienced, well conversed and with an overall project chemistry (Westerveld, 2003) (Dulaimi, 2005). Dealing with risk and uncertainty that are typical in the projects can be effectively managed when the project team is

competent. Competence project team members also ensure sufficient understanding of the project since all individual members is an expert in their respective areas.

One of the factors influencing project delay is lack of qualified and experienced personnel-attributed to the considerable amount of large, innovative, construction projects and associated current undersupply of manpower in the industry (Al-Kharashi & Skitmore, 2009). Non-utilisation of professional construction or contractual management is one of the most significant factors causing the project delays (Abd El-Razek, Bassioni, & Mobarak, 2008). Inadequate experience of construction firm is among the major contributing factors causing delays of construction project (Murali & Soona, 2007). The highly effective methods of minimising construction project delay were identified as having competent project manager, using experienced subcontractors and suppliers and awarding tenders to the right designer/construction company (Pourrostam & Ismail, 2011). It is important to have more capable and experienced project managers and skilled labourers as delay mitigation strategy and to enable construction industry to grow at a faster rate both nationally and internationally (Mohamed, Othman, & Yahya, 2006). A competent project team ensures that there are adequate preparations as well as effective and efficient implementation of the project plans. Therefore, the related hypothesis is proposed:

Hypothesis 1: Higher level of competence leads to higher success of project performance.

2.8.2 Cooperation and Project Performance

Cooperation is required in business environment that faces the challenges of uncertainty, interdependence and complexity in construction, as well as in other project-based industries (Dubois & Gadde, 2002). This factor is repeatedly highlighted for good performance and the absence of it is blamed for poor performance of construction projects (Anvuur & Kumaraswamy, 2006). The significance of cooperation to construction project performance have also been highlighted by Hauck, Walker, Hampson and Peters (2004) and Kale and Arditi (2001). Lack of cooperation has been blamed for the failure of well-intentioned change initiatives in construction (Cicmil & Marshall, 2005; Koskela, 2003; Moore & Dainty, 2001). Besides having competence project team members, cooperation is also critical to the project success. Phua and Rowlinson (2004) in their study established that the cooperation construct was the most important determinant of project success, which justified 28 percent of the variance.

Cooperation among project firms, cooperation between project firm and clients and cooperation among the colleagues in the project firm are important to the construction project success (Phua & Rowlinson, 2004). A project team is essential in a construction project (Pheng & Chuan, 2006). Working in a team is challenging and not everyone may be ready and unwillingness to cooperate was noted as one of the major factors contributing to failed projects (Greenberg & Baron, 2000). Successful project completion depends highly on members being able to work together effectively as a project team (Pheng & Chuan 2006).

Therefore, the related hypothesis is postulated:

Hypothesis 2: Higher level of cooperation from stakeholders leads to higher success of project performance.

2.8.3 Commitment and Project Performance

Commitment includes effective project planning and control, clearly defined goals and priorities of all stakeholders (Toor & Ogunlana, 2008a). It also refers to dedication and interest of all related parties in the project; especially, the sponsorship of top management (Drewer, 2001; Toor, Ofori, & Das, 2007), commitment of project sponsor (Fortune & White, 2006), project team involvement (Chan, Ho, & Tam, 2001), commitment of project manager (Chua, Kog, & Loh, 1999), commitment to planning and control (Li, Akintoye, Edwards, & Hardcastle, 2005).

Commitment is related to the planning and control of the project such as in terms the deliverables, the responsible parties, the scheduled delivery dates. Project planning and control mechanisms are devised in the early project stage. Both factors involved commitment that is generally declared to be the cornerstone of project success (Chua, Kog, & Loh, 1999; Gale & Luo, 2005; Nguyen, Ogunlana, & Lan, 2004). Effective project planning and control includes clear definition of project goals for successful project completion. Definition of project goals and priorities by various stakeholders involved are essential for project success (Westerveld, 2003). Setting very clear, realistic, identifiable, and most of all, measurable goals by all project participants is vital (Lim & Mohamed, 1999).

Construction projects need a very careful and thorough planning before actual execution and then a rigorous control during the construction phase (Arain & Low,

2005). Inadequate planning means that the project can end up behind schedule and with unexpected delays (Clarke, 1999). Once it has been done with appropriate project planning, control, and goal setting, accomplishing the project objectives is rather easier (Toor & Ogunlana, 2008a). Agreeing on the project deliverables, work required, resources that are time and people required, with realistic deadlines and expectations will ensure that there is initial commitment that can be maintained throughout the course of the project. This could be due to several reasons for example work overload, badly defined requirements and unrealistic budgets or deadlines.

Commitment to the project is identified as an important construction project success factors (Frodell, Josephson, & Lindahl, 2008). Projects undertaken without the full commitment of the project stakeholders and the project team are likely to fail because they are assigned to project work that they cannot commit to. All project participants is required to have high level of commitment during the various project stages (Chua, Kog, & Loh, 1999). Planning, scheduling deficiencies and lack of resources are among the problems causing delays in major construction projects (Toor & Ogunlana, 2008). Ensuring availability of resources is one of the effective methods of minimising construction projects delay and this can be used as a guideline in managing construction projects in developing countries (Pourrostam & Ismail, 2011). Commitment is one of the four COM factors that affect the project success in construction industry besides comfort, competence and communication (Nguyen, Ogunlana, & Lan, 2004). Ensuring project stakeholders are committed to their task is a major factor in the quality of the work and the success of a project. Consequently, the following hypothesis is proposed:

Hypothesis 3: Higher level of commitment leads to higher success of project performance.

2.8.4 Project Management Methodology and Project Performance

Project methodology is essentially an effective project management technique that is applied without fail during the project cycle. Successful projects need to be carefully designed from the initial stage, developed according to specification, delivered on time and within budget. To achieve this, a project methodology needs to be followed because methodology is a roadmap of the steps in managing a project in a professional manner.

The benefits of utilising project management methodology includes effective planning and managing of the project; budgets and resources controls(Zmud, 1980); consistent method of reporting for all projects and helps to keep track of project changes effectively by providing appropriate tools and techniques (Kerzner, 2001). A good project management methodology ensures that standard processes are followed and offers the flexibility to introduce improvements in the process. It also focuses on quality to ensure that all the quality aspects of the project are addressed timely. Another benefit of the methodology is that project management documents are tight and are always up-to-date. Methodology also removes the crisis management need by ensuring that proactive planning is put in place to minimise issues.

The key to success of any project is a good project management methodology needs to be selected according to industry best practices and then customizing it to fit the

project and organisational requirements. Therefore, the following hypothesis is advanced:

Hypothesis 4: Higher level of project management methodology adoption leads to higher success of project performance.

2.8.5 IT Systems and Project Performance

Project team needs to have a broad understanding of similar past projects or other related projects in order to implement an effective decision-making (Construction Industry Institute, 1994) and this highlights the importance of having a good documentation system for better and prompt decision-making during various project phases. Interactive computer-based systems can help decision-makers utilise data and model to solve unstructured problems (Robbins, 1991). Computer-aided models are developed to help capture uncertainties and interactions among project variables which influence decisions and both internal and external expert knowledge have been integrated into the decision-making process (Alarcon & Bastias, 2000; Wilson, 2001). The use of the a Web-based construction Project Performance Monitoring System (PPMS) can help senior project management, project directors, project managers, and other parties involved in assessing and monitoring performance of the projects (Cheung *et al*, 2004). PPMS assists project managers in controlling construction project and monitoring is automated via the utilisation of the database technology and World Wide Web (WWW) technology. Project-based industries, especially the construction industry, are under growing pressure to compete in new ways (Egbu, 2004). Construction firms need to innovate to win projects and to improve the financial results of these projects and effective use of new technology can provide important competitive advantages for construction firms (Tatum, 1991)

Therefore, the related hypothesis is proposed:

Hypothesis 5: Higher level of IT systems adoption leads to higher success of project performance.

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2.8.6 Comprehension and Project Performance

Comprehension requires the use of facts and data to support actions at all levels of decision-making, understanding the client needs, clear prioritisation of project goals by the client and client acceptance of plans (Toor & Ogunlana, 2008a). Client must clarify their project's requirements and it is important that all the project team members well understood their requirements (Nitithamyong & Tan, 2007). Good comprehension of the way clients works, their preferences and the way they operate their businesses are vital for a project's success. At the initial project stage, comprehension will generate the baseline knowledge required to be successful. Comprehension at the initial project stage is critical because of the long-term effects and it affects the project throughout all development stages (Toor & Ogunlana, 2008). The understanding stage will involve partnering with the client to develop deeper comprehension of the project and the definitions of success and failure of the project. Success of a project from a client's perspective could be the completion on time, quality, satisfaction and meets the budget. Comprehensive and appropriate design at the right time with clear objectives and scope are also among the most effective methods of minimising construction project delay (Pourrostam & Ismail, 2011). Hence, this research posited the following hypothesis:

Hypothesis 6: Higher level of comprehension leads to higher success of project.

2.8.7 Communication and Project Performance

Communication is an important aspect and success factor of a relationship between two or more parties. It plays a significant role to lead, integrate people, and making decisions to enable the success of the project (Garbharran, Govender, & Msani, 2012). Communication includes regular client consultation and responsiveness of client and these two compliments each other and they are directly associated with client (Toor & Ogunlana, 2008). Project communications are basically the interaction that is required in order to deliver the project results. Construction project involves interaction among different project participants. These consist of the internal project participants that are the construction company project team members and the external team members that are the suppliers and subcontractors.

The communication and interaction process must also starts from the beginning or the initial project phase and continues throughout the entire project duration. “There must be shared project vision, where the project manager identifies the interests of all relevant stakeholders and ensures that there is buy-in to the project” (Yang, Shen & Ho, 2009: p.166). According to Zwikael (2009: p.385), “once the project objectives are set and the scope clarified, there must be constant update as the project progresses”. Proper handover procedures should also be developed given that “the construction industry is being increasingly viewed as a service industry” (Karna, Junnon & Sorvala, 2009: 117). This means that industry players have to become more relationship based that is client-orientated, and the emphasis changes from “working for the client” to “working with the client”.

Efficient and effective communication is crucial for project success, however there is insufficient time for it (Abdomerovic, Blakemore, & Steward, 2003) while the amount of uncertainty involved in a project is also enormous (Koskinen, Pihlanto, & Vanharanta, 2003). Effective and efficient communication is a key area that is important to appreciate in the briefing process (Blyth & Worthington, 2001). It is also a critical factor for feedback (Fortune & White, 2006) and a promising area for improvement in project management practices (Cooke-Davies, 2002).

Good communication in a project is a critical success factor to manage the client and other project stakeholders' expectations. The project manager needs to brief the project team members on what their tasks are and how to accomplish them. Project manager also needs to update Project Board on the project progress or escalates any issues that cannot be resolved at the lower level. The Board typically comprises of the executive (person ultimately responsible for the project) and representatives from the client and the supplier. The chances of project success are higher when there is honest and open communications between the client and construction company. Client also ought to be responsive in meeting the financial and other requirements of concerned parties (Arain & Low, 2005). One of the project failure indicators is the failure of the project manager to detect that there is a breakdown in communication and this leads to a missed opportunity to rectify the situation before it is too late. Lack of communication were noted as one of the significant issues which resulted in cost overruns, delays, failures and conflicts in the projects (Fortune & White, 2006; Toor & Ogunlana, 2006). Accordingly, the following hypothesis is proposed:

Hypothesis 7: Higher level of communication leads to higher success of project.

2.8.8 Competitive Advantage and Project Performance

Barney (1991) defined competitive advantage as the implementation of a strategy that facilitates the reduction of cost, the exploitation of market opportunities, and/or neutralisation of competitive threats (Newbert, 2008). Competitive advantage is measured as the implementation of cost-leadership strategy, quality strategy and innovation strategy (Grant, 2002; Wang & Ang, 2004). Project performance represents the firm's attempt to establish competitive advantage since successful project implementation separate the firm from those struggling to compete.

Studies have shown that the relationship between competitive advantage and performance is significant (Ma, 2000; Fahy, 2000; Gimenez & Ventura, 2002; Wang & Lo, 2003; Wiklund & Shepherd, 2003; Bowen & Ostroff, 2004; Morgan *et al*., 2004; Ray, Barney, & Muhanna, 2004). Significant relationship were also found on the relationship between competitive advantage and the sales-based performance of organisations, when sales-based performance was measured by the level of sales revenue, profitability, return on investments, productivity, product added value, market share and product growth (Wang & Lo, 2003; Neely, 2005; Falshaw, Glaister, & Ekrem, 2006). Further significant relationship were also found between competitive advantage and the organisational-based performance of organisations, when organisational-based performance was measured by the emphasis on efficient organisational internal processes, customer satisfaction, employee development and job satisfaction (Wang & Lo, 2003; Neely, 2005).

Accordingly, the following hypothesis is proposed:

Hypothesis 8: Higher level of competitive advantage strategy leads to higher success of project performance.

2.9 Chapter Summary

This chapter has reviewed the literature related to the current study such as project performance, discussion of strategic resource factors affecting the project performance. The resource based view theory utilised in the current study may help the researcher to justify the relationships among the management and relationship capability factors and the project performance. This chapter guides the researcher to develop some hypotheses and design the survey questionnaire.

CHAPTER 3

METHODOLOGY

3.0 Introduction

This chapter describes the methods and inquiry procedures that were used in this study. Research methodology can be either qualitative or quantitative and what matters is that the methodology selected must complement the research questions and objectives being studied. Selection of an appropriate research methodology is important to ensure the effectiveness of a research conducted. The chapter is divided into four sections and they were the research design, sampling procedure, data collection, measurement and instrumentation, pilot study and chapter summary.

3.1 Research Design

Basic research design employed in this study was a survey design. The study adopted a quantitative approach. The primary data collection was completed via the mail survey instrument. A pilot test was conducted to ensure that the questions are related and valid for the final survey.

This study is correlational in nature. It was conducted with the intention to obtain the understanding of the capabilities among of the construction industry, regardless of the construction firm's class because the classes only differentiate the financial capabilities with regards to capital and cost limit of work that can be carried out. Furthermore, management and marketing capabilities were required for all types of construction firm's class and project performance. This research is a cross-sectional study where data was gathered once from the individual project managers, to answer the study's research questions. The unit of analysis for this research was the

construction company and this study treated each individual project managers' responses as individual data source.

The data that are required for this study are related to demographic profile of the contractors, management capability, research capability, competitive advantage and project performance in order to answer the research question and meet the research objectives. There are no questionnaires readily available from previous studies on construction project performance studies in Malaysia. However, previous studies have identified the critical success factors and items under each factor as chosen for selected variables in the study.

This study has adapted the items from previous studies on critical success factors with minimum addition to formalise and make it more applicable to construction industry in Malaysia. The survey was design to start with the demographic profile followed by the specific questions management capability, research capability, competitive advantage and project performance. This survey was divided into four (4) parts; Part one (1) on the contractor's demographic profile, Part two (2) on the capabilities, Part three (3) on the project performance and Part four (4) on competitive advantages.

Draft questionnaire was designed in one language i.e. English and distributed to the research supervisors, lecturers and experts in construction industry in order to pre-test the questionnaire prior to conducting the pilot study. They provided feedbacks on the various aspects such as readability, proper wordings, sentence length, layout

and formatting of the survey questionnaires. The supervisor's feedback was then incorporated into the revised survey questionnaires for pilot testing.

3.2 Sampling Procedure

The study population consisted of construction firms in Malaysia. The study sample was Bumiputera contractors. The reason why Bumiputera contractors were chosen is because they are crucial for the achievement of Vision 2020 and they also face the limited resources challenges such as lack of expertise and experiences, over-optimistic estimation in tender bids, financial problems, materials supply networking, lack of skilled workers, lack of construction materials and machineries, inefficient and ineffective planning as well as management and communication problems (Ayub & Eman, 2006).

The samples for this study were obtained from the directories of Construction Industry Development Board (CIDB). CIDB is the government agency responsible the registration of construction companies in Malaysia. It provides background and basic business information for 63,000 companies in Malaysia. Construction a company listing was taken from the CIDB's Malaysian Construction Industry Directory 2010–2011, and it is the most accurate and comprehensive database for companies registered with the Malaysian construction industry.

Formula used for estimating the sample size was developed by Krejcie and Morgan (1970):

$$S = \frac{X^2 NP(1-P)}{d^2(N-1) + X^2 P(1-P)}$$

where:

- S = required sample size
- N = the given population size
- P = population proportion that for table construction has been assumed to be .50, as this magnitude yields the maximum possible sample size required
- d = the degree of accuracy as reflected by the amount of error that can be tolerated in the fluctuation of a sample proportion p about the population proportion P - the value for d being .05 in the calculations for entries in the table, a quantity equal to $\pm 1.96\sigma_p$
- X2 = table value of chi square for one degree of freedom relative to the desired level of confidence,

Based on the above formulae, Krejcie and Morgan (1970) also prepared a table for determining the sample size based on confidence level needed for a given population: For a population of 75,000 and above, the recommended study's sample size is 382. Taking into account that the survey method might have poor response rate and to ensure a minimal response number of 400 responses, 1600 questionnaires were distributed to the respondents. As an evidence, Abu Bakar, Yusof, Awang, and Adamy (2011) in their study only managed to obtain a response rate of 25.3%. that was 152 questionnaires received out of 600 sent to Malaysian construction companies classified in the large category by the Construction Industry Development Board of Malaysia (CIDB).

The companies were selected using the systematic random sampling technique which ensures that each individual from a population has the exact same probability of being included in a sample. This technique was employed to select the element in the population frame to obtain the sampling of the firms for this research.

Due to large number of registered contractors that is over 63,000 companies, this study only utilised Bumiputera contractors within Klang Valley area as respondents. The reason is because these two states represent 30 percent of dormant and non-active construction firms in Malaysia from January 2006 to August 2008 as shown in Table 1.2. Furthermore, the Federal Territory Kuala Lumpur and Selangor are the central areas of administration and economic development in Malaysia. It is also assumed that such characteristics of area qualify the sample to represent the Malaysian Construction Industry as a whole. There were a total of 3,280 Bumiputera contractors registered in the Federal Territory of Kuala Lumpur and 6,341 contractors registered in Selangor as of August, 2011**.** Since, it is impossible to survey all the respondents within limited time, a simple random sampling was applied to obtain the number of targeted respondents that is 1,600 contractors. Finally, 800 contractors in Federal Territory Kuala Lumpur and 800 contractors Selangor registered and listed in the CIDB directories were chosen as the respondents for this study. Random samples were selected from the directory and the questionnaires were sent to those randomly selected companies in the directory either by email or by postal mail. The contractors were selected using systematic random sampling to select the representatives from each state based on the directory. For example, since the number of samples required is 800 from each states and there are 3,280 contractors in Federal Territory Kuala Lumpur, 3,280 is divided by 800 which equals 4, thus, every 4th contractor was chosen after a random starting point between 1 and 15. For example, if the random starting point is 6, then the contractors selected are 6, 10, 14, 18 and so on.

3.2.1 Data Collection Procedure

Questionnaire as per Appendix A was delivered to 1,600 construction project managers via postal mail service and online survey for process of sample selection. This was supported by scheduled visits to construction companies get the response from the construction project managers. Construction project managers were targeted because they are in-charge of the project and had knowledge related to overall project activities. The research packet included a cover letter, a consent letter from Universiti Utara Malaysia (UUM) and a copy of the questionnaires. Participants were provided with a postage-paid envelope, allowing surveys to be returned directly to the researcher.

After identifying all the respondents, subsequent procedure performed was to distribute the questionnaires. Data collection was performed via the use of a quantitative mail survey instrument and respondents were requested to mail the completed questionnaires to the researcher. A cross-sectional approach was employed in this study, where data on the variables is collected once that is at the same point in time (Gujarati, 2004) to answer the study's research questions via the survey questionnaire as the research instrument.

Pilot test for this study was performed on 30 construction firms from Kuala Lumpur to ensure that appropriate response rate is achieved. These samples were excluded from the final study sample and they are maintained under a separate data file. This was performed primarily to determine the ease of completion, wording difficulties and vague sentences**.** Subsequently, the survey questionnaire was amended

according to the feedback received during the pilot study. The strategy to further improve the response rates were:

- The questionnaire was presented in a format that is easy to read.
- A stamp self-addressed envelope was also included to facilitate the return of the completed survey questionnaire.
- Information about the survey was provided in a cover letter
- Promise of anonymity was included in the cover letter.
- Specific deadline dates was given that is all the respondents were given two weeks duration to complete the questionnaire
- Follow-up calls were made to increase the response. Up to three follow-up calls was made after sending the survey questionnaire to increase the response rates.

3.3 Operational Definition and Measurement of the Variables.

3.3.1 Project Performance

Project performance is the achievement of the construction firm's in meeting the project objectives relating to budget performance (within budget or cost), schedule (timely completion), client satisfaction, functionality (according to specification), quality and safety.

