IMPACT OF PROJECT AND ORGANIZATIONAL-RELATED FACTORS ON PROJECT PERFORMANCE OF CONSTRUCTION COMPANIES IN MALAYSIA

SEKAR GOPAL

DOCTOR OF BUSINESS ADMINISTRATION
UNIVERSITI UTARA MALAYSIA
AUGUST 2017

IMPACT OF PROJECT AND ORGANIZATIONAL-RELATED FACTORS ON PROJECT PERFORMANCE OF CONSTRUCTION COMPANIES IN MALAYSIA

By

SEKAR GOPAL

Dissertation Submitted to
Othman Yeop Abdullah Graduate School of Business,
Universiti Utara Malaysia,
In Fulfillment of the Requirement for the Degree of Doctor of Business Administration

OTHMAN YEOP ABDULLAH GRADUATE SCHOOL OF BUSINESS
UNIVERSITI UTARA MALAYSIA

PERAKUAN KERJA TESIS / DISERTASI
(Certification of thesis / dissertation)

Kami, yang bertandatangan, memperakukan bahawa
(We, the undersigned, certify that)

SEKAR GOPAL

calon untuk Ijazah **DOCTOR OF BUSINESS ADMINISTRATION**
(candidate for the degree of)

telah mengemukakan tesis / disertasi yang bertajuk:
(has presented his/her thesis / dissertation of the following title):

IMPACT OF PROJECT AND ORGANIZATIONAL RELATED FACTORS ON PROJECT PERFORMANCE OF CONSTRUCTION COMPANIES IN MALAYSIA

seperti yang tercatat di muka surat tajuk dan kulit tesis / disertasi.
(as it appears on the title page and front cover of the thesis / dissertation).

Bahawa tesis/disertasi tersebut boleh diterima dari segi bentuk serta kandungan dan meliputi bidang ilmu dengan memuaskan, sebagaimana yang ditunjukkan oleh calon dalam ujian lisan yang diadakan pada: **25 Mei 2017.**
(That the said thesis/dissertation is acceptable in form and content and displays a satisfactory knowledge of the field of study as demonstrated by the candidate through an oral examination held on: ***25 May 2017.***

Pengerusi Viva *(Chairman for Viva)*	: **Prof. Dr. Shahizan Hassan**	Tandatangan *(Signature)*	
Pemeriksa Luar *(External Examiner)*	: **Prof. Dato' Ir. Dr. Wan Hamidon Wan Badaruzzaman**	Tandatangan *(Signature)*	
Pemeriksa *Dalam* *(Internal Examiner)*	: **Dr. Martino Luis**	Tandatangan *(Signature)*	

Tarikh: **25 Mei 2017**
(Date)

Nama Pelajar (Name of Student)	:	**Sekar Gopal**
Tajuk Tesis / Disertasi *(Title of the Thesis / Dissertation)*	:	Impact of Project and Organizational Related Factors on Project Performance of Construction Companies in Malaysia
Program Pengajian *(Programme of Study)*	:	**Doctor of Business Administration**
Nama Penyelia/Penyelia-penyelia *(Name of Supervisor/Supervisors)*	:	**Prof. Dr. K. Kuperan Viswanathan**

Tandatangan
(Signature)

PERMISSION TO USE

In presenting this dissertation in fulfillment of the requirements for a Post- Graduate degree from the Universiti Utara Malaysia (UUM), I agree that the Library of this university can make it freely available for inspection. I further agree that permission for copying of this dissertation in any manner, whole or in part, for scholarly purposes, may be granted by my supervisors or in their absence, by the Dean of Othman Yeop Abdullah Graduate School of Business, where I did my dissertation. It is understood that any copying or publication or use of this dissertation or parts of it for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to the Universiti Utara Malaysia (UUM) for any scholarly use, which may be made of any material in my dissertation.

Request for permission to copy or to make other use of materials in this dissertation, in whole or in part, should be addressed to:

Dean of Othman Yeop Abdullah Graduate School of Business
Universiti Utara Malaysia
06010 UUM Sintok
Kedah Darul Aman

ABSTRACT

The objective of this study was to examine and investigate the impact of project-related factors and organizational-related factors on the project performance of construction companies in Malaysia. The performance of construction companies is crucial for the economic development of the country and there are various factors which affect their performance. Past studies on project performance have been skewed towards project-related factors such as client, contractor, consultant, material, labor and equipment, contract, external and project management tools/techniques. Through the literature review, it was noticed that a research gap exists, whereby, for the success of a project, not only are project-related factors important, organizational-related factors are important too. Taking a lead from here, the most important organizational-related factors, such as leadership, organizational culture, innovation and learning organization were chosen and used in this study to examine and investigate the impact of these organizational factors on project performance. A pilot study was carried out and the instrument reliability was ascertained. The population for this study was the construction companies in Malaysia registered with the Construction Industry Development Board (CIDB) under the Grade 7 category. This quantitative study was carried out with a survey questionnaire. 1,071 questionnaires were sent to project managers of construction companies and 360 responses were received with a response rate of 33.61%. The collected data were analyzed using the Statistical Package for Social Science version 22 (SPSS) for descriptive, reliability, validity and relative importance index analysis. The results of the study indicate that organizational-related factors have a greater significant impact on project performance over project-related factors. Thus, the outcome of the study is useful for the construction industry practitioners to understand the importance of organizational factors and to implement them in their organizations to improve project performance.

Keywords: construction, project performance, project-related factors, organizational-related factors.

ABSTRAK

Objektif kajian ini adalah untuk mengkaji dan menyiasat kesan faktor-faktor yang berkaitan dengan projek dan organisasi terhadap prestasi projek syarikat pembinaan di Malaysia. Prestasi syarikat pembinaan sangat penting untuk pembangunan ekonomi negara dan terdapat pelbagai faktor yang mempengaruhi prestasi syarikat berkenaan. Kajian lepas tentang prestasi projek adalah lebih cenderung kepada faktor-faktor yang berkaitan dengan projek seperti klien, kontraktor, perunding, bahan, buruh dan peralatan, kontrak, faktor luaran dan alat atau teknik pengurusan projek. Melalui kajian literatur, didapati bahawa wujudnya jurang penyelidikan, iaitu untuk mencapai kejayaan dalam sesuatu projek bukan sahaja faktor-faktor yang berkaitan dengan projek yang penting, malah faktor-faktor yang berkaitan dengan organisasi juga adalah penting. Oleh itu, faktor-faktor yang berkaitan dengan organisasi seperti kepimpinan, budaya organisasi, inovasi dan organisasi pembelajaran telah dipilih dan digunakan dalam kajian ini untuk mengkaji dan menyelidik kesan faktor-faktor organisasi ini terhadap prestasi projek. Kajian perintis dijalankan dan kebolehpercayaan instrumen telah dikenal pasti. Populasi untuk kajian ini adalah syarikat pembinaan di Malaysia yang berdaftar dengan Lembaga Pembangunan Industri Pembinaan (CIDB) di bawah kategori Gred 7. Kajian ini adalah suatu kajian kuantitatif yang dilaksanakan dengan menggunakan kaedah soal selidik tinjauan. Sejumlah 1 071 soal selidik telah dihantar kepada pengurus projek syarikat pembinaan dan 360 borang telah diterima dengan kadar tindak balas sebanyak 33.61%. Data yang dikumpulkan dianalisis dengan menggunakan Pakej Statistik untuk Sains Sosial versi 22 (SPSS) untuk analisis indeks deskriptif, kebolehpercayaan, kesahihan dan analisis relatif. Hasil kajian menunjukkan bahawa faktor-faktor yang berkaitan dengan organisasi mempunyai kesan yang lebih besar terhadap prestasi projek berbanding faktor-faktor yang berkaitan dengan projek. Oleh itu, hasil kajian ini berguna bagi pengamal industri pembinaan agar dapat memahami kepentingan faktor-faktor organisasi dan melaksanakannya dalam organisasi masing-masing bagi meningkatkan prestasi projek.

Kata kunci: pembinaan, prestasi projek, faktor-faktor berkaitan dengan projek, faktor-faktor berkaitan dengan organisasi

ACKNOWLEDGEMENT

Sincere thanks and gratitude to my supervisor, Prof. Dr. Kuperan Viswanathan, for his excellent guidance, motivation, commitment, support and positive and enthusiastic feedback from day one till completion of this dissertation, for helping me to understand the DBA research process in detail and for taking me under his academic wings till completion of this long but beautiful learning journey. His humble and fatherly traits are excellent life-long learning traits.

Sincere thanks and gratitude to my *guru*, Prof. Dr. Murali Sambasivan, who literally walked along with me during the entire course of the research, guiding me, teaching me, advising me and spending his valuable time tirelessly in a simple, humble and spiritualistic way. If not for him, I would not have reached this far in my research studies. His way of living is truly commendable.

Humble submission of this dissertation and prayers to my Lord, Jagadguru Sri Chandrasekarandra Saraswathi Swamigal, for blessing me with such good professors (Prof. Kuperan and Prof. Murali) to learn from them and for giving me this opportunity to study this DBA program.

My sincere thanks and gratitude to UUM, all the professors and administrative staff of OYAGSB who taught me and guided me in this DBA program. Sincere thanks to Rezzen (KL) and my classmates who shared their insightful knowledge and showed compassion during this program. Finally, my sincere thanks go to my beloved wife, Mrs. Mallika Sekar and my little son, Krishna Sekar, for bearing with me and for supporting me in various ways over this three-year memorable journey.

TABLE OF CONTENTS

CHAPTER THREE METHODOLOGY

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

BCM	-	Billion Cubic Meters
B/D	-	Barrel / Day
BETA (ß)	-	Standard co-efficient value
BIM	-	Building Information Modeling
BNM	-	Bank Negara Malaysia
BRT	-	Rapid Transport Bus
C	-	Cost
C,B&I	-	Civil, Building & Infrastructure construction sector
CITP	-	Construction Industry Transformation Program
CIDB	-	Construction Industry Development Board
CPM	-	Critical Path Method
CRM	-	Customer Relationship Management
CSF	-	Critical Success Factors
CV	-	Control Variable
DOSH	-	Department of Occupational Safety & Health
DLOQ	-	Dimensions of Learning Organization Questionnaire
DLP	-	Defect Liability Period
DV	-	Dependent Variable
EDMS	-	Electronic Data Management Systems
EOT	-	Extension Of Time
EPC	-	Engineering, Procurement and Construction
ERP	-	Enterprise Resource Planning
ETP	-	Economic Transformation Program
F	-	Financial
FMCS	-	Field Control Management Systems
G1	-	Grade 1
G7	-	Grade 7
GANTT	-	Project schedule
GDP	-	Gross Domestic Product
GST	-	Goods and Services Tax
H	-	Hypothesis
HMS	-	History Management Systems
HSE	-	Health, Safety & Environment
IBS	-	Industrial Building Systems
ISO	-	International Organization for Standardization
IT	-	Information Technology
IV	-	Independent Variable
KL	-	Kuala Lumpur
KM	-	Kilo Meter
KPI	-	Key Performance Indicator
KPQ	-	Key Performance Questions
KVMRT	-	Klang Valley Mass Rapid Transport
LRT	-	Light Rail Transport

L&VL	-	Large & Very Large construction companies
LTA	-	Lost Time Accident
MBAM	-	Mega Builders Association of Malaysia
M&E	-	Mechanical & Electrical
MS	-	Micro Soft
N	-	Number of samples
NCR	-	Non-Conformance Report
NIOSH	-	National Institute of Occupational Safety & Health
NPEC	-	Net Project Execution Cost
NPOV	-	Net Product Operation Value
O&G	-	Oil & Gas
OVERALL	-	Overall construction industry
P	-	Project
P VALUE	-	Significant Value
PEP	-	Project Execution Plan
PERT	-	Program Evaluation and Review Technique
PEMANDU	-	Performance Management And Delivery Unit
PETRONAS	-	Petroliam Nasional Berhad
PM	-	Project Management
PMBOK	-	Project Management Body Of Knowledge
PMI	-	Project Management Institute
PMP	-	Project Management Professional
PMS	-	Performance Measurement Systems
PPMS	-	Project Performance Monitoring Systems
PQP	-	Project Quality Plan
Q	-	Quality
QCMS	-	Quality Control Management Systems
QLASSIC	-	Quality Assessment System In Construction
QMS	-	Quality Management Systems
R&D	-	Research & Development
RII	-	Relative Important Index
ROA	-	Return On Asset
ROE	-	Return On Equity
ROI	-	Return On Investment
RM	-	Ringgit Malaysia
RQ	-	Research Question
S	-	Safety
S&M	-	Small & Medium
SME	-	Small & Medium Enterprise
SOP	-	Standard Operating Procedures
SPSS	-	Statistical Package for Social Science
T	-	Time
TCE	-	Transaction Cost Economics
TOC	-	Table Of Contents
UCUA	-	You See You Act
UK	-	United Kingdom

USA	-	United States of America
USD	-	United States Dollar
VIF	-	Variation Inflation Factor
VO	-	Variation Order
WBS	-	Work Breakdown Structure
Y-O-Y	-	Year Over Year

CHAPTER ONE

INTRODUCTION

"Project management is like juggling three balls – time, cost and quality. Program management is like a troupe of circus performers standing in a circle, each juggling the three balls and swapping balls from time to time (Reiss, 2013)."

1.1 Background of the study

The construction industry is the backbone of economic transformation in any country. Universally, the performance of the construction industry is a direct indicator of the state of a country's economy and its performance is vital and crucial for the country's economic activities. The higher the performance of the construction industry, the higher the economic growth and vice versa. As most of the economic activities of nations are spun around the construction industry, it is of paramount importance for every country to ensure that the construction industry is doing well and the organizations involved in these activities are also doing well. The following Tables 1.1 and 1.2 show the world's gross domestic product (GDP) growth rate in the year 2015 for the key regions in the world and the construction industry's market size of the major economies as well as the predicted key construction markets in the year 2020. It can be seen from the these Tables that the GDP growth rate for Asia, including Malaysia, is the highest in the world at around 6.0%, which is an indicator that economic activities, including construction activities in Malaysia, are contributing to the high GDP growth rate. The Malaysian government has rolled out a construction industry transformation program (CITP) in the year 2015 to support the construction industry to ensure its performance, which is a facilitator for achieving the national economic transformation program (ETP) of Malaysia.

Table 1.1
World's GDP growth rate as at 2015

Sl. No.	Geography	GDP growth rate in %
1	North America	3.2
2	Latin America	2.8
3	Western Europe	1.4
4	Eastern Europe	2.1
5	Middle East / North Africa	4.1
6	Sub Saharan Africa	4.5
7	Asia (Excluding Japan, Australia & New Zealand	6.0
8	Japan	1.6
9	Australia	2.7

Source: World bank GDP statistics (2015).

Table 1.2
Top 10 construction markets in 2009 and 2020

Country	Market size in 2009 in USD (Billion)	World market share in 2009	Predicted top 10 markets in 2020
USA	1,132	17.4%	China
China	1,034	13.7%	USA
Japan	592	7.9%	India
Germany	303	4%	Japan
Spain	292	3.9%	South Korea
France	270	3.6%	Germany
Italy	262	3.5%	Spain
South Korea	248	3.3%	Russia
India	247	3.3%	UK
UK	243	3.2%	Canada

Source: Global construction 2020 report (USA – United States of America, UK – United Kingdom).

There are many factors which impact the performance of the construction projects in each country. Some factors are unique to the project itself, some factors are unique to the country itself and some factors are common for all the construction projects globally. According to Davies (2002), there are two distinctive groups of factors, which impact project performance in construction companies. The first group of factors is known as hard factors (project-related factors) and the second group of factors is known as soft factors (organizational-related factors). Project-related factors refer to factors which directly impact construction project performance, such as client, contractor, consultant, material, labor and equipment, external and project management tools/techniques related factors. On the other hand, organizational-related factors refer to indirect factors, which impact project performance indirectly, such as leadership, organizational culture, innovation and learning organization. Studying these factors impacting project performance of the construction companies is important for the sustainability and growth of the construction industry.

Thus, being a developing country with the aim to achieve developed nation status by 2050, Malaysia is heavily investing in construction projects to develop infrastructure facilities. This has created opportunities for the construction industry sectors, such as civil, building and infrastructure construction, marine construction, oil and gas construction and multi-discipline construction. However, there were challenges for Malaysia in the year 2015, due to falling oil prices, introduction of goods and services tax (GST), weaker currency, rising inflation, fiscal deficit and so on. Thus, it is important to study the factors which impact the performance of construction projects in Malaysia to assist the industry and professionals to understand and mitigate the issues related to the performance of the projects of the construction industry. Malaysia’s GDP annual growth rate and its GDP from construction are shown in figure 1.1 and 1.2 below.

Figure 1.1
Malaysia’s GDP annual growth rate
Source: www.tradingeconomics.com, Department of Statistics, Malaysia

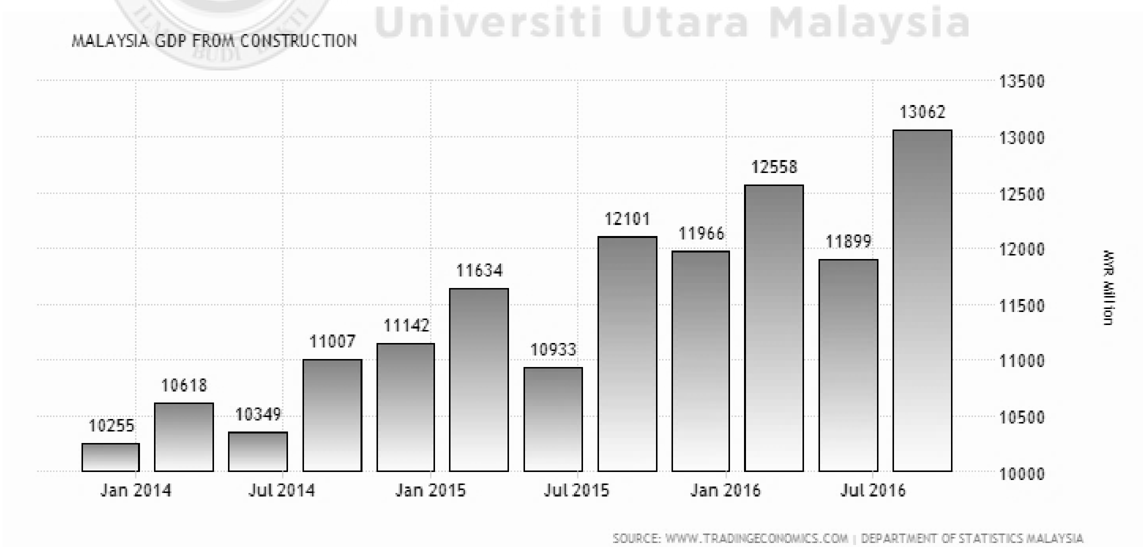


Figure 1.2
Malaysia’s GDP from construction
Source: www.tradingeconomics.com, Department of Statistics, Malaysia

1.1.1 The Malaysian construction industry

The Malaysian construction industry is one of the top five economic drivers of the country, after oil and gas, palm oil, manufacturing and services. According to the World Bank (2015), the construction industry accounts for 10% of the country's GDP of USD 313.2 billion, which is USD 31.3 billion per year. According to the Department of Statistics & Construction Industries Development Board of Malaysia (CIDB) (2015), a total of 1,075,950 workers were working with 152,868 construction companies, which were involved in construction activities in the country to stimulate economic growth and revenue. The Malaysian Government supports the construction industry by identifying suitable infrastructure projects every year, which can help the country's economic policies and plans. This has created a pool of skilled trades in the construction industry in civil, building and infrastructure construction, marine construction, oil and gas construction and multi-discipline construction sectors. The Malaysian economy saw GDP growth decelerating from 5.2% in 2014 to 5.0% in 2015 and to 4.2% in 2016, due to various factors. According to the Bank Negara Malaysia (BNM) Annual Report (2014), in 2015 and 2016, there were signs of weakening consumer demand caused by the combination of monetary tightening and high levels of household debt.

1.1.2 Civil, building and infrastructure construction sector

Malaysia's civil, building and infrastructure construction industry outlook remains stronger for the years 2015 - 2017 due to the announcement of the following mega-projects (Refer to Table 1.3) by the Government of Malaysia.

Table – 1.3

List of 2015/ 2016 projects and estimated value in Ringgit Malaysia (RM) in the Malaysian budget

Project (2015 / 2016)	Estimated value in billion Ringgit Malaysia (RM)
Rail – lines	
1. KVMRT line 2	28.0
2. LRT 3	10.0
3. Upgrading the East Coast railway line	0.150
4. Rapid Transport Bus (BRT)	2.5
5. KL – Singapore high speed rail	Not available
Roads and highways	
1. 1,663 km Pan-Borneo highway	28.9
2. 276 km West Coast Expressway	5.0
3. 59 km Sungai Besi-Ulu Klang Expressway	5.3
4. 47 km Damansara-Shah Alam Expressway	4.2
5. 36 km Eastern Klang Valley Expressway	1.6
6. 635 km of rural roads	0.943

Source: Ministry of Finance, Malaysia - Budget 2015, 2016

This sector's GDP remained at 10% for the year 2015 amidst challenges posed by declining oil prices, implementation of GST, escalation of construction material costs, labor shortage, the Government's fiscal policies and compounded effect of all these on private sector investment in construction and property development markets of Malaysia.

1.1.3 Marine construction sector

According to the Ministry of Transport (2015), Malaysia has 47 active marine ports, of which nine are major ports handling the bulk of the trade. These 47 ports need expansion, upgrading and maintenance regularly to meet the economic growth of the country. Malaysia's main ports volume grew by 2-4% in year 2015, lagging slightly behind the growth of the wider economy. Port Klang and Port Tanjung Pelepas continue to benefit from expansion projects and development that were completed over the last two years.

The marine industry believes that the net effect is marginally negative, as they lead to lower oil sector production and investment, currency depreciation and lower government spending. But there are positive effects as well, with the non-oil economy making some savings, and non-oil exporters benefitting from a more competitive exchange rate. Data on 2014 exports shows strong performance for the electronics and semi-conductors industry. Looking at the long-term, according to the Ministry of Transport (2015), the marine industry expects a growth rate of 4.2% on average during the period 2016-2024. This is below the 5.1% rate seen over the past decade. Thus, the marine construction industry is not seriously affected by the current economic situation in the country and remains stable.

1.1.4 Oil and gas construction sector

The recent crash in oil prices from USD 115/barrel in January 2014 to USD 50/ barrel in December 2014 (Bloomberg & Factset and Goldman Sachs Global Investment Research, 2015) (Refer to Figure 1.3) has emerged as a major risk and drastically changed the outlook for the Malaysian economy and market. Oil and gas (O&G) products contribute to 25-30% of exports and more than 25% of government revenue. According to the Performance Management and Delivery Unit of Malaysia (PEMANDU) and BNM, the oil and gas industry accounts for roughly 20% of Malaysia’s GDP. In other words, the negative spillover implications of a sustained period of lower oil prices could be detrimental to the domestic economy.

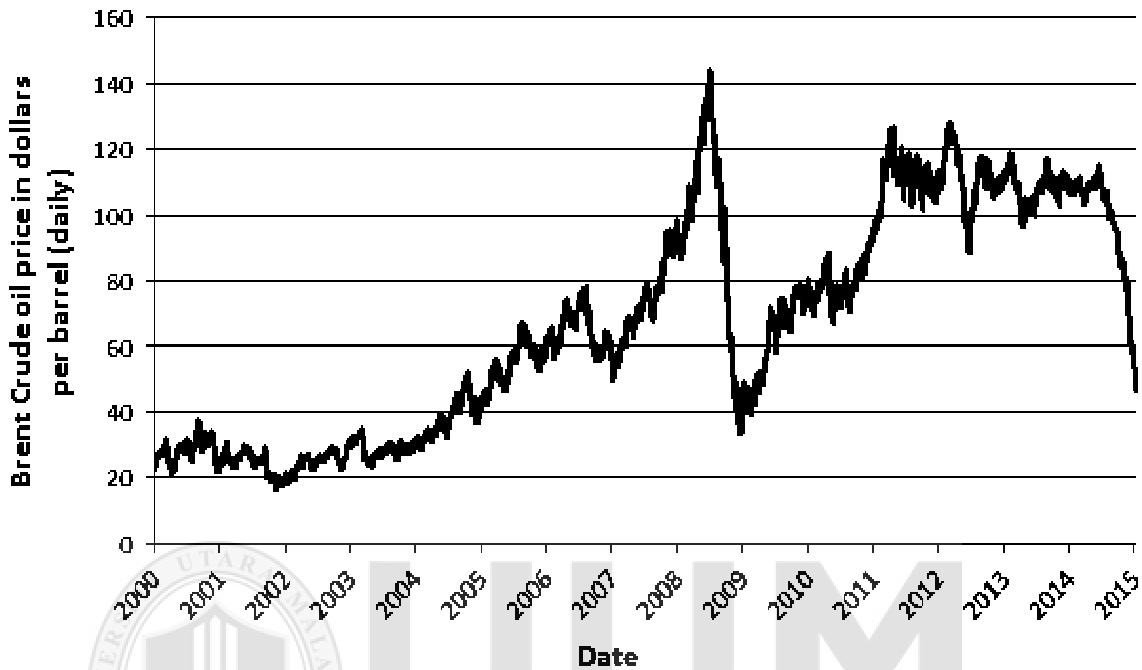


Figure 1.3
Brent crude oil price in dollars
Source: Google crude oil price trend, (2015).

With oil prices hitting multi-year lows, the oil and gas sector seems to be looking bleaker by the day. The latest development in global oil markets has sent shock waves across the Malaysian market as oil and gas counters have fallen by -41.4% on average since end of June, while dragging down the broader market as of 16 December 2014. In light of the falling oil prices, in the beginning of the year 2015, PETRONAS (Petroliam Nasional Berhad) announced budget cuts on its capital expenditure from the current RM60 billion per year capital expenditure by 15 to 20% and may delay new projects. The capital expenditure or production cut by PETRONAS has led to lower corporate earnings and loss of jobs in the industry. This has posed challenges to the oil and gas construction market in Malaysia and there exists stiff competition among the oil and gas construction players in the market to acquire oil and gas projects for their business sustainability.

1.1.5 Multi-discipline construction sector

Due to the competitiveness of the Malaysian construction industry and government policies on promoting foreign construction companies to bid for competitive prices for mega-projects in Malaysia, the local construction industry players were forced to learn and enter into multi-discipline project construction, such as buildings, ports, airports, highways, O&G platforms, steel fabrication and piping fabrication. This is to ensure sustainability of their businesses in the long-run and to manage the operations of the company without serious losses if one of the construction sectors is not doing well due to various issues associated with that particular sector. In 2016, the CIDB has listed Malaysia's top ten construction companies (UEM group, YTL Corporation, IJM Corporation, Gamuda, Malaysian Resources Corporation, WCT group, Kumpulan Europlus, Hock Seng Lee, Mudajaya group and Muhibbah engineering) as examples of leading construction companies that are engaged in multi-discipline construction activities, such as civil, building, infrastructure, marine, O&G, property development and engineering consultancy.

1.1.6 Motivation for the study

1.1.6.1 Time and cost overruns of projects

In addition to the macroeconomic concerns, Malaysia‘s inherent project performance issues, such as cost overruns, delays and safety issues are part and parcel of the industry’s ongoing challenges. Its magnitude can be seen from the studies of Bronte (2015) who studied the time and cost overruns of some of the major construction projects in the world. It is evident that time and cost overruns of construction projects around the globe are matters of concern. In the Malaysian context as well, according to Endut, Akintoye and Kelly (2009), cost overruns of projects were in the range of 0 to 30% in public projects and 0 to 20% in private projects. Similarly, with respect to time overruns of projects in Malaysia, it ranged from 0 to 20% in public projects and 0 to 30% in private projects (Refer to Figures 1.4 & 1.5).

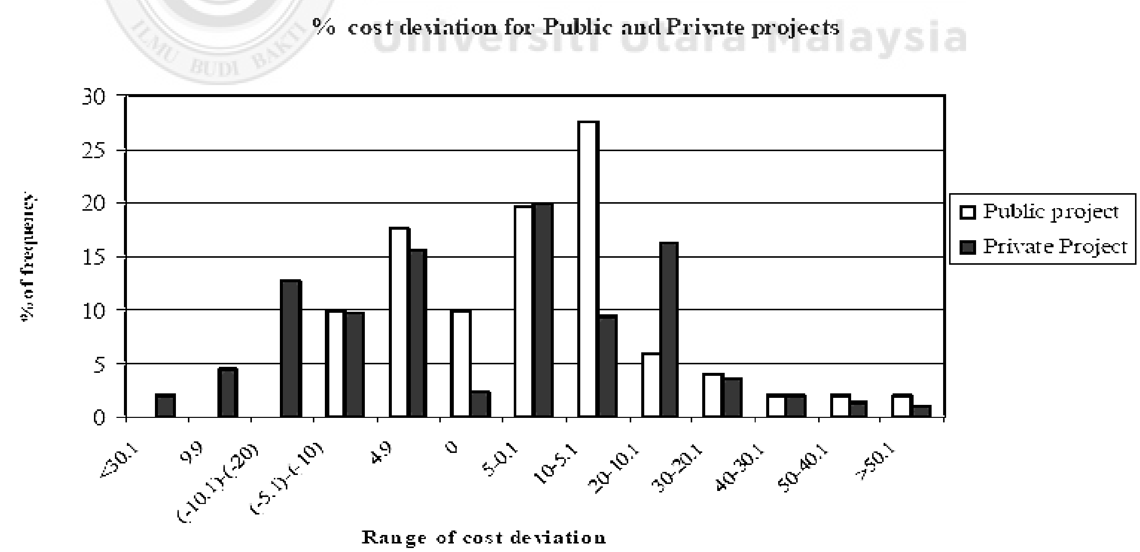


Figure 1.4
Cost overruns in public and private projects of Malaysia
Source: Endut et al. (2009).

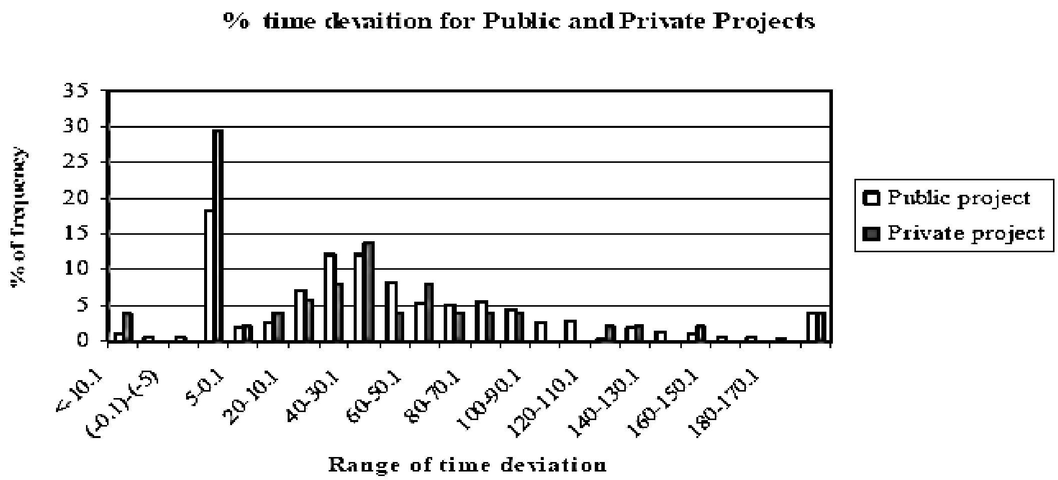


Figure 1.5
Time overruns in public and private projects of Malaysia
Source: Endut et al. (2009).

According to Memon, Rahman and Azis (2012), the cost overruns in construction projects of Malaysia ranged from 0 to 15% for 72% of small projects and more than 15% for 28% of small projects. Similarly, in the case of large projects, the cost overruns ranged from 0 to 15% for 88.7% of large projects and more than 15% for 11.3% of large projects, respectively, as shown in Table 1.4.

Table 1.4
Cost overruns of small and large projects in Malaysia

Extent of Cost Overrun	**Small projects**		**Large Projects**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
0%	0	0	4	4.1
1-5%	5	20.0	15	15.5
5-10%	8	32.0	59	60.8
10-15%	5	20.0	8	8.2
More than 15%	7	28.0	11	11.3

Source: Memon et al. (2012).

1.1.6.2 Quality-related issues in projects

Xiao and Proverbs (2002) studied the quality performance of construction contractors in the USA, the UK and Japan and found that there exist varying levels of contractor's quality. Japanese contractors' construction projects have fewer defects when compared to the USA and the UK. On the other hand, the USA and the UK contractors provide longer defect liability period compared to Japanese contractors. According to CIDB, quality levels vary between contractors in Malaysia and quality-related issues are prevalent in the industry.

1.1.6.3 Safety-related issues in projects

In addition to time overruns, cost overruns and quality variations in projects due to various factors, safety issues, such as accidents, incidents, fatalities and loss of assets are some of the serious problems faced by the construction organizations around the globe. The Malaysian construction industry is not an exception to this global safety-related phenomenon. Chong and Low (2014) studied the accidents in the Malaysian construction industry and found that despite a declining trend in the number of accidents, fatalities and accidents continued to happen in the construction industry. According to the Department of Occupational Safety and Health's (DOSH) statistics on fatality rates, construction fatalities are the highest among all the other sectors. The following figure 1.6, illustrate the fatality statistics of the Malaysian construction industry from 2006 to 2016, while Table 1.5 below shows the sector wise fatality statistics for the year 2016.