This dependent variable that is project performance was operationalised using subjective performance dimension which consists of five items adopted from previous literatures and these items were measured on five-point Likert scale, with 1 for "Strongly Disagree" and 5 for "Strongly Agree".

Table 3.1
Project Performance Measurement

	Variables	Source
1.	Budget performance (within budget/cost)	Ashley, Lurie, and Jaselskis (1987)
2.	Schedule (Timely completion)	Nguyen, Ogunlana, and Lan (2004)
3.	Functionality (according to specification)	Ashley *et al*., (1987)
4.	Quality	Nguyen *et al*., (2004)
5.	Safety	Nguyen *et al*., (2004)

Three different sources were utilised due to non-availability of a comprehensive questionnaire on the project performance items. Each study identified different performance items and there is no study that combines all the relevant items (Ashley et al., 1987 and Nguyen et al., 2004).

3.3.2 Management Capability

Management capability is the ability of the managers of the construction firm to utilise the resources that they possessed via competence project team, obtaining cooperation and commitment from all parties involved in achieving project objectives, utilizing the proper methodology and decision making tools or systems to manage the project.

Management capability was operationalised using 5 dimensions that were competence, cooperation, commitment, methodology and IT systems. All the items of the 5 dimensions were adopted from previous literatures as per Table 3.2. These items were measured on a five-point Likert scale, with 1 for “Strongly Disagree” and 5 for “Strongly Agree”.

Table 3.2
Management Capability Measurement

	Variables	No of items	Source
1.	Competence	3	Toor and Ogunlana (2008)
2.	Cooperation	3	Phua and Rowlinson, (2004)
3.	Commitment	3	Toor and Ogunlana (2008)
4.	Methodology	5	Benjamin (2006)
5.	IT Systems	3	Abdul-Kareem and Abu-Bakar (2011)

The reason why four different sources were utilised was due to non-availability of a comprehensive questionnaire on the capability factors. Each study identified different capability factor items and there is no study that combines all relevant factors.

3.3.3 Relationship Capability

Relationship capability is the ability of the construction firm to interact and understand the customers need via comprehension and communication abilities involved in project performance in order to generate the desired performance from the available resources**.**

Relationship capability was operationalised using two dimensions that are communication and comprehension. Comprehension consists of four items while communication consists of 3 items, adopted from previous literatures and these items were measured on a five-point Likert scale, with 1 for "Strongly Disagree" and 5 for "Strongly Agree".

Table 3.3
Relationship Capability Measurement

	Variables	No of items	Source
1.	Comprehension	4	Thor and Ogunlana (2008)
2.	Communication	3	Toor and Ogunlana (2008)

3.3.3 Competitive Advantage

Competitive advantage is the advantage that the construction firm possesses, as a result from the utilisation of its strategic resources via the organisational capabilities such as cost, innovation and price advantage.

Competitive advantage in this study was operationalised via 3 dimensions that includes the implementation of cost-leadership strategy, quality strategy and innovation strategy. Constructs for these three dimensions were adopted from Chandler and Hanks (1994), Grant (2002), and Wang and Ang (2004). The respondents were required to assess the success of competitive strategy implementation of that is cost leadership, quality and innovation in their firm on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree).

Table 3.4
Competitive Advantage Measurement

	Variables	No of items	Source
1.	Cost strategy	3	Wang and Ang (2004).
2.	Quality strategy	3	Wang and Ang (2004).
3.	Innovation strategy	3	Wang and Ang (2004).

Regarding the constructs for competitive advantage above, all items for each strategy were combined into a corresponding single strategy. Composite score representing the average competitive advantage is calculated by averaging the points for these three strategies. Based on the five point scores, the higher the rating of the construct, the greater the company's competitive advantage.

3.4 Pilot Study

A pilot study was conducted in May 2012, prior to deciding on the actual instrument to be utilised in this research. The draft survey questionnaire was issued on 3rd of May 2012 and the final date of collection was on the 12th of May 2012. This pilot test was performed using a convenience sample of 30 construction firms in Kuala Lumpur. Sekaran and Bougie (2013) suggested that a pilot study is performed to correct any weaknesses in the survey instrument prior to data collection. The researcher also discussed and observed some of the respondents during the survey questionnaire completion to help with the data collection and to identify difficulties in wording and translation. The reliability test for each instrument was calculated using the pilot study data.

Among the criteria for selection of past instruments was internal consistency of the scales using Cronbach's alpha reliability coefficients. Cronbach coefficient alpha was utilised to test on reliability since this is the most common method used for assessing the reliability of a measurement scale with multi-point items (Hayes, 2008). Coefficient alpha can range from 0.0 (no reliability) to 1.0 (perfect reliability). However, a good reliability should produce at least a coefficient value of .7 (Hair, Black, Babin, Anderson, 2009; Pallant, 2007). For exploratory type of research the Cronbach's α values greater than .7 can be considered high levels of reliability; less than .6 is considered to be poor and only those with Cronbach's α values less than .5 should be discarded (Sekaran & Bougie, 2013). All constructs in this pilot test had Cronbach's α values above .5, an indication of acceptable reliability. These analyses established the overall adequacy of the questionnaire.

The results on measures for the pilot study were shown in Table 3.6. The pilot test also identified some problems with respect to the wording of the items and length of completion time. Some vague sentences were noted and corrected. Amendments were made to make sure that the wordings and phrases are clear and understandable. The final version of the questionnaire was three pages long and it took the respondents 15 minutes to complete the whole questionnaires.

Table 3.5
Reliability Coefficient for Multiple Items in Pilot Study (n = 30)

Variable	Alpha (α)
Comprehension	.703
Communication	.732
Competence	.827
Cooperation	.756
Commitment	.826
Methodology	.852
Systems	.843
Project Performance	.855
Competitive Advantage	.890

3.5 Method of Data Analysis

This study used descriptive and inferential analyses to analyse the extent of project performance and the relationship between independent variables and dependent variables.

3.5.1 Descriptive Analysis

Descriptive statistics (mean values and standard deviations) for all the variables of interest were obtained to acquire a feel for the data. Descriptive analysis is performed to transformed the raw data into meaningful information that will make

them easier for understanding and interpretation. This analysis was used to determine the extent of construction project performance in Malaysia.

3.5.2 Inferential Analysis

3.5.2.1 Factor Analysis

Factor analysis was utilised to test the factors for sample proportions. This analysis was utilised to reduce a vast number of variables to a meaningful, interpretable, and manageable set of factors (Sekaran & Bougie, 2013). It also indicates "revealing patterns of interrelationships among variables, detecting clusters of variables and reducing a large number of variables to a smaller number of statistically uncorrelated variables, and the factors of factor analysis that are each linearly related to the original variables" (Agresti & Finlay, 2008). The analysis was used to measure constructs validity (Hair *et al*., 2009).

3.5.2.2 Test of Reliability of the Instrument

Reliability of the instrument specifies the extent to which the treatment variables capture the construct intended to be measured. The instrument reliability which was utilised in this study was measured using Cronbach's Alpha. Reliability analysis was performed on the factors extracted using the recommendation of Hair *et al.* (2009). It was utilised for testing the internal consistency of the measurement instruments. Cronbach's Alpha was utilised to test the response credibility of the questionnaire to ensure harmony between the results and responses of the study sample on the questionnaire. The accepted value of this measurement is 60% or more and less than that it is regarded as poor (Hair *et al*., 2009; Sekaran & Bougie, 2013).

3.5.2.3 Correlation Analysis

Correlation analysis was utilised to explain the strength and direction of the relationship of the two variables. Relationship between project performance and strategic resource factors were investigated using this analysis. Positive correlation shows that as one variable increases, so does the other. Negative correlation displays that as one variable increases, the other decreases. Perfect correlation of 1, or –1 indicates that the value of one variable can be determined exactly by knowing the value of the other variable. Correlation of 0 exhibits no relationship between the two variables.

3.5.2.4 Multiple Regression Analysis

Multiple regression analysis is a more sophisticated extension of correlation and is utilised to explore the predictive ability of a set of independent variables on one dependent variable (Pallant, 2007, Hair *et al.* 2009). Hypotheses developed in the present study were tested by conducting multiple regression analyses. Besides that, the amount of variance of performance justified by the independent variables was also examined through this analysis.

Prior to the analysis, basic assumptions of the linearity (represents the degree to which the change in the dependent variable is associated with the independent variable), normality of the error terms distribution and homoscedasticity (constant variance of the error terms) was first examined. The degree of multicollinearity and its effect on the results was examined before the regression results are considered valid. Multicollinearity is a statistical term referring to a situation when two or more independent variables in a multiple regression model are highly correlated. The

variance inflation factor (VIF) and the condition indices for all the variables were examined to check for multicollinearity. According to Hair *et al.* (2009), the VIF value should be close to 1.00 to indicate little or no multicollinearity. They further suggested the cutoff value of 10.00 as an acceptable VIF.

3.6 Chapter Summary

Past literatures and research have identified the attributes of project performance and the capability factors affecting the project performance in the construction industry. This research used survey instruments to collect data to examine capability factors which influences the project performance in the construction industry. Data of the Bumiputera contractors were collected with regard to the dependent and independent variables. Project managers of Bumiputera construction companies in Malaysia were the respondents in this study and samples were selected using systematic random technique. Pilot test was conducted on 30 firms to ensure achievement of appropriate response rate.

CHAPTER 4

RESULTS AND FINDINGS

4.0 Introduction

The intention of this study was to establish whether management capability, marketing capability and competitive advantage factors identified have a significant relationship with the construction project performance. This chapter discusses the result of data analysis. First, it provides an overview of data collection. Second, it presents profiles of the respondents. This is then followed by analysis to test the validity and reliability of the variables. Lastly, the results of hypothesis testing were presented.

4.1 Overview of Data Collected

4.1.1 Response Rate

For data collection purposes, 1,600 questionnaires were distributed and mailed to the selected construction company's project managers. Survey questionnaire was issued on 13th of August 2012 and final date of submission was initially set on the 30th of August 2012. The dateline was then extended to 10th September 2012 in order to encourage and obtain more respondents to participate in the survey. An online survey form was also e-mailed to the project manager to increase the response rates, followed by telephone calls and gentle reminder via e-mail. Up to three follow-ups was made after sending the survey questionnaire**.** Out of 1,600 questionnaires sent, 420 were received, however only 385 were usable which produced a response rate of 24%.

4.1.2 Test of Non-Response Bias

There is always a possibility that respondents and non-respondents differ in some significant manner, as in the case of any study that relies on voluntary participation (Matteson *et al*., 1984). An alternative test of non-response bias was conducted due to the difficulty associated with the identification of non-respondents' characteristics in anonymous research.

Armstrong and Overton (1977) suggested that non-respondents were assumed to have similar characteristics of late respondents. This process involves dividing the sample into early responses (that is, returns received within two weeks after distribution) and late responses (those returns received after two weeks of distribution) and then conducting chi-square test on the demographic characteristics of the respondents.

There were 195 respondents classified as early responses and 190 were late responses. Table 4.1 displays the result of non-response test. The p values of the analysis revealed no statistically significant difference between the two groups (significant p> .05). Thus, it can be concluded that non-response bias does not significantly affect the generalisability of the findings of this study. Therefore, the analysis was carried out on the full 385 responses.

Table 4. 1
Results of Chi-square Test for Early and Late Response

Variables	**Values of Pearson Chi-Square**	**P-Value**
Gender	.208	.648
Highest Qualifications	.084	1.000
Position	1.720	.787

Note: The critical values were all not significant.

4.2 Profile of the Respondents

Certain demographic profiles were gathered from each respondent. Although the data was not collected to address a specific research question, it provides an insight into the subjects and may assist in interpreting results of the analysis. Table 4.2 presents the profile of the respondents.

Table 4. 2
Profile of the Respondents (n=385)

Variable	Categories	N	(%)
Gender	Male	189	49.1
	Female	196	50.9
Highest Qualifications	Bachelor's degree	189	49.1
	Master's degree	24	6.2
	Doctoral degree / PhD	4	1.0
	Diplomas	152	39.5
	SPM/High School	8	2.1
	Technical Certificate	8	2.1
	Others	4	1.0
Position	Director/Senior Manager	49	12.7
	Manager/Assistant Manager	48	12.5
	Section head/Senior Engineer/	19	4.9
	Others	212	55.1

Forty nine percent (49%) of the respondents were male and fifty percent were female. With regards to highest qualifications obtained, 49.1% of the respondents possessed bachelor degree, followed by 39.5% of the respondents possessed diplomas, 6.2% possessed masters' degree and 1% possessed doctoral degree. The rest of the respondents possessed SPM, technical certificate and other qualification. This indicated that not many respondents were pursuing the doctoral degree, possibly to time constraints as much of their time were spent on managing the project resources, project team and resolving project related matters.

Table 4.3 illustrates the response frequencies with regards to respondent business profile.

Table 4.3
Business Profile of Respondents

Variable	Categories	N	(%)
No of Employees	1 to 10	269	69.9
	11 to 50	56	14.5
	51 to 100	52	13.5
	100 to 200	8	2.1
Years in Business	1 to 5	87	22.6
	6 to 10	174	45.2
	11 to 20	96	24.9
	21 to 30	24	6.2
	31 to 40	4	1.0

The majority of the respondents (69.9%) had between 1 to 10 employees (small size), while 14.5% had between 11 to 50 employees and 13.5% of respondents had between 51 to 100 employees (medium experienced). Only a small number of respondents (2.1% and 2.9%) had between 100 to 200 employees. Smaller size construction companies were more participative in the survey as they were more open to disclose certain information to outsiders as compared to bigger corporation which were more reluctant and more hesitative on the disclosure of information possibly due to concerns on confidentiality.

Regarding the business experience in construction, majority of the respondents (45.2%) had between 6 to 10 years of experience, followed by 24.9% with 11 to 20 years of experience, 22.6% with 1 to 5 years experience, while 6.2% had between 21 to 30 years of experience (experienced) and only 1% of respondents had over 30 years (highly experienced). Newer construction companies' high participation in this survey is possibly due to their willingness to provide the input which could also be beneficial to them as they grow later on and becomes more mature in the industry.

Established companies tend to regard academic studies as non-value added services and thus may choose not to participate in the survey.

4.3 Goodness of Measures

4.3.1 Factor Analysis

Factor analysis is considered as important during the data analysis stage as it was utilised to test the factors for sample proportions. This analysis was utilised to reduce a vast number of variables to a meaningful, interpretable, and manageable set of factors (Sekaran & Bougie, 2013). It was mainly performed to understand the underlying dimensions or proposed dimensionality of variables in a proposed model or relationships in empirical research (Hair, *et al.*, 2002). The following sections discuss the results of factor analysis using principal component methods.

4.3.1.1 Factor Analysis on Project Performance

The factor analysis conducted on project performance showed the Kaiser-Meyer-Ollkin (KMO) value of .913 as per Table 4.4, exceeded the recommended value of .5 (Hair, et al., 2002) and the Bartlett's test of sphericity is highly significant (p = .00), supporting the factorability of the correlation matrix. These indicated that the assumptions of factor analysis were met.

Table 4.4 shows that the factor loading for project performance items were between .731 and .864. The factor analysis conducted on project performance shows the Kaiser-Meyer-Ollkin (KMO) Measure of Sampling Adequacy (MSA) for this variable was 0.821, exceeded the recommended value of 0.5 (Hair *et al*., 2006) and the Bartlett's test of sphericity is highly significant (p = .00), supporting the

factorability of the correlation matrix. These indicate that the assumptions of factor analysis were met. The loading value from the table shows that none of the items were omitted from the factor analysis since the loading values were greater than .5. According to Hair *et al*. (2006), for a sample size of 350 and above factor loadings of .30 is minimally acceptable; however, they further recommended values greater than .50 are generally considered necessary for practical significance. Thus, the cut-off value of .50 is selected for this study. Reliability statistics (Cronbach's alpha) for this factor was .878 which indicates high reliability.

Table 4.4
Summary of Factor and Reliability Analysis on Project Performance

Name	**Items**	**Factor Loading**	**Cronbach's Alpha (α)**
Performance	Budget performance – within budget / cost	.864	.883
	Schedule - Timely completion	.856	
	Functionality – according to specification	.856	
	Quality	.830	
	Safety	.731	

4.3.1.2 Factor Analysis on Management Capability

Management capability in this study was represented by five dimensions, namely Competence, Cooperation, Commitment, Project Methodology and IT Systems. The results of factor and reliability analysis are presented in Table 4.5. This table presents the factor loading of five dimensions of management capability variables. The cut-off point suggested by Hair *et al*. (2006) for a sample size of 350 and above factor loadings of .30 is minimally acceptable; however, they further recommended values greater than .50 are generally considered necessary for practical significance. Thus, the cut-off value of .50 is selected for this study.

Table 4.5
Summary of Factor and Reliability Analysis on Management Capability

Name	**Items**	**Factor Loading (>0.5)**	**Cronbach's Alpha (α) (>0.5)**
Competence	The project team members are competent	.812	.786
	The project manager is competent e.g. able to communicate efficiently and maintain a harmonious working group.	.884	
	We award the bids to the right designers/contractors.	.815	
Cooperation	There is strong cooperation in the relationship between construction firm and the clients.	.816	.736
	There is strong cooperation between the colleagues in the project team.	.862	
	The project team members are able to work together effectively as a project team.	.756	
Commitment	Effective project planning and control mechanism is in place.	.786	.756
	Goals and priorities of all stakeholders involved in the project are clearly defined.	.842	
	The required resources are clearly defined during planning stage.	.832	
Project Methodology	The methodology improves the accuracy of project decisions in significant manner.	.639	.779
	The methodology helps to ensure adequate resources for the full length of the project.	.826	
	The methodology helps the project team to adapt to project changes.	.845	
	The methodology informs how well the project is managed.	.743	

Name	Items	Factor Loading (>0.5)	Cronbach's Alpha (α) (>0.5)
	The methodology provides the statistics on financial performance of the project e.g. ROI, cost, profit, cash flow.	.577	
IT Systems	Adoption of innovative IT tools has increased our profit by reducing the construction costs, time and also increased client satisfaction.	.913	.793
	Adoption of innovative IT tools has provided us with competitive advantage, increased market share and growth.	.812	
	Adoption of innovative IT tools has increased our work flexibility.	.795	

The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy (MSA) value for all items ranged within the acceptable level that is between .51 and .90. The MSA value of above .50 indicates appropriateness (Hair *et al*., 2006). The Bartlett's Test of Sphericity was also significant and indicated that there were sufficient number of significant inter-correlations for factor analysis. Therefore, two main assumptions to run the factor analysis confirmed to the conditions, thus it is acceptable to run the factor analysis. No items were dropped from the factor analysis since the loading values were greater than .5.

4.3.1.3 Factor Analysis on Relationship Capability

Relationship capability was represented by two dimensions, namely comprehension and communication. Table 4.6 shows the findings of factor analysis for the two variables.

Table 4.6
Summary of Factor and Reliability Analysis on Relationship Capability.

Name	**Items**	**Factor Loading**	**Cronbach's Alpha (α)**
Comprehension	We require the use of facts and data to support actions at all levels of decision-making.	.848	.818
	We know what our client really wants.	.851	
	We formally obtain the client acceptance of our plans.	.786	
	We have clear prioritisation of project goals by our client.	.730	
Communication	We regularly perform client consultation.	.868	.772
	Our client is responsive to our inquiry.	.902	
	There is sufficient communication among clients, consultants and contractors.	.704	

The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy (MSA) value for all items ranged within the acceptable level that is between .62 and .69. The MSA value of above .50 indicates appropriateness (Hair *et al.*, 2006). Since both assumptions to run the factor analysis which were the normality, Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's Test of Sphericity were confirming to the conditions, thus running the factor analysis is acceptable. None of the items were omitted from the factor analysis since the loading values were greater than .5. No items were recommended to be omitted from the factor analysis which means all the items were able to measure what the research intended it to measure. This finding gives advantages to all these items to be used to measure the relationship capabilities especially because the reliability of these items was also high (Cronbach's Alpha (α) = .818 and .772).

4.3.1.4 Factor Analysis on Competitive Advantage

Finally with regards to the factor analysis for Competitive Advantage, Table 4.7 shows the findings of the factor analysis for Competitive Advantage which is the last independent variable. Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy (MSA) for all Competitive Advantage items was .774 which ranged within the acceptable level and the Bartlett's Test of Sphericity was significant.

Table 4.7
Summary of Factor and Reliability Analysis on Competitive Advantage

Name	**Items**	**Factor Loading**	**Cronbach's Alpha (α)**
Competitive Advantage	Process innovation in business operation system as a cost reduction strategy.	.682	.852
	Investment in machinery is a cost reduction strategy.	.726	
	Improving productivity and operations of employee as cost reduction strategy.	.773	
	Focusing on product quality as a quality strategy.	.662	
	Strict quality control requirements as a quality strategy.	.742	
	Meeting customer needs and addressing their product requirements as a quality strategy.	.618	
	Strives to introduce new products first as an innovation strategy.	.644	
	Stresses on production process innovation as an innovation strategy.	.687	
	Engagement in novel marketing as an innovation strategy.	.563	

No items on competitive advantage were recommended to be omitted by the factor analysis which means all the items were able to measure what the research intended it to measure. This finding gives advantages to all these items to be used to measure the competitive advantage especially because the reliability of these items was also high.

4.4 Reliability Test

The reliability of the instrument used in this study was tested and measured using Cronbach's Alpha using the SPSS 17 model. A minimum reliability (that is Cronbach's Alpha) of .50 was set as suggested by Hair *et al*. (2006) for the purpose of this study. The idea behind testing the reliability is to trust the findings as reliable observations and results. This reliability measure also helps to determine if any of the questions are not clearly written or ambiguous. It also measures the internal consistency across the items on the instruments (Creswell, 2008).

The Cronbach's alpha value for all survey instrument with 38 items was .936, which is considered excellent and reliable especially because items in this instrument was gathered by the researcher from different sources. Table 4.8 represents the result of the reliability test for each of the factors. This table shows that the Cronbach Alphas of the measures were all comfortably above the lower limit of acceptability that was α greater than .50. Hence, all the measures were highly reliable.

Table 4.8
Reliability Coefficients for the Variables in the Study

Variables	**No. of Items**	**Cronbach's Alpha (Actual, n = 385)**	**Cronbach's Alpha (Pilot, n = 30)**
Comprehension	4	.818	.703
Communication	3	.772	.732
Competence	3	.786	.827
Cooperation	3	.736	.756
Commitment	3	.756	.826
Project Methodology	5	.779	.852
IT Systems	3	.793	.843
Project Performance	5	.878	.855
Competitive Advantage	9	.852	.890

The actual administered survey test results displayed slightly lower cronbach's alpha compared to the pilot test results for six out of the nine variables. However, the value is still higher than the minimum acceptable value of .50 and all the measures were reliable. This is possibly due to larger number of sample size that is from 30 to 385 respondents and the effect of rewording of some sentences and survey questionnaire reorganisation.

4.5 Descriptive Analyses

Descriptive statistics included the minimum and maximum value, means, range, standard deviation and variance for the interval-scaled variables. Descriptive statistics for the final list of variables of the study are shown in Table 4.9 and the scale measurements used was a five-point scale. The range of five point scale was categorised into equal sized categories of low, moderate and high for ease of interpretation. Thus, scores of less than 2.33 [4/3 + lowest value (1)] is considered as low; scores of 3.67 [highest value (5)– 4/3] is considered high and those in between considered moderate.

Table 4.9 displays the mean values for all the independent and dependent variables. All the nine variables exhibit a high score that was above 3.9. Three out of five management capability variables that were Cooperation, Commitment and IT Systems had a score of above 4.0 while Competence and Project Methodology displayed a lower mean score of 3.9. Similarly, the other independent variable that was Competitive Advantage also exhibited a score of 3.9. Communication variable displayed slightly higher mean value of 4.10 than the other relationship capability variable that was Comprehension (mean value of 4.07). The respondents also perceived the level of construction project performance as high with a mean value of 4.0. All the standard deviations were less than 1.00, indicating that the variation between the respondents' opinions was low and the data points for all the variables were not widely spread from the mean which is consistent with their view on each item studied.

Table 4.9
Descriptive Statistics

	N	Min	Max	Mean	Std. Deviation
Comprehension	385	2.75	5.00	4.1039	.47829
Communication	385	3.00	5.00	4.0698	.44850
Competence	385	2.67	5.00	3.9164	.53743
Cooperation	385	2.67	5.00	4.0756	.46710
Commitment	385	2.33	5.00	4.0355	.49436
Project Management Methodology	385	2.25	5.00	3.9208	.62569
IT Systems	385	2.33	5.00	4.0476	.65642
Project Performance	385	2.40	5.00	4.0603	.65136
Competitive Advantage	385	2.44	5.00	3.9209	.48944
Valid N (listwise)	385				

Subsequently, comparison of mean was performed on the dependent variables based on the demographic profile of the respondents. Table 4.10 and 4.11 demonstrated the

results of the comparison on the business profile of the respondents that was the companies that the project manager works for.

Table 4.10 displays the comparison of project performance mean against the number of years the construction companies have been in business. The years in business could also be used as a general measure of business experience. Generally all companies exhibited high scores that were above 3.67 (except for companies with less than 5 years experience) which means that the project managers perceived the success of the project as high. Companies with the highest number of years (31 to 40 years) displayed the highest scores of 4.5. However the number that participated in this survey was relatively small that consisted of only 4 companies. In other words, as the companies become mature, the chances of getting better project performance are also increased as they become more experienced and had more lessons learnt from the projects implemented.

Table 4.10
Mean Comparison of Project_Performance Based on Years In Business

Years In Business	Project Performance (Mean)	N	Std. Deviation
1 to 5	3.3701	87	.44880
6 to 10	4.4356	174	.34989
11 to 20	4.0396	96	.66530
21 to 30	3.8500	24	.79400
31 to 40	4.5000	4	.11547
Total	4.0603	385	.65136

Table 4.11 shows the comparison of project performance mean against the number of employees of the construction companies which can also be used as a general measure of the company size. All companies generally exhibited high scores that

were above 3.67 which mean that the project managers perceived the success of the project as high. Companies with the higher number of employees (over 100) displayed slightly higher scores, however the number is relatively small, that was only 8 companies. This could be due larger size companies having proper organisation structure, clear segregation of duties, dedicated sales and marketing team as well as more organised project team.

Table 4.11
Mean Comparison of Project Performance Based on Number of Employees

Number of Employees	Project Performance (Mean)	N	Std. Deviation
1 to 10	4.0721	269	.64299
11 to 50	4.0214	56	.71420
51 to 100	3.9885	52	.63667
100 to 200	4.4000	8	.54511
Total	4.0603	385	.65136

The result of the comparison on the respondent profile that is the highest academic qualification obtained by the project manager is demonstrated in Table 4.12. The mean scores were high at all level of academic qualification. All respondents regardless of their qualifications generally displayed high scores that were above 3.67 which mean that the project managers perceived the success of the project as high. Except for respondents with master's degree and SPM certificate, all the other respondents displayed a very high scores that is above 4.0 .The project managers with diplomas score the highest (4.13), possibly due to their exposure on the construction business and higher maturity level.

Table 4.12

Mean Comparison of Project Performance Based on Project Manager Highest Qualification

Highest Qualification	Project Performance (Mean)	N	Std. Deviation
Bachelors Degree	4.0466	189	.67474
Diplomas	4.1329	152	.61156
Master's/MBA	3.7750	24	.61662
Others (please specify)	4.0000	4	.23094
SPM/High School	3.9250	8	.70862
Technical Certifcate	4.0250	8	.88439
Total	4.0603	385	.65136

Comparison of mean was also performed on the independent variables based on the demographic profile of the respondents. Table 4.13, 4.14 and 4.15 demonstrate the results of the comparison on the business profile of the respondents that is the companies that the project manager works for as well as the highest academic qualification obtained by the project manager.

Table 4.13 displays the comparison of independent variables mean against the number of years the construction companies have been in business. Generally all companies exhibit high scores that were above 3.67 which reflects that the project managers perceived the management capability, relationship capability and competitive advantage of the construction company as high except for the companies that have just enter the business (1 to 5 years). Companies with the higher experience (above 5 years) display higher scores in most of the independent variables. The justification for this output is that as the companies become matured, the capabilities and competitive advantage level is also increased as they become more experienced with more lesson learnt from various project implementations.

Table 4.13
Mean Comparison of Project Performance Based on Years In Business

Years In Business	Competitive Advantage	Management Capability	Relationship Capability
1 to 5	**3.6232**	**3.6485**	3.6731
6 to 10	4.0492	4.1624	4.2794
11 to 20	3.9745	4.0121	4.1019
21 to 30	3.8241	4.0383	3.9517
31 to 40	4.1111	3.9350	4.2500
Total	3.9209	3.9987	4.0774

Comparison of independent variables mean against the number of employees of the construction companies is displayed in Table 4.14. Generally, all companies exhibit high scores that are above 3.67 which mean that the project managers perceived the management capability, relationship capability and competitive advantage of the construction company as high regardless of the company size. Companies with the higher number of employees (over 100) display slightly higher scores, however the number is relatively small that is only 8 companies. Possible explanation is due to larger size companies having dedicated sales and marketing team as well as more organised project team, proper organisation structure and clear segregation of duties.

Table 4.14
Mean Comparison of All Independent Variables Based on Number of Employees

Number of Employees	Competitive Advantage	Management Capability	Relationship Capability
1 to 10	3.9017	3.9898	4.0782
11 to 50	3.9385	4.0077	4.0464
51 to 100	3.9893	4.0267	4.0846
100 to 200	4.0000	4.0513	4.2200
Total	3.9209	3.9987	4.0774

The result of the comparison on the profile of the respondents that is the highest academic qualification obtained by the project manager was demonstrated in Table 4.15. The mean scores for independent variables were high at all levels of academic qualification. The project managers with technical certificates scores the highest in most of the independent variables, possibly due to their expertise and specific knowledge possessed.

Table 4.15
Mean Comparison of All Independent Variables Based on Highest Qualification

Highest Qualification	Competitive Advantage	Management Capability	Relationship Capability
Bachelors Degree	3.9536	4.0005	4.0959
Diplomas	3.9189	3.9945	4.0710
Master's/MBA	3.7176	3.9592	3.9808
Others (please specify)	4.0000	4.0350	4.2100
SPM/High School	3.8333	4.0288	3.8750
Technical Certifcate	3.8472	**4.1050**	**4.1888**
Total	3.9209	3.9987	4.0774

4.6 Correlation Analysis

Correlation analysis was conducted to obtain an understanding of the relationship between the variables in the study as per all the three research questions and eight hypotheses developed. However, the relationship in correlation analysis was limited to between one independent variable to the independent variable unlike multiple regression which simultaneously examines the relationship between all independent variable and dependent variables. It was also performed to determine whether there are any particular independent variables that highly influenced the dependent variable. If there is such cases, then the independent variables have to be excluded from the subsequent multiple regression analysis. This analysis was performed via the computation of the Pearson correlation coefficients using SPSS statistical software.

Table 4.16 provides a summary of the results from correlation analysis. The values of the correlation coefficients (r) given in Table 4.16 indicate the direction and strength of the relationship between variables that is how does one variable influenced other variable.

Table 4.16
Results of Correlation Analysis

	Project Performance	**Competitive Advantage**	**Managemen Capability**	**Relationship Capability**
Project Performance	1			
Competitive Advantage	.549**	1		
Management Capability	.636**	.458**	1	
Relationship Capability	.688**	.429**	.764**	1

	Project Performance	Competitive Advantage	Managemen Capability	Relationship Capability
Project Performance	1			
Competitive Advantage	.549**	1		
Management Capability	.636**	.458**	1	
Relationship Capability	.688**	.429**	.764**	1

Note: *p<.05; **p<.01

Correlation between relationship capability and project performance was the highest that is .688. This simply means that an improvement in 1 unit of relationship capability will also increase the project performance by .688 unit. This is followed by correlation between project performance and management capability that was .636. This simply means that an improvement in one unit of methodology will also increase the project performance by .636 unit. The r value was lowest at .549 for correlation between project performance and competitive advantage. This implies that an improvement in 1 unit of competitive advantage will only increase the project performance by .549 units.

Cohen (1988) suggests that if the r score is above .50 the correlation between the two variables are considered largely correlated. With regard to the relationship between independent and dependent variables, the majority of the independent variables (7 out of 8 variables) were statistically correlated with project performance with correlation values ranging from .54 to .69 as shown in Table 4.16. This gives indication that the management capability, relationship capability and competitive advantage are among the variables influencing project performance. Pallant (2001),

and Tabachnick and Fidell (1996) recommend that the correlation between independent and dependent variables must be below .7. The variable must be deleted from the study if the score is over .7, because the independent variable greatly influenced the dependent variable. Since the score is below .7, none of the independent variables were dropped for further multiple regression analysis.

4.7 Regression Analysis

Regression analyses were conducted in order to address the three research questions on the relationship between independent variables and dependent variables. Prior to answering the three research questions, which address the relationship between the various independent variables and dependent variables, data were first investigated to detect any serious violations on the basic assumptions of regression analysis, namely linearity, normality and homoscedasticity (Hair *et al*., 1998).

First assumption on linearity was assessed through an analysis of partial plots. Plots in Appendix E display the relationship between a single independent variable to the dependent variable. Visual examination of the plots showed that there was no obvious U-shaped or other curvilinear relationship. Thus, the assumption of linearity for each independent variable was met.

Next assumption deals with homoscedasticity. Hair *et al*. (1998) suggested that diagnosis is made by plotting the residuals (studentized) against the predicted dependent values and comparing them to the null plot to show the existence of homoscedasticity. Appendix F contains the scatter plots which show no discernible patterns, thus, indicating homoscedasticity in the set of independent variables.

The final assumption, which is normality, was examined by normal probability-plot (P-P) of the residuals. From the normal p-p plot in Appendix G, the values fall along the diagonal with no substantial or systematic departures, indicating that the residuals were about normal distributed.

Prior to conducting the regression of independent variables on the dependent variable, the tolerance values and the variance inflation factor (VIF) for all the independent variables were examined to detect multicollinearity problem. This problem exists when the independent variables are too highly correlated (Hair *et al*., 2006). Values of collinearity are considered acceptable when the tolerance value is over .10 or the VIFs value is less than 10 (Hair *et al*., 2006). The tolerance and VIF values shown in the Table 4.17 and the tolerance value was over .1 and VIF value are less than 10. This shows that the variables are free from multicollinearity problem in the multiple regression model.

Table 4.17
Test for Multicollinearity Coefficients

		Collinearity Statistics	
	Model	**Tolerance**	**VIF**
1	(Constant)		
	Competitive Advantage	.775	1.290
	Management Capability	.395	2.529
	Relationship Capability	.408	2.451

Dependent Variable: Project Performance

Overall, inspection of the data revealed that there was no serious violation of the basic assumptions. Thus, the use of regression for subsequent analysis was appropriate. Interpretation of the regression analysis is based on the standardised

coefficient beta (β) and R^2 which provides evidence whether to support or not to support the hypotheses. Regression analysis was performed to test the hypotheses 1 to 8.

4.7.1 Multiple Regression Analysis

Multiple regressions were performed to determine the extent of independent variables explanation on dependent variable variance, which independent variables explained the variance in dependent variable and to determine the most significant predictors on dependent variable. The following table presents the results of the statistical tests of the hypotheses to address all the three research objectives that were:-

1. To investigate the extent of management capability influence on the construction project performance.
2. To examine the extent of relationship capability influence on the construction project performance.
3. To examine the extent of competitive advantage influence on the project performance.

Table 4.18
Summary of Multiple Regression Analysis

Model		Standardized Coefficients Beta	t	P value
1	(Constant)		-5.510	.000
	Competitive Advantage	.282	7.351	.000
	Management Capability	.178	3.304	.001
	Relationship Capability	.431	8.155	.000
	R^2	.752		
	Adjusted R^2	.565		
	F	164.842		
	Sig F	.000		

Dependent Variable: Project Performance

Table 4.18 above shows that the model is significant (F = 164.842) (P value = .000, p <.05). The F-statistic (F = 164.842) indicates that the relationship between independent and dependent variables is significant. The R^2 obtained indicates that the independent variables significantly explained 56.5% of the construction project performance (R^2: .565). Based on the Beta value (.431), relationship capability factors are the most significant predictors of project performance, followed by competitive advantage (.282) and management capability (.178).

4.7.1.1 The Extent of Management Capability Factors Influence on Project Performance

The first research question on the extent of management capability factors influence on project performance is tested via the hypothesis 1 to 5. Table 4.19 displays the results of the regression analysis between management capability factors and project performance.

Table 4.19
Regression Analysis between Management Capability Factors and Project Performance

Model		Standardized Coefficients		
		Beta	**t**	**P value**
1	(Constant)		.510	.611
	Competence	.328	6.989	.000
	Cooperation	.217	4.297	.000
	Commitment	-.045	-1.156	.248
	Project Management Methodology	.332	7.343	.000
	IT Systems	.004	.104	.917

Dependent Variable: Project Performance

Hypothesis 1 : Higher level of competence leads to higher success of project performance.

Table 4.19 shows that competence does have a significant relationship on the construction project performance (Beta = .328, P value = .000 that is $p < .05$). Since the Beta coefficient value is .328, the direction of this relationship is positive. An examination of the t-values ($t = 6.989$) indicates that competence contributes positively to the improvement of the construction project performance. An increase in the independent variable, competence, will lead to an expected increase of 32.8 percent in the dependent variable; the construction project performance. Since the output demonstrated the same direction of competence on over project performance, Hypothesis 1 is supported.

Hypothesis 2: Higher level of cooperation leads to higher success of project performance.

Cooperation does have a positive significant relationship with the construction project performance (Beta = .217, P value = .000 that is $p < .05$) as illustrated by Table 4.19. Positive Beta value of .217 shows that an increase in the independent variable will also lead to an increase in the dependent variable. An increase in cooperation will lead to an expected increase of 21.7 percent in the dependent variable; the construction project performance. The direction of this relationship is positive. An examination of the t-values ($t = 4.297$) indicate that cooperation contributes positively to the improvement of the construction project performance. As been hypothesized, cooperation is found to have a positive influence on project performance. Hence, Hypothesis 2 is supported.

Hypothesis 3: Higher level of commitment leads to higher success of project performance.

Table 4.19 shows that commitment does not have a positive significant relationship with the construction project performance (Beta = -.045, P value = .248 that is p > .05). The Beta value is also negative and it is relatively small that is .013. An increase in the independent variable, commitment, will lead to a decrease of 1.3 percent in the dependent variable; the construction project performance. The direction of this relationship is negative. An examination of the t-values (t =-1.156) also indicates that commitment does not contribute to the improvement of the construction project performance. After considering all the statistical values, the results suggest that commitment is not significant to the construction project performance; hence, Hypothesis 3 is not supported.

Hypothesis 4: Higher level of project management methodology adoption leads to higher success of project performance.

The multiple regression result in Table 4.19 shows that the project management methodology does have a positive significant relationship with the construction project performance (Beta = .332, P value = .000 that is p < .05). The coefficient value of Beta is positive and it is also statistically significant. An increase in the independent variable, project management methodology, will lead to an expected increase of 33.2 percent in the dependent variable; the construction project performance. The direction of this relationship is positive. An examination of the t-values (t = 7.343) indicate that project management methodology contributes positively to the improvement of the construction project performance. Hence, Hypothesis 4 is supported.

Hypothesis 5: Higher level of IT systems adoption leads to higher success of project performance.

Table 4.19 shows that IT systems adoption do not have a positive significant relationship with the construction project performance (Beta = .004, P value = .917 that is p > 005). An increase in the independent variable, IT systems, will only lead to an expected increase of 2.04 percent in the dependent variable; the construction project performance. The direction of this relationship is positive. An examination of the t-values (t = .104) indicates that IT systems do not contribute to the improvement of the construction project performance. This also suggests that IT system is not significant to the construction project performance; hence, Hypothesis 5 is rejected.

Overall, three out of the five hypotheses on management capability are supported. This means that the three management capability variables included in the regression equation have emerged as significant predictors of project performance. These are competence, cooperation and project management methodology. The other three variables namely IT systems and commitment are found to have no significant effects on construction project performance.

4.7.2.1 The Extent of Relationship Capability Factors Influence on Project Performance

Second research question on the extent of relationship capability factors influence on Project Performance was tested via Hypothesis 6 and Hypothesis 7. Table 4.20 exhibit the results of the regression analysis.

Table 4.20
Regression Analysis between Relationship Capability Factors and Project Performance

Model		Standardized Coefficients Beta	t	P value
1	(Constant)		-1.865	.063
	Comprehension	.421	9.082	.000
	Communication	.362	7.809	.000

Dependent Variable: Project Performance

Hypothesis 6: Higher level of comprehension leads to higher success of project.

Comprehension have a positive significant relationship with the construction project performance (Beta = .421, P value = .000 that is p > .05) as displayed in Table 4.18. Beta value of .019 demonstrated that an increase in the independent variable, comprehension, will lead to an expected increase of 42.1 percent in the dependent variable; the construction project performance. The direction of this relationship is positive. An examination of the t-values (t = 9.082) indicates that comprehension does contribute to the improvement of the construction project performance. Since the relevant statistical test shows that that comprehension is significant to the construction project performance; hence, Hypothesis 6 is supported.

Hypothesis 7: Higher level of communication leads to higher success of project.

Table 4.18 shows that communication does have a positive significant relationship with the construction project performance (Beta = .362, P value = .000 that is p < .05). An increase in the independent variable, communication, will lead to an expected increase of 15.7 percent in the dependent variable; the construction project performance. The direction of this relationship is positive. An examination of the t-

values (t = 7.809) indicate that communication contributes positively to the improvement of the construction project performance. Hence, Hypothesis 7 is supported.