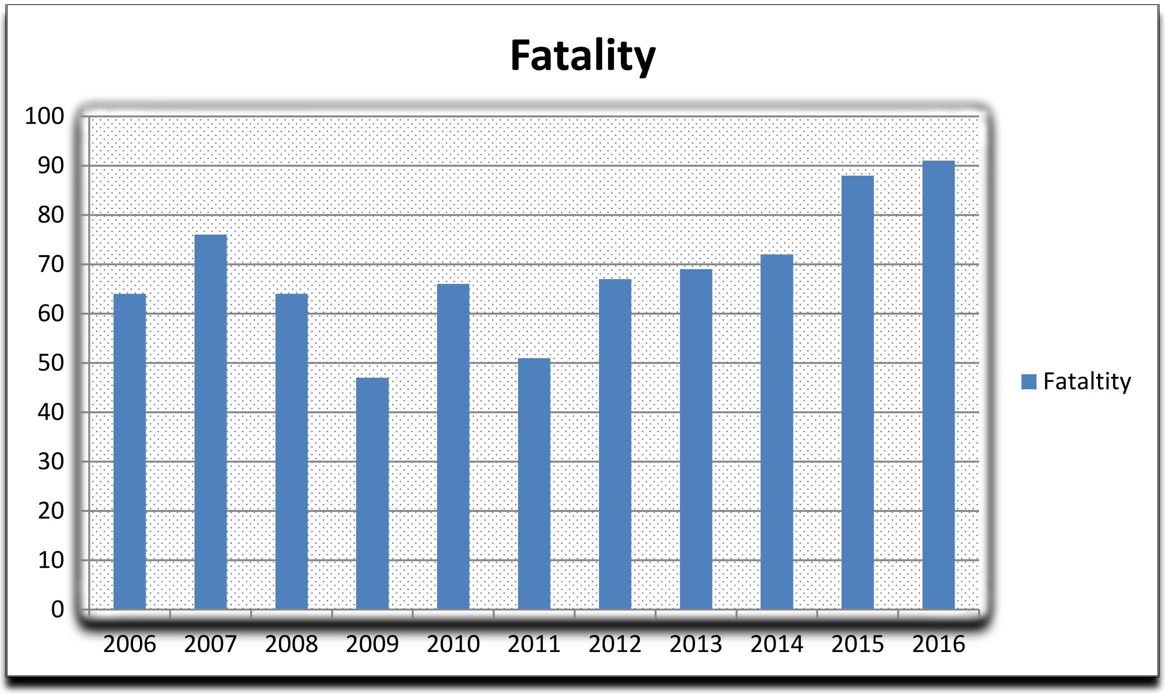


Figure 1.6
Construction fatality statistics of Malaysia
Source: Department of Occupational Safety and Health, Malaysia (2016).

Table 1.5
Sector wise fatality statistics of Malaysia 2016

No.	Sector	Total
1	Manufacturing	68
2	Mining and Quarrying	4
3	Construction	91
4	Agriculture, Forestry, Logging and Fishery	23
5	Utility	2
6	Transport, Storage and Communication	12
7	Wholesale and Retail Trade	0
8	Hotel and Restaurant	3
9	Financial, Insurance, Real Estate and Business Services	14
10	Public Services and Statutory Bodies	6
	Total	**223**

Source: Department of Occupational Safety and Health, Malaysia (2016).

Thus, under the given circumstances described above, the project performance of construction companies in Malaysia is an important area, which needs to be studied to understand the various factors that drive and impact project performance in terms of time, cost, quality, safety and financial performance. This can help the overall construction industry. The above project performance issues (time, cost, quality, safety & financial) faced by the construction industry form the motivation for this research study.

1.2 Problem statement

Construction projects around the world suffer from issues like time overruns, cost overruns, quality problems, contract management disputes, scope changes, design changes, client interference, stop-works, project abandonment, subcontractor problems, labor shortage, financial problems, design failures, material problems and so on. The Malaysian construction industry is not an exception to these global phenomena. In the last two decades, more than 25 research studies have been carried out in several parts of the world on the various causes and its effects on project success in terms of time and cost. For example, Assaf and Hejji (2006) found 73 causes which influence project success, while Sambasivan and Soon ((2007) found 10 major causes. They also found that 70% of the construction projects experience 10–30% of time overrun against their original schedules and the cost overrun in the projects is approximately 20% of the original budgeted cost. Further, these studies have revealed that multiple factors impact project performance in the construction industry in terms of its time and cost.

With regards to project performance, since most of the research studies in the past have been mainly focused on time and cost performance of projects, impact on project performance with respect to quality, safety and financial performance needs to be known. This is a research gap, which need to be studied. For example, Shrnhur, Levy and Dvir (1997), Atkinson (1999) and Cicmil and Hodgson (2006) suggested studying further time, cost, quality and other dimensions of project performance. Lim and Mohamed (1999) suggested investigating further the various factors and models which influence projects and its performance. Quality issues like defects, repairs, reworks, failures are inherent too in the construction projects together with time and cost issues. Similarly, safety-related issues such as accidents, incidents, fatalities are the highest in the construction industry in comparison to the other sectors, which impacts the project performance significantly. Impact on time, cost, quality, safety performance in construction projects lead to impact on the financial performance of the project.

Technological changes and improved construction methodologies, although complimenting project performance to an extent, the problem of time overrun, cost overrun, quality issues and other project performance/success-related issues, are still prevalent in many of the construction projects around the world, which researchers are striving to explore further. This research gap related to five dimensions of project performance such as time, cost, quality, safety and financial is studied in this research.

Davies (2002) stated that human factors (labor-related factors) for project success have not been studied in detail and need to be studied further. Ling, Low, Wang & Lim (2009) suggested the study of the quality of contract management and its impact on construction projects. Memon et al. (2014) suggested studying the impact of construction materials' price fluctuation, shortage and client interference on project performance. Marzouk and El-Rasas (2014) suggested studying the client, contractor and consultant perspectives which impact project performance. Olaniran (2015) suggested the study of the impact of cost-based contractor selection on project performance. Sadkowska (2016) suggested studying the stakeholders' risk on project performance.

Hamzah, Khoiry, Arshad, Badaruzzaman, and Tawil (2012) found in their research studies that, there are 24 factors related to client, contractor, consultant, material, labor & equipment and external, which causes the delay in construction projects in Malaysia.

Tawil, Khoiry, Arshad and Badaruzzaman (2013), found in their research studies that, contractors inability to manage working capital, delay in advance payment by client, delay in approvals by client and consultants, scarcity of construction materials, contractors poor site management practices and additional scope of works given by the client are the factors, which leads to delays in Government construction projects in Malaysia. Truman (2014) found in his study that failure of the project management team to adequately plan, inadequate human resources, failure to control cost and scope changes throughout the project are some of the factors leading to poor project performance. Memon, Rahman, Abdullah and Aziz (2014) found in their studies that raw material price fluctuation, cash flow and financial difficulties faced by contractors, shortage of workers, lack of communication and incorrect planning, are the severe factors which affect project performance in Malaysian construction companies. Olaniran (2015) found in his study that selection of contractors based on lower cost is the main reason for poor project performance. All the above studies were on the relationship and or the impact of project-related factors on project performance of construction projects with respect to time and cost only. Not many studies had been carried out empirically to test the impact of these project-related factors on project performance with respect to quality, safety and financial performance in addition to time and cost. The above indicates the research gap with respect to project performance dimensions other than time and cost, which is studied in this research.

Several studies have been conducted on factors which influence project success/ performance over the last 40 years around the globe, including in Malaysia. Still, the issues of project delays, cost overruns, quality issues, project abandonment and project failures continue and there has been no improvement in the status. This prompts us to think whether there are some other factors other than those project-related factors, such as client, contractor, consultant, material, labor and equipment, contract management, external and project management tools/techniques which are significantly impacting project performance. For example, previous researchers have pointed out that leadership styles of project managers (Nixon, Harrington & Parker, 2012), culture of the organization (Abdul, Sambasivan & Johari, 2003), level of innovation initiatives of the organization (Huang & Liu, 2005) and learning organization initiatives (Garvin, 1985) are important to achieve success in projects and to sustain long-term success.

Similarly, Pollack (2007) suggested expanding the research on soft factors and their influence on project performance. Nixon et al. (2012) and Olivera, Luiz Veriano, Olivera and Possamai (2012) suggested that leadership quality of project managers and its impact on project performance can be studied further. Haniff and Ogunlana (2015) suggested studying the impact of leadership on project performance in highly complex client systems. Misic and Radujkovic (2015) suggested studying the competence development of project managers and its impact on project performance. Henri (2006) suggested studying organizational values, diversity of measurement and use of performance measurement systems (PMS) to improve organizational performance. He further suggested that other than PMS, other dimensions of organizational culture and its impact on organizational performance could be studied. Hussein, Ahmad and Zidane (2015) suggested the study of the role of top management support (related to organizational culture) and its impact on project performance. Diugwu, Mohaamed and Baba (2015) suggested studying the factors which impede the application of project management principles in construction projects.

Additionally, factors, such as innovation and learning organization and its impact on project performance, have not been studied empirically in the construction industry so far. For example, Fernandes, Ferreira and Raposo (2013) suggested that further studies need to be carried out on innovation and its impact on financial performance of an organization. They also stressed on examining the factors of cooperation and cooperative activities that promote innovation in the construction industry. Hashi and Stojčić (2013) and Saunila (2014) suggested the study of the impact of innovation capabilities on a firm's performance. Kaliprasad (2006) and Pounder (2009) suggested studying the cost of establishing high performance culture in an organization and its return on investment (ROI) factors that influence organizational performance. They further suggested that influence of learning organization and its impact on organizational performance could also be studied.

Despite the above mentioned authors' findings on the importance of leadership, organizational culture, innovation and learning organization-related factors, the reason for conducting this study on organizational-related factors is that the study carried out by Nixon et al. (2012) is a theoretical review study and there is no empirical study result available to support their conclusion. Hence, leadership and its impact on project performance need to be studied empirically. Also, the studies carried out with respect to organizational culture by Abdul et al. (2003) are only on the non-construction public listed companies in Malaysia. Thus, for the construction sector, organizational culture and its impact on project performance need to be studied. With respect to innovation, the studies carried out by Huang and Liu (2005) is on information technology project performance and not on construction projects. Thus, to validate the impact of innovation-related factors and its impact on project performance in the construction industry, these need to be studied. With respect to learning organization and its impact on project performance, the study carried out by Garvin (1985) is on innovation and firm performance, which is not an empirical study. The study was carried out in the USA in four big multinational companies using a theoretical and case study approach. The relevance to construction projects needs to be empirically tested and hence, this study is needed in this area.

Project managers and decision-makers of the construction industry are continuously facing the problem of poor project performance in many of the projects undertaken. This justifies the need to know the impact of leadership, organizational culture, innovation and learning organization initiatives (organizational-related factors) on project performance to better understand the relationship between each of these factors and its impact on project and organizational performance.

The above literature review on impact of soft factors on project performance reveals that, not many studies have been conducted on the impact of soft factors (organizational factors, such as leadership, organization culture, innovation and learning organization) on project performance. Thus, there exists a research gap in which, we need to know how and the extent to which leadership, organization culture, innovation and learning organization impact project performance of construction companies. This aspect is studied in this research.

The construction industry in Malaysia is diversified and broadly categorized as four main construction sectors. They are civil, building and infrastructure, marine, oil and gas and multi-discipline. The project scope of works, dynamics, business needs, expectation of the stakeholders and the project performance issues faced by these construction sectors are very much different with respect to each other. Hence, the project and organizational-related factors which impacts significantly on the project performance of these construction sectors are different too. Not many studies in the past had been carried out on this area and hence, the problems on project performance issues continue in these sectors. Thus, there exists a research gap in this area, which is studied in this research.

Additionally, size of the organization is an important factor in determining the key business processes, level of stakeholders engagement, leadership qualities required, organizational culture that need to be nurtured, need for innovation in the organization and for deciding on the learning initiatives required for the organization. This is essential because, the above factors decide the capability of the organization to undertake the size of the project, which suits its business objectives and performance. Accordingly, impact of project-related and organizational-related factors on project performance vary according to the size of the organization. Hence, size of the organization is considered as the control variable for this study and the impact of this control variable on project performance is also studied.

1.3 Research Questions

The following are the research questions (RQ's) pertaining to this research study:

RQ1. Which are the project-related factors such as client, contractor, consultant, material, labor and equipment, contract management, external and project management tools/techniques that significantly impact project performance in terms of time, cost, quality, safety and financial performance of Malaysian construction companies?.

RQ2. Which are the organizational-related factors such as leadership, organizational culture, innovation and learning organization that significantly impact project performance in terms of time, cost, quality, safety and financial performance of Malaysian construction companies?.

1.4 Research Objectives

The objective of this study is to examine and investigate the critical project and organizational factors that impact project performance of Malaysian construction companies as per sub-objectives below:

i. To examine and investigate the project-related factors such as client, contractor, consultant, material, labor and equipment, contract management, external and project management tools/techniques, which have a significant impact on Malaysian construction companies' project performance in terms of time, cost, quality, safety and financial performance.

ii. To examine and investigate the organizational-related factors such as leadership, organizational culture, innovation and learning organization, which have significant impact on Malaysian construction companies' project performance in terms of time, cost, quality, safety and financial performance.

1.5 Significance of the study

1.5.1 The theoretical contribution of the study

Over the last 40 years, a good number of studies have been conducted on various critical success factors and its influence on project success in the construction industry. However, not many studies have been conducted on the soft factors (organizational-related factors) and its impact on project performance. Thus, this study contributes theoretically to the existing body of knowledge in this area. To mention specifically, innovation and learning organization factors have not been studied much in the construction industry with respect to their impact on project performance. Similarly, so far, the research studies on project performance are limited to the major three factors (iron triangle factors of project performance): time, cost and quality. None of the studies has analyzed safety and financial performance. Thus, this study contributes theoretically to how the project and organizational-related factors impact project performance in terms of safety and financial performance in addition to time, cost and quality.

1.5.2 The practical contribution of the study

Practitioners in the construction industry today are facing multi-dimensional project performance issues on a day-to-day basis and much of the time is being spent on fire-fighting, trouble-shooting, correction, corrective action and associated works, which are not only time consuming, but also impacting project cost and budget. All these ultimately result in poor financial performance. Lessons learned from previous projects in the construction industry in many of the organizations are not implemented due to the various organizational-related factors such as leadership styles, culture, level of importance given to innovation and learning initiatives adopted in the organization and its lack of understanding of these factors impact on project performance.

Thus, it is expected that the findings of this study can help industry leaders, policy-makers, project directors, project managers and project management companies to obtain a more comprehensive knowledge on which project and organizational factors critically impact construction project performance. Similarly, as the construction industry in every country is unique in its setting due to various policy matters of the government, this study is expected to give the Malaysian construction industry professionals good knowledge on project and organizational-related factors and their impact on project performance. Additionally, this study looks into the factors and their impact which are unique to civil, building and infrastructure construction, marine construction, oil and gas construction and multi-discipline construction sectors separately. Thus, this study will help the relevant construction sector professionals to understand the critical factors and their impact on project performance.

1.6 Scope and limitations of the study

1.6.1 Scope

The scope of this research study covers all the construction companies in all the states of Malaysia (including east Malaysia), which are registered with the CIDB under Grade 7 (G7) contractor grade (G7 contractors are considered as bigger construction contractors in Malaysia, who are eligible to carry out projects with project value of more than RM 10 million while Grade 1 (G1) contractors are the small-time contractors). The scope also covers civil, building and infrastructure, marine, oil and gas and multi-discipline construction projects being carried out by the CIDB registered G7 construction companies in Malaysia. With respect to project performance dimensions, the scope of this research study covers five of the critical project performance dimensions of construction projects such as time, cost, quality, safety and financial performance.

1.6.2 Limitations

The following are the limitations of this study:

i. The study is limited to only Malaysian construction companies; hence, findings of this study may not be generalizable to the rest of the world. The findings of this study must be applied with caution for other countries as the factors impacting project performance may vary between countries.

ii. The study is limited to only construction projects and the associated factors, which impact project performance. Projects, such as Research and Development (R&D), Information Technology (IT), New Product Development (NPD) and other types of projects, such as social and economic projects, are not within the scope of this study.

iii. The respondents of this study are the project managers[1] (those involved in civil, building & infrastructure, marine, oil & gas and multi-discipline construction projects) of sample organizations and their projects. Hence,

[1] Project manager is the key person in a project, responsible for the successful performance of the project.

this study focuses on the responses of the project managers and does not reflect views of all other actors (such as engineers, supervisors, clerks, supporting staff, tendering staff, administrative staff and workers) in project management.

iv. The sample size used in this research study is 360, out of which only 342 samples were usable. Availability of more data for analysis could further help the analysis to provide more accurate research findings.

v. The results of this study reflect the views of contractors. There can be chances that the results of similar research studies with the representation of clients, consultants and suppliers may yield different results regarding factors impacting project performance in the construction industry.

vi. The research study used eight project-related factors (client, contractor, consultant, material, labor & equipment, contract management, external and project management tools/techniques) and four organizational-related factors (leadership, organizational culture, innovation and learning organization). Past studies' and this study's findings reveal that there are many other important factors, which may have an impact on the construction companies' project performance, such as communication, stakeholders' management and risk management, which are not included in this study. In addition, project performance is only seen from the aspects of time, cost, quality, safety and financial performance. Other project performance factors, such as environmental impact and sustainability were not considered.

1.7 Organization of the dissertation

This dissertation is organized into five chapters. This chapter explains the background of this research study, the construction industry and its major sectors, the problems faced by the construction industry, motivation for the study, the research questions, the research objectives, the significance of the study, scope and limitations of this study and the organization of the dissertation as shown in figure 1.7 below.

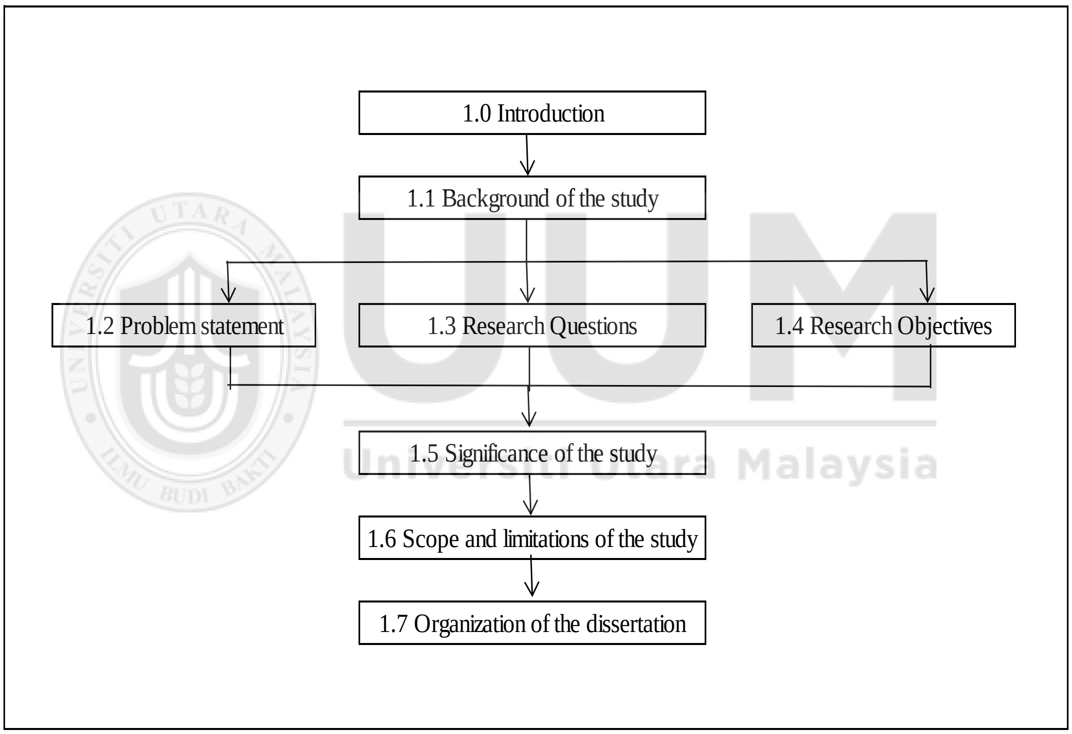


Figure 1.7
The organization and flow of Chapter One.
Source: Developed for this research

Chapter two covers the introduction to literature review, literature on theories related to project management, project performance, project-related factors and organizational-related factors, research gaps and justification for the research and conclusion. Chapter three covers the introduction to research methodology, research framework, hypotheses/

development, research design, operational definitions, measurement of variables/ instrumentation, data collection, sampling, data collection procedures, techniques of data analysis and conclusion. Chapter four covers the introduction to data analysis results and discussion, various data analysis results and the related discussion, hypothesis testing analysis and its results and conclusion. Chapter five encompasses the introduction to conclusion, including recommendations, recapitulation of the study, discussion on the findings, implications of the research study, limitations of the study and recommendations for future research studies.

CHAPTER TWO

LITERATURE REVIEW

“Project proposals, business cases or cost benefit analyses are probably being massaged (either by underestimating costs or time frames or by being very optimistic about the benefits) so projects will be approved. (Bentley & Borman, 2001).”

2.1 Introduction

The organization and flow of Chapter Two is explained in figure 2.1 below. This chapter mainly explains the underpinning theories related to this study, literature review related to this research, research gaps identified and the justification for the research.

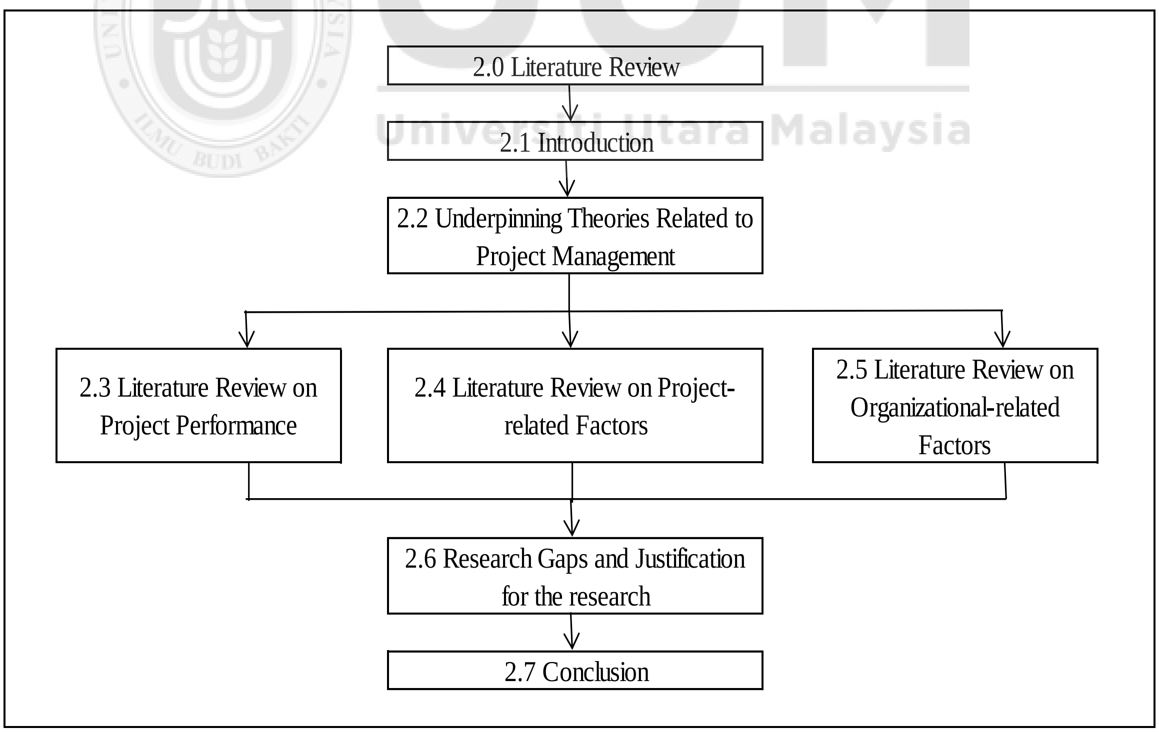


Figure 2.1
The organization and flow of Chapter Two.
Source: Developed for this research

In construction projects, delays, cost overruns, stakeholder issues, conflicts, litigations, arbitrations, abandonment and other factors influences project performance. For more than 40 years, this has been the subject of interest of researchers in various parts of the world. Researchers have found differing results in their studies on the critical success factors (CSFs) and their cause-and-effect on project performance. In this chapter, the various perspectives of past research on factors impacting project performance with respect to project-related factors, such as client-related factors, contractor-related factors, consultant-related factors, material-related factors, labor and equipment-related factors, contract management-related factors, externally-related factors and project management tools/ techniques-related factors, are reviewed critically. Additionally, organizational-related factors, such as leadership, organizational culture, innovation and learning organization and their impact on project performance are analyzed critically. A total of 64 articles (31 articles on project-related factors and 33 articles on organizational-related factors) on project performance from reputed journals covering the period from 1985 to 2015 (30 years) were reviewed critically to summarize their findings and to identify the research gap/s. Detailed literature review matrix is shown in Appendix A.

2.2 Theories related to project management

The following are the underpinning theories related to this study and they are evaluated for their applicability and relevance to project performance of the construction industry:

i. Transaction cost economics (TCE) theory by Williamson (1989).

ii. Leadership theory by Burns (1998).

iii. Organizational culture theory by Schein (1990).
iv. Diffusion of innovation theory by Rogers (1983).
v. Learning organization theory by Argrys and Schon (1997).
vi. Project management theory by PMI (2002), Koskela and Howell (2002).

2.2.1 Transaction cost economics theory

Transaction cost economics theory is the central theory in the field of strategy. It addresses questions about, why firms exist in the first place (i.e., to minimize transaction costs), how firms define their boundaries and how they ought to govern operations. According to Williamson (1989), transaction cost economics focuses on the organization of transactions that occur whenever a good or service is transferred from a provider to a user across a technologically separable interface. When transactions occur within an organization, the transaction costs can include managing and monitoring personnel and procuring inputs and capital equipment. The transaction costs of buying the same good or service from an external provider can include the costs of source selection, contract management, performance measurement and dispute resolution. Thus, the organization of transactions, or "governance structure", affects transaction costs. This relationship is examined in this study.

2.2.2 Leadership theory

Among the various leadership theories, such as situational leadership theory, transformational leadership theory, transactional leadership theory, evolutionary leadership theory, outstanding leadership theory, implicit leadership theory, servant leadership theory, path-goal leadership theory and community leadership theory, the most relevant leadership theory related to this study is transactional leadership theory. This is due to the reason that, construction project deals with large amount of transactions in its life cycle with its various stakeholders from the beginning of the project till completion. According to Burns (1998), transactional leadership, also known as managerial leadership, focuses on the role of supervision, organization and group performance. Transactional leadership is a style of leadership in which the leader promotes compliance of his/her followers through both rewards and punishments. Unlike transformational leadership, leaders using the transactional approach are not looking to change the future; they are looking to merely keep things the same. Leaders using transactional leadership as a model, pay attention to followers' work in order to find faults and deviations. This type of leadership is effective in crisis and emergency situations, as well as for projects that need to be carried out in a specific way. This theory is examined for its suitability in this study.

2.2.3 Organizational culture theory

According to Schein (1990), organizational culture determines values and beliefs which are an integral part of what one chooses to see and absorb. It includes a shared perception of reality, regarding how things are and how things should be. Furthermore, community and group culture determines the willingness and conditions for knowledge sharing with other members of the organization. Knowledge and knowledge sharing are thus inseparable from organizational culture. Organizational culture constitutes:

Artifacts: These represent the visible elements, such as processes, structures, goals, climate, dress codes and furniture. An outsider can see them but may not understand why things are the way they are.

Espoused values: The values are espoused by the leaders. They most often are grounded in shared assumptions (see below) of how the company should be run. If there is a significant mismatch between the leadership espoused values and this perception, the organization may be in trouble.

Assumptions: These are the actual values of the culture. They refer to the (often tacit) views of the world itself (e.g., human nature). Again, these assumptions need to correlate at least to a certain degree to the espoused leadership values for the organization to function smoothly.

This study examines the impact of organizational culture on project performance.

2.2.4 Diffusion of innovation theory

Diffusion of innovation is a theory that seeks to explain how, why and at what rate new ideas and technology spread through cultures. According to Rogers (1983), an innovation is communicated through certain channels over time among the participants in a social system. The origins of the diffusion of innovation theory are varied and span multiple disciplines. Rogers proposed that four main elements influence the spread of a new idea, i.e., the innovation itself, communication channels, time and a social system. This process relies heavily on human capital. The innovation must be widely adopted in order to be self-sustaining. Within the rate of adoption, there is a point at which an innovation reaches critical areas. The categories of adopters are: innovators, early adopters, early majority, late majority and laggards. Diffusion manifests itself in different ways in various cultures and fields and is highly subject to the type of adopters and innovation-decision processes. Extent of innovation culture and its effect on project performance is examined in this study.

2.2.5 Learning organization theory

According to Argrys and Schon (1997), learning is a product of organizational inquiry. This means that whenever an expected outcome differs from actual outcome, an individual (or group) will engage in inquiry to understand, and if necessary, solve this inconsistency. In the process of organizational inquiry, the individual will interact with other members of the organization and learning will take place. Learning is therefore a direct product of this interaction. Argrys and Schon emphasized that this interaction often goes well beyond defined organizational rules and procedures. Their approach to organizational learning theory is based on the understanding of two (often conflicting) modes of operation, i.e.:

Espoused theory: This refers to the formalized part of the organization. Every firm will tend to have various instructions regarding the way employees should conduct themselves in order to carry out their jobs (e.g., problem solving). These instructions are often specific and narrow in focus, confining the individual to a set path. An example of espoused theory might be, "if the computer does not work, try rebooting it and then contact the IT department".

Theory-in-use: This is the actual way things are done. Individuals will rarely follow espoused theory and will rely on interaction and brainstorming to solve a problem. Theory-in-use refers to the loose, flowing, and social way that employees solve problems and learn.

The four vital elements of a learning organization culture, i.e., supportive leaders, culture of continuous improvement, defined learning structure and intuitive knowledge processes and their effect on project performance are examined in this study.

2.2.6 Project management theory

According to Koskela and Howell (2002), in prior literature, it has been generally seen that there is no explicit theory of project performance. It is possible to precisely point out the underlying theoretical foundation of project performance as espoused in the PMBOK by the Project Management Institute (PMI) and mostly applied in practice since 2002. This theory can be divided into a theory of project and a theory of management. The theory of project is provided by the transformation view on operations. In the transformation view, a project is conceptualized as a transformation of inputs to outputs. There are a number of principles by means of which a project is managed. These principles suggest, for example, decomposing the total transformation hierarchically into smaller transformations and tasks and minimizing the cost of each task independently. We contend that understanding of management is based on three theories: management-as-planning model, the dispatching model and the thermostat model. In management-as-planning model, management at the operations level is seen to consist of the creation, revision and implementation of plans. This approach to management shows a strong causal connection between the actions of management and outcomes of the organization. The dispatching model assumes that planned tasks can be executed by a notification of the start of the task to the executor. The thermostat model is the cybernetic model of management control that consists of the following elements: there is a standard of performance; performance is measured at the output; and the possible variance between the standard and the measured value is used for correcting the process so that the standard can be reached.

There is no explicit and strong theory on project management; the current theory which is a combination of project theory and management theory is conceptually loose and does not provide a reflection of the real project management theory. By bringing in transaction cost economics theory, leadership theory, organizational culture theory, innovation theory and learning organization theory into project management, this study aims to strengthen the project management theory. As transaction cost economics deals with transaction between provider and buyer of goods and services, this theory is more applicable to project management, which basically involves a large number of transactions for every project in all its phases, in terms of both goods and services. Similarly, leadership theory explains the various types of leaderships which are suitable for various organizational structures. Past studies have proven that leadership in project management is crucial for the success of the project and different phases of the project require a different type of leadership to deal with the complex situations. Thus, it is more appropriate to use the leadership theory in project management. Adding further, organizational culture is an important factor for the overall performance of the organization. Good organizational culture results in good performance and vice versa. Thus, impact of organizational culture and the related theory needs to be embedded with project management theory. Similarly, innovation and learning organization initiatives are vital for the success and sustainability of an organization. Hence, diffusing the innovation and learning organization theories into project management will strengthen the theory further.

Thus, in this research, the project-related factors and their impact on project performance are studied by using transaction cost economics theory. Similarly, the organizational-related factors and their impact on project performance are studied by using theories such as leadership theory, organizational culture theory, diffusion of innovation theory and learning organization theory. Additionally, the project performance dimensions are studied by using project and management theories. It is believed that by embedding these theories into the existing loosely coupled project management theory, the theory will be stronger conceptually with higher degree of relevance and appropriateness. The conceptual project management theory is shown in Figure 2.2 below:

Figure 2.2
Strengthening the project management theory
Source: Developed for this research

2.3 Project performance

Belout and Gauvreau (2004), found in their studies, that the relationship between various independent variables and project success varies according to the project life cycle. Sodurlund (2004), found in his research, that CSFs do not give real life knowledge of a project's success.

2.3.1 Time

According to Kim (1989), scope of work impacts project lead time considerably in all the projects. Hence, proper scope management is the key to achieve the project time schedules. Lim and Mohamed (1999) stated that though project success is dependent upon macro as well as micro-perspectives, timely completion of the project is the key for project success. Davies (2002) stated that duration of the project is the determining factor for project success; the longer the duration, the higher the chances of delay and the shorter the duration of the project, the higher the chances of completing on time. He further stated that projects with one-year duration are the best to complete on time. Additionally, he stated that keeping the integrity of the performance delivery baseline schedule is important for a project's success.