All the two hypotheses on relationship capability are supported and the variable included in the regression equation that emerged as significant predictors of project performance are the communication and comprehension variable.

4.7.2.2 The Extent of Competitive Advantage Factors Influence on Project Performance

Finally, the third research question on competitive advantage factors influence over the Project Performance was tested via hypothesis 8. Table 4.21 displays the results of the regression analysis.

Table 4.21
Regression Analysis between Competitive Advantage Factors and Project Performance

Model		Standardized Coefficients Beta	t	P value
1	(Constant)		5.299	.000
	Cost Strategy	.261	4.635	.000
	Quality Strategy	.174	2.945	.003
	Innovation Strategy	.220	4.203	.000

Hypothesis 8: Higher level of competitive advantage strategy leads to higher success of project performance.

The output of the regression analysis in Table 4.21 demonstrates that all the competitive advantage factors have positive significant relationship with the construction project performance. All the strategies have positive significant relationship with the construction project performance (Beta = .261, .174, .220; P value = .000 and .003; that is $p < .05$). An increase in the independent variable; cost, quality and innovation strategy will lead to an expected increase of in the construction project performance. The direction of this relationship is positive since all the Beta coefficient values are positive. An examination of the t-values (t =4.635, 2.945 and 4.203) indicate that all the competitive advantage factors contributes positively to the improvement of the construction project performance. The statistical results proved that competitive advantage variable factors are significant in the relationship. Hence, Hypothesis 8 is supported.

4.8 Summary of Findings

Descriptive statistics showed that in general, respondents perceived the construction project performance as highly successful. Regression analyses were performed to investigate the relationship between various factors and construction project performance. The result shows that management capability, relationship capability and competitive advantage positively influences construction project performance. Only two factors (commitment and IT systems) do not have significant influence on construction project performance. Presented below is the summary of the findings of hypotheses testing:

Table 4.22

Summary of Findings

Hypothesis	Results
Hypothesis 1 : Higher level of competence leads to higher success of project performance.	Support
Hypothesis 2: Higher level of cooperation from stakeholders leads to higher success of project performance.	Support
Hypothesis 3: Higher level of commitment leads to higher success of project performance.	Not Supported
Hypothesis 4: Higher level of project management methodology adoption leads to higher success of project performance.	Support
Hypothesis 5: Higher level of IT systems adoption leads to higher success of project performance.	Not Supported
Hypothesis 6: Higher level of comprehension leads to higher success of project.	Support
Hypothesis 7: Higher level of communication leads to higher success of project.	Support
Hypothesis 8: Higher level of competitive advantage strategy leads to higher success of project performance.	Support

CHAPTER 5

DISCUSSION AND CONCLUSION

5.0 Introduction

This chapter provides a recapitulation of the major findings and outlines the implications of the study. Limitations of the study and suggestions for future research were also deliberated.

5.1 Recapitulation of Major Findings

Based on the Resource Based Theory and previous research on construction project performance, this study examines the extent of management capability, relationship capability and competitive advantage influence on Malaysian construction project performance. Project performance is simply the achievement of the construction companies in meeting the project objectives relating to budget performance (within budget or cost), schedule (timely completion), functionality (according to specification), quality and safety.

This study was conducted to achieve three main objectives. First objective was to investigate the extent of management capability influence on construction project performance. Second objective was to examine the extent of relationship capability influence on construction project performance. Third objective was to examine the extent of competitive advantage influence on construction project performance. To achieve these objectives, a quantitative approach was utilised.

Revisiting the research objectives, this research was undertaken to seek answers to several research questions: (a) What is the extent of contractor's management

capability influence on construction project performance? (b) What is the extent of contractor's relationship capability influence on construction project performance? and (c) What is the extent of competitive advantage influence on project performance?

Prior to conducting the inferential analysis, descriptive analysis was performed on the mean scores of the project performance, relationship capability, management capability and competitive advantage. Generally, the mean scores for the variables were high which means that project managers perceived the project performance of their companies as successful and they also perceived that their companies are having high level of relationship capability, management capability and competitive advantage. The results demonstrated that the mean score of project performance as well as the mean score of independent variables for the more experienced and bigger size companies were slightly higher than the rest. This indicates that as the Bumiputera contractors gain more experience, expands their human resources and organization structure, they are able to improve the project performance with the capabilities and competitive strategies employed.

Factor analysis was utilised to test the factorial validity of the measure in this research. Then, subsequently the internal consistency of the measure was then tested by comparing the reliability coefficient. Lastly, the data were analysed using regression analysis to test the hypotheses of the study. Level of significance was set at .05 to be used as the critical level for decision making regarding the hypotheses.

Regression analysis was undertaken to answer the first research question, that is, what is the relationship between construction firm's management capability and construction project performance. Multiple regression analysis shows that management capability has significant positive influence on project performance. Furthermore, regression analysis results revealed that at the individual dimension level, three out of five management capability variables were positively related to construction project performance. Those variables were competence, cooperation and project management methodology. On the other hand, IT systems and commitment were found to be not significantly related to construction project performance.

With regards to the second research question, regression analysis performed on construction firm's relationship capability effect on construction project performance. Multiple regression analysis displays that relationship capability has significant positive influence on project performance. There is also positive effect of the individual relationship capability factors namely communication and comprehension on the construction project performance.

Third research question relating to the extent of competitive advantage effect on construction project performance was also examined via the regression analysis. The multiple regression result revealed there is a positive influence of competitive advantage on project performance. All the three competitive advantage factors also exhibit significant positive effect on project performance. Therefore, the hypothesis on the effect of competitive advantage was also supported.

The major significant findings from the eight hypotheses tested are presented in Table 5.1. The summary of major findings introduces eight hypotheses postulated in this study:

Table 5.1
Summary of Major Findings

Hypothesis 1:
Higher level of competence leads to a higher success of project performance.
Hypothesis 2:
Higher level of cooperation from stakeholders leads to higher success of project performance.
Hypothesis 3:
Higher level of commitment does not lead to higher success of project performance.
Hypothesis 4:
Higher level of project management methodology adoption leads to higher success of project performance.
Hypothesis 5:
Higher level of IT systems adoption does not lead to higher success of project performance.
Hypothesis 6:
Higher level of comprehension leads to higher success of project.
Hypothesis 7:
Higher level of communication leads to higher success of project.
Hypothesis 8:
Higher level of competitive advantage strategy leads to higher success of project performance.

5.2 Discussion

Section 5.1 above provides a summary of significant results of the study. The hypotheses investigated in this study found some evidence with respect to the purpose of this study and confirmed the results of some previous studies (Abbasi & Al-Mharmah, 2000; Aje, Odusami, and Ogunsemi, 2009; Doloi & Lim, 2007; Ling, Pheng, Qing, & Hua, 2007; Nguyen, Ogunlana, and Lan, 2004; Phua & Rowlinson, 2004; Rohaniyati, 2009; Rose, Abdullah, & Ismad, 2010; Toor & Ogunlana, 2008; Tuan & Yoshi, 2010).

This study result shows that there are positive results on Bumiputera contractor's capability and competitiveness as compared to earlier studies. Previously, Ayub and Eman (2006) found that the Bumiputera contractors is lacking in terms of expertise, experiences, planning and over-optimistic in estimation during tender bids. Othman (2010) found that their main problems are related to managing finance, material, employee, plants, machineries and communication issues. The reason for this positive outlook is mainly due to the Malaysian government focused attention via its agencies such as CIDB and Pusat Khidmat Kontraktor (PKK) that has contributed towards improving the Bumiputera contractor's capability via the learning and development activities organised.

The next section discusses in detail the extent of each capability factors influence on construction project performance, namely management capability, relationship capability and competitive advantage. The discussion compared the current study with the earlier studies results and the rationale behind the current study results.

5.2.1 Extent of Management Capability Influence on Project Performance

This study examines the influence of management capability on construction project performance. Management capabilities are the ability of the managers of the construction firm to utilise the resources that they possessed via competence project team, obtaining cooperation and commitment from all parties involved in achieving project objectives, utilizing the proper methodology and decision making tools or IT systems to manage the project.

The results of the multiple regression show that management capability is positively related to project performance. Multiple regression results exhibit the R^2 value of .565 which indicates that the management capability jointly account for 56.5 percent of the variation in project performance together with the other two variables, relationship capability and competitive advantage. Aje, Odusami, and Ogunsemi (2009) also found that contractors' management capability has significant impact on project performance of building projects in Nigeria, especially in terms of cost and time performance. They also highlighted that this capability is one of the criteria used in evaluating the contractors during the prequalification and tender evaluation stage. Three out of five management capability factors also were positively related to construction project performance, namely competence, cooperation and project management methodology.

First, a positive relationships that exist between the cooperation factor and project performance means that when the cooperation level is high, the project performance will also be superior. This confirmed the findings of previous study by Phua and Rowlinson (2004) in Hong Kong which also found that cooperation is one of the constructs that influence the construction project success. Cooperation is also related to the concept of teamwork which is also a component of management capability. Project teams with high-cooperation teams are more likely to frequently communicate with each other, frequently exchange project-related information, frequently evaluating the status of their project, spend more time on brainstorming to improve their performance, receiving feedback on their performance and have positive energy during their participation in the project team. Cooperation levels will also be higher when project managers give clear explanation on project objectives

and team member responsibilities. If the project manager has clearly explained project objectives and team members' responsibilities, the team members will have a better understanding and will not have doubts or conflicting views about the project or their roles, and will work towards achieving the objectives. The project team will also attain the necessary synergy when common goals are clearly visualised and observed. Similarly, Abdullah, Hamali, Deen, Saban, Abdurahman (2009) also highlighted that cooperation from others is one of the critical success factors of Bumiputera entrepreneurs and this includes support from family members, society, government agencies, suppliers and employees.

Another positive relationship was found between project management methodology and project performance. This result confirmed the earlier study by Ling, Pheng, Qing, and Hua (2007) which examined project management methodology adopted by Singaporean construction companies and found that adoption of project management methodology led to better performance. Similarly, Abbasi and Al-Mharmah (2000) also highlighted that lack of project management methodology utilisation also resulted in poor performance of projects. This implies that when there is a proper project management methodology in place and it is highly utilised or followed closely, the performance of the project will also be further improved with regards to its success. Project manager or project sponsor will identify the relevant success criteria in choosing a project management methodology. They will determine the appropriate success factors to increase the chance of achieving those success criteria, and then select a project management methodology that delivers those success factors. Project management methodology will also help the project team in focusing on the important success criteria.

Finally, a positive relationship was found between competence and project performance. This finding further confirmed the studies by Toor and Ogunlana (2008); Doloi and Lim (2007); and Nguyen, Ogunlana, and Lan (2004) which highlighted competence as one of the construction project critical success factors. However, these studies did not measure the relationship between competence and project performance. The positive result of the current study on the influence of competence indicates that a highly competence project team and competence project manager is crucial to generate superior project performance. Lack of management and employee competency are among the factors that could lead to Bumiputera entrepreneur failure as identified by Abdullah, *et al.* (2009). They also highlighted the major areas of weaknesses in management competency are relating to strategic planning, control and financial management while employee competency in are relating to lack of experience and the unavailability of skilled labor.

Results of this study show that IT systems were not significantly related to construction project performance, as indicated by the studies result. This result differed from previous study by Latif, Abidin, and Trigunarsyah (2008) which highlighted that lack of IT adopting leads to construction projects not achieving project cost objectives. Additionally, Doloi and Lim (2007) which examined Australian construction firms in Victoria identified the use of planning software as one of critical success factors influencing construction project performance.

Explanation of this result as found by Kasim (2010) is that the implementation of IT for construction projects in Malaysia is still at early stage especially in the construction materials management. The common IT tools adopted in the materials

management processes are Microsoft Excel Spreadsheet and handheld devices. However, Microsoft Excel Spreadsheet has limitation in usage for project planning and scheduling. Meanwhile, the study also revealed an average level of acceptance towards the transformation of IT implementation in the construction materials management. The main barrier on the IT usage is the cost involved at the initial stage or overall implementation of IT. Another explanation is possibly due to lack of awareness on the importance of IT implementation in managing the construction projects.

Result of the regression shows that commitment factor is not significantly related to construction project performance. This finding differs from the studies by Toor and Ogunlana (2008) and Nguyen, Ogunlana, and Lan (2004) which highlighted commitment as one of the construction project critical success factor. This shows that commitment does not contribute towards the construction project performance. Although the level of cooperation can be high among the project team members, they may not be able to commit to the project and deliver the project as per schedule on time and within budget due to some other external environmental factors or constraints such as price increase of raw materials and labour shortages. Another explanation for this result is that construction projects typically involved a number of stakeholders, participants and some are beyond the construction firm controls. Although commitment from project sponsors, project managers, and project team members can be obtained, it is difficult to ensure commitment of other external parties involved in the project such as clients, sub-contractors, suppliers, consultants and local authorities because each of them has different views, thoughts and expectations. Furthermore, as suggested by Abdullah, *et al.* (2009), the Bumiputera

failure factors were also contributed to external factors that are beyond their control such as economic recession, catastrophic events, regulatory and environmental requirements. Thus, it is also necessary to investigate the level of commitment among all project stakeholders, participants to improve the implementation performance of construction projects.

Construction firm is working with resources with regards to time and budget that are limited. It is also difficult to commit to the project goals and objectives when resources are limited. Othman (2010) found that their main Bumiputera contractor's problems are related to managing limited resources relating financial, material, employee, plants and machineries. Ab-Halim, Jaafar, Osman, and Haniff (2012) also revealed that most Bumiputera contractors have insufficient cash capital to finance the project and they are highly dependent on debt for financing the construction costs.

5.2.2 Extent of Relationship Capability Influence on Project Performance

This study also attempts to investigate the effect of relationship capability on project performance. The result shows that relationship capability positively influences the project performance. This result differed from many other previous studies.

Relationship capabilities are the construction company's ability to interact and understand the customers need via communication and comprehension abilities involved in project performance to generate the desired performance from the available resources**.** Construction firms can learn from the information gathered from their client on how to implement new processes, better systems or technology that

are more cost effective and efficient in meeting their business objectives. They can also respond to changing customer needs by implementing new ideas, introducing new product or services. Furthermore, Abdullah, *et al.* (2009) also suggested improving customer relationship and satisfaction as a measure to improve the Bumiputera entrepreneurs success.

This study results show that relationship capability is positively related to project performance and the two relationship capability factors are also positively related to construction project performance, namely communication and comprehension. Makhura (2011) also found that relationship capability is important because the nature of the construction work which requires network building and negotiation with clients, suppliers, employees and communities.

Positive effect of communication on project performance means that adoption of highly effective communication strategy does help in achieving superior project performance. This is in line with the suggestion of studies by Rohaniyati (2009); Toor and Ogunlana (2008); and Nguyen, Ogunlana, and Lan (2004); which highlighted communication as one of the construction project critical success factors. However, the relationship between competence and construction project performance were not measured in these studies. Communication in this study is simply the interaction between the project team members and all parties involved in the project. Frequent and effective communication method between all the parties involved in the project will ensure proper understanding, planning and coordination of activities, utilisation of scarce resources; identify outstanding issues or important matters that require special attention. Effective communication also helps to reduce

the impact of factors that are beyond the construction firm's control and ensure proper mitigation strategies is put in place to minimise the effect. Ayub and Eman (2006) in their study also identified communication issue as common problems faced by the Bumiputera contractors. As such, this study result shows that improvement in the communication aspect of the Bumiputera contractors plays an important role in project management and ultimately improves the project performance.

This study results show that the comprehension aspect of relationship capabilities is also significantly related to construction project performance, as displayed by the results of the studies. This finding concurs with the recommendation of study by Toor and Ogunlana (2008) which suggested comprehension as one of the construction project critical success factors. This mean that understanding client needs and requirement or changes to these items is crucial in ensuring that the project can still be carried out on time and within budget. Furthermore, Abdullah, *et al.* (2009) also suggested focusing on customer needs as a measure to improve the Bumiputera entrepreneurs success.

Comprehensive understanding of the client needs and requirement can mitigate the project delays or budget overrun that occurs due to other factors that are beyond the construction firm controls such as client financial difficulties, sudden or unexpected material price increase or labour shortage, changes in laws or regulation relating to construction. This implies that they should not only understand the client requirement but also understand the effect of the external factor or environmental changes on the success of the project. Additionally, they have to spend some time on market information gathering and market research activities that could minimise the

impact of the external factors and achieve superior project performance. In line with that, Makhura (2011) suggested that the owners or managers of the construction should also be able to comprehend and scan opportunities.

5.2.3 Extent of Competitive Advantage Influence on Project Performance

This study examines the influence of competitive advantage on project performance. Competitive advantage is the advantage that company possesses, as a result from the utilisation of its strategic resources via organisational capabilities such as cost, innovation and price advantage. From the results, it is observed that competitive advantage is positively related to project performance. This confirms the findings by Abdullah, et al. (2009) that inability to compete is among the factors that lead to Bumiputera entrepreneurs failure. The reason why they are unable to compete is due to highly intense competition or unfair tactics and the source of competition came from bigger local business, new businesses and foreign players particularly those from neighboring countries such as Thailand and Indonesia who were able to offer cheaper goods and services. This study has shown that the Bumiputera contractors which implemented competitive strategies are able to achieve good project performance results.

Positive effect of competitive advantage on project performance means that they are capable of implementing appropriate cost reduction strategy, innovation strategy and pricing strategy that leads to superior project performance via improvement in their processes or introduction of new product and services. The results is consistent with findings of Tuan and Yoshi (2010) in Vietnam which found that “competitive advantage is related to performance”, and also study by Rose, Abdullah, and Ismad

(2010) which highlighted that "competitive advantage does result in superior performance".

Construction project works with limited resources and often encounters unexpected changes such as materials price increase and labour shortage. As such, they need to establish a proper cost reduction strategy, innovation strategy and pricing strategy to minimise the effect of these external factors. They need to innovate their business processes and try to introduce new ways, method or systems to perform their activities in more efficient, effective and productive manner. Introduction of new innovative construction product or services by the firms will have an advantage over the rival which ultimately leads to a superior project performance. The Borneo Post (2013) reported the suggestion by the previous of Caretaker Science, Technology and Innovation Deputy Minister Datuk Fadillah Yusof that said, Bumiputera contractors needs to work with innovators like GiatMara since they have the capabilities to provide research and innovation information. They can also seek out new things at avenues like innovation competitions organised by the Ministry of Science, Technology and Innovation. Therefore, competitive advantage as an organisation capability plays a significant role in improving the business processes and generation of new product and services which ultimately leads to a superior project performance.

5.3 Implications of the Study

The results of this study have both managerial and theoretical implication. This research provides guidance to the construction industry and contributes to theory building. These are addressed in detail in the following sections.

The objective of this research was to examine the extent of management capability, relationship capability and competitive advantage influence on the construction project performance. As a result, several implications have emerged from this study.

5.3.1 Theoretical Implications

This study contributed to the theoretical point of view by bridging the gap between the three separate but related research topics of management capability, relationship capability and competitive advantage by utilising resource based view theory. This study also contributes to the theory via simultaneous examination of the capabilities effect on project performance. The results of this study lead to following answer: management capability needs relationship capability to have a significant positive impact on project performance, and relationship capability needs management capability to have a significant impact on project performance.

The two capabilities complement each other and relationship capability alone may not be sufficient, especially in successfully managing the construction projects which is subject to limited resources and other constraints. Similarly, managing the project requires frequent interaction via the communication aspect of relationship capabilities. Therefore, it would be reasonable if both capabilities as suggested by the resource based view theory is simultaneously examined in a study. The results of this study seem to be consistent with the suggestion by academician for firms to posses both capabilities namely management and relationship capabilities.

5.3.2 Managerial Implications

The results provided several implications for construction firm managers with regard to how to inculcate and further strengthen their management capability, relationship capability and competitive advantage strategy in their organisation.

This research revealed that management capability, relationship capability and competitive advantage significantly influence project performance in a positive manner. Thus, construction firm managers should attempt to develop and strengthen these appropriate capabilities and competitive strategies as an important component of the firm's measures to enhance their project success. Focusing on only certain element will hamper them from competing and strengthening their business.

Relationship capability factors were found to have significant positive effect on project performance as shown by the regression results. This finding provided important basis for the managers in formulating and implementing customer relationship strategies to boost their project performance. For example, they need to improve their communication and comprehension aspect of relationship capability to understand the changing clients' demand as well as the end-user needs, and respond to it in a proper and timely manner.

Management of construction companies must also ensure that all important elements of management capability such as competence, cooperation and project management methodology are adequately embedded in their organisation. They should further improve the existing project management methodology and be aware of the risks involved in the construction business by establishing proper risk management

strategies as construction industry is also well known for fluctuation in material prices. Proper risk mitigation and well managed risk could provide positive benefits to the success of the construction firm project performance.