Jagboro and Aibinu (2002), found in their study, that time overrun is an important factor for project failure in construction projects and delays are significantly impacting project performance in Nigeria. They also found that acceleration programs to cover the time overruns in construction projects in Nigeria have not been successful. Westervel (2003) stated that time is one of the six CSFs in construction projects. Assaf and Al-Hejji (2006), found in their studies, that 70% of the projects experienced time overrun and the average time overrun was about 10 to 30% of the original schedule. They further found that change order is the most common cause for the delay and awarding projects to the lowest cost bidder is the other cause for most of the delays. Sambasivan and Soon (2007), found in their studies, that contractors' poor planning, poor site management, inadequate experience, inadequate finance and payments for completed work by clients, problems with subcontractors, shortage of materials, labor supply, equipment availability and failure, lack of communication between parties and mistakes during the construction stages, are the top 10 causes leading to time overruns in construction projects in Malaysia. Alaghbari, Kadir, Salim and Ernawati (2007), found in their studies, that contractor, client, consultant and related factors are the main causes for delays in construction projects in Malaysia. They also found that coordination problem among the various parties involved in the project is another important factor for delay in construction projects. Chan (2007) found that achieving project schedules is positively correlated to project success in manufacturing-related projects in Malaysia. Nixon et al. (2012), found in their studies, that project failures are highly related to the organization's internal processes, such as meeting deadlines. Hamzah et al. (2012) found in their studies that, factors related to clients such as financial difficulties, poor supervision, unrealistic project schedule, too many scope changes, slow approvals, late supervision, failure to provide required construction site, slow decision making and changes in design are some of the causes, which leads to delay in Malaysian construction projects. They also found that, contractor related factors such as financial difficulties, inadequate experience, poor site management, improper planning, construction mistakes and defects are some of the causes, which contributes to project delay. Similarly, lack of consultant's experience, delay in delivery of materials, increase in material prices, less labor productivity, insufficient manpower, lack of communication, weather conditions, interruptions from the public and delay in building permit approval are some of the factors related to consultant, material, labor and equipment and external causes, which delays the construction projects. Tawil et al. (2013), found in their studies that, the critical sources of delay in Malaysian government related construction projects are insufficient contractor's working capital, poor site management practices of the contractor, delay in payment by clients, delay in approvals by clients and consultants, scarcity of raw materials and additional scope of works given by the client. Truman (2014) stated that failure to plan accurate time schedules and schedule controls and achieving those schedules in projects is the most common cause for project failures in the USA. Marzook and El-Rasas (2014) stated that contractors' ineffective planning and scheduling is one of the causes for delay in construction projects in Egypt.

2.3.2 Cost

Jagboro and Aibinu (2002), found in their study, that cost overrun is an important factor for project failure in construction projects; losses and expenses claims during delay periods are significantly impacting project performance in Nigeria. Additionally, they found that contingency budgets estimated during the pre-contract stage are inadequate to cover the cost overruns and losses. Sambasivan and Soon (2007), found in their studies, that improper planning by the contractors, inefficient management of the project sites, poor job knowledge and expertise, insufficient funds and delay in payments by the clients for contractors for the works completed, poor cooperation between clients and subcontractors, issues related to materials, issues related to labor, issues related to machinery and equipment availability / breakdowns, poor communication among stakeholders in a project and quality / technical issues / mistakes during construction stage are the top 10 causes leading to cost overruns in construction projects in Malaysia. Nixon et al. (2012), found in their studies, that project failures are highly correlated to the organization's internal processes related to budget and cost controls. Truman (2014) stated that failure to accurately plan costing and cost controls in projects is the most common cause for project failures in the USA. Memon et al. (2014), found in their studies, that incorrect planning and scheduling is a severe factor, which impacts the project cost performance of construction projects in Malaysia.

2.3.3 Quality

Burati, Farrington and Ledbetter (1992), found in their studies that, quality deviations in construction projects in terms of repair and re-work lead to 12.4% hike in total project costs. Westervel (2003) stated that quality is a critical factor for project success in construction projects. Jha and Iyer (2006), found in their studies that, project manager's competence and top management support significantly contribute to the quality in construction projects. Ling et al. (2009), found in their studies, that the most important factors for project success for the Singaporean firms, that undertake construction projects in China, are the quality of the contract documents and the quality of response to the perceived variations. There were not many studies conducted with regards to quality in construction projects.

2.3.4 Safety

Cicmil and Hodgson (2006) critically analyzed the various concepts of project, project management, project performance, individual skills and competencies and the other social arrangements involved in a project. They questioned the iron triangle concepts of project management such as time, cost and quality. These concepts have been kept at status quo for the last few decades. They suggested that, studies are not available on other indicators of project performance, such as health & safety and ethics and economy and these areas need to be explored further. Safety is generally understudied and any contribution will add further to the literature in this area.

2.3.5 Financial

Belassi and Tukel (1996) suggested the need to have a proper management information system (MIS) to compliment project success. The same is endorsed by Munns & Bjeirmi (1996), that application of proper project management techniques will lead to project success. Atkinson (1999) argued that apart from time, cost and quality performance of the project, stakeholders and benefits to stakeholders should also be measured as part of the project's success. White and Fortune (2002), found in their study, that 65% of the organizations do not study the risks associated with the project and their effect on an organization's financial performance. Sambasivan and Johari (2003), found in their studies, that both corporate culture and organizational commitment influence the financial performance of companies. Angus, Flett and Bowers (2005) developed a value-centered scheme for project success and suggested that Net Project Execution Cost

(NPEC) and Net Product Operation Value (NPOV) should be studied before project execution to achieve project success. They suggested 12 different options to compare the project's financial performance for decision-making. Alaghbari et al. (2007), found in their studies, that clients' and contractors' financial problems are the main causes for delays in construction projects in Malaysia. Memon et al. (2014), found in their studies, that cash flow problems and financial difficulties faced by contractors are the most severe factors, which affect the cost performance of construction projects in Malaysia. Fernandes et al. (2013), found in their studies, that innovative companies in Spain and Portugal performed better in terms of financial performance and financial issues are inhibitors of organizational performance. Marzook and El-Rasas (2014) stated that contractors' inability to finance the project is one of the causes for delay in construction projects in Egypt. Saunila (2014), found in her study, that innovation capability of an organization has more influence on financial performance of an organization than operational performance.

2.4 Project-related factors

Chan (2007), found in his studies, that Pinto's (1988) CSFs, such as project management personnel, their technical tasks, monitoring and feedback, communication and troubleshooting, are some of the factors positively correlated for project success in manufacturing-related projects in Malaysia. Khang and Moe (2008), found in their studies, that success judgment by various stakeholders during conceptualization, planning, implementation and closing phases of the project life is critical for the success of the projects in developing countries in not-for-profit international development projects. They also found that project planners and designers are important for project success. Memon et al. (2014), found in their studies, that lack of communication between parties in a project is a significant factor affecting project performance in Malaysia.

2.4.1 Client-related factors

According to Munns and Bjeirmi (1996), clients should take an increased role in ensuring the success of their projects. He also stated that client's selection of the right project and dropping potentially unsuccessful projects are the keys to project success. Lim and Mohamed (1999) stated that though project success is dependent on perspectives, from a macro point of view, client satisfaction is the key factor, which determines project success. Jugdev and Muller (2005), found in their studies, that developing and maintaining a good relationship with clients is a very important factor for project success, while using the other CSFs for achieving desired performance. Sambasivan and Soon (2007), found in their studies, that inadequate finance and payments for completed work by clients is one of the top 10 causes leading to time and cost overruns in construction projects in Malaysia. Alaghbari et al. (2007), found in their studies, that client-related factors are one of the four main causes for delays in construction projects in Malaysia. Chan (2007), found in his studies, that consultation with the client and acceptance of the client are positively correlated to project success. Hamzah et al. (2012), found in their research studies that, financial difficulties, poor supervision, unrealistic project schedule, too many changes in the design, slow approval of drawings, late supervision, failure to provide required construction site and slow decision making are some of the client related causes for construction project delays in Malaysia. Tawil et al. (2013), found in their studies that, the critical sources of delay in Malaysian government related construction projects are delay in payment by clients, delay in approvals by clients, and additional scope of works given by the client. Truman (2014) stated that failure of the project management team to execute the projects is one of the most common causes for project failures in the USA. Memon et al. (2014), found in their studies, that client interference and frequent design changes by clients are not significant factors affecting project performance in Malaysia. Marzook and El-Rasas (2014) stated that delay in payment by clients, owner interference, stoppage of work, slow decision-making and delay in approvals are some of the main causes for delay in construction projects in Egypt.

2.4.2 Contractor-related factors

Jugdev and Muller (2005) stated that stakeholders, such as subcontractors and their interest in a project, is a key factor for project success along with other CSFs. Sambasivan and Soon (2007), found in their studies, that problems with subcontractors and mistakes during the construction stage, are the most important causes for delays in construction projects in Malaysia. Hamzah et al. (2012) found in their studies that, financial difficulties, inadequate experience, poor site management, improper planning and construction mistakes / defects are some of the contractor related causes, which leads to delay in construction projects in Malaysia. Tawil et al. (2013), found in their studies that, the critical sources of delay in Malaysian government related construction projects are insufficient contractor's working capital and poor site management practices of the contractor. Marzook and El-Rasas (2014) stated that delay by subcontractors is one of the causes for delay in construction projects in Egypt.

2.4.3 Consultant-related factors

Jugdev and Muller (2005) found in their studies that, role of consultants in a project is important and their interest in a project will lead to less technical problems and will lead to project success. Alaghbari et al. (2007), found in their studies, that consultant-related factors are one of the four main causes for delays in construction projects in Malaysia. Khang and Moe (2008) found that consultants are important for project success in not-for-profit international projects in developing countries. Hamzah et al. (2012) found in their studies that, consultant's lack of experience is one of the cause for delay in construction projects in Malaysia. Tawil et al. (2013), found in their studies that, the critical source of delay in Malaysian government related construction projects is delay in approvals by consultants. Marzook and El-Rasas (2014) stated that consultant-related design mistake is one of the causes for delay in construction projects in Egypt.

2.4.4 Material-related factors

Kim (1989) explained in his research that there exist different structures and supplier relationships between various countries, such as the USA, the European Union (EU) countries and Japan. These different supplier structures and relationships significantly lead to difference in project performance in these countries. Jugdev and Muller (2005) found that, supplier's performance in terms of supplying material on time with right quality is an important factor for the success of the projects. Sambasivan and Soon (2007), found in their studies, that shortage of materials, during the construction stage is one of the top 10 causes leading to time and cost overruns in construction projects in Malaysia. Hamzah et al. (2012) found in their studies that, delay in delivery of materials to site and increase in material prices are the material related causes for the delay in construction projects in Malaysia. Tawil et al. (2013), found in their studies that, the critical source of delay in Malaysian government related construction project is scarcity of raw materials. Memon et al. (2014), found in their studies, that fluctuation in raw material prices from suppliers is a significant factor affecting project performance in Malaysia. Marzook and El-Rasas (2014) stated that shortage of materials from suppliers is one of the causes for delay in construction projects in Egypt.

2.4.5 Labor and equipment-related factors

Westervel (2003) stated that resources, such as labor and equipment, are critical for project success. Assaf and Al-Hejji (2006), found in their studies, that labor-related factors are significant for project success. Sambasivan and Soon (2007), found in their studies, that labor and equipment-related issues are the causes for delay in construction projects in Malaysia. Hamzah et al. (2012), found in their studies that, lower employee productivity and insufficient manpower are some of the causes for delay of construction projects in Malaysia. Truman (2014) stated that failure to provide adequate human resources in projects is one of the most common causes for project failure in the USA. Memon et al. (2014), found in their studies, that shortage of labor is a most severe factor affecting project performance of construction projects in Malaysia. Marzook and El-Rasas (2014) stated that unqualified workers and their low productivity are two of the causes for delays in construction projects in Egypt.

2.4.6 Contract management-related factors

According to Kim (1989), scope differs significantly in the industry even for comparable projects and impacts project performance. Davies (2002) stated that, established procedures for project scope changes and control of these scope changes are important for project success. He argued that scope changes in a project significantly impact project performance in terms of cost, time and other areas. Westervel (2003) stated that contract management is one of the six key factors for achieving project success. Ling et al. (2009), found in their studies, that the most important factors for project success for the Singaporean firms that undertake construction projects in China, are the contract scope management and the extent of changes made to the contracts. Truman (2014) stated that poor scope change management is the reason for project failure in the USA. Marzook and El-Rasas (2014) stated that change management-related factors and delay in scope change approvals are some of the causes for delay in construction projects in Egypt.

2.4.7 Externally-related factors

Belassi and Tukel (1996) explained project attributes and the related environmental factors play a key role in determining project success. Shrnhur et al. (1997) suggested that both direct and indirect success of the project with respect to preparing the organization for the future, need to be considered when assessing a project's success. Similarly, impact on the customers should also be considered when assessing a project's performance. Kaliprasad (2006), found in his research, that external factors significantly influence project performance, and in turn, organizational performance. Alaghbari et al. (2007), found in their studies, that externally-related factors are one of the four main causes for delays in construction projects in Malaysia. Hamzah et al. (2012) found in their studies that, lack of communication, interruption from the public, weather conditions and delay in building permit approval are some of the causes for delay in construction projects in Malaysia. Marzook and El-Rasas (2014) stated that sub-soil conditions are one of the causes for delay in construction projects in Egypt.

2.4.8 Project management tools/techniques-related factors

White and Fortune (2002), found in their studies, that most projects and project management organizations use a limited number of project management tools, which is a reason for a project's poor performance. Murphy and Ledwith (2007), found in their studies, that use of planning management tools by the project managers in high technology projects helps to accomplish the project's goals. White and Fortune (2002), found in their studies, that 41 % of the projects succeed due to the application of suitable project management tools/techniques in projects. Raza and Michael (2001), found in their studies, that application of project risk management tools helps to mitigate the risks and improves the project's performance.

2.5 Organizational-related factors

Pollack (2007), found in his studies, that traditionally, project management is deeply rooted to the hard paradigms, such as clients, consultants, suppliers, subcontractors, labor & equipment, contract management, external factors and project management tools/ techniques. However, in the recent past, the theoretical frameworks on soft paradigms, such as leadership, organizational culture, innovation, learning organization and communication and their impact on project management, have rapidly expanded. He also found that the influence of soft paradigms on project management is substantial and both hard and soft paradigms are dependent on each other to compliment project performance. Belout and Gauvreau (2004), found in their studies, that human resource management (HRM) from a project context is very important. However, the personnel factor is not significantly related to project success.

2.5.1 Leadership-related factors

Belassi and Tukel (1996) argued that apart from many CSFs which influence project success or failure, a project manager's management and leadership skills are important for the project's success. Shrnhur et al. (1997) suggested that top management of project management companies must clearly specify project objectives as early as possible even before the project starts. According to Kotter (2001), leadership is distinctively different from management, where management is about dealing with complex situations while leadership is about dealing with changes in the organization. He also stated that most of the organizations are over-managed and under-led. Kotter further stated that successful and well-led businesses tend to recognize and reward people who successfully develop leaders. White and Fortune (2002), found in their studies, that leaders in an organization should not only focus on time, cost and quality performance, but should also focus on the strategic fit of the project to the organization's objectives and the project's side effects to the organization. Westervel (2003), who developed a project excellence model linking CSFs and project success, found that leadership and teamwork are the most critical factors for project success. Belout and Gauvreau (2004), found in their studies, that top management support and leadership are important for project success. Hardness, Nilsson and Urban (2005), found in their research, that structural changes and changes in organizational performance are only possible with top management's support and leadership. Turner and Muller (2005), found in their research study, that previous studies on project success have ignored the leadership roles of project managers and leadership styles and competency of project managers does not have a significant impact on project success due to the unique and temporary nature of the projects. Kaliprasad (2006), found in his research, that dynamic leadership is the key factor for high performance in organizations. He further stated that leadership influences organizational culture in organizations and leadership issues and lack of understanding of market conditions by organizational leaders are detrimental to organizational performance. Chan (2007), found in his studies, that top management support is positively related to project success in manufacturing projects in Malaysia. Subramaniam, Othman and Sambasivan (2010), found in their research, that there are distinctively implicit leadership styles among Malaysian managers and there is a difference in leadership among ethnic groups in Malaysia. Further, they found that there is no difference in the leadership expectation gap among managers reporting to superiors from the same background, when compared to superiors from different nationalities and ethnicities. Anantamula (2010), found in his studies, that a project manager's leadership role and establishing trust with the project management team members are the keys to achieve project success. Oliveria et al. (2012), found in their studies, that leadership style combined with agility, significantly contributes to achieving the highest project performance. They further found that, transactional leadership does not significantly lead to high performance of innovative projects, while transformational leadership significantly leads to the success of innovative projects. Nixon et al. (2012), found in their studies, that no single leadership style is suitable for the entire life cycle of a project; leadership styles and models should be modified to suit the project performance outcomes and requirements based on each situation. They further stated that project managers need to prioritize training in leadership skills for project success and sustenance. Additionally, they stressed that a project manager's leadership performance is crucial for project success through key performance questions (KPQ) and key performance indicators (KPI). Marzook and El-Rasas (2014) stated that poor site management is one of the causes for delay in construction projects in Egypt. Saunila (2014), found in her research studies, that leadership has an effect on organizational performance.

2.5.2 Organizational culture-related factors

Belassi and Tukel (1996) argued that project management team members' technical background is crucial for the success of projects. However, Munns and Bjeirmi (1996), found in their research, that a project management team is not fully responsible for the success or failure of their project. They further suggested that the project management team members' role should be appreciated. Davies (2002) stated that keeping track of the risks and an adequate up-to-date risk management plan coupled with clear ownership of risks for individuals in an organization is an important factor for achieving project success. He further added that maturity of the organization's processes, project matrix structure and effective benefits delivery as well as line management staff in an organization will pave the way for a project's success. Westervel (2003) stated that organizational policies and strategies significantly relate to project performance. Abdul et al. (2003), found in their studies, that a significant relationship exists between corporate culture and organizational commitment. Belout and Gauvreau (2004), found in their studies, that top organizational structure and trouble-shooting culture of an organization are significantly related to a project's success. Sodurlund (2004), found in his research, that limited knowledge on how project organizations behave in the construction industry, has an impact on project success. He also found that corporate issues and their impact on project success have not been studied in the construction industry. Abdul, Sambasivan and Zohari (2004), found in their research, that there exists an association between organizational culture and the cognitive, affective and behavioral attitude toward organizational change. Further, they found that different types of organizational culture and cultural topology are related/associated with attitude towards organizational change.

Hyvari (2006), found in his research, that CSFs vary for different organizations in different sectors based on organizational conditions. He also found that communication in an organization and in the project during the project life cycle, is an important factor for project success. According to Henri (2006), organizational culture has a direct effect on Performance Measurement Systems (PMS) range of measurement and has an indirect effect on the use of PMS. They further found that organizational culture is an important factor in all the interactions of an organization.

Kaliprasad (2006), found in his research, that the stronger the organizational culture, the higher the resistance to change and vice versa. He further suggested that teamwork, global thinking and focus on solutions, are some of the key factors for a high performance culture in an organization. Adding further, he stated that organizational processes and systems that do not support the organization's vision and goals are detrimental to its performance. Anantamula (2010), found in his studies, that organizations must define the project processes and roles clearly and should monitor the project outcomes closely to achieve project success. Oliveria et al. (2012), found in their studies, that organizational factors combined with leadership factors, significantly contribute to achieving maximum project performance. Nixon et al. (2012), found in their studies, that project failures are highly correlated to an organization's internal processes. Saunila (2014), found in her research, that organizational culture has an effect on organizational performance.

2.5.3 Innovation-related factors

Dubois and Gadde (2002), found in their studies, that the construction industry's pattern of connections, short-term productivity and fast decision-making hampers innovation. They also found that the construction industry players behave differently with one another and since projects are temporary in nature, not much attention is paid to innovation and thus, not promoted. Additionally, they stated that government regulations and industry standards hamper innovation in the construction industry. Sodurlund (2004), found in his research that, innovation as a concept and its impact on project success have not been studied in detail in the construction industry. Huang and Liu (2005), found in their research studies, that innovation capital has a non-linear (inverted U shape) relationship with firm performance, whilst innovation and information technology (IT) capital have a positive effect on firm performance. They also stressed that more investment in intellectual capital is not good for an organization. Pounder (2009), found in his research, that an action-learning approach can help to create a dynamic culture of innovation, which will lead to organizational performance. De Valence (2010), found in his research, that procurement methods used for building construction projects, are a determining factor for innovation in the construction industry. He further stated that, innovation can be the strategic option for complex projects in the construction industry. Additionally, he found, that innovation at the tendering and construction stages are not accepted by the clients and the concepts of innovation used in the tenders are being used by the clients to recall tenders. This is a detrimental factor for innovation in the construction industry. Fernandes et al. (2013), found in their studies, that there are significant differences in terms of drivers and inhibitors of innovation in Portugal and

Spain. They also found that innovation of processes and products are considered significant in both countries. According to them, co-operation with suppliers, clients, universities, existence of business risk, an innovation-friendly climate and infrastructure are some of the drivers for innovation; while difficulty in predicting market demand and unqualified employees are some of its inhibitors. Hashi and Stojcic (2013), found in their studies, that innovation and productivity of an organization have a positive relationship; the higher the innovation, the higher the productivity of the organization and vice versa. They also found that bigger organizations are likely to innovate better than smaller firms and the intensity of competition motivates innovation in firms. Additionally, they found that innovation output decreases with firm size; in addition, regulatory and environmental regulations and related issues contribute to a higher level of innovation in organizations. Saunila (2014), found in her research studies, that development of innovation capability increases organizational performance. She further stated that know-how development has some effect on some aspects of firm performance.

2.5.4 Learning organization-related factors

Garvin (1985) stated that many of the continuous improvement programs in organizations fail and suggested three critical issues, i.e., well-grounded definition, clear operational guidelines and better tools for measurement for learning organizations to be successful. Garvin also suggested that systematic problem solving, experimenting new approaches, learning from past experiences, learning from best practices of others and transferring knowledge quickly and efficiently across the organization can help the organization to be successful. Gordon (1992) stated that performance technologists (training managers) in an organization should treat their employees as clients and should enable the employees to master the five principles of learning organization, i.e., systems thinking, shared vision, learning, personal mastery and mental models. Gordon further insisted that employees in a learning organization should have common purpose, common language, common processes, the resources needed and the authority to make decisions to enhance organizational performance. Argyris, Bellman, Blanchard and Block (1994), found in their studies, that technological changes and speed of change is an enabler for learning. They believed that in the future, learning will become inevitable, learning will become part of the organizational culture, learning will change the business processes and learning will become an important aspect to promote individual as well as organizational performance. Calvert, Mobley and Marshall (1994), found in their research, that many of the learning organization practitioners know little about a learning organization and they do not know how to apply the concepts. They argued that learning organizations are a work-in-progress, both conceptually and practically. They stressed that learning organizations differ distinctively from other organizations in terms of their learning strategies and tactics to achieve improved business performance in terms of efficiency, productivity and other organizational goals. According to Elkjaer (2001), learning organization initiatives in an organization will not succeed if changes at the top management level do not take place. He also found that learning organization is a result of personal mastery of employees, changes in managerial and work structures of an organization, top management's commitment and employees' involvement. Davies (2002) stated that companywide education, awareness and learning of risk management are vital to achieve project success. He further stated that learning from experience of past projects and improving continuously in an organization is a performance enabler. Brady and Davies (2004), found in their research studies, that there exist project-led learning and organization-led learning, which complement each other for better project performance. They also found that organizations learn from a project's experience (exploratory learning) and implement it in other projects (exploitive learning). Hardness et al. (2005), found in their research, that unsuccessful projects can be considered as successful if the organization learns from the mistakes of the unsuccessful projects and does not repeat the same mistakes. They also found that learning through reflection is significant and the perceptions about learning vary between individuals with regards to individual and organizational performance. They also stated that learning interventions alone will not bring in bigger changes in organizations. Kaliprasad (2006), found in his research, that sustaining high performance in an organization involves its competence to learn and adaptation to the learning organization concepts. Pounder (2009), found in his research, that action learning is a powerful tool of organizational learning; it helps to identify real solutions for problems, solves complex problems and helps to improve an organization's performance directly.

2.6 Research gaps and justification for the research

From the above detailed literature review, it is found that many research gaps prevail in the area of factors impacting project performance. These need to be explored further for the benefit of both academicians and practitioners in the construction industry. As such, the following gaps are significant and are included in this study.

Gap one

Many of the past studies have been focused on project performance indicators, such as time performance and cost performance (timely completion of the project within the cost/budget) only. No study has analyzed project performance with respect to quality, safety and financial performance. Quality, safety and financial performance of projects is increasingly getting attention in the construction industry; hence, studying these performance indicators will benefit the industry to a greater extent.

Gap two

Studies by past researchers, on CSFs and their impact on project success have mostly been on the various causes and effects on time and cost elements of a project's success/failure. Project-related factors and their impact on project performance with respect to quality, safety and financial performance have not yet been studied. Hence, this study aims to address this gap.

Gap three

Past research studies on project-related factors and their impact on project success have mainly been focused on project-related factors, such as clients, contractors, consultants, materials, contract management, external and project management tools/techniques-related factors. Many researchers identified the need for studying the organizational-related factors, such as leadership, organizational culture, innovation and learning organization. No empirical study in the past has examined the relationship and impact of organizational factors on project performance in the construction industry, particularly in the Malaysian construction industry. As organizational factors are gaining increased attention in organizations for improvement in performance, it is important to study this gap, which is taken up in this research.

Gap four

Past research studies on factors related to project success, project performance and project management have been conducted mainly on conventional construction projects, such as civil, building and/or infrastructure-related construction projects. None of the studies has focused on the projects from the oil and gas marine and multi-discipline construction sectors. In the case of Malaysia, being a major oil and gasproducer/exporter and a strategically located marine hub for port operations in the region, studying project performance of these projects will be an enabler for the industry and for the practitioners to understand the real-time issues and their impact on project performance in these sectors.

2.7 Conclusion

It is evident from the related literature review and the research gaps identified related to both project-related and organizational-related factors and their impact on organizational performance, that many studies have been conducted on CSFs, which are project-related factors per se and their impact on project performance. However, not many studies have been conducted on organizational factors, such as leadership, organizational culture, innovation and learning organization and their impact on project performance. Thus, this research combines both project and organizational factors to find out their impact on project performance holistically. Additionally, project performance has been measured using the traditional iron triangle concept of time, cost and quality. Not many studies have been conducted to measure project performance in terms of financial performance. This study aims to address this gap as well. In addition, safety hazards and safety issues are the highest in the construction industry resulting in the highest number of accidents, incidents and fatalities when compared to other industries of the economy. However, factors impacting safety performance of the projects have not been studied adequately in Malaysia. This gap is also addressed in this study. Thus, among the many research gaps identified in the literature, in order to get a holistic view on project-related factors as well as organizational-related factors, most commonly discussed project-related factors, such as client, contractor, consultant, material, labor and equipment, contract management, external and project management tools/techniques, are chosen. With regards to organizational-related factors, the most important soft factors, such as leadership, organizational culture, innovation and learning organization are chosen. Both the project- and organizational-related factors are studied to identify their relationship with the traditional iron triangle project performance factors, i.e., time, cost and quality. In addition, the safety and financial performance factors are also considered to provide a new contribution for understanding project performance of construction companies in Malaysia.

CHAPTER THREE

METHODOLOGY

"No matter how good the team or how efficient the methodology, if we are not solving the right problem, the project will not succeed (Williams, 2012)."

3.1 Introduction

The organization and flow of Chapter three is shown in figure 3.1 below. This chapter covers the introduction to the research methodology, research framework, hypotheses, research design, operational definitions, variables measurement and instrumentation used, data collection, data collection procedures and techniques of data analysis.

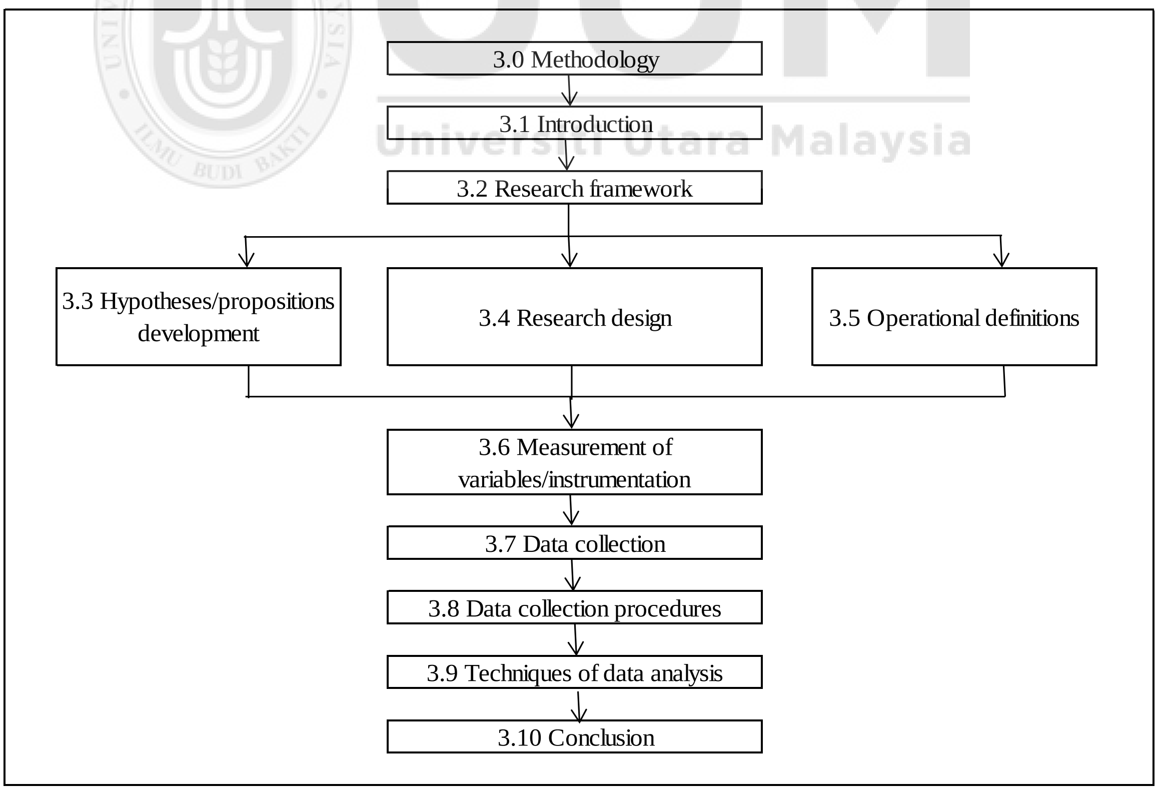


Figure 3.1
The organization and flow of Chapter Three.
Source: Developed for this research

Having reviewed the literature on CSFs, various theories, models, frameworks, research gaps, directions leading to further research in the area of the construction industry and the factors impacting project performance, in this chapter, the theoretical framework development and hypotheses developed and tested are discussed.

3.2 Research framework

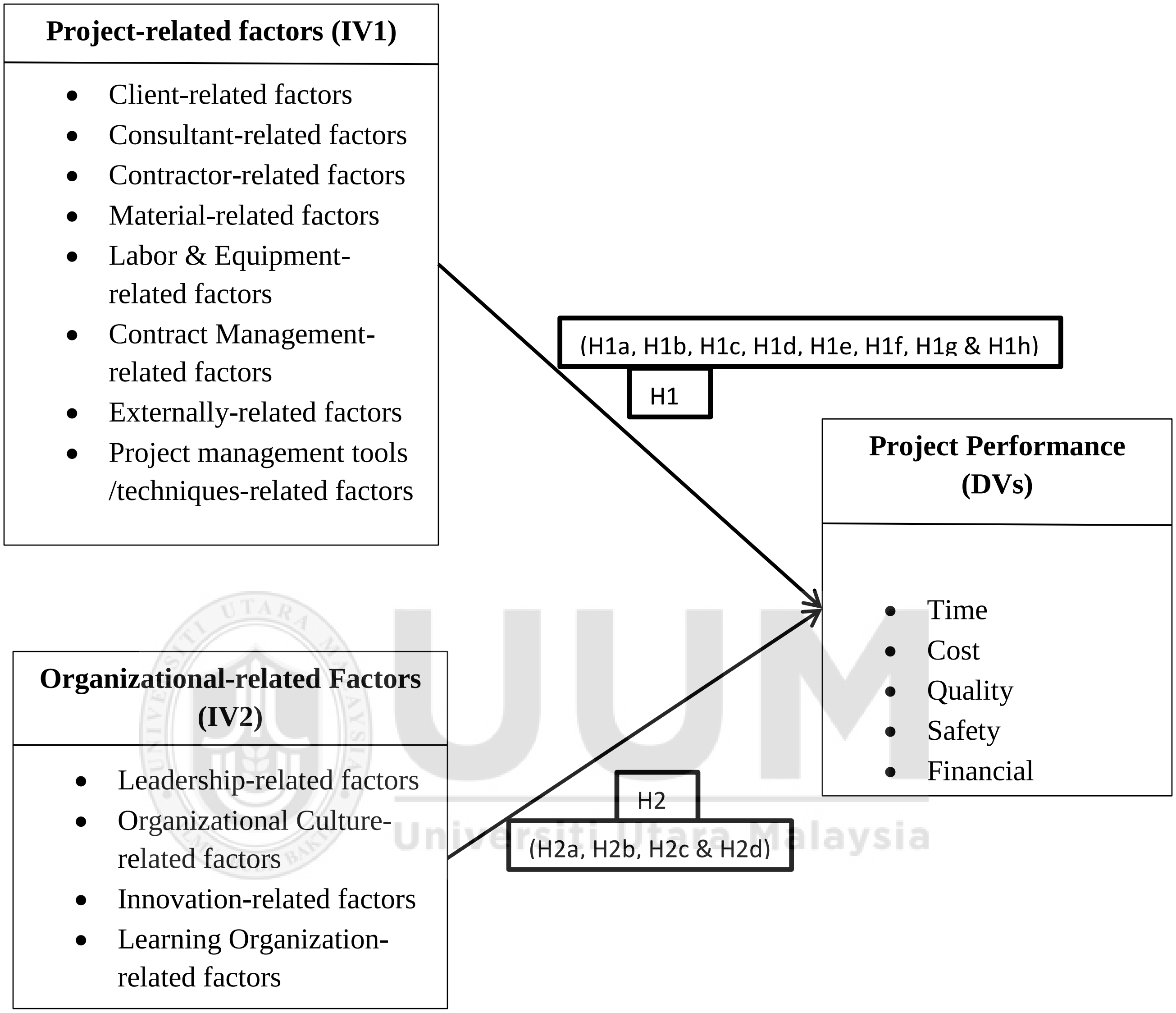
The research framework for this study was developed based on the research gaps identified in the literature review matrix as well as based on the scope of this study. Successful performance of a construction project largely depends on the performance of the key stakeholders/tools involved in the project such as client, contractors, consultants, material suppliers, labor and equipment suppliers, contract management professionals, externally-related parties and usage of necessary project management tools / techniques in the project. These stakeholders/tools-related factors often called as the hard factors in project management are chosen as one of the independent variable (IV1) named as project-related factors.

Performance of the stakeholders / application of suitable tools to ensure success in a construction project is highly connected to the leadership styles of the project managers / organizations involved, culture of the organization where they work, innovation capabilities / freedom given to the employees in the organization, opportunities given to individuals and the company as a whole to learn and to improve. These four factors (leadership, organization culture, innovation & learning organization) are often referred as soft factors in the organization, which influences the hard factors and impacts the performance of the project / organizations. These soft factors are chosen as another independent variable (IV2) named as organizational-related factors.

Success of a project is measured in terms of completing within the schedule (time performance), completing within the budget (cost performance), completing without defects / repairs (quality performance), completing without accidents / fatalities (safety performance) and by earning profits from the projects completed (financial performance). All these five essential performance dimensions are chosen as dependent variable (DV) named as project performance dimensions.

Impact of these chosen IVs on the DVs vary with respect to the size of the organization such as small, medium, large and very large. This is due to the fact that, the organizational set up and the way the organization operates vary significantly with respect to it's size, which obviously will have an impact on the projects, which these organizations execute. Even for comparable projects performance of a small and medium construction company will vary significantly with that of large and very large projects. Thus, since size of the organization is critical in studying the impact of the IVs on the DVs, size of the organization is chosen as the control variable (CV).

The following figure 3.2 illustrates the research framework for this study.



"Size of the organization" is the control variable (**CV**)

Figure 3.2
Research Framework
Source: Developed for this research

3.2.1 Research model

The research model of this study is as follows:

Project Performance (DV) = f (Project-Related Factors (IV1) & Organizational-Related Factors (IV2).

i.e., (y1,y2,y3,y4,y5) = f (x1,x2,x3,x4,x5,x6,x7,x8), (x9,x10,x11,x12) and the weightage is equal for y1, y2, y3, y4 & y5. Project Performance dimensions y1, y2, y3, y4 & y5 are individually calculated by

Time (y1) = f(x1,x2,x3,x4,x5,x6,x7,x8), (x9,x10,x11,x12)

Cost (y2) = f(x1,x2,x3,x4,x5,x6,x7,x8), (x9,x10,x11,x12)

Quality (y3) = f(x1,x2,x3,x4,x5,x6,x7,x8), (x9,x10,x11,x12)

Safety (y4) = f(x1,x2,x3,x4,x5,x6,x7,x8), (x9,x10,x11,x12)

Financial (y5) = f(x1,x2,x3,x4,x5,x6,x7,x8), (x9,x10,x11,x12)

Where x1 is the client-related factor, x2 is the contractor-related factor, x3 is the consultant-related factor, x4 is the material-related factor, x5 is the labor and equipment-related factor, x6 is the contract management-related factor, x7 is the externally-related factor, x8 is the project management tools/techniques-related factor, x9 is the leadership-related factor, x10 is organizational culture-related factor, x11 is the innovation-related factor and x12 is the learning organization-related factor. This research model is applied for the overall construction industry and the different sectors of construction in this study to examine the impact of project and organizational-related factors on project performance.

3.3` Hypothesis/propositions development

3.3.1 Project-related factors and project performance:

Hypothesis H1 examines overall project related factors, in that:

H1 Project-related factors significantly impact project performance.

Construction projects in general constitute a large number of activities and transactions in various stages of their life cycle in order to achieve desired and timely completion, cost, quality and other stakeholder objectives. According to the transaction cost economics theory (Williamson, 1989), governance structure of transaction cost in a project between the buyer and seller for goods and services is a major factor which contributes significantly to project performance. Poor transaction governance is likely to heavily increase the transaction costs in a project. Project-related factors are the main transaction partners in a project; hence, efficient transaction between the project-related factors is more likely to impact project performance. Few scholars, like Winch (1989), Klein and Shelanski (1996) and Lua, Zhang and Pan (2014) used the Transaction Cost Economics (TCE) Theory to understand the relationships between different stakeholders in the construction industry.

Project-related factors have received greater attention from many researchers across the globe, particularly on project performance factors, such as time, cost and quality. Kim (1989) studied the relationship between project scope and project time and cost and found that the scope's impact on time varies significantly in the industry even for comparable projects. Belassi (1996) studied the relationship between CSFs and its impact on and interaction with project performance. He found many neglected factors still exist and their relationship needs to be studied further. Atkinson (1999) studied the success criteria for projects other than time, cost and quality and found that there are other criteria to be considered and their relationship needs to be studied as well. Davies (2002) studied the factors leading to project management issues and the critical factors for project success. He found that human factors have not been considered in the studies and the relationship needs to be studied. Jagboro and Aibinu (2002) studied the relationship between project delay and cost and found a linear relationship. They also studied the relationship between client interference and its impact on project time and cost and found a positive relationship. Westervel (2003) studied the relationship between CSFs and project success and concluded only six factors are significant for project success, while the other factors are not. Angus et al. (2005) studied the relationship between a value-based approach for project and project success and found that the current measurement for project success and its relationships is not adequate.

Assaf and Al-hejji (2006) studied the relationship between various causes and their influence on project delay. They found that change order and labor-related factors have significant relationship, while the others are not significant. Sambasivan and Soon (2007) studied the relationship between the various delay factors and their impact on project completion and concluded 10 major causes and six major effects have a significant relationship with project delay. Alaghbari et al. (2007) studied the relationship between contractors, owners, consultants, external factors and project delay. They found that the relationship is significant. Ling et al. ((2009) studied the relationship between CSFs and its relationship with project success and found that only scope management and quality have a significant relationship, while the others do not. Hamzah et al. (2012) examined the various causes related to client, contractor, consultants, material and external, which leads to delay in construction projects and found that, there are 24 causes, which leads to project's delay. Tawil et al. (2013), found in their studies that, the relative important factors for construction projects delay are clients, contractors, consultants, material and scope changes. Memon et al. (2014) studied the relationship between procurement strategies and cost overrun. They found that there is a significant relationship, while owner interference has an insignificant relationship with cost overrun. Marzook (2014) studied the relationship between the causes of delay and their effect on project success and found that there is a significant relationship between clients, contractors, consultants, labor and contract management with project delays. From the above, it can be seen that TCE plays a vital role in project-related factors and project performance. Accordingly, the TCE theory holistically covers all the project-related factors and its transactions.

Additionally, hypothesis H1 examines the individual project-related factors and their significant impact on project performance as hypothesized below:

3.3.1.1 Client-related factors and project performance

In the construction industry, clients are the important stakeholders as they are owners, who conceive the project idea, fund the project, establish the requirements of the project in order to achieve their business objectives. Role of clients for the success of a project is very crucial. Leaving the entire project to contractors and consultants will have serious implications, while too much interference by the client on contractors work will lead to delay and conflicting issues in the project. Thus, clients need to play a balanced role in the projects to ensure its success. Many researchers in the past had studied the role of clients on project performance in terms of time overruns and cost overruns. For example, Sambsivan and Soon (2007) found in their studies that, client's inadequate finance capabilities and delay in payments to contractors for completed works is one of the main cause for project delays. Alaghbari et al. (2007) studied the relationship between owners and project delay. They found that the relationship is significant. Hamzah et al. (2012) examined the various causes related to client, which leads to delay in construction projects and found that, clients are one among the 24 causes, which leads to project's delay. Tawil et al. (2013), found in their studies that, one of the relative important factors for construction projects delay are clients. It can be seen from the above, clients play a significant role in achieving the desired performance in a construction project. Having said the above, the above studies by the past researchers are mainly focused on either time delays of cost overruns. Project performance areas such as quality, safety and financial performance are not looked into. Thus, hypothesis H1a examines,

H1a Client-related factors significantly impact project performance.

3.3.1.2 Contractor-related factors and project performance

Among the stakeholders in a construction project, next to the client are the contractors, who actually execute the project on-site. Their role is very critical as their technical capability, resources availability, performance of the project management team and financial capability decides the performance of the project. Contractor's failure in a project with respect to time, cost, quality, safety and financial are the direct indicators of project performance status for the other key stakeholders in the project. For example, Sambasivan and Soon (2007) found in their studies that, contractor's improper planning, poor site management, inadequate experience, mistakes during construction and problems with other stakeholders are the five out of 10 causes for the delays in construction projects in Malaysia. Similarly, Alaghbari et al. (2007) studied the relationship between contractors and project delay. They found that the relationship is significant. Hamzah et al. (2012) examined the various causes related to contractor, which leads to delay in construction projects and found that, contractors are one of the 24 causes, which leads to project's delay. Tawil et al. (2013), found in their studies that, one of the relative important factors for construction projects delay are contractors. It can be seen from the above, contractors play a significant role in achieving the desired performance in a construction project. Having said the above, the above studies by the past researchers are mainly focused on either time delays. Project performance areas such as cost, quality, safety and financial performance are not looked into. Thus, hypothesis H1b examines,

H1b Contractor-related factors significantly impact project performance.

3.3.1.3 Consultant-related factors and project performance

Next to clients and contractors, the other important stakeholder in a project is consultants. These consultants are technical experts, who help the clients and contractors in achieving their desired objectives in a project by providing engineering, technical and regulatory knowledge. In many of the construction projects, based on their role of engagement, consultants do play a key role to monitor the timely completion of the project with quality and safety. For example, Alaghbari et al. (2007) studied the relationship between consultants-related factors and the project delay. They found that the relationship is significant and consultants are one of the four main causes for delays in construction projects in Malaysia. Hamzah et al. (2012) examined the various causes related to consultants, which leads to delay in construction projects and found that, consultants are one of the 24 causes, which leads to project's delay. Tawil et al. (2013), found in their studies that, one of the relative important factors for construction projects delay is consultants. Having said the above, the above studies by the past researchers are mainly focused on either time delays. Project performance areas such as cost, quality, safety and financial performance are not looked into. Thus, hypothesis H1c examines,

H1c Consultant-related factors significantly impact project performance.

3.3.1.4 Material-related factors and project performance

Availability of construction materials, availability of quality construction materials, materials availability at reasonable prices, access to construction material suppliers are another important factors, which determines the project performance in construction companies. Project delays, cost, quality and financial performance of the projects are directly linked to materials-related factors and the associated transactions. For example, Sambasivan and Soon (2007) found in their studies that, shortage of material is one of the main causes for construction projects delay in Malaysia. Hamzah et al. (2012) examined the various causes related to material, which leads to delay in construction projects and found that, material is one of the 24 causes, which leads to project's delay. Tawil et al.

(2013), found in their studies that, one of the relative important factors for construction projects delay is material. Memon et al. (2014) studied the relationship between procurement strategies and cost overrun. They found that there is a significant relationship between procurement and material-related factors on cost overrun. From the above, it is evident that, material-related factors have significant impact on project performance with respect to time and cost. However, impact of material-related factors and its associated transactions on quality, safety and financial performance are unknown. Thus, Hypotheses H1d examines that,

H1d Material-related factors significantly impact project performance.

3.3.1.5 Labor and equipment-related factors and project performance

Availability of skilled and required labor, their competence, discipline is a determining factor for timely completion of construction projects in Malaysia. Similarly, availability of required construction equipment, conditions of these equipment, availability of skilled operators and mechanics to keep the equipment in good working condition at all times, frequent breakdowns and or equipment unavailability are some of the equipment-related factors which determines the time, cost, quality, safety and financial performance of the projects. For example, Sambasivan and Soon (2007) found in their studies that, shortage of labor supply and equipment breakdowns are two of the main causes for delay in construction projects in Malaysia. Similarly, Marzook (2014) studied the relationship between the causes of delay and their effect on project success and found that there is a significant relationship between labor and project delays. From the above, it can be seen that, the labor and equipment-related factors does have significant impact on project performance. However, impact of these labor and equipment-related factors on project performance with respect to cost, quality, safety and financial performance are unknown. Thus, hypotheses H1e examines that,

H1e Labor & equipment-related factors significantly impact project performance.

3.3.1.6 Contract management-related factors and project performance

As discussed in the transaction cost economics theory, the association between various stakeholders such as clients, contractors, consultants, material suppliers, labor and equipment suppliers are governed by the transaction binding agreements named as contracts. Disputes in terms of technical, commercial and other aspects of contract management lead to arbitration, suspension, delays and project abandonment. For example, Kim (1989) found in his research that, scope differs significantly in the industry even for comparable projects and impacts project performance. Davies (2002) found in his research that, established procedures for project scope changes and control of these scope changes are important for project success. Westervel (2003) found in his studies that contract management is one of the six key factors for achieving project success. Ling et al. (2009), found in their studies, that the most important factors for project success for the Singaporean firms that undertake construction projects in China, are the contract scope management and the extent of changes made to the contracts. Truman (2014) stated that poor scope change management is the reason for project failure in the USA. Marzook and El-Rasas (2014) stated that change management-related factors and delay in scope change approvals are some of the causes for delay in construction projects in Egypt. Having said the above, impact of contract management-related factors and their impact on project performance with respect to quality, safety and financial dimensions are clearly unknown. Thus, hypotheses H1f examines that,

H1f Contract management-related factors significantly impact project performance.

3.3.1.7 Externally-related factors and project performance

Externally-related factors such as weather conditions (rains, floods, earthquakes and natural calamities), statutory and or legal requirements, government policies and procedural changes, major structural changes in the organization and stakeholder-related issues have significant direct impact on construction project performance. For example, Belassi and Tukel (1996) explained the project attributes and the related environmental factors which play a key role in determining the project success. Kaliprasad (2006), found in his research, that external factors significantly influence project performance, and in turn, organizational performance. Alaghbari et al. (2007) studied the relationship between external factors and project delay. They found that the relationship is significant. Hamzah et al. (2012) examined the various causes related to external, which leads to delay in construction projects and found that, external-related factors are one of the 24 causes, which leads to project's delay. Having said the above, impacts of external-related factors on all the five project performance dimensions are unknown. Hence, hypotheses H1g examines that,

H1g Externally- related factors significantly impact project performance.

3.3.1.8 Project management tools/techniques-related factors and project performance

Size of the organization, size, complexity, technicality and scope of the project demands application of suitable project management tools/techniques such as software, hardware, systems, standards, protocols and procedures to ensure optimal performance in the project. Capturing the transaction cost among the stakeholders in a project through the application suitable cost and financial-related tools/techniques determines the cost and financial performance of the project. Similarly, application of project duration control tools/techniques such as program evaluation review techniques, work breakdown structures and critical path helps to achieve optimum time performance in the project. Similarly application of ISO 9001 quality management systems and OHSAS 18001 occupational health and safety management systems helps to achieve desired quality and safety performance in the projects. For example, White and Fortune (2002), found in their studies, that most projects and project management organizations use a limited number of project management tools, which is a reason for a project's poor performance. Murphy and Ledwith (2007), found in their studies, that use of planning management tools by the project managers in high technology projects helps to accomplish the project's goals. White and Fortune (2002), found in their studies, that 41 % of the projects succeed due to the application of suitable project management tools/techniques in projects. Raza and Michael (2001), found in their studies, that application of project risk management tools helps to mitigate the risks and improves the project's performance. Having said the above, the extent of application of necessary project management tools/techniques to improve construction projects performance in Malaysia is unknown. Thus, hypotheses H1g examines that,

H1h Project management tools/techniques-related factors significantly impact project performance.

3.3.2 Organizational-related factors and project performance:

Hypothesis H2 examines the overall organizational-related factors, in that:

H2 Organizational-related factors significantly impact project performance.

Pollack (2007), Belout and Gauvreau (2004) found in their studies that, construction organizations, as with other organizations, do need proper leadership at the top to ensure things are happening as planned. These organizations need to have a good organizational culture to ensure that the project management teams of various projects are performing to the expected levels. Similarly, they should find out innovative ways of carrying out the project tasks to save cost, time and in a safe manner to compete in the industry and should learn from their past projects and through other means to establish a learning organizational culture to sustain the business and to grow. Thus, organizational-related factors, such as leadership, organizational culture, innovation and learning organization are very important for the construction industry to understand which of these organizational factors are significantly important to move forward.

3.3.2.1 Leadership and project performance

Organizational-related factors in this study constitute four distinctive dimensions: leadership, organizational culture, innovation and learning organization. Each dimension is likely to have an impact on project performance. Specifically, many studies in the past by Belassi and Tukel (1996), Shrnhur et al. (1997), White and Fortune (2002), Westervel (2003), Hardness et al. (20025), Turner and Muller (2005), Kaliprasad (2006), Chan (2007), Subramaniam et al. (2010), Oliveria et al. (2012), Nixon et al. (2012), Marzook and El-Rasas (2014) and Saunila (2014) have examined the impact of leadership on project performance with diverse results. According to the leadership theory, transformational leadership brings in quantum changes in the organizations, while transactional leadership brings in efficiency and effectiveness in operations. Similarly, other leadership theories, such as servant leadership, path-goal leadership, situational leadership, evolutionary leadership, outstanding leadership, implicit leadership and community leadership are distinctively associated with different environments, which are suitable for application for better results. Coupled with the above theories are the four different types of leadership styles, such as bureaucratic, autocratic, authoritarian and laissez-faire, which contribute further to the performance of organizations. Construction project performance does depend on the project manager's leadership style and application of leadership style on the management of the project.

Thus, H2a hypothesizes that:

H2a Organizational leadership significantly impact project performance.

3.3.2.2 Organizational culture and project performance

According to organizational culture (fatalist, individualist, egalitarian and hierarchist) theories, each of these cultures has its own applications in certain types of businesses. Predominantly, fatalist and individualist organizational cultures promote individualistic performance in organizations. Egalitarian and hierarchist organizational cultures promote group culture and performance. While a stronger culture is a better performance driver in certain type of businesses, it is difficult to change and hence, inhibits performance in certain types of businesses. Which of the above organizational culture drives a construction company's project performance is currently unknown. Many studies in the past by Belassi and Tukel (1996), Westervel (2003), Belout and Gauvreau (2004), Abdul et al. (2004), Hyvari (2006) and Henri (2006) studied the impact of organizational culture on project performance and found diverse results.

Thus, hypothesis H2b states that:

H2b. Organizational culture significantly impact project performance.

3.3.2.3 Innovation and project performance

According to the diffusion of innovation theory by Rogers (1983), the categories of adopters in the industry are: innovators, early adopters, early majority, late majority and laggards. While organizations which are innovators, early adopters or early majority, enjoy enhanced business performance, late majority and laggards suffer in performance. Innovation, in general, is seen as a driver of organizational performance. However, past studies by Dubois and Gadde (2002), Huang and Liu (2005), pounder (2009), De Valence (2010), Hashi and Stojcic (2013) and Saunila (2014) on innovation and its impact on project performance of construction projects found diverse results Thus, it is important to study whether or not the construction industry in Malaysia falls under the late majority or laggard category in terms of innovation.

Thus, hypothesis H2c is as follows:

H2c. Organizational innovation significantly impact project performance.

3.3.2.4 Learning organization and project performance

According to the learning organization theory by Argrys and Schon (1997), the four vital elements of a learning organization culture, i.e., supportive leaders, culture of continuous improvements, defined learning structure and intuitive knowledge processes, are likely to influence organizational performance. Past researchers, like Brady and Davies (2004) and Hardness et al. (2005), found that organizations which learn lessons from previous projects and implement the lessons learned in subsequent projects gain in terms of better performance. Other studies, such as by Garvin (1985) and Elkjaer (2001) have found that poor top management support derails the learning organization culture. Construction companies around the globe differ considerably in their operations even for comparable projects; hence, the effect of learning organization initiatives and their impact on project performance is vital.

Thus, hypothesis H2d states that:

H2d. An organization’s learning organization initiatives significantly impact project performance.

3.3.3 Size of the organization and project performance

From the discussions on hypothesis H1, H1a, H1b, H1c, H1d, H1e, H1f, H1g, H1h, H2, H2a, H2b, H2c and H2d, it is evident that there exist relevant theories which support project-related factors and organizational-related factors and their possible impact on project performance. However, as discussed in Chapter two, section 2.2 (theories related to project management), there is no strong theory to support project management. The available theory according to Koskela and Howell (2002), which is a combination of project and management elements, is not theoretically strong enough to support the possible impact of these project-related factors and organizational-related factors on project performance. It is believed that the identified theories, such as TCE theory (Williamson, 1981), leadership (Burns, 1998), organizational culture (Schein, 1990), innovation (Rogers, 1983) and learning organization (Argrys & Schon, 1997) can strengthen the project management theory to a greater extent and help in the further understanding as to how these project and organizational-related factors individually impact project performance. While there exists a reasonable number of studies on project-related factors and their impact on project performance with diverse perspectives, there exist only a few studies which have examined the relationship between organizational-related factors and project performance. Additionally, no study has been conducted so far in the context of the Malaysian construction industry with the size of the organization as a control variable and its relationship with project and organizational-related factors and project performance. Size of the organization does have an impact on the organizational decision-making processes, organizational culture, leadership styles as well as importance paid to innovation and learning organization initiatives. Thus, with respect to organizational-related factors, the size of the organization does matter. Similarly, with respect to project-related factors, the extent of the influence of clients, selection of contractors and consultants also impact project performance and vary with the size of the organization. In addition, procurement of materials, management of labor & equipment, handling contract management-related issues, diverse externally-related issues and usage of project management tools/techniques in the organization significantly vary with the size (small, medium, large and very large). Thus, it is important to study and understand the impact of size of the organization as a control variable and its impact on project performance.

3.4 Research design

This research study uses a quantitative research approach to identify the factors which impact project performance and the relationships among the variables. A survey research design method was used to collect the data from the targeted population. According to Lee, Benoit-Bryan and Johnson (2011), survey is a widely used approach in quantitative research. The survey instrument used in the survey research with the sample enables researchers to assess population attitudes, perceptions, and opinions about particular research issues, as well as factual knowledge. The quantitative information for the required analysis was collected through the use of various measuring instruments adopted from past researchers and rephrased to suit the requirements of this research. Actual data collection process was started after a validated pilot study. Data collection is done by sending the research questionnaire to the targeted sample population through mail post, e-mails and hand over in person. Analysis of project and organizational-related factors and their impact on project performance was done using the quantitative data collected.

3.5 Operational definitions

For the purpose of this research, the researcher provides the operational definition for the key terms used in this research as follows:

Table 3.1
Operational definition of project performance, project-related factors and organizational-related factors

Author	Definition
PMBOK (2000)	Project - A project is a temporary endeavor undertaken to create a unique product or service. 'Temporary' means every project has a definite beginning and definite end. 'Unique' means the product or service is different in some distinguishing way from all other products or services. Projects are often implemented as a means to achieve the organization's strategic plans.
Oisen (1971)	Project management can be defined as the application of a collection of tools and techniques to plan, control and direct the use of diverse resources for the accomplishment of a unique, complex, one-time task within the time, cost, and quality constraints. Each task requires a particular application of tools and techniques structured to fit the task environment and life cycle of the task (from concept to completion).
Odeh and Battaineh (2002)	Client-related factors - Factors, such as finance and payment of completed work in the project, too much owner

	interference on project matters, slow decision-making on critical issues of the project and unrealistic duration imposed for completion by the owner.
Odeh and Battaineh (2002)	Contractor-related factors - Factors related to sub-contractors of the project, such as improper site management, improper planning and work execution, inadequate experience, mistakes during construction, improper construction methods and delays caused by the sub-contractors.
Odeh and Battaineh (2002)	Consultant-related factors - Factors, such as technical items related to contract management, preparation and approval of project drawings, quality assurance/control of works carried out in the project, long waiting time for approval of tests and inspections by the consultant team.
Odeh and Battaineh (2002)	Material-related factors - Factors, such as delay in delivery of materials and equipment, wrong delivery of materials and equipment, short supply of materials and equipment, quality and performance issues of supplied material and equipment.
Odeh and Battaineh (2002)	Labor and equipment-related factors - Factors, such as labor supply, labor shortage, labor productivity, labor skill issues, equipment availability and equipment failure issues faced at the project.
Odeh and Battaineh (2002)	Contract management-related factors - Factors, such as change orders imposed by the client, mistakes, discrepancies and technical inconsistencies in contract documents, disputes and negotiations during construction related to time, cost, quality and on technical matters.
Odeh and Battaineh (2002)	Externally-related factors - Factors, such as weather conditions, changes in regulations, social, political, religious and other economic changes that happen during the course of the project.
Maserang (2002)	Project management tools/techniques-related factors - Project management is challenging with many complex tasks, objectives and responsibilities. There are many tools/ techniques available to assist in accomplishing the tasks and executing the responsibilities to meet the objectives. Some require a computer with supporting software, while others can be undertaken manually. Project managers should

	choose a project management tool/technique that best suits the project undertaken. No one tool/ technique will address all project management needs. The Program Evaluation Review Technique (PERT) and Gantt Charts are two of the most commonly used project management tools.
Sambasivan and Soon (2007)	Time overrun - Delay in completing the project within the agreed time duration of the project due to factors, such as inadequate planning by contractors, improper site management by the contractors, inadequate project handling experience of contractors and delay in payments by the client for the work completed by the contractors.
Sambasivan and Soon (2007)	Cost overrun - Factors related to the contract, such as change orders (changes to the original deliverables and requirements, mistakes and discrepancies in the contract document) that result in cost of execution of the project exceeding the estimated cost of the project.
Kotter (2001)	Leadership - Leadership is different from management. Leadership and management are two distinctive and complementary systems of action. Each has its own functions and distinctive features. Management is about coping with complexity. Leadership, by contrast, is about coping with change. Leaders do not make plans, they do not solve problems and they do not even organize people. What they do is prepare the organizations for change and help them cope as they struggle through it (Kotter, 2001).
Rashid, Sambasivan and Johari (2002)	Organizational culture- Organizational culture can be defined as the set of values, beliefs and behavior patterns that form the core identity of an organization, which help shape the employees' behavior. It provides the selection mechanisms or norms and values which people enact and perform.
Thornhill (2006)	Innovation - Innovation is defined as the ability of a firm's intellectual capability to produce new products to the market to sustain and to improve organizational performance. Innovative organizations are successful and lead the market, in which they operate. R&D and adopting new technologies are the keys to innovate new products or services in organizations.
Garvin (1985)	Learning organization - A learning organization is an

	organization skilled at creating, acquiring and transferring knowledge and at modifying its behavior to reflect new knowledge and insights in all its business processes for sustainability and for improvement in its performance.

3.6 Measurement of variables/instrumentation

The research questionnaire was developed to collect the quantitative data from the selected population and sample size. The complete research questionnaire can be found in Appendix B. The instrument (as shown in Table 3.1 above) was designed in such a way that the relevant factors related to the project and the organization and project performance could be measured appropriately. The instrument design contains five parts, which are as follows:

Part one - Demographic factors (about the respondent): details, such as name, position, division, department, age, gender, race, education level, years of experience, total projects handled and specialized experience were collected in this section. This section has a total of 11 questions.

Part two - Organization details (about the organization, where the respondent is attached): details, such as name of the organization, year of establishment, nature of business, annual turnover, company status (Government, semi-government, public listed, private, multinational and or other companies) were collected in this section. A total of nine questions constitute this section.

Part three - In this section, a total of 35 questions were asked on project-related factors (critical factors, which could impact project performance), such as client-related (four questions), contractor-related (six questions), consultant-related (four questions), material-related (four questions), labor and equipment-related (four questions), contract management-related (five questions), external factors (four questions) and project management tools/techniques-related (four questions).

Part four - Organizational-related factors (critical factors which could impact project performance), such as leadership-related (18 questions), organizational culture-related (23 questions), innovation-related (12 questions) and learning organization-related (20 questions) were asked in this section, constituting a total of 73 questions.

Part five - Project performance is measured in terms of five dimensions, namely time (five questions), cost (five questions), quality (five questions), safety (five questions) and financial performance (four questions), totaling 24 questions in this section.

Parts one and two of the questionnaire (demographic factors) were developed by the author, while the questions for the other parts (parts three, four and five) were adopted from past research studies. The details are shown in Table 3.2.

Table 3.2
Research questionnaire items and sources

Variable	Author and Source	Items of the questionnaire	Reliability
Independent Variable (IV1) – Project-related factors			
Client-related factors	Sambasivan and Soon (2007).	1. Lack of finance and payment for completed works. 2. Owner interference. 3. Slow decision-making. 4. Unrealistic contract duration and	0.88 – 0.97

		requirement imposed.	
Contractor-related factors	Sambasivan and Soon (2007).	1. Contractor's poor performance. 2. Contractor's poor site management practices. 3. Poor construction methods used in projects. 4. Improper planning by contractor. 5. Mistakes during construction stage. 6. Contractor's inadequate experience.	0.88 – 0.97
Consultant-related factors	Sambasivan and Soon (2007).	1. Contractor management. 2. Preparation and approval of drawings. 3. Quality assurance control. 4. Waiting time for approval of tests and inspection.	0.88 – 0.97
Material-related factors	Sambasivan and Soon (2007).	1. Availability of materials. 2. Availability of quality materials. 3. Shortage of materials. 4. On-time material delivery.	0.88 – 0.97
Labor & Equipment-related factors	Sambasivan and Soon (2007).	1. Labor productivity. 2. Lack of appropriate skills. 3. Equipment availability. 4. Adequacy of equipment.	0.88 – 0.97
Contract management-related factors	Sambasivan and Soon (2007).	1. Change orders. 2. Mistakes and discrepancies in contract document. 3. Major disputes and	0.88 – 0.97

		negotiations. 4. Inappropriate overall organizational structure linked to the project. 5. Lack of communication between the parties.	
Externally-related factors	Sambasivan and Soon (2007).	1. Weather conditions. 2. Regulatory changes. 3. Problems with neighbors. 4. Unforeseen site conditions.	0.88 – 0.97
Project management tools/techniques-related factors	Sambasivan and Soon (2007).	1. The organization supports the use of project management tools/techniques in managing the projects. 2. The organization uses adequate and appropriate project management tools/techniques to improve the project performance results in terms of time, cost, quality, safety and financial performance. 3. The organization effectively uses the project management tools/techniques to detect the problems/issues of the projects at an early stage and mitigate them accordingly. 4. The project management tools/techniques employed in the organization have no	0.88 – 0.97

		limitations and fit well for all types of projects.	
Independent Variable (IV2)			
Organizational-related factors			
Leadership-related factors	Antonakis, Avolio and Sivasubramaniam (2003).	1. Employees need to be supervised closely, or they are not likely to do their work. 2. Employees want to be part of the decision- making process. 3. In complex situations, leaders should let subordinates work problems out on their own. 4. It is fair to say that most employees in the general population are lazy. 5. Providing guidance without pressure is the key to being a good leader. 6. Leadership requires staying out of the way of subordinates as they do their work. 7. As a rule, employees must be given rewards or punishments in order to motivate them to achieve organizational objectives. 8. Most workers want frequent and supportive communication from their leaders.	0.71 – 0.90

		9.	As a rule, leaders should allow subordinates to appraise their own work.	
		10.	Most employees feel insecure about their work and need direction.	
		11.	Leaders need to help subordinates accept responsibility for completing their work.	
		12.	Leaders should give subordinates complete freedom to solve problems on their own.	
		13.	The leader is the chief judge of the achievements of the members in the group.	
		14.	It is the leader's job to help subordinates find their "passion".	
		15.	In most situations, workers prefer little input from the leader.	
		16.	Effective leaders give orders and clarify procedures.	
		17.	People are basically competent and if given a task, will do a good job.	
		18.	In general, it is best to leave subordinates alone.	
Organizational culture- related factors	Abdul et al. (2004).	1.	The group, I am assessing (organization, division unit team) knows its business objectives clearly.	0.67 – 0.92

	2.	People genuinely like one another.
	3.	People follow clear guidelines and instructions about work.
	4.	People get along very well and disputes are rare.
	5.	Poor performance is dealt with quickly and firmly.
	6.	People often socialize outside of work.
	7.	The group really wants to win.
	8.	People do favors for each other because they like one another.
	9.	When opportunities for competitive advantage arise, people move decisively to capitalize on them.
	10.	People make friends for the sake of friendship and there is no other agenda.
	11.	Strategic goals are shared.
	12.	People often confide in one another about personal matters.
	13.	People build close long-term relationships that someday may be of benefit.
	14.	Reward and punishment are clear.
	15.	People know a lot about each other's families.
	16.	The group is

			determined to beat clearly defined enemies.	
		17.	People are always encouraged to work things out flexibly as they go along.	
		18.	Hitting targets is the single most important thing.	
		19.	To get something done, you can work around the system.	
		20.	Projects that are started are completed.	
		21.	When people leave, co-workers stay in contact to see how they are doing.	
		22.	It is clear where one person's job ends and another person's begins.	
		23.	People protect each other.	
Innovation-related factors	Trigo, Calapez and Santos (2009).	1.	The company does not value an effective network of contacts towards innovation.	0.64 – 0.82
		2.	The company does not reward its employees for their creativity, for accepting risks and for being entrepreneurial.	
		3.	The company is more interested in preserving resources than in taking risks to capitalize an opportunity.	
		4.	Resource management has a greater influence on	

		the company's strategy than the pursuit of opportunity.
	5.	The employees are evaluated for how well they follow the rules rather than for the value they add to the company.
	6.	The company prefers to follow formal procedures instead of modifying usual practices.
	7.	There is a hierarchy and formal description of tasks and functions.
	8.	The company does not give autonomy to the employees and allows them to express their personality and judgment.
	9.	The company does not have a formal process of innovation and research and development defined with the participation of top managers.
	10.	In general, there is no formal process of identification of new ideas and opportunities and these are accidental.
	11.	There are no partnerships with universities or other organizations in order to do research.
	12.	In general, the company

			communicates with customers in an informal way and on a face-to-face basis.	
Learning organization-related factors	Song (2009).	1.	My organization provides a conducive climate to help each other to learn.	0.71 – 0.91
		2.	Employees in my organization are allowed to take time to support learning for themselves and others.	
		3.	Employees in my organization are rewarded for learning.	
		4.	Employees in my organization are allowed to provide open feedback to superiors.	
		5.	Superiors in my organization often ask what others think on matters of interest related to the company and its performance.	
		6.	Employees and managers in my organization often spend time building trust among themselves.	
		7.	Employees in my organization are given freedom to adopt goals for their responsible areas.	
		8.	In my organization, employees are encouraged to revise their thinking with relevant information	

		pertaining to their responsibilities.
	9.	Managers in my organization listen and act on our recommendations.
	10.	In my organization, managers create measurement system for learning and performance.
	11.	In my organization, lessons learned information is available to all the employees to learn and adopt.
	12.	My organization recognizes employees for taking initiatives.
	13.	My organization measures the results of training provided to employees.
	14.	In my organization, management gives control over resources for better performance and learning.
	15.	In my organization, management supports calculated risk-taking by employees to promote learning.
	16.	In my organization, employees are given opportunity to be aware of global perspectives.
	17.	Employees in my organization are encouraged to have diverse perspectives.