Competitive advantage strategies in terms of cost, quality and strategies also have significant positive influence on project performance. Thus, the construction firms also need to consistently enhance their processes, product or services and organisation because firms that innovate successfully would increase their chances of survival and growth. Construction firm is also encouraged to take creative and innovative actions, as well as implementing quality and cost reduction strategies as they are operating in a competitive environment with the constraint of limited resource in order to further improve their project performance. They should constantly search for new construction method to further improve their project performance.

The government and its agency such as CIDB should also provide necessary assistance, awareness and consultative service to construction firms to prepare them with the necessary elements highlighted above. Furthermore, the Contractor Service Centre or Pusat Khidmat Kontraktor (PKK) was established by the Malaysian government on 11th April 1984 with the objective of enhancing the ability and current skills of Bumiputera contractors. This study utilise Bumiputera contractors as sample and the result shows that the human capital development program conducted by CIDB and PKK has bear fruits in terms of developing capabilities as it positively influences the project performance. As such, the seminar and training programs need to direct towards promoting and enhancing the management capability, relationship

capability and competitive advantage of construction firms. Furthermore, these capabilities may also be included as important criteria used in evaluating the contractors during the prequalification and tender evaluation stage.

5.4 Limitations of the Study

Despite the interesting results produced by this study, several limitations need to be acknowledged, since the validity of the results depends on several key research design and method. The limitations of this study are basically relating to formulating the survey questionnaire, variables measurement and getting sufficient respondents that can represent the overall construction firms population.

There were difficulties in formulating the survey questionnaire as there were no previous study that measures the construction project performance, contractor's management capability and contractor's relationship capability. Previous studies only determine the important factors by conducting factor analysis but did not investigate the effect of the factors. Furthermore, the questionnaire needs to be sourced from various authors and combined in order to operationalise and measure the variables. Another limitation is with regards to the project performance measure as measurement utilised to assess performance remain limited to subjective performance rather than objective performance. This is measured on the basis of perceptions of respondents as there are no published project performance measures for construction firms, except for the financial performance of the public listed companies which provide annual reports.

There was great challenge and difficulty is in getting the non-Bumiputera construction firms participation. Initially 420 construction firms responded but due to the low participation rate from the non-Bumiputera (35 companies), only 385 Bumiputera contractors were included in this study. This only representative of 0.06 percent of the total approximately 63,000 construction firms listed in the CIDB's Malaysian Construction Industry Directory 2010–2011. The respondents of this study are mostly from small and medium sized companies and also from newer or less experience companies. Their view on the management capability, relationship capability, competitive advantage and project performance may also differ from bigger and more matured construction companies. Consequently, the results may not be generalised to the population of construction firm as a whole.

5.5 Suggestions for Future Research

Most of the suggestions for future research are born from the limitations just discussed. The others, however, are suggested by the findings of the study. This research study was an initial attempt to jointly explore the extent of management capability, relationship capability and competitive advantage effect on construction project performance via multiple regression analysis. Since these results are available, extensions of this line of research are suggested.

Several research ideas can be offered with regards to future direction. Future research can include the external environmental factors such as client financial, labour supply and material price stability. This is to determine whether these variables have any impact on the project performance of construction firm. Future research needs to consider the mediating or moderating impact of other factors on

the relationship between management capability and performance as well as on the relationship between relationship capability and performance.

Future research should also consider performance measurement using a combination of project performance and company financial performance measures. It may be worthwhile to consider including company financial performance such as sales and profit figures from the audited accounts of the company.

It could be helpful to perform a comparative study between two or more countries to improve generalisation of the study. It may also be fruitful to measure management capability, relationship capability and competitive advantage based on various perspectives of relevant literature with a particular focus on construct validity.

5.6 Conclusion

This research examines the extent of management capability, relationship capability and competitive advantage influence on the construction project performance. Based on the findings derived from this research endeavour, the following can be concluded:

Management capability is positively related to project performance. Furthermore, three out of five management capability factors are positively related to construction project performance, namely competence, cooperation and project management methodology. However, commitment and IT systems factors were not significantly related to construction project performance.

Relationship capability is positively related to project performance and all the two factors are positively related to construction project performance, namely communication and comprehension.

Competitive advantage's positive effect on project performance means that firms that are capable of implementing appropriate cost reduction strategy, innovation strategy and pricing strategy will benefit and achieve superior project performance via improvement in their processes or introduction of new product and services. Construction firms work with limited resources and often encounter unexpected changes such as materials price increase and labour shortage. Therefore, they need to establish a proper cost reduction strategy, innovation strategy and pricing strategy to minimise the effect of these external factors.

Managers of construction firm need to improve their communication and comprehension aspect of relationship capability to understand the effect of external environmental changes and achieve sustainable project performance. They need to understand and gather sufficient information how to address the changing business environment needs.

Construction firm also needs to periodically enhance their processes, product or services and organisation because firm that is successful in innovation could increase their chances of survival and growth. Managers of construction firm must also ensure that all important elements of management and relationship capability such as competence, cooperation, project management methodology and communication are practiced in their organisation.

The government and its agency such as CIDB should also provide necessary assistance and consultative service to construction firms to prepare them with the necessary elements highlighted above. They need to direct more resources and energy to promote and encourage towards enhancing the management capability, relationship capability and competitive advantage of construction firms.

Overall, this study contributes to a better understanding of project performance of the construction industry in Malaysia and how management and relationship capabilities as well as competitive advantage influence Bumiputera contractor's project performance.

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APPENDIX A:

QUESTIONNAIRE

PILOT TEST QUESTIONNAIRE ON:

THE IMPACT OF STRATEGIC RESOURCES FACTORS ON SUCCESS OF CONSTRUCTION PROJECTS

Date: 3rd May, 2012

MANAGERS OF CONSTRUCTION COMPANIES

Dear Sir/Madam,

I am conducting a study on the above topic. This study is undertaken to fulfill the partial requirement of the academic program leading to a Doctor in Business Administration (DBA) at the Universiti Utara Malaysia (UUM). By taking fifteen minutes of your valuable time, you are providing information that is relevant to this study.

The managers from various construction companies in Malaysia have been asked to complete this survey. I will be most appreciative if you could complete and return the enclosed survey in the pre-addressed, stamped envelope by **12th May 2012**.

Strict confidentiality is assured. The identity related to the code reflected on the instrument is known only to the researcher and will not be communicated in any form anytime.

Thank you very much for your time and cooperation. I greatly appreciate your contributions. If you have any questions, please contact me at 019-3835656.

Yours sincerely,

…….
(BADERISHAM BIN JOLLY)

PART 1: DEMOGRAPHIC PROFILE

Please tick (/) the appropriate choice.

1. Number of Employees

	1 to 10
	11 to 50
	51 to 100
	100 to 200
	> 200

2. Years in Business

	1 to 10
	11 to 20
	21 to 30
	31 to 40
	41 to 50

3. Education Level

	Phd/Doctorate
	Master's/MBA
	Bachelors Degree
	Diplomas
	Technical Certificate
	SPM/High School
	Others

4. Position

	Director/Senior Manager
	Manager/Assistant Manager
	Section Head/Senior Engineer/ Senior Executive
	Others

5. Business Category

	Fully Malaysian-owned company
	Local and foreign joint venture company
	Fully owned by foreign company

6. Gender

	Male
	Female

7. Ethnic

	Malay
	Chinese
	Indian
	Others

8. Nationality

	Malaysian
	Others (please specify) :

9. Average Number of Projects Handled Yearly

PART 2:
Instructions:
Please indicate the extent of your opinion with the statements by "circling" the corresponding box using the following scales:

Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
1	2	3	4	5	6	7

1 We require the use of facts and data to support actions at all levels of decision-making.
1 2 3 4 5 6 7

2 We know what our client really wants.
1 2 3 4 5 6 7

3 We formally obtain the client acceptance of our plans
1 2 3 4 5 6 7

4 We have clear prioritisation of project goals by our client.
1 2 3 4 5 6 7

5 We regularly perform client consultation.
1 2 3 4 5 6 7

6 Our client is responsive to our inquiry.
1 2 3 4 5 6 7

7 There is sufficient communication among clients, consultants and contractors.
1 2 3 4 5 6 7

8 The project team members are competent
1 2 3 4 5 6 7

9 The project manager is competent e.g. able to communicate efficiently and maintain a harmonious working group.
1 2 3 4 5 6 7

10 We award the bids to the right designers/contractors.
1 2 3 4 5 6 7

11 There is strong cooperation in the relationship between construction firm and the clients.
1 2 3 4 5 6 7

12 There is strong cooperation between the colleagues in the project team.
1 2 3 4 5 6 7

13 The project team members are able to work together effectively as a project team.
1 2 3 4 5 6 7

14 Effective project planning and control mechanism is in place.
1 2 3 4 5 6 7

15 Goals and priorities of all stakeholders involved in the project are clearly defined.
1 2 3 4 5 6 7

16 The required resources is clearly defined during planning stage.
1 2 3 4 5 6 7

17 The methodology improves the accuracy of project decisions in significant manner.
1 2 3 4 5 6 7

18 The methodology helps to ensure adequate resources for the full length of the project.
1 2 3 4 5 6 7

19 The methodology helps the project team to adapt to project changes.

1 2 3 4 5 6 7

20 The methodology informs how well the project is managed.

1 2 3 4 5 6 7

21 The methodology provides the statistics on financial performance of the project (e.g. ROI, cost, profit, cash flow).

1 2 3 4 5 6 7

22 Adoption of innovative ICT tools has increased our profit by reducing the construction costs, time and also increased client satisfaction.

1 2 3 4 5 6 7

23 Adoption of innovative ICT tools has provided us with competitive advantage, increased market share and growth.

1 2 3 4 5 6 7

24 Adoption of innovative ICT tools has increased our work flexibility.

1 2 3 4 5 6 7

PART 3: PROJECT PERFORMANCE

Instructions:

Relative to your industry's average or to comparable organisations, what is, in your opinion, the performance of the project in regard to the following criteria:

Very Unsuccessful	**Successful**	**Moderately Successful**	**Highly Successful**	**Very Successful**
1	**2**	**3**	**4**	**5**

1.	Budget performance (within budget/cost)	1	2	3	4	5
2.	Schedule (Timely completion)	1	2	3	4	5
2.	Client satisfaction	1	2	3	4	5
3.	Functionality (according to specification)	1	2	3	4	5
4.	Contractor satisfaction	1	2	3	4	5
5.	Quality	1	2	3	4	5
6.	Safety	1	2	3	4	5

PART 4: COMPETITIVE ADVANTAGE

Instructions: Rate the implementation of competitive strategies in your firm with regard to the following criteria:

Very Unsuccessful Successful Moderately Successful Highly Successful Very Successful

1 2 3 4 5

Cost strategy	through emphasising on cost reductions : • via process innovation, • in business operation system, • investing in machinery • improving productivity and operations of employee	1	2	3	4	5
Quality strategy	• focusing on product quality, • strict quality control, • meeting customer needs and addressing their product requirements.	1	2	3	4	5
Innovation strategy	• strives to introduce new products first, • stresses production process innovation, • engages in novel marketing.	1	2	3	4	5

REVISED QUESTIONNAIRE ON:

THE EXTENT OF MANAGEMENT CAPABILITY, RELATIONSHIP CAPABILITY, AND COMPETITIVE ADVANTAGE INFLUENCE ON BUMIPUTERA CONTRACTORS' PROJECT PERFORMANCE

Date: 13th August, 2012

PROJECT MANAGERS OF CONSTRUCTION COMPANIES

Dear Sir/Madam,

I am conducting a study on the above topic. This study is undertaken to fulfill the partial requirement of the academic program leading to a Doctor in Business Administration (DBA) at the Universiti Utara Malaysia (UUM). By taking fifteen minutes of your valuable time, you are providing information that is relevant to this study.

The managers from various construction companies in Malaysia have been asked to complete this survey. I will be most appreciative if you could complete and return the enclosed survey in the pre-addressed, stamped envelope by **30th August 2012.**

Strict confidentiality is assured. The identity related to the code reflected on the instrument is known only to the researcher and will not be communicated in any form anytime.

Thank you very much for your time and cooperation. I greatly appreciate your contributions. If you have any questions, please contact me at 019-3835656.

Yours sincerely,

…….
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"KEDAH SEJAHTERA"

UUM/OYAGSB/K-14

17 July 2012

TO WHOM IT MAY CONCERN

Dear Sir/Madam

DATA COLLECTION

COURSE : DISSERTATION
COURSE CODE : BDMX8024
LECTURER : DR. FILZAH BINTI MD. ISA & DR. SITI NOREZAM BIN OTHMAN

This is to certify that the following is a postgraduate student from the OYA Graduate School of Business, Universiti Utara Malaysia. He is pursuing the above mentioned course which requires him to undertake an academic study at any organization. The details are as follows:

NO.	NAME	MATRIC NO.
1.	Baderisham Bin Jolly	92470

In this regard, I hope that you could kindly provide assistance and cooperation for him to successfully complete the assignment given. All the information gathered will be strictly used for academic purposes only.

Your cooperation and assistance is very much appreciated.

Thank you.

"SCHOLARSHIP, VIRTUE, SERVICE"

Yours faithfully,

KARTINI BINTI DATO' TAJUL URUS
Assistant Registrar
p/b Dean
Othman Yeop Abdullah Graduate School of Business

c.c - Student's File

The Eminent Management University

PART 1: DEMOGRAPHIC PROFILE

Please tick (/) the appropriate choice.

1. Number of Employees

	1 to 10
	11 to 50
	51 to 100
	100 to 200
	> 200

2. Years in Business

	1 to 5
	6 to 10
	11 to 20
	21 to 30
	31 to 40
	41 to 50

3. Highest Education Level

	Phd/Doctorate
	Master's/MBA
	Bachelors Degree
	Diplomas
	Technical Certificate
	SPM/High School
	Others

4. Position

	Director/Senior Manager
	Manager/Assistant Manager
	Section Head/Senior Engineer/ Senior Executive
	Others

5. Business Category

	Fully Malaysian-owned company
	Local and foreign joint venture company
	Fully owned by foreign company

6. Gender

	Male
	Female

7. Ethnic

	Malay
	Chinese
	Indian
	Others

8. Nationality

	Malaysian
	Others (please specify) :

9. Average Number of Projects Handled Yearly

PART 2:
Instructions:
Please indicate the extent of your opinion with the statements by "circling" the corresponding box using the following scales:

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	2	3	4	5

1 We require the use of facts and data to support actions at all levels of decision-making.
1 2 3 4 5

2 We know what our client really wants.
1 2 3 4 5

3 We formally obtain the client acceptance of our plans
1 2 3 4 5

4 We have clear prioritisation of project goals by our client.
1 2 3 4 5

5 We regularly perform client consultation.
1 2 3 4 5

6 Our client is responsive to our inquiry.
1 2 3 4 5

7 There is sufficient communication among clients, consultants and contractors.
1 2 3 4 5

8 The project team members are competent
1 2 3 4 5

9 The project manager is competent e.g. able to communicate efficiently and maintain a harmonious working group.
1 2 3 4 5

10 We award the bids to the right designers/contractors.
1 2 3 4 5

11 There is strong cooperation in the relationship between construction firm and the clients.
1 2 3 4 5

12 There is strong cooperation between the colleagues in the project team.
1 2 3 4 5

13 The project team members are able to work together effectively as a project team.
1 2 3 4 5

14 Effective project planning and control mechanism is in place.
1 2 3 4 5

15 Goals and priorities of all stakeholders involved in the project are clearly defined.
1 2 3 4 5

16 The required resources are clearly defined during planning stage.
1 2 3 4 5

17 The methodology improves the accuracy of project decisions in significant manner.
1 2 3 4 5

18 The methodology helps to ensure adequate resources for the full length of the project.

1 2 3 4 5

19 The methodology helps the project team to adapt to project changes.

1 2 3 4 5

20 The methodology informs how well the project is managed.

1 2 3 4 5

21 The methodology provides the statistics on financial performance of the project (e.g. ROI, cost, profit, cash flow).

1 2 3 4 5

22 Adoption of innovative ICT tools has increased our profit by reducing the construction costs, time and also increased client satisfaction.

1 2 3 4 5

23 Adoption of innovative ICT tools has provided us with competitive advantage, increased market share and growth.

1 2 3 4 5

24 Adoption of innovative ICT tools has increased our work flexibility.

1 2 3 4 5

PART 3: PROJECT PERFORMANCE

Instructions:

Please indicate the extent of your opinion with the statements by "circling" the corresponding box using the following scales:

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	2	3	4	5

1. Cot incurred is within budget for most of the project completed

1 2 3 4 5

2. Most of the projects were on schedule (Timely completion)

1 2 3 4 5

3. Most of the projects were delivered according to specification (Functionality)

1 2 3 4 5

4. Most of the projects were delivered with satisfactory quality

1 2 3 4 5

5. Most of the projects were delivered with satisfactory safety level

1 2 3 4 5

PART 4: COMPETITIVE ADVANTAGE

Instructions: Rate the success of competitive strategies implementation in your firm with regard to the following criteria by "circling" the corresponding box:

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	2	3	4	5

1. Process innovation in business operation system as a cost reduction strategy implementation is successful

   1 2 3 4 5

2. Investment in machinery is a cost reduction strategy implementation is successful

   1 2 3 4 5

3. Improving productivity and operations of employee as cost reduction strategy implementation is successful

   1 2 3 4

4. Focusing on product quality as a quality strategy implementation is successful.

   1 2 3 4 5

5. Strict quality control requirements as a quality strategy implementation is successful.

   1 2 3 4 5

6. Meeting customer needs and addressing their product requirements as a quality strategy implementation is successful.

   1 2 3 4 5

7. Strives to introduce new products first as an innovation strategy implementation is successful.

   1 2 3 4 5

8. Stresses on production process innovation as an innovation strategy implementation is successful.

   1 2 3 4 5

9. Engagement in novel marketing as an innovation strategy implementation is successful.

   1 2 3 4 5

APPENDIX B:

DESCRIPTIVE STATISTICS

```
GET
  FILE='F:\DBA\DBA Baderi\After VIVA\Data.sav'.
DATASET NAME DataSet1 WINDOW=FRONT.
FREQUENCIES VARIABLES=Number_of_Employees Years_in_Business Qualification Position Gender
  /ORDER=ANALYSIS.
```

Frequencies

Notes

Output Created		06-Dec-2013 12:28:05
Comments		
Input	Data	F:\DBA\DBA Baderi\After VIVA\Data.sav
	Active Dataset	DataSet1
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	N of Rows in Working Data File	385
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data.
Syntax		FREQUENCIES VARIABLES=Number_of_Employees Years_in_Business Qualification Position Gender /ORDER=ANALYSIS.
Resources	Processor Time	00:00:00.000
	Elapsed Time	00:00:00.407

[DataSet1] F:\DBA\DBA Baderi\After VIVA\Data.sav

Statistics

		Number of Employees	Years In Business	Highest Qualification	Position	Gender
N	Valid	385	385	385	385	385
	Missing	0	0	0	0	0

Frequency Table

Number of Employees

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 to 10	269	69.9	69.9	69.9
	100 to 200	8	2.1	2.1	71.9
	11 to 50	56	14.5	14.5	86.5
	51 to 100	52	13.5	13.5	100.0
	Total	385	100.0	100.0	

Years In Business

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 to 5	87	22.6	22.6	22.6
	11 to 20	96	24.9	24.9	47.5
	21 to 30	24	6.2	6.2	53.8
	31 to 40	4	1.0	1.0	54.8
	6 to 10	174	45.2	45.2	100.0
	Total	385	100.0	100.0	

Highest Qualification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Bachelors Degree	189	49.1	49.1	49.1
	Diplomas	152	39.5	39.5	88.6
	Master's/MBA	24	6.2	6.2	94.8
	Others (please specify)	4	1.0	1.0	95.8
	SPM/High School	8	2.1	2.1	97.9
	Technical Certifcate	8	2.1	2.1	100.0
	Total	385	100.0	100.0	

Position

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Director/Senior Manager	49	12.7	12.7	12.7
	Manager/Assistant Manager	48	12.5	12.5	25.2
	Others	212	55.1	55.1	80.3
	Section head/Senior Engineer/	19	4.9	4.9	100.0
	Total	385	100.0	100.0	

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	196	50.9	50.9	50.9
	Male	189	49.1	49.1	100.0
	Total	385	100.0	100.0	

APPENDIX C:

FACTOR ANALYSIS

```
FACTOR
  /VARIABLES PERFORM1 PERFORM2 PERFORM3 PERFORM4 PERFORM5
  /MISSING LISTWISE
  /ANALYSIS PERFORM1 PERFORM2 PERFORM3 PERFORM4 PERFORM5
  /PRINT INITIAL KMO EXTRACTION
  /CRITERIA FACTORS(1) ITERATE(25)
  /EXTRACTION PC
  /ROTATION NOROTATE
  /METHOD=CORRELATION.
```

Factor Analysis

Notes

Output Created		03-Dec-2013 09:27:43
Comments		
Input	Data	F:\DBA\DBA Baderi\After VIVA\Data.sav
	Active Dataset	DataSet1
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	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	385
Missing Value Handling	Definition of Missing	MISSING=EXCLUDE: User-defined missing values are treated as missing.
	Cases Used	LISTWISE: Statistics are based on cases with no missing values for any variable used.
Syntax		FACTOR /VARIABLES PERFORM1 PERFORM2 PERFORM3 PERFORM4 PERFORM5 /MISSING LISTWISE /ANALYSIS PERFORM1 PERFORM2 PERFORM3 PERFORM4 PERFORM5 /PRINT INITIAL KMO EXTRACTION /CRITERIA FACTORS(1) ITERATE(25) /EXTRACTION PC /ROTATION NOROTATE /METHOD=CORRELATION.
Resources	Processor Time	00:00:00.032
	Elapsed Time	00:00:00.016
	Maximum Memory Required	4100 (4.004K) bytes

[DataSet1] F:\DBA\DBA Baderi\After VIVA\Data.sav

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.821
Bartlett's Test of Sphericity	Approx. Chi-Square	1.100E3
	df	10
	Sig.	.000

Communalities

	Initial	Extraction
PERFORM1	1.000	.747
PERFORM2	1.000	.733
PERFORM3	1.000	.733
PERFORM4	1.000	.689
PERFORM5	1.000	.534

Extraction Method: Principal Component Analysis.