		18.	Leaders and managers in my organization provide coaching and mentoring to employees.	
		19.	My organization provides opportunities to learn.	
		20.	In my organization, employees are encouraged to ensure consistent actions.	
Dependent variable (DV)	**Project Performance**			
Time-related performance	Cheung, Suen and Cheung (2004).	1.	Organization completes the projects within the agreed contract schedule with the clients.	0.72 – 0.83
		2.	Organization achieves the critical milestone dates always on time.	
		3.	Organization is effective in getting Extension of Time (EOT) for change orders initiated by the client, which have an impact on the schedule.	
		4.	Organization is efficient in identifying delays and deploying mitigation/catch-up plans to avoid project delay.	
		5.	Organization always submits the project turn- over documents in time to the client.	

Cost-related performance	Cheung, Suen and Cheung (2004).	1. Organization completes the project within the cost/budget allocated to the project. 2. Organization is prompt in raising the cost claims for the works carried out in the project. 3. Clients normally certify the claims on time and make timely payment. 4. Organization is prompt in documenting the change orders requested by the clients and raising cost claims on time to mitigate cost escalation. 5. Organization does not have disputes with the clients on project-related costs/claims/retention sum.	0.72 – 0.83
Quality-related performance	Cheung, Suen and Cheung (2004).	1. Organization pays attention to quality and does not compromise quality. 2. Mistakes and defects are identified through periodic quality inspections and resolved on time. 3. There were no major quality issues and no major non-conformance report (NCR) raised by the client. 4. There were no quality rejection and	0.72 – 0.83

		reworks in projects 5. There were no customer claims on quality- related works in the organization.	
Safety-related performance	Cheung, Suen and Cheung (2004).	1. In the organization, safety is given top most priority. 2. Most of the projects are completed without accidents and Lost Time Accidents (LTAs). 3. The organization monitors safety statistics very closely and reports to authorities on safety statistics/incidents regularly. 4. The organization conducts safety-related training, education and campaigns regularly to promote safety awareness in projects. 5. In the organization, safety inspections and audits are part of the system and employees are rewarded/punished for safety performance.	0.72 – 0.83
Financial-related performance	Cheung, Suen and Cheung (2004).	1) In the organization, most of the projects are successfully completed and profits are earned. 2) The organization achieves good Return on Investment (ROI) from the projects it	0.72 – 0.83

		has undertaken.
	3)	The organization achieves good Return on Assets (ROA) and Return on Equity (ROE) from the projects undertaken.
	4)	The organization's financial performance is strongly related to the project's performance.

Legend: SME – Small and Medium Enterprises. PPMS – Project Performance Monitoring System.

A total of 152 data points were established in the questionnaire and the data were collected for all the 152 points. A total of 132 questions were used to examine the project and organizational-related factors and their impact on project performance.

In the Likert scale, score one stands for "strongly disagree", two stands for "disagree", three stands for "neither agree nor disagree", four stands for "agree" and five stands for "strongly agree". For areas where the questions are negatively stated in the questionnaire, the low scores explain the positive situation in the organization while the high scores explain the negative situation in the organization. Similarly, for areas where the questions are positively asked in the questionnaire, the low score explains the negative situation in the organization and the high score explains the positive situation in the organization.

3.7 Data collection

3.7.1 Data collection procedure

The survey was conducted by sending the questionnaire to the sample population by email, post, fax, courier and by hand-over in person. All collected responses were properly compiled for analysis with identification numbers. To facilitate getting more responses, a follow-up email was sent to some of the participants whose email addresses were known after two weeks from the date of sending the original questionnaire. All the questionnaires were given a code to identify and to trace where and to whom it was sent to administer the responses properly. Similarly, civil, building & infrastructure, marine, oil and gas and multi-discipline construction projects were coded to facilitate proper administering of the questionnaire related to the industry and their responses for analysis.

3.7.2 Sampling

3.7.2.1 Population

The construction industry in Malaysia is represented by an apex organization known as the Construction Industry Development Board (CIDB), which is a government organization, representing the government to the industry and vice versa. Construction companies in Malaysia are required to register with CIDB as a contractor depending upon their capabilities from grades G1 to G7. G7 is the highest grade of construction contractors, who are eligible to carry out projects with individual project value of more than RM 10 million. Accordingly, the population of construction companies registered with CIDB for grade G7 is considered as the population for this study. The population covers the whole of Malaysia (including east Malaysian states) representing 13 states and two federal territories of Kuala Lumpur and Labuan. The registered companies are under the trade classification of civil construction, building construction and mechanical & electrical (M&E) construction. A total of 14,042 G7 companies were registered with the CIDB as of July 2015 and this is the population used in this study (please refer to Table 3.3 below for details of companies registered with CIDB state-wise and grade wise). To get a good idea of the industry's feedback covering civil, building & infrastructure construction, marine construction, oil and gas construction and multi-discipline construction, the sampling frame for this study comprised all the G7 contractors in civil, building & infrastructure construction, marine construction, oil and gas construction and multi-discipline construction in all the states and two federal territories of Malaysia.

According to Hinze and Tracey (1994), among the stakeholders in the construction projects such as clients, consultants, contractors, labor and equipment suppliers, contract management professionals, external parties such as Government and regulatory authorities and project management tools / techniques providers, the most important stakeholders are the contractors. The reason being, they are the executors of the project and the success or failure of the project largely depends on their performance. Contractors are the main elements in the project life cycle and they bring in other stakeholders either independently or in agreement with the client based on the type of the project contract. Thus, construction project performance as a whole can be measured from the performance of the contractors who executes the projects. Hence, contractors are chosen as the population for this research study.

Table 3.3
List of construction companies registered with Construction Industry Development Board (CIDB)

Sl. No.	**State**	**Contractor Grade**							**Total**
		G7	**G6**	**G5**	**G4**	**G3**	**G2**	**G1**	
1	Selangor	3480	800	2418	1689	3981	3446	9275	25089
2	Sabah	1145	190	468	321	1402	2907	12771	19204
3	Kuala Lumpur*	3701	706	2365	1254	2670	1269	4177	16142
4	Johor	1003	304	793	767	2121	2738	6987	14713
5	Perak	400	226	563	493	1058	1660	6438	10838
6	Terengganu	507	228	499	388	707	1502	6073	9904
7	Sarawak	1225	229	439	356	856	1708	4081	8894
8	Pahang	343	152	384	462	622	1473	5047	8483
9	Negeri Sembilan	257	102	348	281	775	1497	4941	8201
10	Kedah	487	150	308	273	620	1270	5085	8193
11	Kelantan	298	154	241	188	524	1229	5334	7968
12	Penang	762	204	440	341	1084	872	3908	7011
13	Melaka	339	98	257	302	595	764	2582	4937
14	Perlis	92	17	77	46	121	320	2244	2917
15	Labuan*	3	0	3	4	38	44	282	374
Total		**14042**	**3560**	**9603**	**7165**	**17174**	**22699**	**78625**	**152868**
Active G7 companies		**5134**	**Not applicable**						

*Federal territories of Malaysia. Source: CIDB, Malaysia (2015).

Although, there are 14,042 G7 companies registered with CIDB, many companies were not active in business due to various reasons. Some were closed, some were inactive and some had changed their trade. Thus, from the 14,042 G7 registered companies, details of the active companies were obtained from the CIDB and the number of active companies in construction was 5,134 as of 2015, which were selected as the population for this research study.

3.7.2.2 Sample

From Table 3.3, as the population size for this study involves 5,134 construction companies, the sample size for this study was selected from the sampling table with a population size of 5,000, with a confidence level of 95%, as per Sekaran and Bougie (2013). The required sample size as per the above criteria is 357. Accordingly, the sample size selected for this study is 357 construction companies. Considering the lower response rates of less than 20% identified from the literature review from the past research studies by Abdul et al. (2003), Alaghbari et al. (2007) and Memon et al. (2014) for research studies in Malaysia and in order to get 357 responses from construction companies across Malaysia, the questionnaires were sent to the project managers of construction companies, of approximately 200% more than that of the required sample size (357 x 3 = 1,071). Accordingly, the questionnaire was sent to 1,071 construction companies at the G7 contractor grade across Malaysia.

The sampling strategy for this study is simple random sampling. The reason being the population covers all the active G7 registered companies involved in civil, building and infrastructure, marine, oil and gas and multi-discipline categories. Simple random sampling provides a probable opportunity to each company listed in the population to be represented in the study. To facilitate this, all the companies in the population were given running serial numbers and for the entire population, samples were selected via the random sampling technique using Microsoft excel. This helped to get a homogenous mix of samples from all the contractors from civil, building and infrastructure, marine, oil and gas and multi-discipline construction sectors, from all the states and the two federal territories of Malaysia.

3.7.2.3 Unit of analysis

The unit of analysis for this research study is Malaysian construction companies involved in construction activities such as civil, building and infrastructure construction, marine construction, oil and gas construction and multi-discipline construction, who are registered under G7 contractor grade in CIDB.

3.7.2.4 Pilot study

Prior to the survey, face validity of the questionnaire was checked by issuing the questionnaire to 30 industry experts in the construction industry. Similarly, content validity of the questionnaire was tested by a pilot study with 30 samples from the construction industry and the results were evaluated to ensure that the questionnaire is relevant for the study. The reliability test results of the pilot study are shown below in table 3.4.

Table 3.4
Reliability test results of pilot study

Variable	No. of Items	Reliability Analysis Cronbach Alpha
Project-related factors (IV1)		
Client-related factors	4	0.799
Contractor-related factors	6	0.870
Consultant-related factors	4	0.723
Material-related factors	4	0.923
Labor and equipment-related factors	4	0.614
Contract-related factors	5	0.781
Externally-related factors	4	0.666
Project management tools/techniques-related factors	4	0.853
Organizational-related factors (IV2)		
Leadership-related factors	18	0.691
Organizational culture-related factors	23	0.864
Innovation-related factors	12	0.567
Learning organization-related factors	20	0.941
Project performance (DV)		
Time-related performance	5	0.785
Cost-related performance	5	0.808
Quality-related performance	5	0.575
Safety-related performance	5	0.748
Financial-related performance	4	0.717

N = 30.

The reliability results of all the eight project-related factors, three organizational-related factors and four project performance dimensions are well above the minimum requirement of Cronbach alpha value 0.6 and hence the related instruments are considered good for use as it is. In organizational-related factors, one of the factor, (innovation-related factors) and in project performance dimensions, one of the dimension (quality performance) had the Cronbach alpha value less than 0,6 and more than 0.56.

Considering the number of samples tested (30), the instrument is considered for use as it is as the Cronbach alpha value may increase with higher number of samples.

3.8 Data collection

The questionnaire was sent to project managers by email, postal mail (with self-addressed stamped envelope), handed over in person directly and through friends of G7 construction companies in Malaysia. Professional associations, such as Mega Builders Association of Malaysia (MBAM) and the Project Management Institute (PMI) were also approached to email the questionnaire to their professional members who are project managers in G7 construction companies. A covering letter was also attached along with the questionnaire explaining the purpose of the research. A total of 1,071 questionnaires were sent. Responses were received through email, postal mail and personally handed over. A total of 360 responses were received, giving a response rate of 33.61 %. It took close to six months (February – August 2016) to collect all the responses.

3.9 Techniques of data analysis

Data analysis of this research was carried out using Statistical Package for Social Sciences (SPSS) version 22 software for several types of analysis as described below. In addition to that, Microsoft office excel program was used to populate the data for both SPSS and relative importance index analysis calculations.

The first step in the data analysis process started with populating the data from all the respondents using Microsoft office excel. All the variables were coded to identify the variables uniquely for the necessary analysis later.

The following data analyses were carried out on the collected data and the results are discussed in Chapter four:

3.9.1 Missing value analysis

The first analysis carried out on the collected data was the missing value analysis using SPSS software, which helped to identify missing values in the collected data. The analysis outcome produces mean, standard deviation, missing count and percentage. This gives a first-hand idea about the quality of the data collected.

3.9.2 Demographic factors analysis

Demographic factors analysis was carried out to determine how each of the individual demographic profiles of research respondents, such as age, gender, race, education, years of experience, company status and company size, were captured and to analyze how many of them belong to distinct categories in terms of age, experience, education, specialized experience and position. Each of these demographic factors was analyzed in quantitative form for easy understanding and interpretation. The collected data were subjected to this demographic analysis to understand their importance in achieving project performance and the results are discussed in Chapter four.

3.9.3 Factor loading and reliability analysis

Factor loading analysis is a correlational technique to determine meaningful clusters of shared variance. Factor loading analysis begins with a large number of variables and then tries to reduce the interrelationships amongst the variables to a fewer number of clusters or factors. Factor loading analysis finds relationships or natural connections, where variables are maximally correlated with one another and minimally correlated with other variables and then groups the variables accordingly. A factor loading of 0.5 and above for each of the item is required for further analysis. Eight constructs with 35 items related to the first independent variable (IV1) (project-related factors), four constructs with 73 items related to the second independent variable (IV2) (organizational-related factors) and five constructs with 24 items related to the dependent variables (project performance) were tested for factor loading analysis. Factor loading analysis helps to identify some of the items, which do not explain the variable by getting a factor loading value of less than 0.5. Thus, we can remove some of the items whose factor loading values are less than 0.5 prior to further analysis of the data.

Subsequent to factor loading analysis, reliability analysis was carried out to find out the internal consistency of the constructs. The total score, which is a summated scale of several items, was combined to represent its consistency in terms of reliability. Reliability in statistical analysis is measured using Cronbach's Alpha. A value of 0.6 and above for Cronbach's Alpha for various constructs used in the independent and dependent variables is considered acceptable for social sciences research. The collected responses of this study were subjected to reliability analysis before and after factor loading analysis. This is to ascertain, which are the factors that needs to be dropped from the constructs for further analysis.

3.9.4 Multicollinearity diagnostics analysis

Multicollinearity diagnostics analysis is carried out to ascertain the problem of two or more independent variables that are highly correlated in a multiple regression analysis. A high correlation between two independent variables makes the estimation of the regression coefficients unreliable. Multicollinearity statistics of each of the constructs in the independent variable with that of the dependent variable is represented by the variance inflation factor (VIF) in SPSS. A VIF value of less than 10 is considered acceptable and explains there is less multicollinearity effect and a VIF value of one represents that there is no multicollinearity effect among the independent variables. The collected data of this research study was subjected to multicollinearity diagnostics analysis and the results are discussed in Chapter four.

3.9.5 Descriptive statistics analysis

Descriptive statistics analysis is carried out to obtain a better picture of the key characteristics of the data. This provides simple summaries of the samples and the measures in the form of graphics and in quantitative descriptions. It provides the minimum value, maximum value, mean, standard deviation, skewness and kurtosis values for each of the variables. A value of less than +/- 2.0 skewness and kurtosis and a value of less than 10 for standard deviation is considered acceptable for social sciences research. The collected data of this research study were subjected to descriptive analysis to understand the quality of the data obtained. Results of the analysis are discussed in Chapter four.

3.9.6 Correlations analysis

Correlations analysis is carried out to determine the strength of the linear relationship between the independent and dependent variables. The outcome of the analysis is presented in the form of correlations co-efficient which varies from -1.0 to +1.0. The higher the value of the coefficient, the higher the strength of the relationship and vice-versa. A positive sign indicates a positive relationship and a negative sign indicates a negative relationship. The collected data of this research study were subjected to correlations analysis to find out the strength of the relationship for both project and organizational-related factors with project performance.

3.9.7 Relative importance index analysis

The collected data were analyzed for its relative importance index (RII) to understand the most important factors for project performance of construction companies. The RII method was used by Kometa et al. (1994), Sambasivan and Soon (2007), Hamzah et al. (2012) to determine the relative importance of the various causes and its effects. This RII method is used in this study to determine the relative importance of factors among the group of factors which impact project performance.

The five-point Likert scale, starting from one (strongly disagree) to five (strongly agree) was converted to one (less important) to five (extremely important) and the data were transformed to RII for each factor as follows:

$RII = \sum W / A * N$

where, ‘W’ is the weightage given to each factor by the respondents, whilst ‘A’ is the highest weightage and ‘N’ is the total number of respondents (In this study, ‘A’ is five and ‘N’ is 342 after removing 13 outliers and 5 incomplete questionnaires). The RII value has a range from zero to one (zero not inclusive). The higher the value of RII, the more important the factor is in impacting project performance. The RII was used to rank the different factors which are important for project performance. The following RII analysis as shown in Table 3.5 were carried out on the collected data and the results are discussed in Chapter four.

Table 3.5
Relative importance index (RII) analysis

Construction sector	Independent variable 1	Independent variable 2	Dependent variable
Overall construction industry	Project-related factors	Organizational-related factors	Project performance dimensions
Civil, building & infrastructure construction sector	Project-related factors	Organizational-related factors	Project performance dimensions
Marine construction sector	Project-related factors	Organizational-related factors	Project performance dimensions
Oil & gas construction sector	Project-related factors	Organizational-related factors	Project performance dimensions
Multi-discipline construction sector	Project-related factors	Organizational-related factors	Project performance dimensions
Small and medium size construction companies	Project-related factors	Organizational related factors	Project performance dimensions
Large and very large size construction companies	Project-related factors	Organizational-related factors	Project performance dimensions

3.9.8 Regression and hypotheses testing analysis

Regression analysis is used to measure the linear relationship between the independent variables and the dependent variable. By doing regression analysis, we will be able to determine the causal relationship between the independent variables and the dependent variable. The collected data of this research was subjected to the following types of regression analysis as shown in Table 3.6 to understand the relationships between the various variables and the results are discussed in Chapter four.

Table 3.6
Regression analysis

Construction sector	Independent variables	Dependent variable	Control variable
Overall construction industry	Project-related factors and organizational-related factors	Project performance dimensions	Size of the organization
Civil, building & infrastructure construction sector	Project-related factors and organizational-related factors	Project performance dimensions	Size of the organization
Marine construction sector	Project-related factors and organizational-related factors	Project performance dimensions	Size of the organization
Oil & gas construction sector	Project-related factors and organizational-related factors	Project performance dimensions	Size of the organization
Multi-discipline construction sector	Project-related factors and organizational-related factors	Project performance dimensions	Size of the organization
Overall construction industry and sector-wise project performance with all dependent variable dimensions as one indicator (Total project performance)	Project-related factors and organizational-related factors	Project performance dimensions	Size of the organization
Small and medium size construction companies	Project-related factors and organizational-related factors	Project performance dimensions	Size of the organization
Large and very large size construction companies	Project-related factors and organizational-related factors	Project performance dimensions	Size of the organization

Hypotheses testing was carried out to identify which of the hypotheses are supported by the results of the research and which are not. The results of the hypotheses testing show which of the project and organizational-related factors significantly impact the construction company's project performance. The hypotheses were tested for the overall construction industry and the various construction sectors. The results of hypotheses testing are shown and discussed in Chapter four.

3.9.9 Open questions feedback analysis

There are two open questions in the questionnaire for the respondents to answer freely. One is related to the project management tools/techniques most commonly used in the construction industry to enhance project performance and the other is about suggestions to improve the construction company's project performance in Malaysia. The objective of the first open question is to investigate the most common project management tools / techniques used in the construction industry and its diversity. This will enable the practitioners and academicians to understand the important project management tools / techniques used in the construction industry so that, they can use in their respective organizations to improve project performance. The objective of the second open question is to collect the suggestions from the respondents to improve the construction companies performance in Malaysia. Since the respondents are project managers of construction companies, their suggestions will reveal the real time industry problems. This will enable the practitioners, academicians and policy makers to understand the issues of the industry and to mitigate suitable actions necessary to improve construction industry's performance in Malaysia. The collected responses were analyzed to evaluate how many responses were received categorically and to understand the response rates. The other analysis was to understand the perspectives of the project managers engaged in various sectors of construction companies in Malaysia and to identify which are the most important areas of concern for the practitioners in the construction industry related to project-related factors, organizational-related factors and project performance.

3.10 Conclusion

In conclusion, the outcome of this research is expected to contribute to the existing body of knowledge in terms of theoretical, practical, managerial and policy decision-making. In the theoretical area, this research tested the various organizational factors which impact project performance in the construction industry. Additionally, this research adds to the theory on the factors impacting project performance by understanding the significant project and organizational-related factors which impact project performance of construction companies in Malaysia. These findings can then be used at the practical level by the project managers and policy decision-makers to improve project performance and project policy decision-making.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

"The "P" in "PM" is as much about "People" management as much as it is about "Project" management (Fichtner, 2012)."

4.1 Introduction

In this chapter, the research results are presented and discussed. This chapter is divided into 11 parts, where all the 11 different types of data analysis undertaken and their results are presented and discussed. The organization and flow of Chapter four is shown below in figure 4.1.

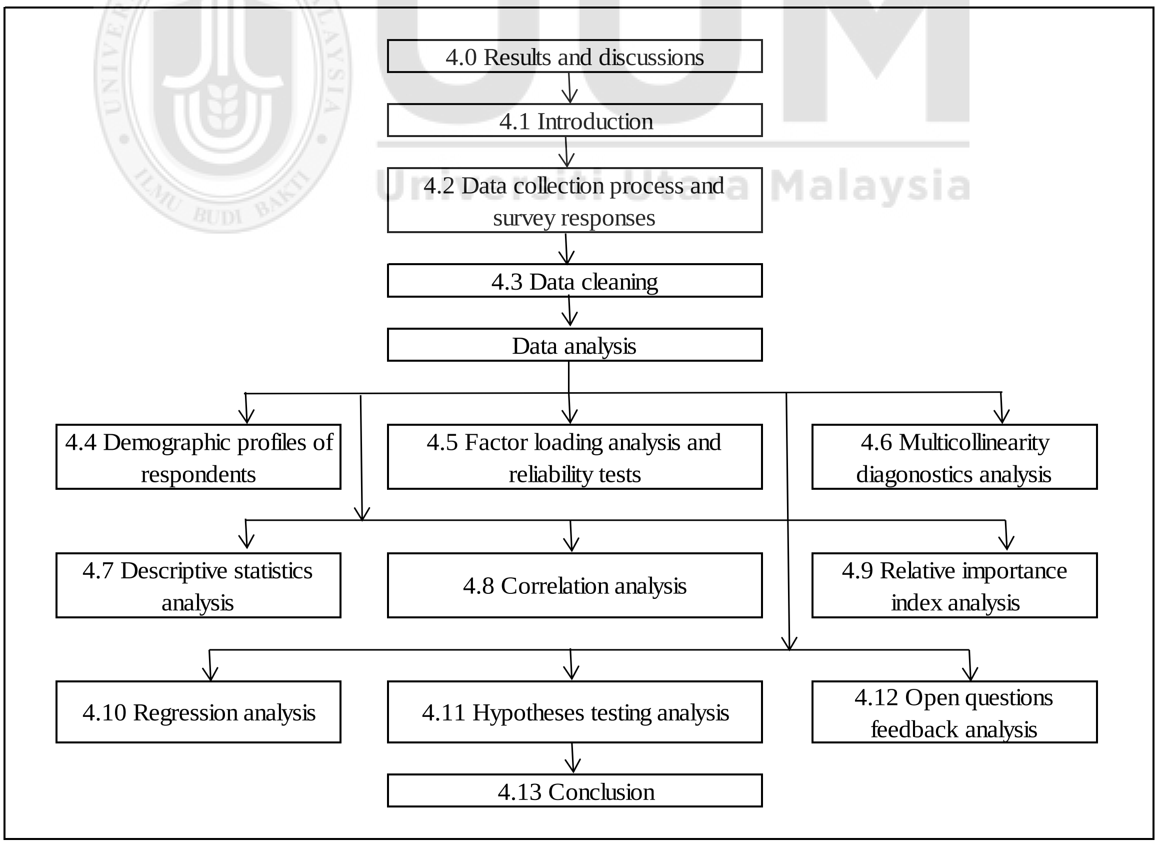


Figure 4.1
The organization and flow of Chapter Four.
Source: Developed for this research

4.2 Data collection process and survey responses

Data collection for this research started in the month of February 2016 and was completed by the month of August 2016. The total duration for the data collection process was six months. The researcher used follow-up emails, and in-person calls for some of the respondents to get the responses on time. Most of the responses came voluntarily upon sending the research questionnaires to the respondents.

4.2.1 Response rate

A total of 1,071 research questionnaires were sent to the respondents in the month of February 2016 and the distribution of questionnaires was completed by May 2016. Responses started coming in from the month of February onwards progressively till August 2016. Table 4.1 below shows the response rate achieved in this research survey.

Table 4.1
Response rate summary

Description	**Rate**
Number of research questionnaires distributed	1,071
Number of responses received from respondents	360
Incomplete responses	5
Outlier responses from SPSS analysis	13
Number of good responses for analysis	342
Response rate overall	33.61%
Good responses for analysis	31.93%

4.2.2 Non-response bias

The researcher sent 1,071 research questionnaires to the respondents, which is three times the response received. The total number of responses received was 360, which is a

33.61% response rate. As the response rate of this research study is more than 30%, according to Armstrong and Overton (1977), non-response bias analysis is not required. Another point is that the researcher collected the completed questionnaires over the period of six months in stages. The questionnaires received were not bundled during the early or end period of the survey. Thus, the problem of non-response bias does not arise. In addition, analysis undertaken on the questionnaires received at the early stage, middle stage and end stage of the survey did not show significant differences in the pattern of the responses. This is another indicator that the collected data were free from non-response bias.

4.3 Data cleaning

The collected data were cleaned to understand the two aspects of quality of data, i.e., to identify the missing data, if any, in the collected data and to find out the outliers.

4.3.1 Outliers

Before proceeding with the data for further analysis, the data were screened for outliers, if any, using SPSS descriptive analysis technique to find out the outliers on standard deviation, skewness and kurtosis. The results of boxplots, stem-and-leaf descriptive analysis and normality plots were critically analyzed and it was found that 13 out of 360 data were common outliers. These outliers were removed from the data set for further analysis.

4.3.2 Missing data analysis

The 347 usable responses were checked and it was found that five of the responses were incomplete in many parts of the research questionnaire, and hence, were removed. The remaining 342 questionnaires were analyzed for missing value analysis and the results of the analysis are shown in Table 4.2.

Table 4.2
Missing value analysis

Variable	Mean	Standard Deviation	Missing Count	Missing Percent
Project-related factors (IV1)				
Client-related factors	14.1053	3.04329	0	.0
Contractor-related factors	22.8187	3.85011	0	.0
Consultant-related factors	15.1667	2.43719	0	.0
Material-related factors	15.0146	2.89044	0	.0
Labor and equipment-related factors	15.1170	2.75666	0	.0
Contract-related factors	18.3450	3.12087	0	.0
Externally-related factors	13.8129	2.67826	0	.0
Project management tools/techniques-related factors	14.6433	2.67523	0	.0
Organizational-related factors (IV2)				
Leadership-related factors	55.2222	6.61357	0	.0
Organizational culture-related factors	55.5497	6.02017	0	.0
Innovation-related factors	29.9094	3.87646	0	.0
Learning organization-related factors	61.0497	8.38378	0	.0
Project performance (DV)				
Time-related performance	14.1696	2.57564	0	.0
Cost-related performance	16.6959	2.72513	0	.0
Quality-related performance	17.7865	2.99825	0	.0
Safety-related performance	20.1023	2.88866	0	.0
Financial-related performance	14.7076	2.24246	0	.0

Number of samples tested = 342.

The results indicate that the 342 responses do not have any missing values and are acceptable for further analysis.

4.4 Demographic profiles of respondents

As discussed in Chapter three, section 3.9.2, the respondents for this research study are project managers of construction companies in Malaysia. Table 4.3 below explains the demographic profile of the respondents in a summarized form.

Table 4.3
Demographic Characteristics of Respondents Analysis

Demographic Characteristic	Frequency	Percentage
Age		
20 to 30	92	26.9
31 to 40	99	28.9
41 to 50	97	28.4
51 and above	54	15.8
Gender		
Male	253	74.0
Female	89	26.0
Race		
Malay	146	42.7
Chinese	81	23.7
Indian	94	27.5
Others	21	6.1
Education		
Primary / Secondary / Diploma	81	23.7
Degree	194	56.7
Post-Graduate	67	19.4
Years of Experience		
5 and below	106	31.0
6 to 10	61	17.8
11 to 15	39	11.4
16 to 20	59	17.3
21 to 25	46	13.4

26 and above	31	9.1
Total Projects Handled		
5 and below	124	36.3
6 to 10	61	17.8
11 to 15	47	13.7
16 to 20	34	9.9
21 to 25	76	22.2
Company Status		
Govt./Semi-Government	3	0.9
Public Listed	176	51.5
Private	153	44.7
Multinational	10	2.9
Organization Size		
Small Scale	58	17.0
Medium Scale	50	14.6
Large Scale	38	11.1
Very Large Scale	196	57.3
Specialized in Construction		
Civil, Building & Infrastructure	139	40.6
Marine	40	11.7
Oil & Gas	82	24.0
Multi-Discipline	81	23.7
Position		
Project managers	163	47.6%
Senior project managers	88	25.7%
Project directors	91	26.6%

N = 342

As seen above, the age group of the respondents varies from 20 years and above to 51 years and above. The analysis shows that the study represents all the age groups of project managers involved in project management in the construction industry. While analyzing the gender component of the respondents, it was noticed that the construction industry is a male-dominated industry due to the nature of work involved. The ethnic analysis of the data reveals that, the construction industry is represented fairly by all the three ethnic communities of Malaysia proportionately to the population. Analysis of the education level of the respondents reveals that more and more educated professionals from universities in Malaysia are entering into the construction industry.

Analysis of number of years of experience of the respondents reveals that Thus, the respondents' range of experience varies from 0 – 26 years and more in a proportional way. The data are not skewed to represent either lesser experienced project managers or highly experienced project managers. Analysis on the total number of projects handled by the project managers reveals that fair representation of project managers' expertise in the construction industry has been represented in this study. An overview of comparison of years of experience and number of projects handled reveals that there is a meaningful relationship between years of experience and number of projects handled. The more the number of years of experience, the higher the number of projects handled and vice versa.

Analysis on the company status where the respondents are from shows that, fair proportion of Government/Semi-Government companies, public listed companies, private companies and multinational companies had responded to this study. Analysis of the size of the organization, where the respondents work, reveals that, construction companies from small size, medium size, large size and very large size had responded proportionately in the survey. The idea behind analyzing the demographic factor, "specialized in construction", is to understand how many of these construction companies are specialized in each of the sectors, like civil, building and infrastructure, marine, oil and gas and multi-discipline construction projects. Analysis of the responses reveals that fair representation of construction companies specialized in civil, building and infrastructure, marine construction, oil and gas construction and multi-discipline (civil, building, infrastructure, marine, & oil and gas) construction companies had responded to the survey. The final part of the demographic analysis was on the position of the respondents of this research study. Analysis of data reveals that, project managers, senior project managers and project directors of construction companies had participated in the survey. The above analysis was helpful to understand the position profile of the respondents to relate to the findings of this research study.

4.5 Factor loading analysis and reliability tests

4.5.1 Factor loading analysis

As discussed in Chapter three, section 3.9.3, factor loading analysis tests were carried out to ascertain the true representation of the factors in the construct with respect to each associated variable. According to Hair, Anderson, Babin and Black (2010), the individual factor loading values for all the items should be more than 0.5 for considering them to use for further analysis. The collected data were analyzed for factor loading analysis in SPSS individually for all the constructs, i.e., client-related factors, contractor-related factors, consultant-related factors, material-related factors, labor and equipment-related factors, contract management-related factors, externally-related factors and project management tools/techniques-related factors associated with the first independent variable of the study, i.e., project-related factors.

Similarly, constructs, i.e., leadership-related factors, organizational culture-related factors, innovation-related factors and learning organization-related factors associated with the second independent variable, i.e., organizational-related factors were also analyzed separately.

As above, the dependent variable, i.e., project performance constructs, i.e., time, cost, quality, safety and financial performance were also analyzed for factor loading analysis separately and the results are as follows:

4.5.1.1 Factor loading analysis for project-related factors

Table 4.4 below shows the factor loading analysis results of project-related factors (independent variable IV1).

Table 4.4
Factor loading analysis for the first independent variable – project-related factors

Variable	N	Component Loading
Project-related factors (IV1)		
Client-related factor 1	4	0.747
Client-related factor 2		0.768
Client-related factor 3		0.769
Client-related factor 4		0.716
Contractor-related factor 1	6	0.715
Contractor-related factor 2		0.764
Contractor-related factor 3		0.751
Contractor-related factor 4		0.792
Contractor-related factor 5		0.731
Contractor-related factor 6		0.643
Consultant-related factor 1	4	0.761
Consultant-related factor 2		0.773
Consultant-related factor 3		0.823
Consultant-related factor 4		0.671

Material-related factor 1	4	0.867
Material-related factor 2		0.804
Material-related factor 3		0.790
Material-related factor 4		0.737
Labor and equipment-related factor 1	4	0.758
Labor and equipment-related factor 2		0.786
Labor and equipment-related factor 3		0.789
Labor and equipment- related factor 4		0.814
Contract-related factor 1	5	0.545
Contract-related factor 2		0.769
Contract-related factor 3		0.752
Contract-related factor 4		0.712
Contract-related factor 5		0.799
Externally-related factor 1	4	0.758
Externally-related factor 2		0.798
Externally-related factor 3		0.752
Externally-related factor 4		0.766
Project management tools/techniques-related factor 1	4	0.811
Project management tools/techniques-related factor 2		0.899
Project management tools/techniques-related factor 3		0.880
Project management tools/techniques-related factor 4		0.781

** Items with factor loading less than 0.5

Eight factors with a total of 35 items represent the first independent variable, i.e., project-related factors. The factor loadings for all the 35 items of these eight factors are well above the minimum requirement of 0.5, and hence, the items of these eight factors are acceptable for further analysis of the data.

4.5.1.2 Factor loading analysis for organizational-related factors

Table 4.5 below shows the factor loading analysis results of organizational-related factors (independent variable IV2).

Table 4.5
Factor loading analysis for the second independent variable – organizational-related factors

Variable	**N**	**Component loading**
Organizational-related factors (IV2)		
Leadership-related factor 1		0.731
Leadership-related factor 2		0.382**
Leadership-related factor 3		0.762
Leadership-related factor 4		0.658
Leadership-related factor 5		0.572
Leadership-related factor 6		0.598
Leadership-related factor 7		0.585
Leadership-related factor 8		0.773
Leadership-related factor 9		0.645
Leadership-related factor 10	18	0.607
Leadership-related factor 11		0.623
Leadership-related factor 12		0.488**
Leadership-related factor 13		0.754
Leadership-related factor 14		0.693
Leadership-related factor 15		0.602
Leadership-related factor 16		0.808
Leadership-related factor 17		0.796
Leadership-related factor 18		0.585

Organization culture-related factor 1	23	0.779
Organization culture-related factor 2		0.736
Organization culture-related factor 3		0.613
Organization culture-related factor 4		0.758
Organization culture-related factor 5		0.408**
Organization culture-related factor 6		0.642
Organization culture-related factor 7		0.442**
Organization culture-related factor 8		0.663
Organization culture-related factor 9		0.851
Organization culture-related factor 10		0.600
Organization culture-related factor 11		0.444**
Organization culture-related factor 12		0.527
Organization culture-related factor 13		0.649
Organization culture-related factor 14		0.475**
Organization culture-related factor 15		0.623
Organization culture-related factor 16		0.712
Organization culture-related factor 17		0.473**
Organization culture-related factor 18		0.509
Organization culture-related factor 19		0.831
Organization culture-related factor 20		0.704
Organization culture-related factor 21		0.471**
Organization culture-related factor 22		0.496
Organization culture-related factor 23		0.486**
Innovation-related factor 1	12	0.455**
Innovation-related factor 2		0.732
Innovation-related factor 3		0.720
Innovation-related factor 4		0.718
Innovation-related factor 5		0.533
Innovation-related factor 6		0.524
Innovation-related factor 7		0.467**
Innovation-related factor 8		0.784
Innovation-related factor 9		0.589
Innovation-related factor 10		0.699
Innovation-related factor 11		0.484**
Innovation-related factor 12		0.584

Learning organization-related factor 1		0.587
Learning organization-related factor 2		0.723
Learning organization-related factor 3		0.699
Learning organization-related factor 4		0.730
Learning organization-related factor 5		0.617
Learning organization-related factor 6		0.562
Learning organization-related factor 7		0.539
Learning organization-related factor 8		0.608
Learning organization-related factor 9		0.431**
Learning organization-related factor 10		0.638
Learning organization-related factor 11	20	0.594
Learning organization-related factor 12		0.468**
Learning organization-related factor 13		0.756
Learning organization-related factor 14		0.749
Learning organization-related factor 15		0.539
Learning organization-related factor 16		0.733
Learning organization-related factor 17		0.824
Learning organization-related factor 18		0.505
Learning organization-related factor 19		0.414**
Learning organization-related factor 20		0.498

** Removed items with factor loading less than 0.5

There are four factors with 73 items in the second independent variable, i.e., organizational-related factors. While analyzing the factor loading for these 73 items, it was noticed that the following items' factor loading values were less than 0.5 and were removed for further analysis.

Leadership	-	Items 2, 12
Organizational culture	-	Items 5,7,11,14,17,21,23
Innovation	-	Items 1,7,11
Learning organization	-	Items 9,12,19

This means a total of 15 out of 73 items had a factor loading of less than 0.5, which is 20% of the items originally planned. The remaining 80% of the items were acceptable for further analysis and were analyzed accordingly.

4.5.1.3 Factor loading analysis for project performance dimensions

For the dependent variable (project performance), there are five dimensions with 24 items. The collected data were analyzed for factor loading analysis. Out of 24 items, one item loading was less than 0.5 (item no. 3) related to time performance with the question, "My organization is effective in getting EOT (Extension of Time) for change orders initiated by the client, which has impact on the schedule". Accordingly, data related to this item was removed for further analysis.

Table 4.6 below shows the factor loading analysis results of project performance dimensions (dependent variable).

Table 4.6
Factor loading analysis for the dependent variable – Project performance dimensions

Variable	***N***	***Component loading***
Project performance (DV)		
Time-related performance 1		0.832
Time-related performance 2		0.777
Time-related performance 3		0.483**
Time-related performance 4	5	0.770
Time-related performance 5		0.806
Cost-related performance 1		0.699
Cost-related performance 2		0.714
Cost-related performance 3	5	0.665
Cost-related performance 4		0.775
Cost-related performance 5		0.655
Quality-related performance 1		0.823
Quality-related performance 2		0.887
Quality-related performance 3	5	0.620
Quality-related performance 4		0.905
Quality-related performance 5		0.875
Safety- related performance 1		0.785
Safety- related performance 2		0.640
Safety- related performance 3	5	0.824
Safety- related performance 4		0.827
Safety- related performance 5		0.827
Financial-related performance 1		0.831
Financial-related performance 2		0.899
Financial-related performance 3	4	0.868
Financial-related performance 4		0.670

** Removed items with factor loading less than 0.5

4.5.2 Reliability tests

As discussed in Chapter three, section 3.9.3, reliability tests were performed to find out the internal consistency of the constructs' total score, where summated scale of several items were combined to represent its consistency. The collected data of this research was evaluated for reliability before and after factor loading analysis to show the reliability of its constructs. The reliability values (Cronbach's alpha) for all the constructs before and after the factor loading analysis were analyzed and found to be more than 0.6, which was good for further analysis. It was noticed that there was no significant change in the reliability values before and after factor loading analysis, which explains the internal consistency of the constructs. The reliability data are presented in Table 4.7 below.

Table 4.7
Reliability Analysis before and after Factor Loading Analysis

Variable	No. of Items	Before Factor Analysis Cronbach Alpha	No. of Items Dropped	No. of Items Retained	After Factor Analysis Cronbach Alpha
Project-related factors (IV1)					
Client-related factors	4	0.738	0	4	0.738
Contractor-related factors	6	0.826	0	6	0.826
Consultant-related factors	4	0.748	0	4	0.748
Material-related factors	4	0.811	0	4	0.811
Labor and equipment-related factors	4	0.795	0	4	0.795
Contract-related factors	5	0.766	0	5	0.766
Externally-related factors	4	0.768	0	4	0.768
Project management tools/techniques-related factors	4	0.863	0	4	0.863
Organizational-related factors (IV2)					
Leadership-related factors	18	0.779	2**	16	0.754
Organizational culture-related factors	23	0.838	7**	16	0.763
Innovation-related factors	12	0.671	3**	9	0.666
Learning organization-related factors	20	0.929	3**	17	0.917
Project performance (DV)					
Time-related performance	5	0.793	1**	4	0.822
Cost-related performance	5	0.739	0	5	0.739
Quality-related performance	5	0.773	0	5	0.773
Safety-related performance	5	0.837	0	5	0.837
Financial-related performance	4	0.833	0	4	0.833

**Factor loading values less than 0.5, N = 342.

4.6 Multicollinearity diagnostics analysis

As discussed in Chapter three, section 3.9.4 of this dissertation, multicollinearity diagnostics analysis was carried out to determine whether or not there exists a high level of correlation between two variables, which will lead to the insignificance of a significant variable. The collected data were analyzed for multicollinearity diagnostics analysis and the results are shown in Table 4.8 below. The multicollinearity effect represented by VIF values of the collected data reveals that all the project and organizational-related factors of this study have a VIF value of less than 10, which is considered as acceptable and that there is no significant multicollinearity effect between the variables under study.

Table 4.8

Collinearity Statistics Analysis

Model		Unstd. Coeffs.		Std. Coeffs			Collin. Statistics	
		B	Std. Error	Beta	t	Sig.	Tol.	VIF
1	(Constant)	10.206	1.158		8.816	.000		
	Total client-related factors	.081	.057	.095	1.421	.156	.575	1.739
	Total contractor-related factors	-.201	.052	-.301	-3.893	.000	.432	2.314
	Total consultant-related factors	.105	.068	.099	1.536	.125	.615	1.626
	Total material-related factors	.087	.060	.098	1.460	.145	.576	1.737
	Total labor and equipment-related factors	.035	.066	.037	.525	.600	.519	1.926
	Total contract-related factors	.008	.059	.009	.129	.898	.500	2.000
	Total externally-related factors	-.018	.055	-.018	-.323	.747	.792	1.262
	Total project management tools/techniques-related factors	.280	.052	.291	5.405	.000	.891	1.122
2	(Constant)	2.643	1.523		1.736	.084		
	Total client-related factors	.056	.052	.066	1.078	.282	.572	1.749
	Total contractor-related factors	-.173	.048	-.259	-3.647	.000	.422	2.371
	Total consultant-related factors	.102	.063	.096	1.617	.107	.602	1.661
	Total material-related factors	.016	.055	.018	.293	.769	.560	1.784
	Total labor and equipment-related factors	.038	.060	.040	.628	.531	.518	1.932
	Total contract-related factors	.061	.054	.074	1.131	.259	.491	2.036
	Total externally-related factors	-.040	.050	-.042	-.800	.424	.777	1.288
	Total project management tools/techniques-related factors	.123	.051	.128	2.435	.015	.772	1.295
	Total leadership-related factors after factor loading analysis	-.021	.022	-.053	-.954	.341	.681	1.469
	Total organizational culture-related factors after factor loading analysis	.122	.026	.285	4.634	.000	.561	1.783
	Total innovation-related factors after factor loading analysis	-.025	.039	-.037	-.630	.529	.609	1.642
	Total learning organization-related factors after factor loading analysis	.083	.017	.271	4.855	.000	.685	1.460

a. Dependent Variable: TRF Total Time Related Performance after Factor loading analysis

4.7 Descriptive statistics analysis

As discussed in Chapter three, section 3.9.5 of this dissertation, descriptive statistics analysis was carried out to ascertain the mean, standard deviation, skewness and kurtosis values, which demonstrate the normality of the data. A lower value of standard deviation, skewness and kurtosis explains the data are normal and not skewed. For studies with large sample size like this, to verify the normality of the data, skewness and kurtosis is preferred over normality tests. The reason being, normality tests are sensitive to sample size. The collected data were subjected to descriptive statistics analysis and the results of the analysis are shown in Table 4.9 below. The results indicate that the skewness and kurtosis values are well below +/- 2, which show that the data are not skewed and thus normal. Similarly, the standard deviation values are around 3.0 for project-related factors, well below 3.0 for project performance dimensions and less than 10 for organizational-related factors, which is satisfactory.

Table 4.9
Descriptive statistics analysis

	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Total client-related factors	4.00	20.00	14.1053	3.04329	-.659	.132	.400	.263
Total contractor-related factors	9.00	30.00	22.8187	3.85011	-.851	.132	.888	.263
Total consultant-related factors	7.00	20.00	15.1667	2.43719	-.735	.132	.725	.263
Total material-related factors	5.00	20.00	15.0146	2.89044	-.449	.132	.217	.263
Total labor and equipment-related factors	8.00	20.00	15.1170	2.75666	-.553	.132	.167	.263
Total contract-related factors	10.00	25.00	18.3450	3.12087	-.260	.132	-.172	.263
Total externally-related factors	4.00	20.00	13.8129	2.67826	-.205	.132	.197	.263
Total project management tools/techniques-related factors	7.00	20.00	14.6433	2.67523	-.365	.132	.123	.263
Total leadership-related factors	31.00	79.00	55.2222	6.61357	.151	.132	1.397	.263
Total organizational culture-related factors	40.00	77.00	55.5497	6.02017	.211	.132	.238	.263
Total innovation-related factors	19.00	45.00	29.9094	3.87646	.445	.132	.568	.263
Total learning organization-related factors	20.00	83.00	61.0497	8.38378	-.660	.132	1.252	.263
Total time-related performance	7.00	20.00	14.1696	2.57564	-.162	.132	.123	.263
Total cost-related performance	8.00	25.00	16.6959	2.72513	-.036	.132	.457	.263
Total quality-related performance	6.00	25.00	17.7865	2.99825	-.412	.132	.869	.263
Total safety-related performance	10.00	25.00	20.1023	2.88866	-.377	.132	.549	.263
Total financial-related performance	7.00	20.00	14.7076	2.24246	.024	.132	.351	.263
Valid N (listwise)								

N = 342.

4.8 Correlation analysis

As discussed in Chapter three, section 3.9.6, correlation analysis was carried out to determine the strength of the linear relationship between the independent and dependent variables. The collected data were analyzed for correlations and the overall results are shown in Table 4.10 below. The results indicate that there exists a positive relationship between both project and organizational-related factors and project performance. The correlation coefficients are well below 0.70, indicating that there are no serious collinearity problems.

Table 4.10

Corrlations Analysis

		TCRF	F	TCSRF	RF	F	TCoRF	TERF	F	TLRF	TOCRF	TIRF	TLORF	TTRP	TCRP	TQRP	TSRP	TFRP
TCRF	Pearson	1	.630**	.379**	.364**	.414**	.469**	.206**	-.008	.069	.018	.066	.022	-.008	-.018	.000	.065	.010
	Sig. (1-tailed)		.000	.000	.000	.000	.000	.000	.442	.101	.371	.110	.342	.445	.367	.497	.115	.429
TCTRF	Pearson	.630**	1	.511**	.491**	.574**	.540**	.300**	.055	.032	-.004	.089	.010	-.105*	-.046	-.010	.036	-.035
	Sig. (1-tailed)	.000		.000	.000	.000	.000	.000	.157	.280	.469	.050	.428	.026	.201	.425	.251	.261
TCSRF	Pearson	.379**	.511**	1	.486**	.426**	.486**	.351**	.180**	.189**	.116*	.132**	.067	.095*	.014	.088	.205**	.048
	Sig. (1-tailed)	.000	.000		.000	.000	.000	.000	.000	.000	.016	.007	.108	.039	.399	.052	.000	.190
TMARF	Pearson	.364**	.491**	.486**	1	.525**	.543**	.320**	.190**	.105*	.187**	.122*	.109*	.107*	.051	.095*	.122*	.098*
	Sig. (1-tailed)	.000	.000	.000		.000	.000	.000	.000	.026	.000	.012	.022	.024	.173	.039	.012	.035
TLERF	Pearson	.414**	.574**	.426**	.525**	1	.607**	.226**	.112*	.070	.068	.063	-.004	.031	.034	.027	.045	.047
	Sig. (1-tailed)	.000	.000	.000	.000		.000	.000	.019	.099	.107	.123	.471	.281	.268	.311	.202	.192
TCoRF	Pearson	.469**	.540**	.486**	.543**	.607**	1	.294**	.119*	.104*	.048	.093*	-.034	.045	-.044	.048	.018	.067
	Sig. (1-tailed)	.000	.000	.000	.000	.000		.000	.014	.028	.189	.043	.263	.204	.208	.188	.369	.107
TERF	Pearson	.206**	.300**	.351**	.320**	.226**	.294**	1	.276**	.172**	.187**	.193**	.117*	.068	.030	-.026	.116*	.047
	Sig. (1-tailed)	.000	.000	.000	.000	.000	.000		.000	.001	.000	.000	.015	.104	.288	.315	.016	.193
TPMTRF	Pearson	-.008	.055	.180**	.190**	.112*	.119*	.276**	1	.099*	.326**	.165**	.343**	.310**	.248**	.268**	.326**	.190**
	Sig. (1-tailed)	.442	.157	.000	.000	.019	.014	.000		.034	.000	.001	.000	.000	.000	.000	.000	.000
TLRF	Pearson	.069	.032	.189**	.105*	.070	.104*	.172**	.099*	1	.448**	.487**	.213**	.147**	.237**	.119*	.138**	.220**
	Sig. (1-tailed)	.101	.280	.000	.026	.099	.028	.001	.034		.000	.000	.000	.003	.000	.014	.005	.000
TOCRF	Pearson	.018	-.004	.116*	.187**	.068	.048	.187**	.326**	.448**	1	.514**	.474**	.427**	.482**	.335**	.311**	.391**
	Sig. (1-tailed)	.371	.469	.016	.000	.107	.189	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000
TIRF	Pearson	.066	.089	.132**	.122*	.063	.093*	.193**	.165**	.487**	.514**	1	.400**	.210**	.299**	.144**	.107*	.314**
	Sig. (1-tailed)	.110	.050	.007	.012	.123	.043	.000	.001	.000	.000		.000	.000	.000	.004	.024	.000
TLORF	Pearson	.022	.010	.067	.109*	-.004	-.034	.117*	.343**	.213**	.474**	.400**	1	.423**	.417**	.345**	.324**	.428**
	Sig. (1-tailed)	.342	.428	.108	.022	.471	.263	.015	.000	.000	.000	.000		.000	.000	.000	.000	.000
TTRP	Pearson	-.008	-.105*	.095*	.107*	.031	.045	.068	.310**	.147**	.427**	.210**	.423**	1	.604**	.578**	.471**	.482**
	Sig. (1-tailed)	.445	.026	.039	.024	.281	.204	.104	.000	.003	.000	.000	.000		.000	.000	.000	.000
TCRP	Pearson	-.018	-.046	.014	.051	.034	-.044	.030	.248**	.237**	.482**	.299**	.417**	.604**	1	.485**	.256**	.501**
	Sig. (1-tailed)	.367	.201	.399	.173	.268	.208	.288	.000	.000	.000	.000	.000	.000		.000	.000	.000
TQRP	Pearson	.000	-.010	.088	.095*	.027	.048	-.026	.268**	.119*	.335**	.144**	.345**	.578**	.485**	1	.503**	.416**
	Sig. (1-tailed)	.497	.425	.052	.039	.311	.188	.315	.000	.014	.000	.004	.000	.000	.000		.000	.000
TSRP	Pearson	.065	.036	.205**	.122*	.045	.018	.116*	.326**	.138**	.311**	.107*	.324**	.471**	.256**	.503**	1	.331**
	Sig. (1-tailed)	.115	.251	.000	.012	.202	.369	.016	.000	.005	.000	.024	.000	.000	.000	.000		.000
TFRP	Pearson	.010	-.035	.048	.098*	.047	.067	.047	.190**	.220**	.391**	.314**	.428**	.482**	.501**	.416**	.331**	1
	Sig. (1-tailed)	.429	.261	.190	.035	.192	.107	.193	.000	.000	.000	.000	.000	.000	.000	.000	.000	

**. Correlation is significant at the 0.01 level (1-tailed). *. Correlation is significant at the 0.01 level (1-tailed). N = 342.
TCRF-Total client-related factors, TCTRF - Total contractor-related factors, TCSRF - Total consultant-related factros, TMARF - Total material-related factors, TLERF-Total labor&equipment realted factors, TCoRF - Total contract related factors, TERF - Total externally related factors, TPMTRF - Total project management tools / techniques related factors, TLRF - Total leadership related factors, TOCRF - Total organizational culture related factors, TIRF - Total innovation related factors, TLORF - Total learning organization related factors, TTRP - Total time related performance, TCRP - Total cost related performance, TQRP - Total quality related performance, TSRP - Total safety related performance & TFRP - Total financial related performance.

4.9 Relative importance index (RII) analysis

As discussed in Chapter three, section 3.9.7 of this dissertation, the RII is a statistical method to calculate and determine the relative importance of the variables, whose values range from zero to one. The higher the value of RII, the higher the importance of the variable and vice versa. As the study has three different variables (project-related factors, organizational-related factors and project performance dimensions), based on the number of factors within these three variables, the top three factors with higher RII scores are considered as most significant. Accordingly, for project-related factors, out of eight factors, three of them with higher RII scores are considered most important. Similarly, for organizational-related factors, the same method was applied in which, out of four factors, the first three with higher RII scores are considered as most important. For project performance dimensions, as there are five dimensions, the first three with higher RII scores are considered as most important. The collected data of this research study were subjected to RII analysis and the results of the RII analysis are shown in Tables 4.11 to 4.18 of this dissertation. The details of the results are discussed in the following sections:

4.9.1 RII analysis – overall construction industry's project performance

Table 4.11 below shows the RII analysis details of the overall construction industry's project performance.

Table 4.11
Relative Importance Index Analysis – Overall construction industry's project performance

Variable	RII Score	RII Ranking
Project-related factors (IV1)		
Client- related factors	0.7053	7
Contractor-related factors	0.7606	1
Consultant-related factors	0.7584	2
Material-related factors	0.7513	4
Labor and equipment-related factors	0.7561	3
Contract-related factors	0.7336	5
Externally-related factors	0.6908	8
Project management tools/techniques-related factors	0.7320	6
Organizational-related factors (IV2)		
Leadership- related factors	0.6903	3
Organizational culture- related factors	0.6944	2
Innovation- related factors	0.6647	4
Learning organization- related factors	0.7183	1
Project Performance (DV)		
Time-related performance	0.7080	4
Cost-related performance	0.6680	5
Quality-related performance	0.7115	3
Safety-related performances	0.8042	1
Financial-related performance	0.7343	2

N = 342

From the above analysis, it is evident that the most important factors for project performance of the overall construction industry are as follows:

Table 4.11 (a)
Overall construction industry's project performance – Most important factors

Variable	Most important factors
Project-related factors	Contractor, consultant and labor and equipment-related factors.
Organizational-related factors	Learning organization, organizational culture and leadership-related factors.
Project performance dimensions	Safety, financial and quality-related dimensions.

The above analysis reveals that for the overall construction industry's project performance, with respect to the project-related factors, the organizations must primarily focus on their contractors, consultants and labor and equipment. With respect to the organizational-related factors, the organizations must focus on learning organization initiatives, organizational culture and leadership. Similarly, with respect to project performance, these organizations must pay attention to safety, financial and qualify performance when compared to time and cost performance of the projects.

4.9.2 RII analysis – civil, building and infrastructure construction sector's project performance

Table 4.12 below shows the RII analysis of the civil, building and infrastructure construction sector's project performance:

Table 4.12
Relative Importance Index Analysis – civil, building and infrastructure construction sector's project performance

Variable	RII Score	RII Ranking
Project-related factors (IV1)		
Client-related factors	0.6855	8
Contractor-related factors	0.7506	2
Consultant-related factors	0.7540	1
Material-related factors	0.7499	3
Labor and equipment-related factors	0.7488	4
Contract-related factors	0.7336	5
Externally-related factors	0.7008	7
Project management tools/techniques-related factors	0.7325	6
Organizational related factors (IV2)		
Leadership-related factors	0.6950	3
Organizational culture-related factors	0.7039	2

Innovation-related factors	0.6790	4
Learning organization-related factors	0.7215	1
Project Performance (DV)		
Time-related performance	0.7075	4
Cost-related performance	0.6665	5
Quality-related performance	0.7192	3
Safety-related performance	0.7722	1
Financial-related performance	0.7449	2

N = 139

From the above analysis, it is evident that the most important factors for the project performance of the civil, building and infrastructure construction industry are as follows:

Table 4.12 (a)
Civil, building and infrastructure construction sector's project performance – Most important factors

Variable	Most important factors
Project-related factors	Consultant, contractor and material-related factors.
Organizational-related factors	Learning organization, organizational culture and leadership-related factors.
Project performance dimensions	Safety, financial and quality-related dimensions.

The above analysis reveals that for the civil, building and infrastructure construction sector's project performance, with respect to the project-related factors, the organizations must primarily focus on their consultants, contractors and material. With respect to the organizational-related factors, the organizations must focus on the learning organization initiatives, organizational culture and leadership. Similarly, with respect to project performance, these organizations must pay attention to safety, financial and qualify performance compared to time and cost performance of the projects.

4.9.3 RII analysis – Marine construction sector's project performance

Table 4.13 below shows the RII analysis details of the marine construction sector's project performance.

Table 4.13
Relative Importance Index Analysis – marine construction sector's project performance

Variable	RII Score	RII Ranking
Project-related factors (IV1)		
Client-related factors	0.7638	4
Contractor-related factors	0.7791	3
Consultant-related factors	0.7912	2
Material-related factors	0.7587	5
Labor and equipment-related factors	0.7925	1
Contract-related factors	0.7380	6
Externally-related factors	0.6700	8
Project management tools/techniques-related factors	0.7150	7
Organizational-related factors (IV2)		
Leadership-related factors	0.6862	3
Organizational culture-related factors	0.6893	2
Innovation-related factors	0.6500	4
Learning organization-related factors	0.7070	1
Project Performance (DV)		
Time-related performance	0.7287	3
Cost-related performance	0.6600	5
Quality-related performance	0.7520	2
Safety-related performance	0.8360	1
Financial-related performance	0.7050	4

N = 40

From the above analysis, it is evident that the most important factors for project performance of the marine construction sector are as follows:

Table 4.13 (a)
Marine construction sector's project performance – Most important factors

Variable	**Most important factors**
Project-related factors	Labor & equipment, consultant and contractor-related factors.
Organizational-related factors	Learning organization, organizational culture and leadership-related factors.
Project performance dimensions	Safety, quality and time-related dimensions.

The RII analysis results of the marine construction sector are different in terms of project-related factors, organizational-related factors and project performance dimensions due to the nature of the sector. Construction work of this sector is different from that of the civil, building and infrastructure sector, as the works are carried out in a marine environment, which has exposure to safety hazards as well as corrosion and erosion due to seawater. Thus, the organizations engaged in this marine construction sector should focus primarily on labor and equipment, consultant and contractor in terms of project-related factors and for organizational-related factors, these organizations need to focus on learning organization, organizational culture and leadership-related factors over innovation. With respect to project performance, safety, quality and time performance are relatively important over financial and cost performance.

4.9.4 RII analysis – Oil and gas construction sector's project performance

Table 4.14 below shows the RII analysis details of the oil and gas construction sector's project performance.

Table 4.14
Relative Importance Index Analysis – oil and gas construction sector's project performance

Variable	RII Score	RII Ranking
Project-related factors (IV1)		
Client-related factors	0.7010	7
Contractor-related factors	0.7599	3
Consultant-related factors	0.7476	4
Material-related factors	0.7671	2
Labor and equipment-related factors	0.7765	1
Contract-related factors	0.7316	6
Externally-related factors	0.6732	8
Project management tools/techniques-related factors	0.7351	5
Organizational-related factors (IV2)		
Leadership-related factors	0.6865	3
Organizational culture-related factors	0.6948	2
Innovation-related factors	0.6608	4
Learning organization-related factors	0.7262	1
Project Performance (DV)		
Time-related performance	0.6948	4
Cost-related performance	0.6848	5
Quality-related performance	0.7186	3
Safety-related performance	0.8326	1
Financial-related performance	0.7443	2

N = 82

From the above analysis, it is evident that the most important factors for project performance of the oil and gas construction sector are as follows:

Table 4.14a
Oil and gas construction sector's project performance – Most important factors

Variable	Most important factors
Project-related factors	Labor & equipment, material and contractor-related factors.
Organizational-related factors	Learning organization, organizational culture and leadership-related factors.
Project performance dimensions	Safety, financial and quality-related dimensions.

The RII analysis results of the oil and gas construction sector are slightly different from that of the marine construction sector and similar to the overall construction industry and the civil, building and infrastructure construction sector, whereby the relative important items on project-related factors are labor & equipment, material and contractor. For the organizational-related factors, it is similar to the overall construction industry and the civil, building and infrastructure sector, whereby the relatively important factors are learning organization, organizational culture and leadership. With respect to project performance dimensions, the results are similar to the overall and civil, building and infrastructure construction sectors, whereby the most important dimensions are safety, financial and quality performance.

4.9.5 RII analysis – multi-discipline construction sector's project performance

Table 4.15 below shows the RII analysis details of the multi-discipline construction sector's project performance.

Table 4.15
Relative Importance Index Analysis – multi-discipline construction sector's project performance

Variable	RII Score	RII Ranking
Project-related factors (IV1)		
Client-related factors	0.7160	7
Contractor-related factors	0.7694	1
Consultant-related factors	0.7595	2
Material-related factors	0.7332	6
Labor and equipment-related factors	0.7463	3
Contract-related factors	0.7342	5
Externally-related factors	0.7007	8
Project management tools/techniques-related factors	0.7365	4

Organizational-related factors (IV2)		
Leadership-related factors	0.6892	2
Organizational culture-related factors	0.6850	3
Innovation-related factors	0.6544	4
Learning organization-related factors	0.7077	1
Project Performance (DV)		
Time-related performance	0.6670	4
Cost-related performance	0.6483	5
Quality-related performance	0.6978	3
Safety-related performance	0.8133	1
Financial-related performance	0.7247	2

N = 81

From the above analysis, it is evident that the most important factors for project performance of the multi-discipline construction sector are as follows:

Table 4.15 (a)
Multi discipline construction sector's project performance – Most important factors

Variable	**Most important factors**
Project-related factors	Contractor, consultant and labor and equipment-related factors.
Organizational-related factors	Learning organization, leadership and organizational culture-related factors.
Project performance dimensions	Safety, financial and quality-related dimensions.

The RII analysis results of the multi-discipline construction sector are similar to the overall construction industry in terms of project-related factors. For this sector, the relatively important factors for project-related factors are contractor, consultant and labor and equipment. As for the organizational-related factors, the most important factors are learning organization, leadership and organizational culture. Contrary to the overall construction industry, leadership is relatively important for this sector as per the ranking.

This can be explained from the fact that for multi-discipline construction sector organizations, leadership should be stronger to achieve the desired project performance due to the diverse nature of construction involved. On the project performance part, the multi-discipline construction sector falls in the same category with the overall construction industry and the civil, building and infrastructure and oil and gas construction sectors, in which safety, financial and qualify performance are relatively important in comparison to time and cost performance.

4.9.6 RII analysis – Small and medium construction companies' project performance

Table 4.16 below shows the RII analysis details of small and medium construction companies' project performance.

Table 4.16
Relative Importance Index Analysis – small and medium construction companies' project performance

Variable	RII Score	RII Ranking
Project-related factors (IV1)		
Client-related factors	0.6993	7
Contractor-related factors	0.7592	2
Consultant-related factors	0.7610	1
Material-related factors	0.7535	3
Labor and equipment-related factors	0.7447	4
Contract-related factors	0.7362	5
Externally-related factors	0.6938	8
Project management tools/techniques-related factors	0.7303	6
Organizational-related factors (IV2)		
Leadership-related factors	0.6643	3
Organizational culture-related factors	0.6903	2

Innovation-related factors	0.6557	4
Learning organization-related factors	07120	1
Project Performance (DV)		
Time-related performance	0.6916	4
Cost-related performance	0.6533	5
Quality-related performance	0.7014	3
Safety-related performance	0.8176	1
Financial-related performance	0.7315	2

N = 197

From the above analysis, it is evident that the most important factors for the project performance of small and medium construction companies are as follows:

Table 4.16 (a)
Small and medium construction companies' project performance – Most important factors

Variable	**Most important factors**
Project-related factors	Consultant, contractor and material-related factors.
Organizational-related factors	Learning organization, organizational culture and leadership-related factors.
Project performance dimensions	Safety, financial and quality-related dimensions.

The RII analysis results of small and medium construction companies are similar to the civil, building & infrastructure construction sector in terms of project-related factors as most of the small and medium construction companies are engaged in civil, building and infrastructure projects. With respect to organizational-related factors and project performance dimensions, the most important factors for the small and medium construction companies are the same as the overall construction industry and oil and gas construction companies.

4.9.7 RII analysis – Large and very large construction companies' project performance

Table 4.17 below shows the RII analysis details of large and very large construction companies' project performance.