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.435	68.704	68.704	3.435	68.704	68.704
2	.660	13.198	81.902			
3	.380	7.610	89.511			
4	.324	6.484	95.995			
5	.200	4.005	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
PERFORM1	.864
PERFORM2	.856
PERFORM3	.856
PERFORM4	.830
PERFORM5	.731

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

```
RELIABILITY
  /VARIABLES=PERFORM1 PERFORM2 PERFORM3 PERFORM4 PERFORM5
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
```

Reliability

Notes

Output Created		03-Dec-2013 09:28:11
Comments		
Input	Data	F:\DBA\DBA Baderi\After VIVA\Data.sav
	Active Dataset	DataSet1
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	N of Rows in Working Data File	385
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=PERFORM1 PERFORM2 PERFORM3 PERFORM4 PERFORM5 /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA.
Resources	Processor Time	00:00:00.000
	Elapsed Time	00:00:00.000

[DataSet1] F:\DBA\DBA Baderi\After VIVA\Data.sav

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	385	100.0
	Excluded[a]	0	.0
	Total	385	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.883	5

```
FACTOR
  /VARIABLES COMPETENCE1 COMPETENCE2 COMPETENCE3
  /MISSING LISTWISE
  /ANALYSIS COMPETENCE1 COMPETENCE2 COMPETENCE3
  /PRINT INITIAL KMO EXTRACTION
  /CRITERIA FACTORS(1) ITERATE(25)
  /EXTRACTION PC
  /ROTATION NOROTATE
  /METHOD=CORRELATION.
```

Factor Analysis

Notes

Output Created		03-Dec-2013 09:31:33
Comments		
Input	Data	F:\DBA\DBA Baderi\After VIVA\Data.sav
	Active Dataset	DataSet1
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	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	385
Missing Value Handling	Definition of Missing	MISSING=EXCLUDE: User-defined missing values are treated as missing.
	Cases Used	LISTWISE: Statistics are based on cases with no missing values for any variable used.
Syntax		FACTOR /VARIABLES COMPETENCE1 COMPETENCE2 COMPETENCE3 /MISSING LISTWISE /ANALYSIS COMPETENCE1 COMPETENCE2 COMPETENCE3 /PRINT INITIAL KMO EXTRACTION /CRITERIA FACTORS(1) ITERATE(25) /EXTRACTION PC /ROTATION NOROTATE /METHOD=CORRELATION.
Resources	Processor Time	00:00:00.031
	Elapsed Time	00:00:00.015
	Maximum Memory Required	1860 (1.816K) bytes

[DataSet1] F:\DBA\DBA Baderi\After VIVA\Data.sav

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.675
Bartlett's Test of Sphericity	Approx. Chi-Square	348.684
	df	3
	Sig.	.000

Communalities

	Initial	Extraction
COMPETENCE1	1.000	.659
COMPETENCE2	1.000	.781
COMPETENCE3	1.000	.664

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.104	70.129	70.129	2.104	70.129	70.129
2	.548	18.250	88.380			
3	.349	11.620	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
COMPETENCE1	.812
COMPETENCE2	.884
COMPETENCE3	.815

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

```
RELIABILITY
  /VARIABLES=COMPETENCE1 COMPETENCE2 COMPETENCE3
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
```

Reliability

Notes

Output Created		03-Dec-2013 09:32:25
Comments		
Input	Data	F:\DBA\DBA Baderi\After VIVA\Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	385
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=COMPETENCE1 COMPETENCE2 COMPETENCE3 /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA.
Resources	Processor Time	00:00:00.032
	Elapsed Time	00:00:00.016

[DataSet1] F:\DBA\DBA Baderi\After VIVA\Data.sav

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	385	100.0
	Excluded[a]	0	.0
	Total	385	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.786	3

```
FACTOR
  /VARIABLES COOPERATION1 COOPERATION2 COOPERATION3
  /MISSING LISTWISE
  /ANALYSIS COOPERATION1 COOPERATION2 COOPERATION3
  /PRINT INITIAL KMO EXTRACTION
  /CRITERIA FACTORS(1) ITERATE(25)
  /EXTRACTION PC
  /ROTATION NOROTATE
  /METHOD=CORRELATION.
```

Factor Analysis

Notes

Output Created		03-Dec-2013 09:33:25
Comments		
Input	Data	F:\DBA\DBA Baderi\After VIVA\Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	385
Missing Value Handling	Definition of Missing	MISSING=EXCLUDE: User-defined missing values are treated as missing.
	Cases Used	LISTWISE: Statistics are based on cases with no missing values for any variable used.
Syntax		FACTOR /VARIABLES COOPERATION1 COOPERATION2 COOPERATION3 /MISSING LISTWISE /ANALYSIS COOPERATION1 COOPERATION2 COOPERATION3 /PRINT INITIAL KMO EXTRACTION /CRITERIA FACTORS(1) ITERATE(25) /EXTRACTION PC /ROTATION NOROTATE /METHOD=CORRELATION.
Resources	Processor Time	00:00:00.062
	Elapsed Time	00:00:00.016
	Maximum Memory Required	1860 (1.816K) bytes

[DataSet1] F:\DBA\DBA Baderi\After VIVA\Data.sav

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.658
Bartlett's Test of Sphericity	Approx. Chi-Square	272.295
	df	3
	Sig.	.000

Communalities

	Initial	Extraction
COOPERATION1	1.000	.666
COOPERATION2	1.000	.743
COOPERATION3	1.000	.572

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.981	66.030	66.030	1.981	66.030	66.030
2	.619	20.646	86.676			
3	.400	13.324	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
COOPERATION1	.816
COOPERATION2	.862
COOPERATION3	.756

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

```
RELIABILITY
  /VARIABLES=COOPERATION1 COOPERATION2 COOPERATION3
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
```

Reliability

Notes

Output Created		03-Dec-2013 09:34:01
Comments		
Input	Data	F:\DBA\DBA Baderi\After VIVA\Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	385
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=COOPERATION1 COOPERATION2 COOPERATION3 /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA.
Resources	Processor Time	00:00:00.000
	Elapsed Time	00:00:00.000

[DataSet1] F:\DBA\DBA Baderi\After VIVA\Data.sav

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	385	100.0
	Excluded[a]	0	.0
	Total	385	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.736	3

```
FACTOR
  /VARIABLES COMMITMENT1 COMMITMENT2 COMMITMENT3
  /MISSING LISTWISE
  /ANALYSIS COMMITMENT1 COMMITMENT2 COMMITMENT3
  /PRINT INITIAL KMO EXTRACTION
  /CRITERIA FACTORS(1) ITERATE(25)
  /EXTRACTION PC
  /ROTATION NOROTATE
  /METHOD=CORRELATION.
```

Factor Analysis

Notes

Output Created		03-Dec-2013 09:34:51
Comments		
Input	Data	F:\DBA\DBA Baderi\After VIVA\Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	385
Missing Value Handling	Definition of Missing	MISSING=EXCLUDE: User-defined missing values are treated as missing.
	Cases Used	LISTWISE: Statistics are based on cases with no missing values for any variable used.
Syntax		FACTOR /VARIABLES COMMITMENT1 COMMITMENT2 COMMITMENT3 /MISSING LISTWISE /ANALYSIS COMMITMENT1 COMMITMENT2 COMMITMENT3 /PRINT INITIAL KMO EXTRACTION /CRITERIA FACTORS(1) ITERATE(25) /EXTRACTION PC /ROTATION NOROTATE /METHOD=CORRELATION.
Resources	Processor Time	00:00:00.062
	Elapsed Time	00:00:00.014
	Maximum Memory Required	1860 (1.816K) bytes

[DataSet1] F:\DBA\DBA Baderi\After VIVA\Data.sav

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.686
Bartlett's Test of Sphericity	Approx. Chi-Square	281.805
	df	3
	Sig.	.000

Communalities

	Initial	Extraction
COMMITMENT1	1.000	.618
COMMITMENT2	1.000	.708
COMMITMENT3	1.000	.692

Extraction Method: Principal Component Analysis.

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.019	67.295	67.295	2.019	67.295	67.295
2	.552	18.385	85.680			
3	.430	14.320	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
COMMITMENT1	.786
COMMITMENT2	.842
COMMITMENT3	.832

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

```
RELIABILITY
  /VARIABLES=COMMITMENT1 COMMITMENT2 COMMITMENT3
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
```

Reliability

Notes

Output Created		03-Dec-2013 09:35:26
Comments		
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	Active Dataset	DataSet1
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	Split File	<none>
	N of Rows in Working Data File	385
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=COMMITMENT1 COMMITMENT2 COMMITMENT3 /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA.
Resources	Processor Time	00:00:00.000
	Elapsed Time	00:00:00.000

[DataSet1] F:\DBA\DBA Baderi\After VIVA\Data.sav

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	385	100.0
	Excluded[a]	0	.0
	Total	385	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.756	3

```
FACTOR
  /VARIABLES METHOD1 METHOD2 METHOD3 METHOD4 METHOD5
  /MISSING LISTWISE
  /ANALYSIS METHOD1 METHOD2 METHOD3 METHOD4 METHOD5
  /PRINT INITIAL KMO EXTRACTION
  /CRITERIA FACTORS(1) ITERATE(25)
  /EXTRACTION PC
  /ROTATION NOROTATE
  /METHOD=CORRELATION.
```

Factor Analysis

Notes

Output Created		03-Dec-2013 09:36:13
Comments		
Input	Data	F:\DBA\DBA Baderi\After VIVA\Data.sav
	Active Dataset	DataSet1
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	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	385
Missing Value Handling	Definition of Missing	MISSING=EXCLUDE: User-defined missing values are treated as missing.
	Cases Used	LISTWISE: Statistics are based on cases with no missing values for any variable used.
Syntax		FACTOR /VARIABLES METHOD1 METHOD2 METHOD3 METHOD4 METHOD5 /MISSING LISTWISE /ANALYSIS METHOD1 METHOD2 METHOD3 METHOD4 METHOD5 /PRINT INITIAL KMO EXTRACTION /CRITERIA FACTORS(1) ITERATE(25) /EXTRACTION PC /ROTATION NOROTATE /METHOD=CORRELATION.
Resources	Processor Time	00:00:00.078
	Elapsed Time	00:00:00.031
	Maximum Memory Required	4100 (4.004K) bytes

[DataSet1] F:\DBA\DBA Baderi\After VIVA\Data.sav

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.727
Bartlett's Test of Sphericity	Approx. Chi-Square	596.404
	df	10
	Sig.	.000

Communalities

	Initial	Extraction
METHOD1	1.000	.409
METHOD2	1.000	.682
METHOD3	1.000	.714
METHOD4	1.000	.552
METHOD5	1.000	.333

Extraction Method: Principal Component Analysis.

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.689	53.789	53.789	2.689	53.789	53.789
2	.809	16.184	69.973			
3	.786	15.726	85.700			
4	.431	8.624	94.323			
5	.284	5.677	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
METHOD1	.639
METHOD2	.826
METHOD3	.845
METHOD4	.743
METHOD5	.577

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

```
RELIABILITY
  /VARIABLES=METHOD1 METHOD2 METHOD3 METHOD4 METHOD5
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
```

Reliability

Notes

Output Created		03-Dec-2013 09:36:55
Comments		
Input	Data	F:\DBA\DBA Baderi\After VIVA\Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	385
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=METHOD1 METHOD2 METHOD3 METHOD4 METHOD5 /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA.
Resources	Processor Time	00:00:00.000
	Elapsed Time	00:00:00.000

[DataSet1] F:\DBA\DBA Baderi\After VIVA\Data.sav

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	385	100.0
	Excluded[a]	0	.0
	Total	385	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.779	5

```
FACTOR
  /VARIABLES SYSTEM1 SYSTEM2 SYSTEM3
  /MISSING LISTWISE
  /ANALYSIS SYSTEM1 SYSTEM2 SYSTEM3
  /PRINT INITIAL KMO EXTRACTION
  /CRITERIA FACTORS(1) ITERATE(25)
  /EXTRACTION PC
  /ROTATION NOROTATE
  /METHOD=CORRELATION.
```

Factor Analysis

Notes

Output Created		03-Dec-2013 09:38:01
Comments		
Input	Data	F:\DBA\DBA Baderi\After VIVA\Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	385
Missing Value Handling	Definition of Missing	MISSING=EXCLUDE: User-defined missing values are treated as missing.
	Cases Used	LISTWISE: Statistics are based on cases with no missing values for any variable used.
Syntax		FACTOR /VARIABLES SYSTEM1 SYSTEM2 SYSTEM3 /MISSING LISTWISE /ANALYSIS SYSTEM1 SYSTEM2 SYSTEM3 /PRINT INITIAL KMO EXTRACTION /CRITERIA FACTORS(1) ITERATE(25) /EXTRACTION PC /ROTATION NOROTATE /METHOD=CORRELATION.
Resources	Processor Time	00:00:00.047
	Elapsed Time	00:00:00.015
	Maximum Memory Required	1860 (1.816K) bytes

[DataSet1] F:\DBA\DBA Baderi\After VIVA\Data.sav

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.622
Bartlett's Test of Sphericity	Approx. Chi-Square	401.820
	df	3
	Sig.	.000

Communalities

	Initial	Extraction
SYSTEM1	1.000	.833
SYSTEM2	1.000	.659
SYSTEM3	1.000	.633

Extraction Method: Principal Component Analysis.

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.125	70.848	70.848	2.125	70.848	70.848
2	.601	20.033	90.881			
3	.274	9.119	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
SYSTEM1	.913
SYSTEM2	.812
SYSTEM3	.795

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

```
RELIABILITY
  /VARIABLES=SYSTEM1 SYSTEM2 SYSTEM3
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
```

Reliability

Notes

Output Created		03-Dec-2013 09:38:32
Comments		
Input	Data	F:\DBA\DBA Baderi\After VIVA\Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	385
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=SYSTEM1 SYSTEM2 SYSTEM3 /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA.
Resources	Processor Time	00:00:00.000
	Elapsed Time	00:00:00.000

[DataSet1] F:\DBA\DBA Baderi\After VIVA\Data.sav

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	385	100.0
	Excluded[a]	0	.0
	Total	385	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.793	3

```
FACTOR
  /VARIABLES COMPREHENSION1 COMPREHENSION2 COMPREHENSION3 COMPREHENSION4
  /MISSING LISTWISE
  /ANALYSIS COMPREHENSION1 COMPREHENSION2 COMPREHENSION3 COMPREHENSION4
  /PRINT INITIAL KMO EXTRACTION
  /CRITERIA FACTORS(1) ITERATE(25)
  /EXTRACTION PC
  /ROTATION NOROTATE
  /METHOD=CORRELATION.
```

Factor Analysis

Notes

Output Created		03-Dec-2013 09:41:18
Comments		
Input	Data	F:\DBA\DBA Baderi\After VIVA\Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	385
Missing Value Handling	Definition of Missing	MISSING=EXCLUDE: User-defined missing values are treated as missing.
	Cases Used	LISTWISE: Statistics are based on cases with no missing values for any variable used.
Syntax		FACTOR /VARIABLES COMPREHENSION1 COMPREHENSION2 COMPREHENSION3 COMPREHENSION4 /MISSING LISTWISE /ANALYSIS COMPREHENSION1 COMPREHENSION2 COMPREHENSION3 COMPREHENSION4 /PRINT INITIAL KMO EXTRACTION /CRITERIA FACTORS(1) ITERATE(25) /EXTRACTION PC /ROTATION NOROTATE /METHOD=CORRELATION.
Resources	Processor Time	00:00:00.094
	Elapsed Time	00:00:00.032
	Maximum Memory Required	2872 (2.805K) bytes

[DataSet1] F:\DBA\DBA Baderi\After VIVA\Data.sav

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.698
Bartlett's Test of Sphericity	Approx. Chi-Square	609.903
	df	6
	Sig.	.000

Communalities

	Initial	Extraction
COMPREHENSION1	1.000	.719
COMPREHENSION2	1.000	.724
COMPREHENSION3	1.000	.618
COMPREHENSION4	1.000	.533

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.594	64.856	64.856	2.594	64.856	64.856
2	.681	17.037	81.893			
3	.491	12.278	94.171			
4	.233	5.829	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
COMPREHENSION1	.848
COMPREHENSION2	.851
COMPREHENSION3	.786
COMPREHENSION4	.730

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

```
RELIABILITY
  /VARIABLES=COMPREHENSION1 COMPREHENSION2 COMPREHENSION3 COMPREHENSION4
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
```

Reliability

Notes

Output Created		03-Dec-2013 09:41:55
Comments		
Input	Data	F:\DBA\DBA Baderi\After VIVA\Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	385
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=COMPREHENSION1 COMPREHENSION2 COMPREHENSION3 COMPREHENSION4 /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA.
Resources	Processor Time	00:00:00.000
	Elapsed Time	00:00:00.000

[DataSet1] F:\DBA\DBA Baderi\After VIVA\Data.sav

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	385	100.0
	Excluded[a]	0	.0
	Total	385	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.818	4

```
FACTOR
  /VARIABLES COMM1 COMM2 COMM3
  /MISSING LISTWISE
  /ANALYSIS COMM1 COMM2 COMM3
  /PRINT INITIAL KMO EXTRACTION
  /CRITERIA FACTORS(1) ITERATE(25)
  /EXTRACTION PC
  /ROTATION NOROTATE
  /METHOD=CORRELATION.
```

Factor Analysis

Notes

Output Created		03-Dec-2013 09:42:25
Comments		
Input	Data	F:\DBA\DBA Baderi\After VIVA\Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	385
Missing Value Handling	Definition of Missing	MISSING=EXCLUDE: User-defined missing values are treated as missing.
	Cases Used	LISTWISE: Statistics are based on cases with no missing values for any variable used.
Syntax		FACTOR /VARIABLES COMM1 COMM2 COMM3 /MISSING LISTWISE /ANALYSIS COMM1 COMM2 COMM3 /PRINT INITIAL KMO EXTRACTION /CRITERIA FACTORS(1) ITERATE(25) /EXTRACTION PC /ROTATION NOROTATE /METHOD=CORRELATION.
Resources	Processor Time	00:00:00.047
	Elapsed Time	00:00:00.015
	Maximum Memory Required	1860 (1.816K) bytes

[DataSet1] F:\DBA\DBA Baderi\After VIVA\Data.sav

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.620
Bartlett's Test of Sphericity	Approx. Chi-Square	382.076
	df	3
	Sig.	.000

Communalities

	Initial	Extraction
Communication1	1.000	.754
Communication2	1.000	.813
Communication3	1.000	.495

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.062	68.743	68.743	2.062	68.743	68.743
2	.672	22.410	91.154			
3	.265	8.846	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
Communication1	.868
Communication2	.902
Communication3	.704

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

```
RELIABILITY
  /VARIABLES=COMM1 COMM2 COMM3
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
```

Reliability

Notes

Output Created		03-Dec-2013 09:42:56
Comments		
Input	Data	F:\DBA\DBA Baderi\After VIVA\Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	385
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=COMM1 COMM2 COMM3 /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA.
Resources	Processor Time	00:00:00.000
	Elapsed Time	00:00:00.000

[DataSet1] F:\DBA\DBA Baderi\After VIVA\Data.sav

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	385	100.0
	Excluded[a]	0	.0
	Total	385	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.772	3

```
FACTOR
```

```
  /VARIABLES COST1 COST2 COST3 QUALITY1 QUALITY2 QUALITY3 INNOVATION1 INNOVATIO
N2 INNOVATION3
  /MISSING LISTWISE
  /ANALYSIS COST1 COST2 COST3 QUALITY1 QUALITY2 QUALITY3 INNOVATION1 INNOVATION2
 INNOVATION3
  /PRINT INITIAL KMO EXTRACTION
  /CRITERIA FACTORS(1) ITERATE(25)
  /EXTRACTION PC
  /ROTATION NOROTATE
  /METHOD=CORRELATION.
```

Factor Analysis

Notes

Output Created		03-Dec-2013 09:48:07
Comments		
Input	Data	F:\DBA\DBA Baderi\After VIVA\Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	385
Missing Value Handling	Definition of Missing	MISSING=EXCLUDE: User-defined missing values are treated as missing.
	Cases Used	LISTWISE: Statistics are based on cases with no missing values for any variable used.
Syntax		FACTOR /VARIABLES COST1 COST2 COST3 QUALITY1 QUALITY2 QUALITY3 INNOVATION1 INNOVATION2 INNOVATION3 /MISSING LISTWISE /ANALYSIS COST1 COST2 COST3 QUALITY1 QUALITY2 QUALITY3 INNOVATION1 INNOVATION2 INNOVATION3 /PRINT INITIAL KMO EXTRACTION /CRITERIA FACTORS(1) ITERATE(25) /EXTRACTION PC /ROTATION NOROTATE /METHOD=CORRELATION.
Resources	Processor Time	00:00:00.047
	Elapsed Time	00:00:00.031
	Maximum Memory Required	11172 (10.910K) bytes

[DataSet1] F:\DBA\DBA Baderi\After VIVA\Data.sav

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.774
Bartlett's Test of Sphericity	Approx. Chi-Square	1.452E3
	df	36
	Sig.	.000

Communalities

	Initial	Extraction
COST1	1.000	.464
COST2	1.000	.527
COST3	1.000	.598
QUALITY1	1.000	.438
QUALITY2	1.000	.550
QUALITY3	1.000	.382
INNOVATION1	1.000	.414
INNOVATION2	1.000	.472
INNOVATION3	1.000	.317

Extraction Method: Principal Component Analysis.

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.162	46.247	46.247	4.162	46.247	46.247
2	1.139	12.658	58.905			
3	.925	10.273	69.178			
4	.849	9.438	78.617			
5	.653	7.254	85.870			
6	.409	4.549	90.419			
7	.347	3.851	94.270			
8	.312	3.470	97.740			
9	.203	2.260	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
COST1	.682
COST2	.726
COST3	.773
QUALITY1	.662
QUALITY2	.742
QUALITY3	.618
INNOVATION1	.644
INNOVATION2	.687
INNOVATION3	.563

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

```
RELIABILITY
  /VARIABLES=COST1 COST2 COST3 QUALITY1 QUALITY2 QUALITY3 INNOVATION1 INNOVATIO
N2 INNOVATION3
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
```

Reliability

Notes

Output Created		03-Dec-2013 09:49:45
Comments		
Input	Data	F:\DBA\DBA Baderi\After VIVA\Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	385
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=COST1 COST2 COST3 QUALITY1 QUALITY2 QUALITY3 INNOVATION1 INNOVATION2 INNOVATION3 /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA.
Resources	Processor Time	00:00:00.000
	Elapsed Time	00:00:00.000

[DataSet1] F:\DBA\DBA Baderi\After VIVA\Data.sav

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	385	100.0
	Excluded[a]	0	.0
	Total	385	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.852	9

APPENDIX D:

CORRELATION ANALYSIS

```
GET
  FILE='F:\DBA\DBA Baderi\After VIVA\Data.sav'.
DATASET NAME DataSet1 WINDOW=FRONT.
CORRELATIONS
  /VARIABLES=PROJECT_PERFORMANCE COMPETITIVE_ADVANTAGE MGTCAPABILITY RELCAP
ABILITY
  /PRINT=TWOTAIL NOSIG
  /MISSING=PAIRWISE.
```

Correlations

Notes

Output Created		06-Dec-2013 12:45:13
Comments		
Input	Data	F:\DBA\DBA Baderi\After VIVA\Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	385
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics for each pair of variables are based on all the cases with valid data for that pair.
Syntax		CORRELATIONS /VARIABLES=PROJECT_PERFORMANCE COMPETITIVE_ADVANTAGE MGTCAPABILITY RELCAPABILITY /PRINT=TWOTAIL NOSIG /MISSING=PAIRWISE.
Resources	Processor Time	00:00:00.000
	Elapsed Time	00:00:00.463

[DataSet1] F:\DBA\DBA Baderi\After VIVA\Data.sav

Correlations

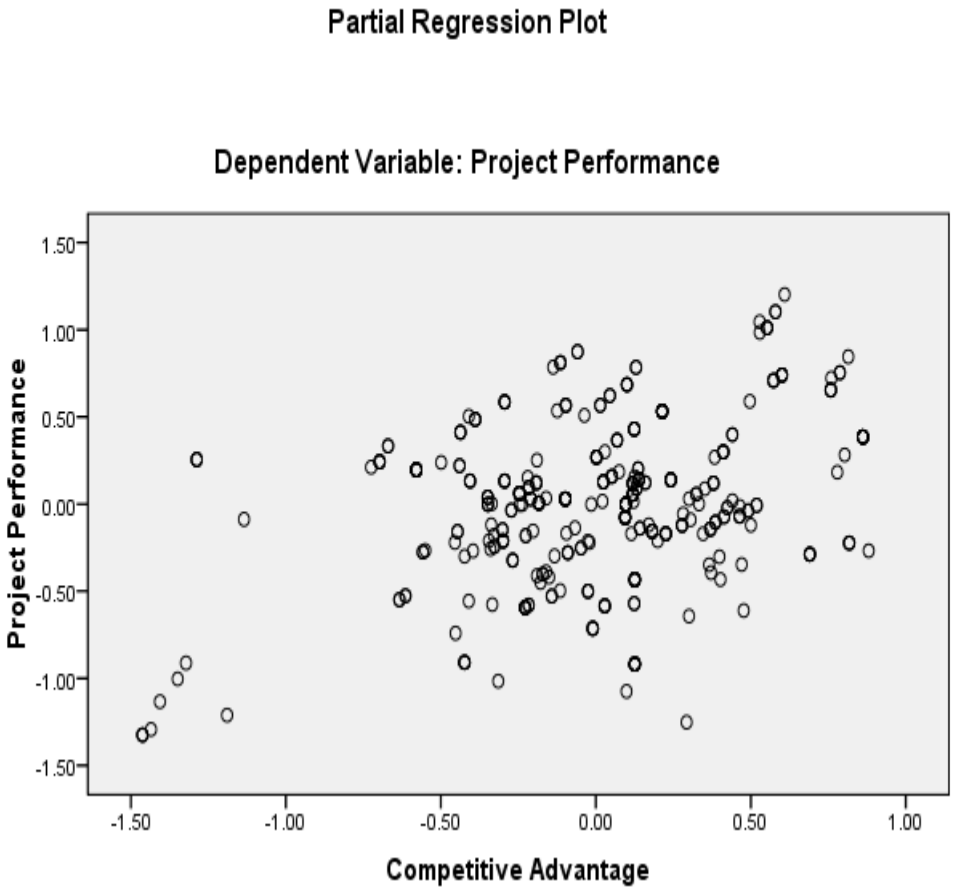
		Project Performance	Competitive Advantage	Management Capability	Relationship Capability
Project Performance	Pearson Correlation	1	.549**	.636**	.688**
	Sig. (2-tailed)		.000	.000	.000
	N	385	385	385	385
Competitive Advantage	Pearson Correlation	.549**	1	.458**	.429**
	Sig. (2-tailed)	.000		.000	.000
	N	385	385	385	385
Management Capability	Pearson Correlation	.636**	.458**	1	.764**
	Sig. (2-tailed)	.000	.000		.000
	N	385	385	385	385
Relationship Capability	Pearson Correlation	.688**	.429**	.764**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	385	385	385	385

**. Correlation is significant at the 0.01 level (2-tailed).

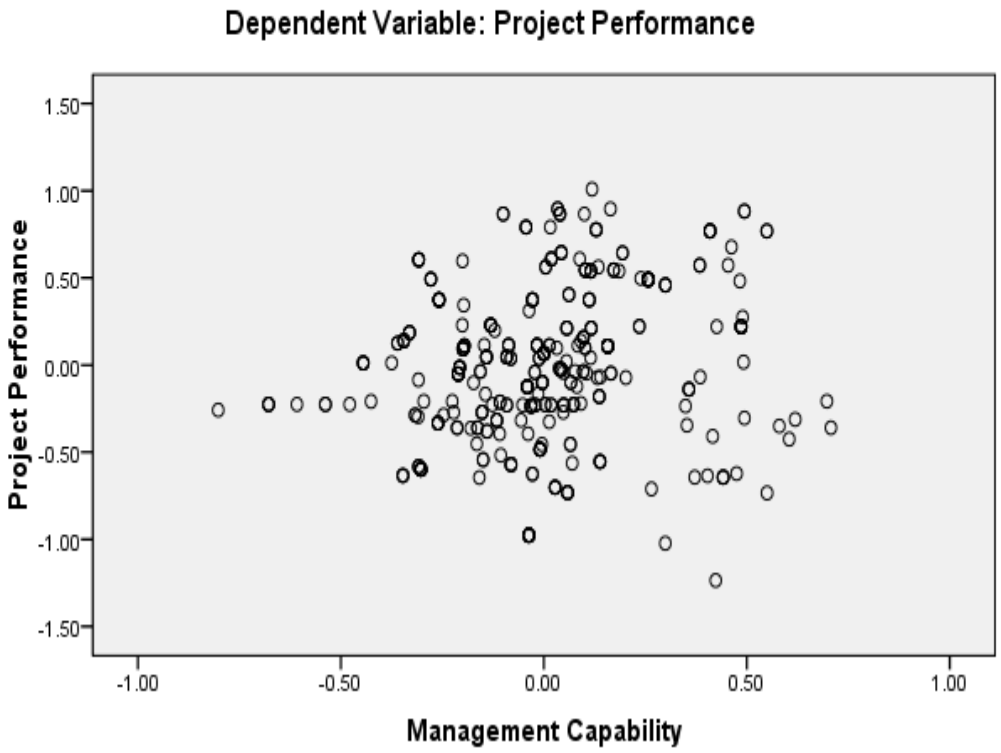
APPENDIX E:

PARTIAL REGRESSION PLOT

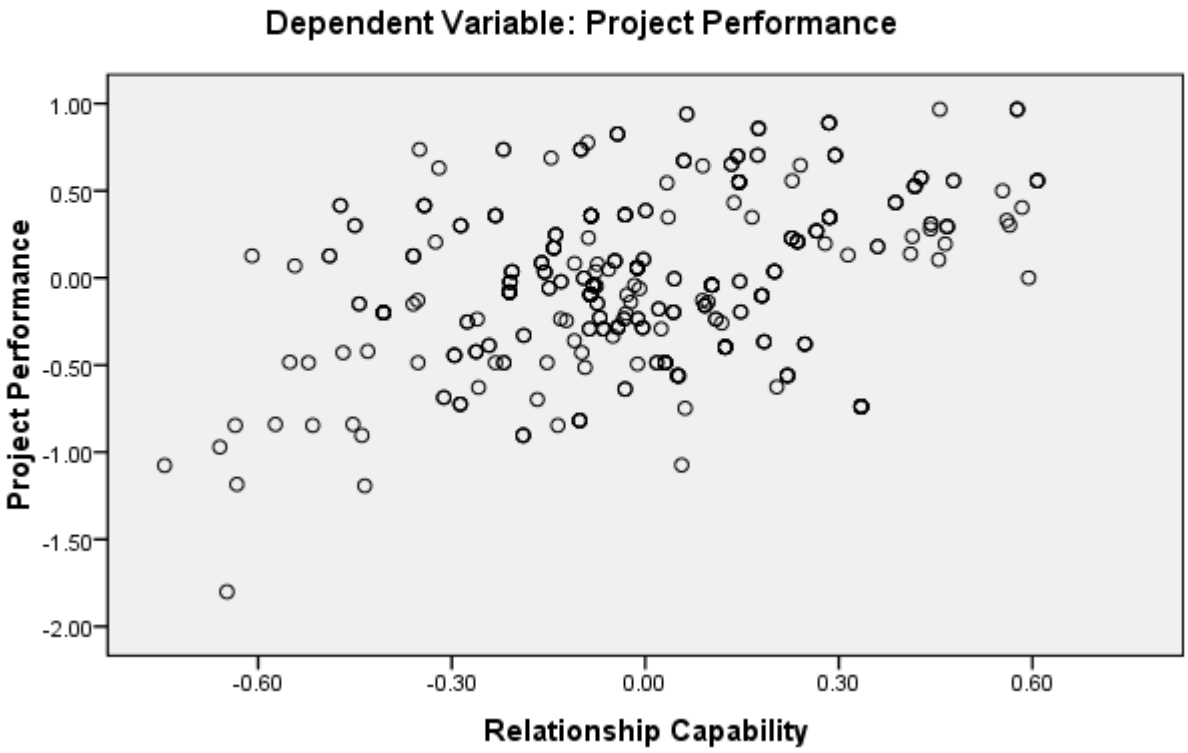
Charts


Partial Regression Plot
Dependent Variable: Project Performance
Project Performance
1.50
1.00
0.50
0.00
-0.50
-1.00
-1.50
-1.50
-1.00
-0.50
0.00
0.50
1.00
Competitive Advantage

Partial Regression Plot



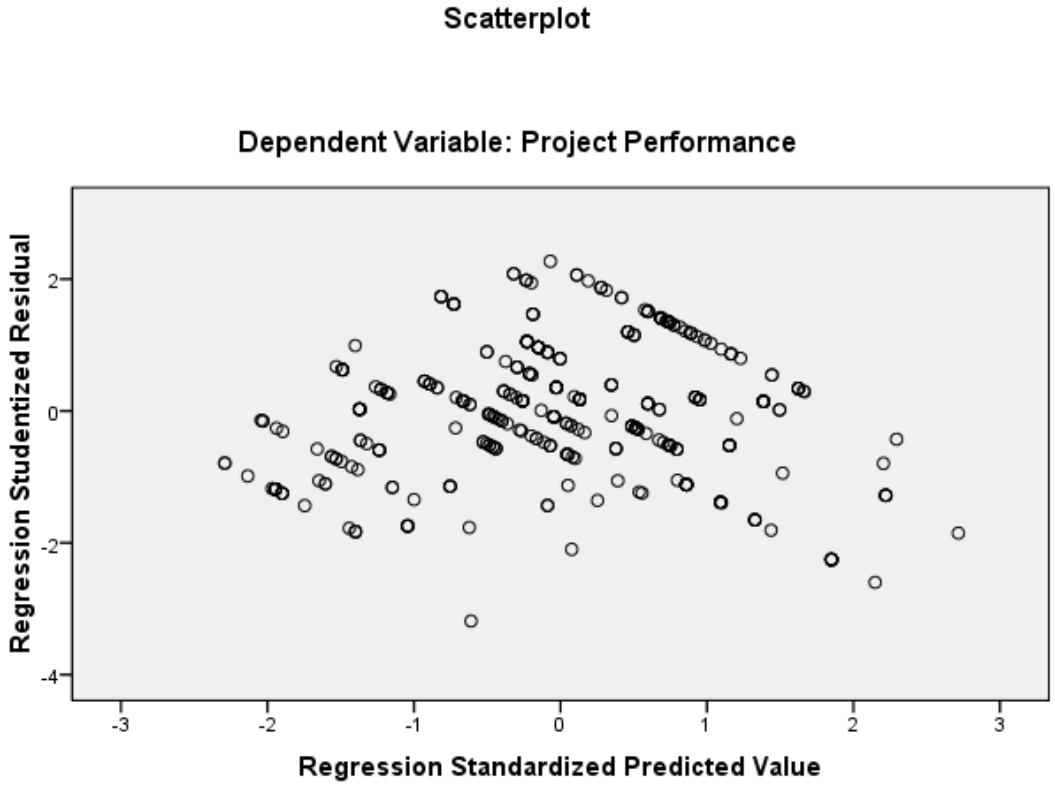
Partial Regression Plot



APPENDIX F:

SCATTER PLOT

Charts


Scatterplot
Dependent Variable: Project Performance
Regression Studentized Residual
Regression Standardized Predicted Value
2
0
-2
-4
-3
-2
-1
0
1
2
3

APPENDIX G:

NORMAL PROBABILITY PLOT

PPlot

Notes		
Output Created		02-Dec-2013 23:25:03
Comments		
Input	Data	F:\DBA\DBA Baderi\After VIVA\Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	385
	Date	<none>
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	For a given sequence or time series variable, cases with missing values are not used in the analysis. Cases with negative or zero values are also not used, if the log transform is requested.

Syntax		PPLOT /VARIABLES=COMPETITIVE_ADVANTAGE MGTCAPABILITY RELCAPABILITY /NOLOG /NOSTANDARDIZE /TYPE=P-P /FRACTION=BLOM /TIES=MEAN /DIST=NORMAL.	
Resources	Processor Time		00:00:01.063
	Elapsed Time		00:00:01.125
Use	From	First observation	
	To	Last observation	
Time Series Settings (TSET)	Amount of Output	PRINT = DEFAULT	
	Saving New Variables	NEWVAR = CURRENT	
	Maximum Number of Lags in Autocorrelation or Partial Autocorrelation Plots	MXAUTO = 16	
	Maximum Number of Lags Per Cross-Correlation Plots	MXCROSS = 7	
	Maximum Number of New Variables Generated Per Procedure	MXNEWVAR = 60	
	Maximum Number of New Cases Per Procedure	MXPREDICT = 1000	

Treatment of User-Missing Values	MISSING = EXCLUDE
Confidence Interval Percentage Value	CIN = 95
Tolerance for Entering Variables in Regression Equations	TOLER = .0001
Maximum Iterative Parameter Change	CNVERGE = .001
Method of Calculating Std. Errors for Autocorrelations	ACFSE = IND
Length of Seasonal Period	Unspecified
Variable Whose Values Label Observations in Plots	Unspecified
Equations Include	CONSTANT

[DataSet1] F:\DBA\DBA Baderi\After VIVA\Data.sav

Model Description

Model Name		MOD_1
Series or Sequence	1	Competitive Advantage
	2	Management Capability
	3	Relationship Capability
Transformation		None
Non-Seasonal Differencing		0
Seasonal Differencing		0
Length of Seasonal Period		No periodicity
Standardization		Not applied
Distribution	Type	Normal
	Location	estimated
	Scale	estimated
Fractional Rank Estimation Method		Blom's
Rank Assigned to Ties		Mean rank of tied values

Applying the model specifications from MOD_1

Case Processing Summary

		Competitive Advantage	Management Capability	Relationship Capability
Series or Sequence Length		385	385	385
Number of Missing Values in the Plot	User-Missing	0	0	0
	System-Missing	0	0	0

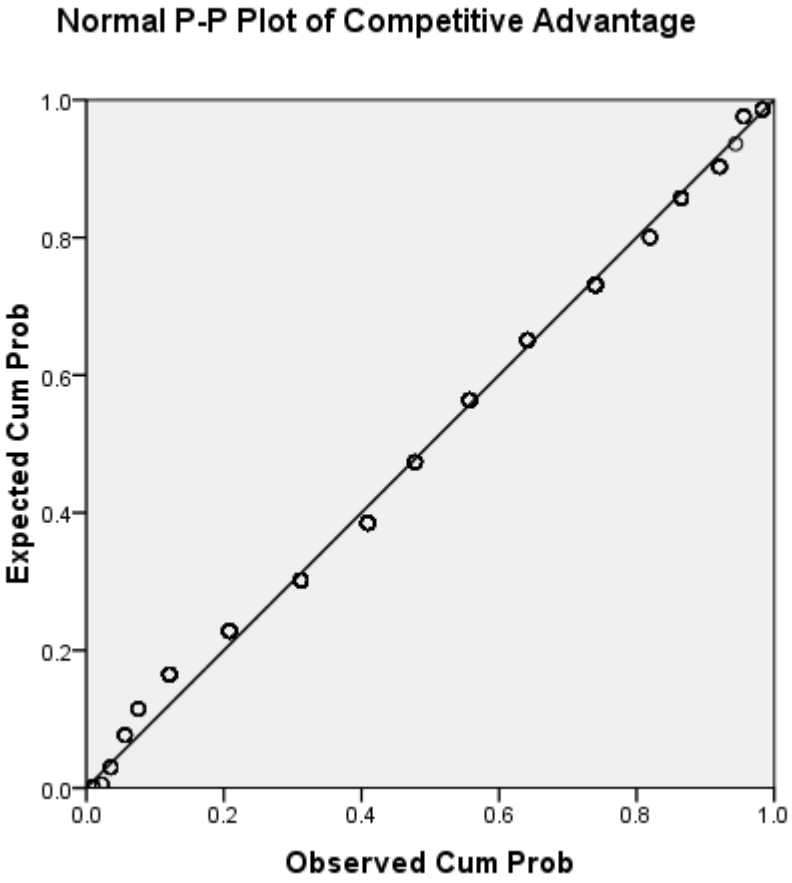
The cases are unweighted.