Table 4.17
Relative Importance Index Analysis – large and very large construction companies' project performance

Variable	RII Score	RII Ranking
Project-related factors (IV1)		
Client-related factors	0.7136	7
Contractor-related factors	0.7627	2
Consultant-related factors	0.7516	3
Material-related factors	0.7465	4
Labor and equipment-related factors	0.7705	1
Contract-related factors	0.7146	6
Externally-related factors	0.6864	8
Project management tools/techniques-related factors	0.7382	5
Organizational-related factors (IV2)		
Leadership-related factors	0.6947	3
Organizational culture-related factors	0.6997	2
Innovation-related factors	0.6764	4
Learning organization-related factors	0.7262	1
Project Performance (DV)		
Time-related performance	0.7318	3
Cost-related performance	0.6874	5
Quality-related performance	0.7202	4
Safety-related performance	0.7856	1
Financial-related performance	0.7442	2

N = 145

From the above analysis, it is evident that the most important factors for the project performance of large and very large construction companies are as follows:

Table 4.17 (a)
Large and very large construction companies' project performance – Most important factors

Variable	**Most important factors**
Project-related factors	Labor and equipment, contractor and consultant-related factors.
Organizational-related factors	Learning organization, organizational culture and leadership-related factors.
Project performance dimensions	Safety, financial and time-related dimensions.

The RII analysis results of large and very large construction companies reveal that the relative importance of project-related factors for this sector are the labor and equipment, contractor and consultant-related factors, which are relatively important over the others. With respect to organizational-related factors, this sector's relatively important factors are the same as the overall construction companies, and multi-discipline construction sector. With respect to project performance dimensions, the relative importance of project performance dimensions, such as safety, financial and time performance are relatively important over time and cost performance.

In conclusion, with regards to the RII analysis, from an overall perspective, the relative importance rankings for project-related factors are, contractor (1), consultant (2), labor and equipment (3), material (4), contract management (5), project management tools/techniques (6), client (7) and external factors (8). Similarly, with respect to organizational-related factors, the relative importance rankings are: learning organization (1), organizational culture (2), leadership (3) and innovation (4). On the part of project performance, the relative importance rankings are: safety (1), financial (2), quality (3), time (4) and cost (5). Table 4.18 summarizes the relative importance ranking details of the various construction sectors studied above.

Table 4.18
Summary of RII of factors

Factors	Over All	C,B & I	Marine	O & G	Multi Disc	S & M	L & VL
Project-related factors (IV1)							
Client-related factors	7	8	4	7	7	7	7
Contractor-related factors	1	2	3	3	1	2	2
Consultant-related factors	2	1	2	4	2	1	3
Material- elated factors	4	3	5	2	6	3	4
Labor and equipment-related factors	3	4	1	1	3	4	1
Contract-related factors	5	5	6	6	5	5	6
Externally-related factors	8	7	8	8	8	8	8
Project management tools/techniques-related factors	6	6	7	5	4	6	5
Organizational-related factors (IV2)							
Leadership-related factors	3	3	3	3	2	3	3
Organizational culture-related factors	2	2	2	2	3	2	2
Innovation-related factors	4	4	4	4	4	4	4
Learning organization-related factors	1	1	1	1	1	1	1
Project Performance (DV)							
Time-related performance	4	4	3	4	4	4	3
Cost-related performance	5	5	5	5	5	5	5
Quality- elated performance	3	3	2	3	3	3	4
Safety-related performance	1	1	1	1	1	1	1
Financial-related performance	2	2	4	2	2	2	2
N	342	139	40	82	81	197	145

1,2&3 **-** Most important factor, Overall – Overall construction industry, C,B&I – Civil, building & infrastructure construction sector, Marine – Marine construction sector, O & G – Oil & gas construction sector, Multi Disc – Multi-discipline construction sector, S & M – Small & Medium construction companies, L & VL – Large & very large construction companies.

4.10 Regression analysis

As discussed in Chapter three, section 3.9.8, the collected data were subjected to multiple hierarchical linear regression analysis (with size of the organization in block one and project and organizational-related factors in block two) to understand the association between the independent and dependent variables and to determine whether or not the independent variables and control variable have a significant impact on the dependent variable. The following regression analysis was carried out to ascertain the impact of independent variables (project-related factors and organizational-related factors) and the control variable on project performance. An attempt was made to analyze the regression analysis for the overall construction industry as well as the four important construction industry sectors, i.e., civil, building and infrastructure, marine, oil and gas and multi-discipline sectors, to ascertain the key project and organizational factors which have a significant impact on project performance. In addition, regression analysis on small and medium construction companies, large and very large construction companies' project performance was also carried out to determine which of the project and organizational-related factors are significant. The results of the analysis are shown in Tables 4.19 to 4.26.

4.10.1 Regression analysis – Overall construction industry's project performance with control variable

The regression analysis results of the overall construction industry's project performance, inclusive of all the 342 responses, are shown in Table 4.19 below.

Table 4.19

Regression analysis – overall construction industry's project performance with control variable

	Dependent variable				
Independent variable	**Time**	**Cost**	**Quality**	**Safety**	**Financial**
Project-related Factors (IV1)					
Client- related factors	0.053	0.004	-0.017	0.083	0.008
Contractor-related factors	-0.263**	-0.044	-0.028	-0.068	-0.121
Consultant-related factors	0.088	-0.038	0.058	0.186**	-0.027
Material-related factors	0.033	-0.005	0.021	-0.008	0.022
Labor and equipment-related factors	0.017	0.075	-0.033	0.027	0.030
Contract-related factors	0.106	-0.039	0.097	-0.087	0.121
Externally-related factors	-0.044	-0.072	-0.164**	-0.031	-0.059
Project management tools/techniques-related factors	0.126**	0.085	0.145**	0.185**	0.010
Organizational-related Factors (IV2)					
Leadership-related factors	-0.061	0.049	0.014	0.012	0.017
Organizational culture-related factors	0.296**	0.326**	0.268**	0.245**	0.182**
Innovation-related factors	-0.035	0.022	-0.095	-0.111	0.122
Learning organization-related factors	0.253**	0.203**	0.212**	0.189**	0.292**
Control variable (size of the organization)	**0.127****	**0.102****	**0.061**	**-0.156****	**0.009**
R^2 Value	0.321	0.297	0.215	0.257	0.255
Adjusted R^2 Value	0.295	0.259	0.184	0.228	0.225
F Value	11.951	10.655	6.908	8.727	8.613
P Value	0.000	0.000	0.000	0.000	0.000

**Significant at 0.05 level of significance, N = 342.

The results indicate that for the overall construction companies' project performance, with respect to project-related factors, for time performance, contractor-related factors are negatively significant and project management tools/techniques-related factors are positively significant. For cost performance, none of the project-related factors is significant. For quality performance, external factors are negatively significant and project management tools/techniques-related factors are positively significant. For safety performance, consultant-related and project management tools/techniques-related factors are positively significant and for financial-related performance, none of the project-related factors is significant.

With respect to organizational factors and its significance on project performance, both organizational culture and learning organization are positively significant for time, cost, quality, safety and financial performance. The other organizational factors, i.e., leadership and innovation, are not significant.

The regression analysis with the control variable (size) of the organization for the overall construction industry reveals that size of the organization has a significantly positive impact on time and cost performance, with a significantly negative impact on safety performance of the projects.

The 29.5% variance[1] in time performance, 25.9% variance in cost performance, 18.4% variance in quality performance, 22.8% variance in safety performance and 22.5% variance in financial performance of the project is explained by both project-related factors, organizational-related factors and size of the organization.

In summary, for the overall construction companies project performance, contractor, consultant, external, project management tools/techniques, organizational culture, learning organization and size of the organization are significant factors.

4.10.2 Regression analysis – Civil, building and infrastructure construction sector's project performance with control variable

The regression analysis results of the civil, building and infrastructure construction sector's project performance, which consists of 139 responses, are shown in Table 4.20 below.

[1] Variance means the amount of difference or change.

Table 4.20
Regression analysis – civil, building and infrastructure construction sector's project performance with control variable

	Dependent variable				
Independent variable	**Time**	**Cost**	**Quality**	**Safety**	**Financial**
Project-related Factors (IV1)					
Client-related factors	0.024	0.002	-0.078	-0.075	0.099
Contractor-related factors	-0.086	0.120	0.230	0.165	-0.097
Consultant-related factors	0.076	0.014	-0.153	0.190	0.039
Material-related factors	-0.018	0.088	0.002	-0.024	0.074
Labor and equipment-related factors	-0.068	-0.078	-0.144	-0.124	-0.070
Contract-related factors	-0.005	-0.087	0.164	-0.072	0.001
Externally-related factors	0.009	-0.198	-0.079	0.140	-0.001
Project management tools/techniques-related factors	0.090	0.104	0.249**	0.178**	0.019
Organizational-related Factors (IV2)					
Leadership-related factors	-0.054	0.070	0.138	0.050	-0.003
Organizational culture-related factors	0.259**	0.429**	0.210**	0.214**	0.269**
Innovation-related factors	0.061	0.046	-0.117	-0.043	0.078
Learning organization-related factors	0.310**	0.234**	0.250**	0.174	0.299**
Control variable (Size of the organization)	0.023	0.062	0.066	-0.181**	0.018
R^2 Value	0.308	0.464	0.321	0.348	0.327
Adjusted R^2 Value	0.236	0.408	0.250	0.280	0.257
F Value	4.287	8.309	4.541	5.138	4.670
P Value	0.000	0.000	0.000	0.000	0.000

**Significant at 0.05 level of significance, N = 139.

The results indicate that for the civil, building and infrastructure construction sector's project performance, with respect to project-related factors, for time performance and cost performance, none of the factors is significant. For quality and safety performance, project management tools/techniques-related factors are positively significant. For financial performance, none of the project-related factors is significant. With respect to organizational factors and its significance to project performance, organizational culture-related factors are positively significant for time, cost, quality, safety and financial performance. Similarly, learning organization-related factors are positively significant for time, cost, quality and financial performance. The other two organizational factors, i.e., leadership and innovation, are not significant. The regression analysis with the control variable (size) of the organization for the civil, building & infrastructure construction sector reveals that size of the organization has a significantly negative impact on safety performance of the projects. A 23.6% variance in time performance, 40.8% variance in cost performance, 25.0% variance in quality performance, 28.0% variance in safety performance and 25.7% variance in financial performance of the project is explained by both project-related factors, organizational-related factors and size of the organization. In summary, for the civil, building & infrastructure construction sector's project performance, project management tools/techniques, organizational culture, learning organization and size of the organization are significant factors.

4.10.3 Regression analysis – Marine construction sector's project performance with control variable

The regression analysis results of the marine construction sector's project performance which consists of 40 responses, are shown in Table 4.21 below.

Table 4.21
Regression analysis - Marine construction sector's project performance with control variable

	Dependent variable				
Independent variable	**Time**	**Cost**	**Quality**	**Safety**	**Financial**
Project-related Factors (IV1)					
Client-related factors	0.203	-0.342	-0.127	-0.188	0.209
Contractor-related factors	-0.607**	0.178	-0.013	-0.508**	-0.202
Consultant-related factors	0.440	0.078	0.366**	0.671**	0.540**
Material-related factors	0.216	-0.423	0.166	0.389**	-0.263
Labor and equipment-related factors	-0.085	0.313	-0.084	0.003	-0.269
Contract-related factors	-0.115	-0.293	-0.055	-0.289	0.000
Externally-related factors	-0.004	0.330	-0.197	-0.101	-0.046
Project management tools/techniques-related factors	0.029	-0.146	-0.100	-0.184	0.105
Organizational-related Factors (IV2)					
Leadership-related factors	0.056	0.075	0.394**	0.123	-0.04
Organizational culture-related factors	0.203	0.428	0.218	0.403**	0.064
Innovation-related factors	0.104	-0.065	-0.291	-0.107	0.199
Learning organization-related factors	0.045	0.289	0.297**	0.200	0.434**
Control variable (Size of the organization)	0.462**	0.409**	0.503**	0.280**	-0.152
R^2Value	0.737	0.452	0.700	0.739	0.602
Adjusted R^2 Value	0.606	0.178	0.550	0.609	0.402
F Value	5.607	1.648	4.672	5.674	3.021
P Value	0.000	0.100	0.000	0.000	0.015

**Significant at 0.05 level of significance, N = 40.

The results indicate that for the marine construction sector's project performance, with respect to project-related factors, for time performance, contractor-related factors are negatively significant and for cost performance, none of the factors is significant. For quality performance, consultant-related factors are positively significant and for safety performance, contractor-related factors are negatively significant, while consultant and material-related factors are positively significant. For financial performance, consultant-related factors are positively significant. With respect to organizational factors and its significance on project performance, for time and cost performance, none of the organizational factors is significant. For quality performance, leadership and learning organization-related factors are positively significant. For safety performance, organizational culture-related factors are positively significant and for financial performance, learning organization-related factors are significant. The regression analysis with the control variable (size) of the organization for the marine construction sector reveals that size of the organization has a significantly positive impact on time, cost, quality and safety performance of the projects. A 60.6% variance in time performance, 17.8% variance in cost performance, 55.0% variance in quality performance, 60.9% variance in safety performance and 40.2% variance in financial performance of the project is explained by both project and organizational-related factors and size of the organization. In summary, for the marine construction sector's project performance, contractor, consultant, material, leadership, organizational culture, learning organization and size of the organization are significant factors.

4.10.4 Regression analysis – Oil and gas construction sector's project performance with control variable

The regression analysis results of the oil and gas construction sector's project performance, which consists of 82 responses, are shown in Table 4.22 below.

The results indicate that for the oil and gas construction sector's project performance, with respect to project-related factors, for time, cost, quality and safety performance, none of the project-related factors is significant. Only for financial performance, contractor- related factors are negatively significant. With respect to organizational factors and its significance to project performance, for time performance, organizational culture and learning organization-related factors are positively significant. For cost performance, organizational culture-related factors are positively significant. For quality performance, none of the organizational factors is significant. For safety performance, learning organization-related factors are positively significant and for financial performance, innovation-related factors are positively significant. The regression analysis with the control variable (size) of the organization for the oil and gas construction sector reveals that size of the organization has a significantly positive impact only on time performance of the oil and gas projects. A 42.0% variance in time performance, 15.5% variance in cost performance, 23.8% variance in quality performance, 25.0% variance in safety performance and 12.9% variance in financial performance of the project is explained by both project and organizational-related factors and size of the organization. In summary, for the oil and gas construction sector's project performance, contractor, organizational culture, innovation, learning organization and size of the organization are significant factors.

Table 4.22
Regression analysis – Oil and gas construction sector's project performance with control variable

	Dependent variable				
Independent variable	**Time**	**Cost**	**Quality**	**Safety**	**Financial**
Project-related Factors (IV1)					
Client-related factors	-0.011	0.021	-0.048	0.127	0.093
Contractor-related factors	-0.146	-0.195	-0.239	0.017	-0.476**
Consultant-related factors	-0.152	-0.103	0.021	-0.033	0.101
Material-related factors	0.031	0.046	0.153	-0.104	-0.183
Labor and equipment-related factors	0.004	0.075	-0.104	-0.009	0.294
Contract-related factors	0.071	-0.143	-0.009	-0.049	0.153
Externally-related factors	0.076	0.036	-0.146	-0.010	-0.121
Project management tools/techniques-related factors	0.148	0.077	0.151	0.212	0.074
Organizational-related Factors (IV2)					
Leadership-related factors	0.072	0.222	-0.150	-0.099	-0.027
Organizational culture-related factors	0.287**	0.366**	0.280	0.122	0.045
Innovation-related factors	-0.152	-0.040	-0.111	-0.146	0.311**
Learning organization-related factors	0.451**	0.042	0.246	0.428**	0.149
Control variable (Size of the organization)	0.253**	0.151	0.135	-0.103	-0.133
R^2 Value	0.513	0.291	0.361	0.371	0.269
Adjusted R^2 Value	0.420	0.155	0.238	0.250	0.129
F Value	5.513	2.146	2.949	3.081	1.922
P Value	0.000	0.015	0.003	0.002	0.050

**Significant at 0.05 level of significance, N = 82.

4.10.5 Regression analysis – Multi-discipline construction sector's project performance with control variable

The regression analysis results of multi-discipline construction sector's project performance, which consists of 81 responses, are shown in Table 4.23 below.

The results indicate that for the multi-discipline construction sector's project performance, with respect to project-related factors, for time performance, contractor-related factors are negatively significant. For cost performance, project management tools/techniques-related factors are positively significant. For quality performance, none of the factors is significant. For safety-related performance, client-related factors are positively significant and contractor-related factors are negatively significant. For financial performance, none of the project-related factors is significant. With respect to organizational factors and its significance on project performance, for time, quality and safety performance, none of organizational-related factors is significant. For cost performance, leadership-related factors are positively significant and for financial performance, learning organization-related factors are positively significant. The regression analysis with the control variable (size) of the organization for the multi-discipline construction sector reveals that size of the organization has a significantly negative impact only on quality and safety performance of the multi-discipline construction projects. A 21.8% variance in time performance, 27.2% variance in cost performance, 19.9% variance in quality performance, 26.9% variance in safety performance and 21.2% variance in financial performance of the project is explained by both project and organizational-related factors and size of the organization.

Table 4.23
Regression analysis – Multi-discipline construction sector's project performance with control variable

	Dependent variable				
Independent variable	**Time**	**Cost**	**Quality**	**Safety**	**Financial**
Project-related factors (IV1)					
Client-related factors	0.057	-0.127	-0.095	0.318**	-0.219
Contractor-related factors	-0.365**	-0.120	-0.188	-0.355**	-0.034
Consultant-related factors	0.036	-0.148	0.013	0.170	-0.164
Material-related factors	-0.026	0.004	-0.152	-0.080	0.058
Labor and equipment-related factors	0.080	0.319	0.159	0.162	0.220
Contract-related factors	0.295	-0.130	0.337	-0.090	0.248
Externally-related factors	-0.078	0.009	-0.210	-0.188	-0.062
Project management tools/techniques-related factors	0.229	0.366**	0.193	0.195	0.019
Organizational-related factors (IV2)					
Leadership-related factors	-0.127	0.282**	-0.092	0.105	-0.036
Organizational culture-related factors	0.261	0.125	0.197	0.246	0.207
Innovation-related factors	-0.011	0.228	0.217	-0.010	0.017
Learning organization-related factors	0.245	0.193	0.238	0.096	0.359**
Control variable (Size of the organization)	-0.019	0.014	-0.267**	-0.247**	0.063
R^2Value	0.345	0.391	0.329	0.388	0.340
Adjusted R^2 Value	0.218	0.272	0.199	0.269	0.212
F Value	2.714	3.303	2.530	3.267	2.653
P Value	0.005	0.001	0.012	0.001	0.006

**Significant at 0.05 level of significance, N = 81.

In summary, for the multi-discipline construction sector's project performance, client, contractor, project management tools/techniques, leadership, learning organization and size of the organization are significant factors.

4.10.6 Regression analysis – Size of the organization as control variable – small and medium construction companies' project performance

As an additional analysis, since size of the organization is a control variable for this research study, a separate regression analysis was carried out for small/medium organizations and large/very large organizations to understand which factors significantly impact project performance in these two categories of organizations. The results are shown in Tables 4.24 and 4.25.

Table 4.24
Regression analysis – small and medium construction companies project performance with control variable

	Dependent variable				
Independent variable	**Time**	**Cost**	**Quality**	**Safety**	**Financial**
Project-related Factors (IV1)					
Client-related factors	0.038	-0.063	-0.124	0.034	0.086
Contractor-related factors	-0.283**	-0.119	0.018	-0.022	-0.216**
Consultant-related factors	0.167**	0.079	0.044	0.196**	-0.002
Material-related factors	0.051	-0.090	-0.201**	-0.076	-0.055
Labor and equipment-related factors	-0.048	0.179	0.013	0.009	0.082
Contract-related factors	0.060	-0.121	0.152	-0.073	0.094
Externally-related factors	0.012	-0.039	-0.061	-0.049	-0.071
Project management tools/techniques-related factors	0.135	0.005	0.140	0.164**	0.081
Organizational-related Factors (IV2)					
Leadership-related factors	-0.162**	-0.068	-0.129	-0.095	-0.024
Organizational culture-related factors	0.294**	0.398**	0.157	0.307**	0.140
Innovation-related factors	0.022	-0.016	-0.039	-0.155	0.061
Learning organization-related factors	0.287**	0.266**	0.230**	0.242**	0.303**
R^2 Value	0.373	0.324	0.149	0.264	0.205
Adjusted R^2 Value	0.332	0.280	0.093	0.216	0.153
F Value	9.120	7.362	2.675	5.509	3.956
P Value	0.000	0.000	0.002	0.000	0.000

**Significant at 0.05 level of significance, N = 197.

The results indicate that for small and medium construction companies' project performance, with respect to project-related factors, for time performance, contractor-related factors are negatively significant and consultant-related factors are positively significant. With respect to organizational factors and its significance to project performance, for time performance, leadership-related factors are negatively significant, while organizational culture and learning organization-related factors are positively significant.

For cost performance, none of the project-related factors is significant, while with respect to organizational-related factors, organizational culture and learning organization-related factors are positively significant.

For quality performance, with respect to project-related factors, material-related factors are negatively significant, while with respect to organizational-related factors, learning organization-related factors are positively significant.

For safety performance, with respect to project-related factors, consultant and project management tools/techniques-related factors are positively significant, while with respect to organizational-related factors, organizational culture and learning organization-related factors are positively significant.

For financial performance, with respect to project-related factors, contractor-related factors are negatively significant and with respect to organizational-related factors, learning organization-related factors are positively significant. A 33.20% variance in time performance, 28.0% variance in cost performance, 9.3% variance in quality performance, 21.6% variance in safety performance and 15.3% variance in financial performance of the projects is explained by both project and organizational-related factors. In summary, for small and medium construction companies, contractor, consultant, material, project management tools/techniques, leadership, organizational culture and learning organization are significant factors.

4.10.7 Regression analysis – Size of the organization as control variable – large and very large construction companies' project performance

Table 4.25 below explains the impact of the control variable on project performance of large and very large construction companies.

Table 4.25
Regression analysis – large and very large construction companies project performance with control variable

	Dependent variable				
Independent Variable	**Time**	**Cost**	**Quality**	**Safety**	**Financial**
Project-related Factors (IV1)					
Client-related factors	0.064	0.067	0.044	0.129	-0.066
Contractor-related factors	-0.202	0.112	-0.032	-0.099	-0.020
Consultant-related factors	0.032	-0.130	0.078	0.208**	-0.023
Material-related factors	-0.002	0.036	0.185**	0.027	0.090
Labor and equipment-related factors	0.072	-0.089	-0.072	0.033	-0.004
Contract-related factors	0.102	-0.103	0.029	-0.129	0.131
Externally-related factors	-0.110	-0.099	-0.212**	0.011	-0.052
Project management tools/techniques-related factors	0.120	0.164	0.122	0.216**	-0.058
Organizational-related Factors (IV2)					
Leadership-related factors	0.053	0.194**	0.101	0.136	0.080
Organizational culture-related factors	0.269**	0.260**	0.250**	0.059	0.212**
Innovation-related factors	-0.107	-0.014	-0.139	-0.067	0.104
Learning organization-related factors	0.252**	0.190**	0.323**	0.202**	0.347**
R^2 Value	0.266	0.324	0.357	0.242	0.341
Adjusted R^2 Value	0.200	0.264	0.298	0.173	0.281
F Value	3.994	5.278	6.105	3.514	5.700
P Value	0.000	0.000	0.000	0.000	0.000

**Significant at 0.05 level of significance, N = 145.

The results indicate that for large and very large construction companies' project performance, with respect to project-related factors, for time performance, none of the factors is significant. With respect to organizational factors and its significance on project performance, for time performance, organizational culture and learning organization-related factors are positively significant.

For cost performance, none of the project-related factors is significant, while with respect to organizational-related factors, leadership, organizational culture and learning organization-related factors are positively significant.

For quality performance, with respect to project-related factors, material-related factors are positively significant, while external factors are negatively significant. With respect to organizational-related factors, organizational culture and learning organization-related factors are positively significant.

For safety performance, with respect to project-related factors, consultant and project management tools/techniques-related factors are positively significant, while with respect to organizational-related factors, learning organization-related factors are positively significant.

For financial performance, with respect to project-related factors, none of the factors is significant and with respect to organizational-related factors, organizational culture and learning organization-related factors are positively significant. A 20.0% variance in time performance, 26.4% variance in cost performance, 29.8% variance in quality performance, 17.3% variance in safety performance and 28.1% variance in financial performance of the projects is explained by both project and organizational-related factors. In summary, for large and very large construction companies, consultants, material, external, project management tools/techniques, leadership, organizational culture and learning organization are significant factors.

Table 4.26 below summarizes the regression analysis results of various construction sectors studied above.

Table 4.26

Summary of regression analysis

	Construction sector / dependent variable																																		
Independent variable	**Overall T/C/Q/S/F/**					**C,B & I T/C/Q/S/F**					**Marine T/C/Q/S/F**					**Oil & Gas T/C/Q/S/F**					**Multi Disc T/C/Q/S/F**					**S & M T/C/Q/S/F**					**L & VL T/C/Q/S/F**				
	T	C	Q	S	F	T	C	Q	S	F	T	C	Q	S	F	T	C	Q	S	F	T	C	Q	S	F	T	C	Q	S	F	T	C	Q	S	F
IV1																																			
CRF																								√		√				√					
CTF	√										√			√						√	√			√		√									
CSF				√									√	√	√														√					√	
MAF														√														√					√		
LEF																																			
CoRF																																			
EXF			√																														√		
PMT	√		√	√				√	√													√												√	
IV2																																			
LRF													√									√				√						√			
OCF	√	√	√	√	√	√	√	√	√	√				√		√	√									√	√		√		√	√	√		√
IRF																			√																
LORF	√	√	√	√	√	√	√	√		√			√		√	√			√						√	√	√	√	√	√	√	√	√	√	√
CV																																			
SIZE	√	√		√				√			√	√	√	√		√								√	√										

√ - Significant, IV – Independent variable., CV – Control variable, CRF – Client-related factors, CTF – Contractor-related factors, CSF – Consultant-related factors, MAF – Material-related factors, CoRF – Contract management-related factors, EXF – Externally- related factors., PMT – Project management tools / techniques-related factors., LRF – Leadership-related factors., OCF – Organizational culture-related factors, IRF – Innovation-related factors, LORF – Learning organization-related factors, T – Time-related performance, C – Cost-related performance, Q – Quality-related performance, S – Safety-related performance, F – Financial-related performance and Size – Size of the organization, C,B&I – Civil, Building & Infrastructure construction sector, Overall – Overall construction industry, S & M – Small & Medium construction companies, L & VL – Large & Very large construction companies.

4.11 Hypotheses testing analysis

The research questions of this dissertation are described in section 1.3 and hypotheses to be tested are described in section 3.2. The following hypotheses (H1, H1a, H1b, H1c, H1d, H1e, H1f, Hg, H1h, H2, H2a, H2b, H2c and H2d) were analyzed using hierarchical multiple regression and the results are presented and discussed below. In the following sections, the hypotheses testing analysis and the results are discussed:

H1a: Client-related factors significantly impact project performance

The following Table 4.27(a) shows the linear multiple regression analysis which tested the relationship between the client-related factors and project performance. The standardized coefficient (ß) values and its significance ($p<0.05$) are presented.

Table 4.27(a)
Client-related factors significantly impact project performance

Division	Time	Cost	Quality	Safety	Financial
Overall (ß)	0.053	0.004	-0.017	0.083	0.008
C,B & I (ß)	0.024	0.002	-0.078	-0.075	0.099
Marine (ß)	0.203	-0.342	-0.127	-0.188	0.209
Oil & gas (ß)	-0.011	0.021	-0.048	0.127	0.093
Multi-discipline (ß)	0.057	-0.127	-0.095	0.318**	-0.219

**Significant at 0.05 level of significance.

From the above values, it is evident that client-related factors are not significant to project performance in terms of time, cost, quality, safety and financial dimensions in all the construction sectors, i.e., overall, civil, building and infrastructure, marine, oil and gas and multi-discipline sectors. The only area where client-related factors have a significant impact on project performance is safety performance in the multi-discipline construction sector.

Thus, Hypothesis H1a is supported for the multi-discipline construction sector's safety performance.

H1b: Contractor-related factors significantly impact project performance

The following Table 4.27(b) shows the linear multiple regression analysis which tested the relationship between contractor-related factors and project performance. The standardized coefficient (ß) values and its significance ($p<0.05$) are presented.

Table 4.27(b)
Contractor-related factors significantly impact project performance

Division	Time	Cost	Quality	Safety	Financial
Overall (ß)	-0.263**	-0.044	-0.028	-0.068	-0.121
C,B & I (ß)	-0.086	0.120	0.230	0.165	-0.097
Marine (ß)	-0.607**	-0.178	-0.013	-0.508**	-0.202
Oil & gas (ß)	-0.146	-0.195	-0.239	0.017	-0.476**
Multi-discipline (ß)	-0.365**	-0.120	-0.188	-0.355**	-0.034

**Significant at 0.05 level of significance.

From the above results, it is evident that contractor-related factors are significant to project performance in terms of time for the overall construction industry, marine and multi-discipline construction sectors. Similarly, contractor-related factors are not significant in terms of cost and quality for any of these sectors. For safety, contractor-related factors are significant for marine and multi-discipline sectors and for financial performance, contractor-related factors are significant for the oil and gas sector only. In summary, contractor-related factors are significant for some sectors in some areas and in some areas, it is not significant.

Thus, Hypothesis H1b is supported for time performance for the overall construction industry, quality performance for the civil, building and infrastructure construction sector, time and safety performance for the marine construction sector, financial performance for the oil and gas construction sector and time and safety performance for the multi-discipline construction sector.

H1c: Consultant-related factors significantly impact project performance

The following Table 4.27(c) shows the linear multiple regression analysis which tested the relationship between consultant-related factors and project performance. The standardized coefficient (ß) values and its significance ($p<0.05$) are presented.

Table 4.27(c)
Consultant-related factors significantly impact project performance

Division	Time	Cost	Quality	Safety	Financial
Overall (ß)	0.088	-0.038	0.058	0.186**	-0.027
C,B & I (ß)	0.076	0.014	-0.153	0.190	0.039
Marine (ß)	0.440	0.078	0.366**	0.671**	0.540**
Oil & gas (ß)	-0.152	-0.103	0.021	-0.033	0.101
Multi-discipline (ß)	0.036	-0.148	0.1013	0.170	-0.164

**Significant at 0.05 level of significance.

From the above results, it is evident that consultant-related factors are significant to project performance in terms of quality, safety and financial performance for the marine construction sector. Similarly, consultant-related factors are not significant in terms of time and cost for any of these sectors. For safety, consultant-related factors are significant for overall and marine construction sectors. In summary, consultant-related factors are significant for some sectors in some areas and in some areas, it is not significant.

Thus, hypothesis H1c is supported for safety performance in the overall construction industry, civil, building and infrastructure, marine and multi-discipline construction sectors. Similarly, hypothesis H1c is supported for the marine construction sector's time, quality and financial performance.

H1d: Material-related factors significantly impact project performance

The following Table 4.27(d) shows the linear multiple regression analysis which tested the relationship between material-related factors and project performance. The standardized coefficient (ß) values and its significance ($p<0.05$) are presented.

Table 4.27(d)
Material-related factors significantly impact project performance

Division	**Time**	**Cost**	**Quality**	**Safety**	**Financial**
Overall (ß)	0.033	-0.005	0.021	-0.008	0.022
C,B & I (ß)	-0.018	0.088	0.002	-0.024	0.074
Marine (ß)	0.216	-0.423	0.166	0.389**	-0.263
Oil & gas (ß)	0.031	0.046	0.153	-0.104	-0.183
Multi-discipline (ß)	-0.026	0.004	-0.152	-0.080	0.058

**Significant at 0.05 level of significance.

From the above results, it is evident that material-related factors are not significant to project performance in terms of time, cost, quality, safety and financial performance for all the sectors except for safety performance in the marine sector. In summary, material-related factors are significant only for the marine construction sector.

Thus, hypothesis H1d is supported for safety performance of the marine construction sector.

H1e: Labor and Equipment-related factors significantly impact project performance

The following Table 4.27(e) shows the linear multiple regression analysis which tested the relationship between the labor and equipment-related factors and project performance. The standardized coefficient (ß) values and its significance ($p<0.05$) are presented.

Table 4.27(e)

Labor & equipment-related factors significantly impact project performance

Division	Time	Cost	Quality	Safety	Financial
Overall (ß)	0.017	0.075	-0.033	0.027	0.030
C,B & I (ß)	-0.068	-0.078	-0.144	-0.124	-0.070
Marine (ß)	-0.085	0.313	-0.084	0.003	-0.269
Oil & gas (ß)	0.004	0.075	-0.104	-0.009	0.294
Multi-discipline (ß)	0.080	0.319	0.159	0.162	0.220

**Significant at 0.05 level of significance.

From the above results, it is evident that, labor and equipment-related factors are not significant to project performance in terms of time, cost, quality, safety and financial performance for all the sectors. In summary, labor and equipment-related factors are not significant for all the sectors.

Thus, hypothesis H1e is not supported for project performance of any of the construction sector.

H1f: Contract management-related factors significantly impact project performance

The following Table 4.27(f) shows the linear multiple regression analysis which tested the relationship between the contract management-related factors and project performance. The standardized coefficient (ß) values and its significance ($p<0.05$) are presented.