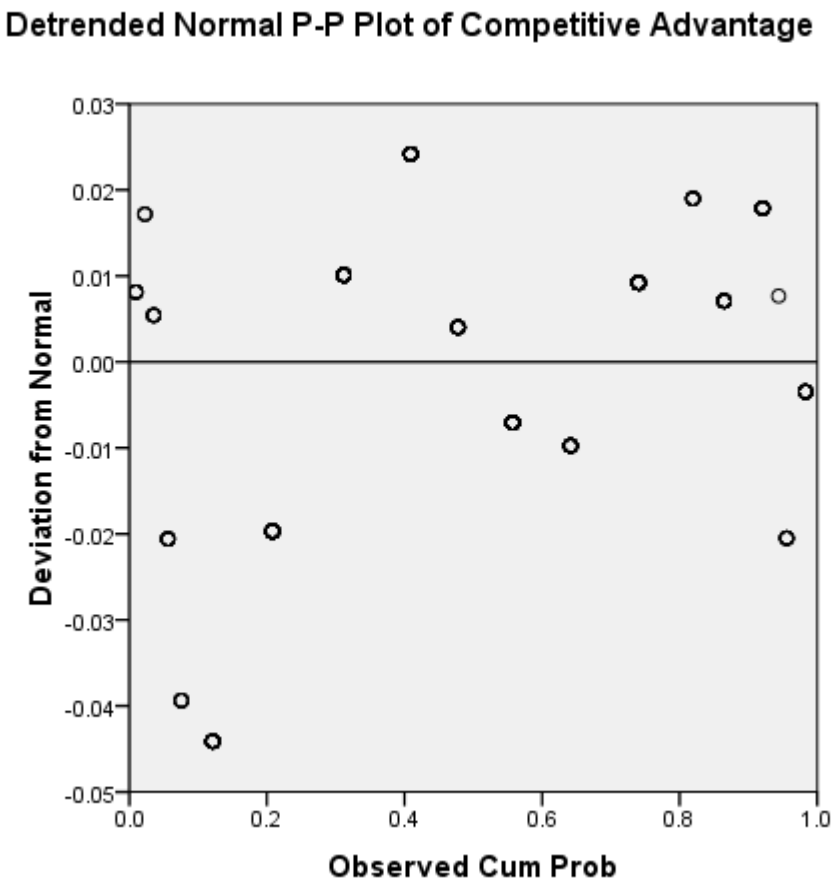
Estimated Distribution Parameters

		Competitive Advantage	Management Capability	Relationship Capability
Normal Distribution	Location	3.9209	3.9987	4.0774
	Scale	.48944	.38766	.41451

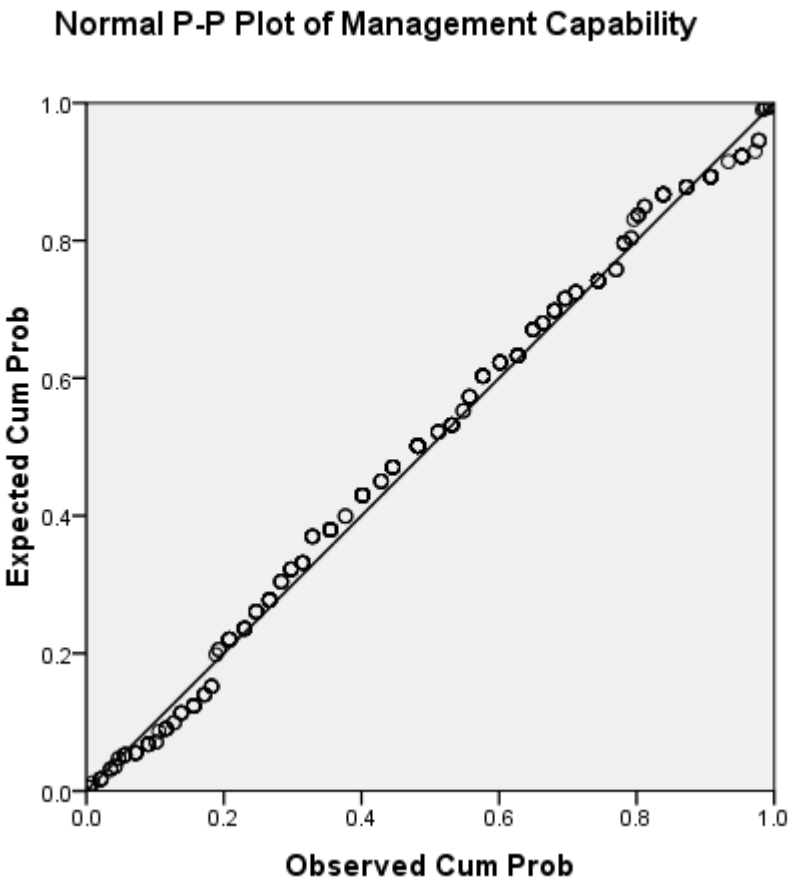
The cases are unweighted.

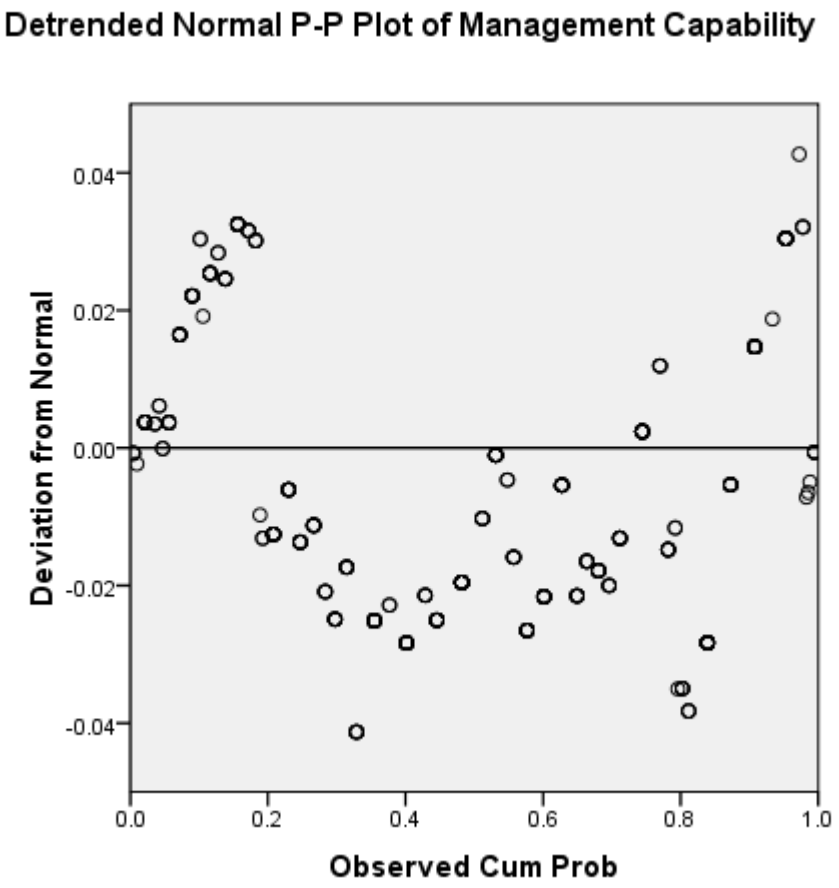
Competitive Advantage



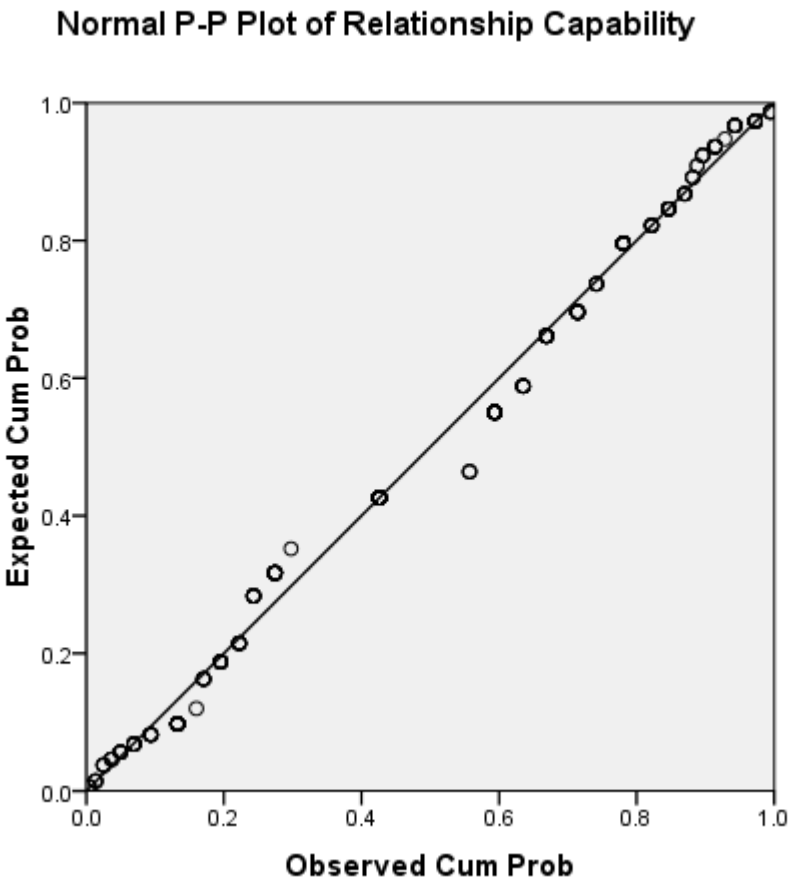

Detrended Normal P-P Plot of Competitive Advantage
Deviation from Normal
0.03
0.02
0.01
0.00
-0.01
-0.02
-0.03
-0.04
-0.05
0.0
0.2
0.4
0.6
0.8
1.0
Observed Cum Prob

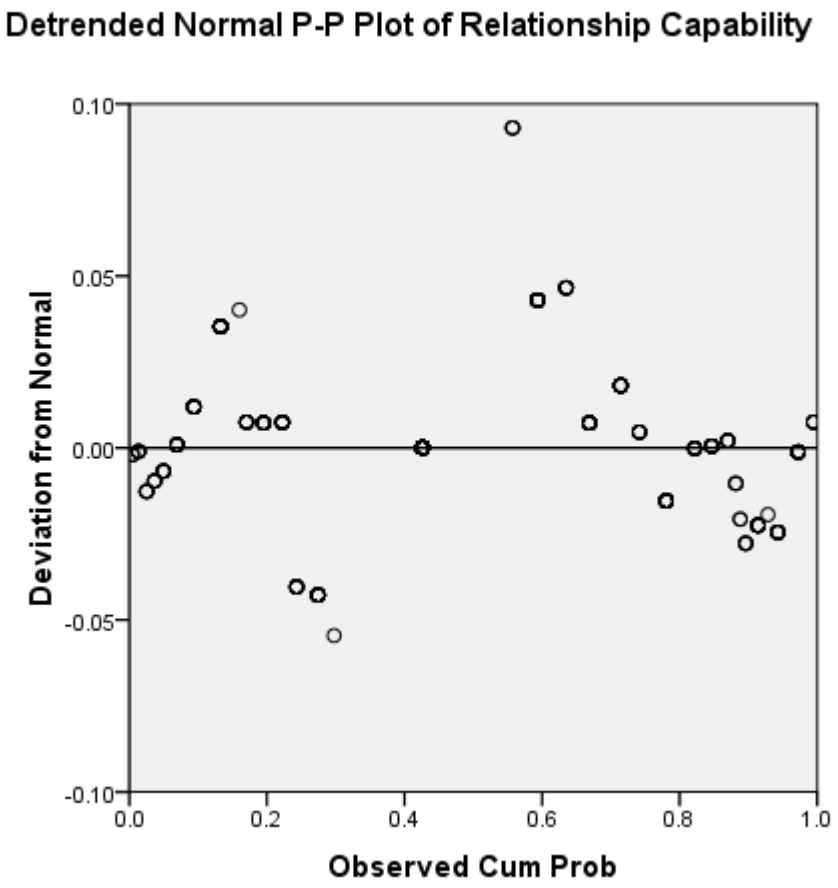
Management Capability




Detrended Normal P-P Plot of Management Capability
Deviation from Normal
0.04
0.02
0.00
-0.02
-0.04
0.0
0.2
0.4
0.6
0.8
1.0
Observed Cum Prob

Relationship Capability




Detrended Normal P-P Plot of Relationship Capability
Deviation from Normal
0.10
0.05
0.00
-0.05
-0.10
0.0
0.2
0.4
0.6
0.8
1.0
Observed Cum Prob

APPENDIX H:

MULTIPLE REGRESSION ANALYSIS

```
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA COLLIN TOL
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT PROJECT_PERFORMANCE
  /METHOD=ENTER COMPETITIVE_ADVANTAGE MGTCAPABILITY RELCAPABILITY.
```

Regression

Notes

Output Created		06-Dec-2013 14:34:27
Comments		
Input	Data	F:\DBA\DBA Baderi\After VIVA\Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	385
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on cases with no missing values for any variable used.
Syntax		REGRESSION /MISSING LISTWISE /STATISTICS COEFF OUTS R ANOVA COLLIN TOL /CRITERIA=PIN(.05) POUT(.10) /NOORIGIN /DEPENDENT PROJECT_PERFORMANCE /METHOD=ENTER COMPETITIVE_ADVANTAGE MGTCAPABILITY RELCAPABILITY.

Resources	Processor Time	00:00:00.000
	Elapsed Time	00:00:00.531
	Memory Required	3460 bytes
	Additional Memory Required for Residual Plots	0 bytes

[DataSet1] F:\DBA\DBA Baderi\After VIVA\Data.sav

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Relationship Capability, Competitive Advantage, Management Capability[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Project Performance

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.752[a]	.565	.561	.43138

a. Predictors: (Constant), Relationship Capability, Competitive Advantage, Management Capability

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	92.024	3	30.675	164.842	.000[a]
	Residual	70.898	381	.186		
	Total	162.922	384			

a. Predictors: (Constant), Relationship Capability, Competitive Advantage, Management Capability

b. Dependent Variable: Project Performance

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-1.370	.249		-5.510	.000		
	Competitive Advantage	.375	.051	.282	7.351	.000	.775	1.290
	Management Capability	.298	.090	.178	3.304	.001	.395	2.529
	Relationship Capability	.678	.083	.431	8.155	.000	.408	2.451

a. Dependent Variable: Project Performance

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	Competitive Advantage	Management Capability	Relationship Capability
1	1	3.983	1.000	.00	.00	.00	.00
	2	.009	21.075	.05	.99	.03	.05
	3	.006	26.324	.94	.01	.07	.14
	4	.002	41.815	.01	.00	.89	.81

a. Dependent Variable: Project Performance

```
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA COLLIN TOL
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT PROJECT_PERFORMANCE
  /METHOD=ENTER COMPETENCE COOPERATION COMMITMENT PROJECTMETHODOLOGY ITSYS
TEMS.
```

Regression

Notes

Output Created		06-Dec-2013 14:35:44
Comments		
Input	Data	F:\DBA\DBA Baderi\After VIVA\Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	385
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on cases with no missing values for any variable used.

Syntax		REGRESSION /MISSING LISTWISE /STATISTICS COEFF OUTS R ANOVA COLLIN TOL /CRITERIA=PIN(.05) POUT(.10) /NOORIGIN /DEPENDENT PROJECT_PERFORMANCE /METHOD=ENTER COMPETENCE COOPERATION COMMITMENT PROJECTMETHODOLOGY ITSYSTEMS.
Resources	Processor Time	00:00:00.031
	Elapsed Time	00:00:00.016
	Memory Required	4140 bytes
	Additional Memory Required for Residual Plots	0 bytes

[DataSet1] F:\DBA\DBA Baderi\After VIVA\Data.sav

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	IT Systems, Commitment, Competence, Project Management Methodology, Cooperation[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Project Performance

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.699[a]	.488	.481	.46903

a. Predictors: (Constant), IT Systems, Commitment, Competence, Project Management Methodology, Cooperation

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	79.546	5	15.909	72.318	.000[a]
	Residual	83.376	379	.220		
	Total	162.922	384			

a. Predictors: (Constant), IT Systems, Commitment, Competence, Project Management Methodology, Cooperation

b. Dependent Variable: Project Performance

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.137	.269		.510	.611		
	Competence	.397	.057	.328	6.989	.000	.613	1.631
	Cooperation	.302	.070	.217	4.297	.000	.531	1.882
	Commitment	-.059	.051	-.045	-1.156	.248	.903	1.107
	Project Management Methodology	.346	.047	.332	7.343	.000	.661	1.513
	IT Systems	.004	.043	.004	.104	.917	.721	1.387

a. Dependent Variable: Project Performance

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions					
				(Constant)	Competence	Cooperation	Commitment	Project Management Methodology	IT Systems
1	1	5.942	1.000	.00	.00	.00	.00	.00	.00
	2	.020	17.204	.03	.02	.00	.21	.12	.39
	3	.013	21.122	.02	.02	.00	.03	.67	.52
	4	.013	21.549	.01	.43	.06	.27	.16	.00
	5	.007	28.866	.47	.30	.17	.31	.01	.09
	6	.005	35.162	.47	.23	.76	.18	.05	.00

a. Dependent Variable: Project Performance

```
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA COLLIN TOL
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT PROJECT_PERFORMANCE
  /METHOD=ENTER COMPREHENSION COMMUNICATION.
```

Regression

Notes		
Output Created		06-Dec-2013 14:36:06
Comments		
Input	Data	F:\DBA\DBA Baderi\After VIVA\Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	385
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on cases with no missing values for any variable used.

Syntax		REGRESSION /MISSING LISTWISE /STATISTICS COEFF OUTS R ANOVA COLLIN TOL /CRITERIA=PIN(.05) POUT(.10) /NOORIGIN /DEPENDENT PROJECT_PERFORMANCE /METHOD=ENTER COMPREHENSION COMMUNICATION.
Resources	Processor Time	00:00:00.063
	Elapsed Time	00:00:00.015
	Memory Required	3164 bytes
	Additional Memory Required for Residual Plots	0 bytes

[DataSet1] F:\DBA\DBA Baderi\After VIVA\Data.sav

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Communication, Comprehension[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Project Performance

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.706[a]	.499	.496	.46225

a. Predictors: (Constant), Communication, Comprehension

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	81.298	2	40.649	190.237	.000[a]
	Residual	81.624	382	.214		
	Total	162.922	384			

a. Predictors: (Constant), Communication, Comprehension

b. Dependent Variable: Project Performance

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.434	.233		-1.865	.063		
	Comprehension	.574	.063	.421	9.082	.000	.610	1.640
	Communication	.526	.067	.362	7.809	.000	.610	1.640

a. Dependent Variable: Project Performance

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	Comprehension	Communication
1	1	2.988	1.000	.00	.00	.00
	2	.007	20.724	.95	.33	.08
	3	.005	25.236	.05	.67	.92

a. Dependent Variable: Project Performance

```
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA COLLIN TOL
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT PROJECT_PERFORMANCE
  /METHOD=ENTER CostStrategy QualityStrategy InnovationStrategy.
```

Regression

Notes		
Output Created		06-Dec-2013 14:36:20
Comments		
Input	Data	F:\DBA\DBA Baderi\After VIVA\Data.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	385
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on cases with no missing values for any variable used.

Syntax		REGRESSION /MISSING LISTWISE /STATISTICS COEFF OUTS R ANOVA COLLIN TOL /CRITERIA=PIN(.05) POUT(.10) /NOORIGIN /DEPENDENT PROJECT_PERFORMANCE /METHOD=ENTER CostStrategy QualityStrategy InnovationStrategy.
Resources	Processor Time	00:00:00.062
	Elapsed Time	00:00:00.015
	Memory Required	3460 bytes
	Additional Memory Required for Residual Plots	0 bytes

[DataSet1] F:\DBA\DBA Baderi\After VIVA\Data.sav

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	InnovationStrategy, CostStrategy, QualityStrategy[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Project Performance

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.549[a]	.302	.296	.54652

a. Predictors: (Constant), InnovationStrategy, CostStrategy, QualityStrategy

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	49.122	3	16.374	54.820	.000[a]
	Residual	113.800	381	.299		
	Total	162.922	384			

a. Predictors: (Constant), InnovationStrategy, CostStrategy, QualityStrategy

b. Dependent Variable: Project Performance

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.217	.230		5.299	.000		
	CostStrategy	.271	.059	.261	4.635	.000	.578	1.730
	QualityStrategy	.218	.074	.174	2.945	.003	.525	1.905
	InnovationStrategy	.236	.056	.220	4.203	.000	.668	1.498

a. Dependent Variable: Project Performance

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	CostStrategy	QualityStrategy	InnovationStrategy
1	1	3.969	1.000	.00	.00	.00	.00
	2	.013	17.512	.16	.66	.01	.32
	3	.012	18.235	.64	.01	.00	.61
	4	.007	24.528	.20	.33	.99	.07

a. Dependent Variable: Project Performance