Table 4.27(f)

Contract management-related factors significantly impact project performance

Division	Time	Cost	Quality	Safety	Financial
Overall (ß)	0.106	-0.039	0.097	-0.087	0.121
C,B & I (ß)	-0.005	-0.087	0.164	-0.072	0.001
Marine (ß)	-0.115	-0.293	-0.055	0.289	0.000
Oil & gas (ß)	0.071	-0.143	-0.009	-0.049	0.153
Multi-discipline (ß)	0.295	-0.130	0.337	-0.090	0.248

**Significant at 0.05 level of significance.

From the above results, it is evident that contract management-related factors are not significant to project performance in terms of time, cost, quality, safety and financial performance for all the sectors. In summary, labor and equipment-related factors are not significant for all the sectors.

Thus, hypothesis H1f is supported for quality performance of the multi-discipline construction sector.

H1g: Externally-related factors significantly impact project performance

The following Table 4.27(g) shows the linear multiple regression analysis which tested the relationship between the externally-related factors and project performance. The standardized coefficient (ß) values and its significance ($p<0.05$) are presented.

Table 4.27(g)
Externally-related factors significantly impact project performance

Division	**Time**	**Cost**	**Quality**	**Safety**	**Financial**
Overall (ß)	-0.044	-0.072	-0.164**	-0.031	-0.059
C,B & I (ß)	0.009	-0.198	-0.079	0.140	-0.001
Marine (ß)	-0.004	0.330	-0.197	-0.101	-0.046
Oil & gas (ß)	0.076	0.036	-0.146	-0.010	-0.121
Multi-discipline (ß)	-0.078	0.009	-0.210	-0.188	-0.062

**Significant at 0.05 level of significance.

From the above results, it is evident that the externally-related factors are not significant to project performance in terms of time, cost, quality, safety and financial performance for all the sectors except for quality performance in the overall construction industry. In summary, external factors impact significantly the overall construction industry's quality performance.

Thus, hypothesis H1g is supported for quality performance of the overall construction industry .

H1h: Project management tools/techniques-related factors significantly impact project performance

The following Table 4.27(h) shows the linear multiple regression analysis which tested the relationship between project management tools/techniques-related factors and project performance. The standardized coefficient (ß) values and its significance ($p<0.05$) are presented.

Table 4.27(h)
Project management tools/techniques-related factors significantly impact project performance

Division	**Time**	**Cost**	**Quality**	**Safety**	**Financial**
Overall (ß)	0.126**	0.085	0.145**	0.185**	0.010
C,B & I (ß)	0.090	0.104	0.249**	0.178**	0.019
Marine (ß)	0.029	-0.146	-0.100	-0.184	0.105
Oil & gas (ß)	0.148	0.077	0.151	0.212	0.074
Multi-discipline (ß)	0.229	0.366**	0.193	0.195	0.019

**Significant at 0.05 level of significance.

From the above results, it is evident that project management tools/techniques-related factors are significant to project performance in terms of time, quality and safety performance for the overall construction industry. Similarly, project management tools/ techniques-related factors are significant for the civil, building and infrastructure sector for quality and safety performance. Also, project management tools/techniques-related factors are significant for the multi-discipline construction sector for cost performance. In summary, project management tools/techniques-related factors are significant for some of the sectors in some areas and in some areas, it is not significant.

Thus, hypothesis H1h is supported for time, quality and safety performance of the overall construction industry, quality and safety performance of the civil, building and infrastructure construction sector, and cost performance of the multi-discipline construction sector.

H2a: Leadership-related factors significantly impact project performance

The following Table 4.28(a) shows the linear multiple regression analysis which tested the relationship between leadership-related factors and project performance. The standardized coefficient (ß) values and its significance ($p<0.05$) are presented.

Table 4.28(a)
Leadership-related factors significantly impact project performance

Division	**Time**	**Cost**	**Quality**	**Safety**	**Financial**
Overall (ß)	-0.061	0.049	0.014	0.012	0.017
C,B & I (ß)	-0.054	0.070	0.138	0.050	-0.003
Marine (ß)	0.056	0.075	0.394**	0.123	-0.040
Oil & gas (ß)	0.072	0.222	-0.150	-0.099	-0.027
Multi-discipline (ß)	-0.127	0.282**	-0.092	0.105	-0.036

**Significant at 0.05 level of significance.

From the above results, it is evident that leadership-related factors are not significant to project performance in terms of time, cost, quality, safety and financial performance for all the construction sectors except for quality performance in the marine construction sector and for cost performance in multi-discipline construction sector. In summary, leadership-related factors are significant for the marine construction and multi-discipline construction sectors only.

Thus, hypothesis H2a is supported for quality performance of the marine construction sector and cost performance of multi-discipline construction sector.

H2b: Organizational culture-related factors significantly impact project performance

The following Table 4.28(b) shows the linear multiple regression analysis which tested the relationship between organizational culture-related factors and project performance. The standardized coefficient (ß) values and its significance ($p<0.05$) are presented.

Table 4.28(b)
Organizational culture-related factors significantly impact project performance

Division	**Time**	**Cost**	**Quality**	**Safety**	**Financial**
Overall (ß)	0.296**	0.326**	0.268**	0.245**	0.182**
C,B & I (ß)	0.259**	0.429**	0.210**	0.214**	0.269**
Marine (ß)	0.203	0.428	0.218	0.403	0.064
Oil & gas (ß)	0.287**	0.366**	0.280	0.122	0.045
Multi-discipline (ß)	0.261	0.125	0.197	0.246	0.207

**Significant at 0.05 level of significance.

From the above results, it is evident that organizational culture is significant for the overall construction industry and for the civil, building and infrastructure construction sector for all the performance factors, i.e., time, cost, quality, safety and financial performance. In addition, organizational culture-related factors are significant for the oil and gas construction sector for time and cost performance. In summary, organizational culture-related factors are significant for the overall construction industry and civil, building and infrastructure and oil and gas sectors and not significant for the marine and multi-discipline construction sectors.

Thus, hypothesis H2b is supported for time, cost, quality, safety and financial performance for the overall construction industry; civil, building and infrastructure construction sector; and for time and cost performance of the oil and gas construction sector.

H2c: Innovation-related factors significantly impact project performance

The following Table 4.28(c) shows the linear multiple regression analysis which tested the relationship between the innovation-related factors and project performance. The standardized coefficient (ß) values and its significance ($p<0.05$) are presented.

Table 4.28(c)
Innovation-related factors significantly impact project performance

Division	Time	Cost	Quality	Safety	Financial
Overall (ß)	-0.035	0.022	-0.095	-0.111	0.122
C,B & I (ß)	0.061	0.046	-0.117	-0.043	0.078
Marine (ß)	0.104	-0.065	-0.291	-0.107	0.199
Oil & gas (ß)	-0.152	-0.040	-0.111	-0.146	0.311**
Multi-discipline (ß)	-0.011	0.228	0.217	-0.010	0.017

**Significant at 0.05 level of significance.

From the above results, it is evident that innovation-related factors are significant to project performance in terms of financial performance for the oil and gas construction sector. In summary, innovation-related factors are significant only for oil and gas construction sector and not significant for others.

Thus, hypothesis H2c is supported for the financial performance of the oil and gas construction sector.

H2d: Learning organization-related factors significantly impact project performance

The following Table 4.28(d) shows the linear multiple regression analysis which tested the relationship between learning organization-related factors and project performance. The standardized coefficient (ß) values and its significance (p<0.05) are presented.

Table 4.28(d)
Learning organization-related factors significantly impact project performance

Division	**Time**	**Cost**	**Quality**	**Safety**	**Financial**
Overall (ß)	0.253**	0.203**	0.212**	0.189**	0.292**
C,B & I (ß)	0.310**	0.234**	0.250**	0.174	0.299**
Marine (ß)	0.045	0.289	0.297**	0.200	0.434**
Oil & gas (ß)	0.451**	0.042	0.246	0.428**	0.149
Multi-discipline (ß)	0.245	0.193	0.238	0.096	0.359**

**Significant at 0.05 level of significance.

From the above results, it is evident that learning organization-related factors are significant to project performance in terms of time, cost, quality, safety and financial performance for the overall construction industry. In addition, for the civil, building and infrastructure construction sector, learning organization-related factors are significant for time, cost, quality and financial performance. Similarly, learning organization-related factors are significant for the marine construction sector for quality and financial performance and significant for the oil and gas construction sector for time and safety performance. Also, learning organization-related factors are significant for the multi-discipline construction sector for financial performance. In summary, learning organization- related factors are significant for all the sectors.

Thus, hypothesis H1c is supported for time, cost, quality, safety and financial performance of the overall construction industry; time, cost, quality and financial performance of the civil, building and infrastructure construction sector; quality and financial performance of the marine construction sector; time and safety performance of the oil and gas construction sector; and financial performance of the multi- discipline construction sector.

4.11.1 Control variable (size of the organization) significantly impacts project performance

The following Table 4.29 shows the linear regression analysis which tested the relationship between the control variable (size of the organization) and project performance. The standardized coefficient (ß) values, its significance ($p<0.05$) and its R^2 values are presented and discussed.

Table 4.29
Control variable (size of the organization) significantly impacts project performance

	Dependent variable				
Construction sector	**Time**	**Cost**	**Quality**	**Safety**	**Financial**
Overall (ß)	0.127**	0.102**	0.061	-0.156**	0.009
R^2 value	0.321	0.297	0.215	0.257	0.255
Adj. R^2 value	0.295	0.259	0.184	0.228	0.225
C,B & I (ß)	0.023	0.062	0.066	-0.181**	0.018
R^2 value	0.308	0.464	0.321	0.348	0.327
Adj. R^2 value	0.236	0.408	0.250	0.280	0.257
Marine (ß)	0.462**	0.409**	0.503**	0.280**	-0.152
R^2 value	0.737	0.452	0.700	0.739	0.602
Adj. R^2 value	0.606	0.178	0.550	0.609	0.402
Oil & gas (ß)	0.253**	0.151	0.135	-0.103	-0.133
R^2 value	0.513	0.291	0.361	0.371	0.269
Adj. R^2 value	0.420	0.155	0.238	0.250	0.129
Multi-discipline (ß)	-0.019	0.014	-0.267**	-0.247**	0.063
R^2 value	0.345	0.391	0.329	0.388	0.340
Adj. R^2 value	0.218	0.272	0.199	0.269	0.212

**Significant at 0.05 level of significance.

From the above results, it is evident that the control variable (size of the organization) is significant to project performance in terms of time, cost and safety performance for the overall construction industry. Similarly, the control variable is significant in terms of safety performance for the civil, building and infrastructure construction sector; significant in terms of time, cost, quality and safety performance for the marine construction sector; significant in terms of time performance for the oil and gas construction sector; and significant in terms of quality and safety for the multi-discipline construction sector. In summary, the control variable is significant for all the sectors.

Thus, the control variable (size of the organization) is supported for time, cost and performance of the overall construction industry; safety performance of the civil, building and infrastructure construction sector; time, cost, quality and safety performance of the marine construction sector; time performance of the oil and gas construction sector; and quality and safety performance of the multi-discipline construction sector.

Table 4.30 below summarizes the hypotheses testing details of the various construction sectors studied above.

Table 4.30
The Summary for each Hypothesis Testing

Independent variable	Construction sector / Dependent variable																								
	Project Performance Overall (N* = 342)					**Project Performance C,B & I (N* = 139)**					**Project Performance Marine (N* = 40)**					**Project Performance Oil and Gas (N*= 82)**					**Project Performance Multi-Discipline (N*=81)**				
	T	**C**	**Q**	**S**	**F**	**T**	**C**	**Q**	**S**	**F**	**T**	**C**	**Q**	**S**	**F**	**T**	**C**	**Q**	**S**	**F**	**T**	**C**	**Q**	**S**	**F**
Project-related Factors (IV1)																									
Client-related factors																								√	
Contractor-related factors	√										√			√						√	√			√	
Consultant-related factors				√									√	√	√										
Material-related factors														√											
Labor and equipment-related factors																									
Contract-related factors																									
Externally-related factors			√																						
Project management tools/techniques-related factors	√		√	√				√	√													√			
Organizational-related Factors (IV2)																									
Leadership-related factors													√									√			
Organizational culture-related factors	√	√	√	√	√	√	√	√	√	√				√		√	√								
Innovation-related factors																				√					
Learning organization-related factors	√	√	√	√	√	√	√	√		√			√		√	√			√						√

√ – Hypothesis supported, T – Time, C – Cost, Q – Quality, S – Safety, F – Financial, C, B & I – Civil, Building & Infrastructure and N* - Number of samples tested.

4.12 Open questions feedback analysis

In the research questionnaire used in this dissertation, there were two open questions which asked the respondents to give their opinions as follows:

i. What are the most commonly used project management tools/techniques in your organization currently? and

ii. What would you recommend to improve the project performance of the Malaysian construction industry?

The responses received from all 342 valid research responses were compiled separately for each of the questions above. Table 4.31 below summarizes the responses to the open questions:

Table 4.31
Open questions feedback – summary

Category	**N**	**Number of responses**	**Percentage**
Overall feedback	342	214	63%
Feedback from C, B & I sector	139	93	67%
Feedback from Marine sector	40	18	45%
Feedback from O&G sector	82	61	74%
Feedback from multi-discipline sector	81	42	51%
Feedback for question no. 1 (Most commonly used project management tools/techniques)	342	158	46%
Feedback for question no. 2 (Recommendations to improve performance of the Malaysian construction industry)	342	165	48%

Table 4.31(a) below describes the most commonly used project management tools/techniques in the respondents' construction companies.

Table 4.31(a)

Open questions feedback – Question no. 1 – Most commonly used project management tools/techniques

Sl. No.	Most commonly used project management tools/techniques	Sl. No.	Most commonly used project management tools/techniques
1	Primavera planning software	2	Tekla* / Stadpro* / PDMS* Engineering software
3	Ostenda procurement software	4	IT tools
5	Welding management and control software	6	Just In Time concept
7	MS Project planning software	8	Autocad drawing software
9	BOCAD* / PDMS* engineering software	10	Critical Path Method (CPM)
11	Resource histograms	12	Electronic data management systems
13	Share point software	14	(EDMS)
15	Enterprise resource planning (ERP) software	16	ISO 21500 Project management systems
17	Master scheduler software	18	GANTT chart
19	Smart sheet	20	Microsoft office – word / excel
21	Work breakdown structure (WBS)	22	Risk management tools
23	Program evaluation review technique (PERT)	24	Budgeting
25	Bench marking	26	Strategic planning
27	ISO 9001 Quality management systems	28	Balanced score card Job descriptions
29	Project specific procedures	30	Project specifications
31	Quality control management systems (QCMS)	32	Field control management systems (FMCS)
33	Project charter	34	SAP software
35	Team binder	36	Job risk / hazard analysis
37	Key performance indicators (KPI)	38	Project management professional (PMP)
39	Project progress reports	40	Project progress meetings
41	Project management body of knowledge (PMBOK)	42	Customer relationship management (CRM)
43	Brainstorming	44	History management systems (HMS)
45	Acqura – Dimensional control software	46	Smart plant software
47	Parts production centre (PPC)	48	Non- conformance reports (NCRs)
49	Internal / external audits	50	Project quality plan (PQP)
51	ROVIT* software	52	Gap analysis
53	Project close out reports	54	Project execution plans (PEP)

55	Milestone checklist	56	Cost control
57	Peer review	58	Lessons learnt sessions
59	Occupational health and safety management systems (OHSAS)	60	BRAVA*– project online software
61	Systematic inventory controls	62	Building information modeling (BIM)
63	Standard operating procedures (SOP)	64	Internet

*Tekla, Stadpro, PDMS, BOCAD, ROVIT are engineering software used in the construction industry.

The feedback shows a variety of project management tools/techniques are being employed by various construction companies to suit their budget and skills-set. There exists a lack of standardization in the industry with respect to the project management tools/techniques. Among the 158 responses received for this question, the most commonly used project management tools/techniques were analyzed and it was found that Primavera, MS project, Excel, ISO 9001 Quality management systems, GANTT charts, electronic data management systems, work breakdown structure, critical path method, welding control software and enterprise resource planning software, were some of the tools which were used by multiple respondent companies.

On the second question, suggestions for improvement of the Malaysian construction industry, 165 responses were received and are summarized in Appendix C. There were 372 suggestions, out of which the top 20 suggestions are:

i. Lack of availability of skilled workforce;
ii. Need for training and courses for construction workers to enhance their skills;
iii. Need for timely payment from clients to contractors;
iv. More Government support needed for the construction industry;
v. Need for control of material prices;
vi. Need for elimination of payments or bribes;

vii. Need for the standardization of policies (contract terms and conditions) for the construction sector;

viii. Need for application of latest technologies in construction;

ix. Need for learning from other countries related to construction technology;

x. Need for realistic schedules to be given by clients to contractors;

xi. Need for extension of time and variation orders to be finalized then and there rather than waiting till the project completion;

xii. Need for competent project management teams;

xiii. Need for application of proper project management tools;

xiv. Need for better coordination and communication between all the stakeholders;

xv. Need to reduce the documentation requirements from clients;

xvi. Need to improve productivity in the industry;

xvii. Need to adopt early project start techniques by the contractors and clients;

xviii. Need for proper project planning;

xix. Need to have fair competition among construction players in the industry; and

xx. Need to maintain and to improve quality in construction.

Apart from the above top 20 suggestions, there are numerous other suggestions, which are very important for the Malaysian construction industry's project performance, which need to be seriously looked into. These other suggestions are listed in Appendix C of this dissertation and further details are discussed in Chapter five.

4.13 Conclusion

From the above extensive analysis of data, it can be concluded that the project-related factors that are significant for project performance of construction companies in Malaysia are client, contractor, consultant, material, external and project management tools/techniques-related factors; while the other factors, i.e., labor and equipment and contract management are not significant factors.

In addition, the results show that organizational-related factors, such as leadership-related factors are significant only for marine construction sector quality performance and multi-discipline construction sector cost performance. Whilst, organizational culture-related factors are predominantly significant for the project performance in all the construction sectors except multi-discipline construction sector. Similarly, innovation-related factors are significant only for oil and gas construction sector's financial performance. However, learning organization-related factors are significant for all the construction sectors for all or some of the project performance dimensions. The implications of the results are discussed in Chapter five together with a summary and conclusion.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

"Companies often forget about the culture and ultimately they suffer for it, because, you can't deliver good projects from unhappy employees (Hsich, 2014)."

5.1 Introduction

In this chapter, recapitulation of the study, conclusion on the research findings, implications of the research study, and recommendations for the future research studies are discussed. The organization and flow of this chapter is shown below in figure 5.1.

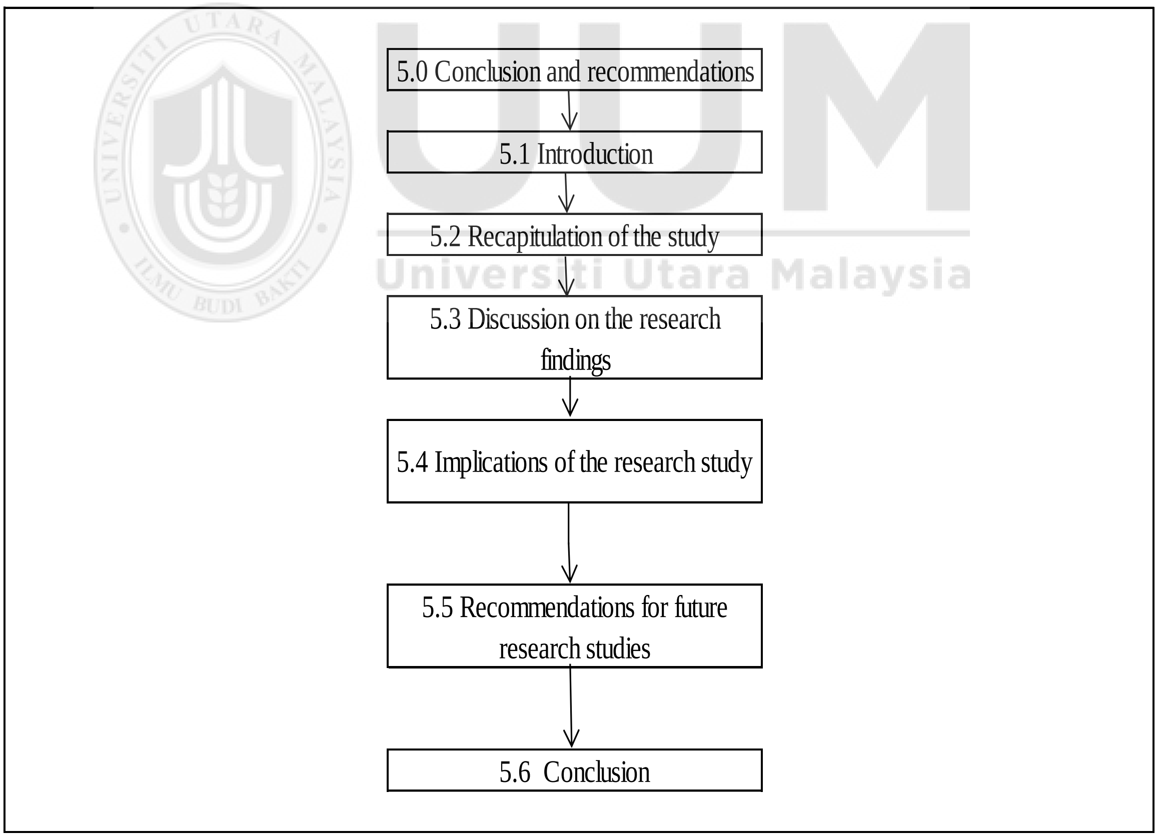


Figure 5.1
The organization and flow of Chapter Five
Source: Developed for this research

5.2 Recapitulation of the study

The objective of this research is to study the impact of project and organizational-related factors on project performance of construction companies in Malaysia. The overall construction industry's project performance and sector-wise project performance (civil, building & infrastructure, marine, oil & gas and multi-discipline construction sectors), is also examined to identify the sector-specific project and organizational-related factors that have an impact on their projects' performance. In addition, size of the organization as a control variable is also studied to ascertain whether the organization's size has an impact on certain areas of project performance.

From the correlations, regression and relative importance index analyses, it is noted that there exists a significant relationship between the project and organizational-related factors and project performance. The results of the analyses support the hypotheses for some construction sectors. The summary of hypotheses testing results is shown in Table 4.30. From the above, it is clear that, six out of the eight project-related factors (client, contractor, consultant, material, external & project management tools/techniques) significantly impact project performance of construction companies in one sector or the other, thus supporting the hypotheses H1 (H1a, H1b, H1c, H1d, H1g & H1h). Whilst, two of the project-related factors such as labor and equipment and contract management-related factors did not turn to be significantly impacting the project performance of the construction companies and thus, not supporting the hypotheses H1e and H1f. This answers the research question number one below:

RQ1. Which are the project-related factors such as client, contractor, consultant, material, labor and equipment, contract management, external and project management tools/techniques that significantly impact project performance in terms of time, cost, quality, safety and financial performance of Malaysian construction companies?.

Similarly, from the above hypotheses testing analysis summary, it can be clearly seen that all the organizational factors, such as leadership, organizational culture, innovation and learning organization are significant for the project performance of construction companies in one sector or the other. Thus supporting hypotheses H2a, H2b, H2c and H2d. This answers the research question number two below:

RQ2. Which are the organizational-related factors such as leadership, organizational culture, innovation and learning organization that significantly impact project performance in terms of time, cost, quality, safety and financial performance of Malaysian construction companies?.

Further to the above, it is evident from the regression analysis summary that, the control variable (size of the organization) has a significant impact on project performance of construction companies in all the sectors of Malaysia in one project performance dimension or the other. In the next section of this chapter, the research findings are discussed in detail.

5.3 Conclusion on the research findings

In the following sections, detailed explanations and conclusions on the research findings of this study are presented.

5.3.1 Conclusion on research question one (RQ1):

Which are the project-related factors such as client, contractor, consultant, material, labor and equipment, contract management, external and project management tools/techniques that significantly impact project performance in terms of time, cost, quality, safety and financial performance of Malaysian construction companies?.

As discussed in section 1.3, eight project-related factors and five project performance dimensions are researched in this study. Additionally, with respect to Construction Company sectors, overall construction companies, civil, building and infrastructure construction sector, marine construction sector, oil and gas construction sector and multi-discipline construction sector are also individually studied to determine, which are the project-related factors that significantly impact project performance. In order to understand the impact of each of the project-related factors and its unique impact on project performance, the project-related factors question RQ1 is further sub-divided into eight sub-questions from RQ1a to RQ1h, each representing one project-related factor. The result of the research study for each sub-question is explained and conclusions are provided in the following pages.

RQ1a. Conclusion on - Do client-related factors significantly impact project performance?

From the regression analysis results shown in table 4.26, it is evident that client-related factors do not significantly impact project performance of the overall construction industry, civil, building and infrastructure construction sector, marine construction sector and oil and gas construction sector. For the multi-discipline construction sector, client-related factors are not significant for time, cost, quality and financial performance. The only area where client-related factors significantly impact project performance is safety performance in multi-discipline construction sector. Thus, it can be concluded that client-related factors are not significant from an overall perspective to construction companies.

This finding is consistent with the findings of Munns and Bjeirmi (1996), that clients should take an increased role in ensuring the success of projects, selecting the right project and discarding unsuccessful projects. This finding is consistent with Memon et al. (2014) that client interference and frequent design changes by client are not significant factors affecting project performance in Malaysian construction companies.

This finding is inconsistent with the findings of Sambasivan and Soon (2007) that inadequate client finance and payments for completed works is one of the top ten causes leading to cost and time overruns of Malaysian construction projects. Similarly, these findings are inconsistent with Alaghbari et al. (2007) that client-related factors are one of the four main causes for delays in construction projects in Malaysia. Same as above, these findings are inconsistent with the findings of Hamzah et al. (2012), Tawil et al. (2013), where they found that, client related factors causes delays in construction projects in Malaysia. As seen from the above results, client-related factors are significant only for safety performance of the multi-discipline construction sector. This reflects the real time importance of safety in the construction industry, whereby most of the clients impose safety compliance as one of the top priority items from the tendering stage till completion of the construction projects in Malaysia, which needs to be strictly followed by the contractors. As the construction fatality rates and accidents are on the increasing side in Malaysia, regulatory bodies of safety in Malaysia, such as the CIDB, NIOSH and DOSH are enforcing strict compliance to safety rules and regulations in the construction industry to avoid accidents and untoward incidents. This poses pressure to the clients to strictly follow the safety rules and regulations in the projects undertaken by them.

Conclusion: Client-related factors are significant only for multi-discipline construction sector's safety performance and not significant for other sectors and other project performance dimensions.

RQ1b. Conclusion on - Do contractor-related factors significantly impact project performance?

From the regression analysis results shown in table 4.26, it is evident that contractor-related factors significantly impact project performance as measured by completion of projects on time for the overall construction industry, marine and multi-discipline construction sectors. Similarly, contractor-related factors are significant for the safety performance of marine and multi-discipline construction sectors. Also, contractor-related factors are significant for the financial performance of oil and gas construction sector. The study thus shows that contractor-related factors significantly impact project performance. The findings of this study are consistent with previous studies by Jugdev and Muller (2005), Sambasivan and Soon (2007), Hamzah et al. (2012), Tawil et al. (2013), and Marzook and El-Rasas (2014) that contractors and their interest in a project is a key factor for success of the project; mistakes by contractors during construction is a key factor for delays in a project; and contractors' delay in completing a project is the main cause for the failure of the project. From the above results, we can see that time performance of the projects is highly dependent on contractors' performance in the overall construction industry, marine and multi-discipline construction sectors. Good performance of the contractor leads to timely completion and vice versa. As contractors are the executors in the project, their technical capabilities, skill levels, financial strength, resources availability largely determines the time performance of the construction projects, which supports the above findings. Similarly, for safety performance of the marine and multi-discipline construction sector, contractor-related factors are significant. This is due to the industry observation that, marine construction involves high level of safety requirements due to its marine environment and the safety requirements of multi-discipline construction projects are diverse and contractors attention to safety is highly critical. For oil and gas construction sector, contractor-related factors are significant for the financial performance. This result also supports the industry situation, where contractors involved in oil and gas projects are costlier in relative comparison to the conventional projects and the cost of the oil and gas projects execution is multi-times costlier than the conventional projects due to the off-shore location and the safety / logistics requirements involved. Thus, in order to achieve estimated financial performance in oil and gas projects, contractor's performance is important.

Conclusion: Contractor-related factors are significant for overall construction industry, marine, oil and gas and multi-discipline construction sectors.

RQ1c. Conclusion on - Do consultant-related factors significantly impact project performance?

From the regression analysis results shown in table 4.26, it is evident that consultant-related factors have a significant impact in terms of quality, safety and financial performance for marine construction sector and for the safety performance for overall construction. Thus, on an overall note, consultant-related factors have a significant impact on project performance. The above results are consistent with the previous research studies by Jugdev and Muller (2005), Alaghbari et al. (2007), Khang and Moe (2008), Hamzah et al. (2012), Tawil et al. (2013) and Marzook and El-Rasas (2014), that consultant-related factors are among the main factors for project success in the construction industry. It is interesting to note that consultant-related factors are significant for the quality, safety and financial performance of the marine construction sector, which is consistent with the industry observation, where consultants play a very important role in the marine construction sector in achieving quality, safety and financial performance. This is in line with the nature of marine projects, where the duration of the project, quality and safety measures required are extensively studied by the consultants prior to awarding the contract to the construction companies. According to Gerwick, (2002), unlike land projects, contractors cannot see the sub-soil conditions of the sea bed (rocks, clay, sand and submerged foreign items) and do not know the water quality and conditions (corrosiveness, tide levels and current). Thus, consultants study the above parameters and suggest to the client and to the contractors, the acceptable time period, quality levels and safety requirements for marine-related projects. The technical expertise required for the marine construction projects are entirely different from the other construction sectors due to the marine environment, which requires higher quality materials to avoid corrosion, higher amount of safety due to the marine environment. Obviously, due to the higher level of engagement of consultants in marine projects, performance of the consultants and the related factors play a significant role in the financial performance of the project as well, which is reflected in this study.

Similarly, consultant-related factors are significant for the safety performance of the overall construction industry, which is consistent with the industry observation that, the construction companies rely on client appointed consultants and or self-employed consultants to specify safety requirements for the projects based on the site conditions, project type, location and intended use of the project. Safety compliance has a linear relationship with cost of the project, and hence, consultants play an important role in working out the reasonable safety requirements for the projects.

Conclusion: Consultant-related factors are significant for overall construction industry and marine construction sector.

RQ1d. Conclusion on - Do material-related factors significantly impact project performance?

From the regression analysis results shown in table 4.26. It is evident that the material-related factors do not significantly impact project performance in all the construction sectors, except for the marine construction sector's safety performance. On an overall note, material-related factors do not significantly impact project performance of construction companies. This findings are inconsistent with the previous research studies in this area by Jugdev and Muller (2005), Sambasivan and Soon (2007), Hamzah et al. (2012), Tawil et al. (2013), Marzook and El-Rasas (2014), and Memon et al. (2014) that material-related factors, such as shortage and fluctuation in prices, are important for minimizing delays and cost overruns of construction projects in Malaysia. It can be seen from the above that material-related factors are significant for the marine construction sector as against the other sectors. This is consistent with the industry situation, where the materials used in the marine construction sector are different from that of the other construction sectors due to the corrosive nature of the marine environment. The quality and durability of the materials used in the marine projects are relatively higher than that of the conventional projects like civil, building and infrastructure to ensure the safe operation of the marine structures for a longer period of time and to ensure safety of the people, who uses them.

Conclusion: Material-related factors are significant for the safety performance of the marine construction sector only.

RQ1e. Conclusion on - Do labor and equipment-related factors significantly impact project performance?

From the regression analysis results shown in table 4.26, the labor and equipment-related factors do not significantly impact project performance in all the construction sectors.This finding is inconsistent with the previous findings in this area by Westervel (2003), Assaf and Al-Hejji (2006), Sambasivan and Soon (2007), Khoiry et al. (2012), Tawil et al. (2013), Truman (2014), Memon et al. (2014) and Marzook and El-Rasas (2014) in which, they found that labor and equipment-related factors are very critical and one of the main causes for delay and project failure. They further found that shortage of labor is the most severe factor for the poor performance of construction projects. In addition, unqualified and low productivity workforce cause delay in construction projects. As we can see from the above results, labor and equipment-related factors do not have a significant impact on any of the project performance dimensions of all the construction sector projects. This is consistent with the industry situation, where automation, latest technologies, research and development in the fields of construction had reduced the significance of labor skills requirement in the construction projects. For example, concreting in the past needs multiple labors with skills to ensure concreting of the structures are done. But, in today's context, automatic concrete mixers bring high quality concrete right from the concrete supplier, which saves a lot of labor, time and cost. Similarly, with respect to equipment, construction equipments are available in all locations of Malaysia. Breakdown and or failure of a construction equipment is easily mitigated by either having additional equipment at the site and or by replacing the equipment faster from the available sources.

Conclusion: Labor and equipment-related factors are not significant for the project performance of the construction companies in Malaysia.

RQ1f. Conclusion on - Do contract management-related factors significantly impact project performance?

From the regression analysis results shown in table 4.26, the contract management-related factors do not significantly impact project performance in all the construction sectors.

This finding is consistent with the findings of Kim (1989), that the scope of contract management significantly differs in the construction industry even for comparable projects. Thus, contract management-related factors are not significant as it can be handled on a case to case basis. On the other hand, this finding is inconsistent with the previous research findings by Davies (2002), Westervel (2003), Ling et al. (2009) and Marzook and El-Rasas (2014), that contract management-related factors are the most important factors for project success in the construction industry. This finding on contract management-related factors are not significant for the construction companies in Malaysia, is consistent with the industry situation, where construction companies in Malaysia engaged in different construction discipline projects had learned from the past that, proper contract management is essential to mitigate the unwanted issues in the projects. Today, all the major construction companies in Malaysia do have qualified contract management personnel, who wet through the contract-related items in the project from the conceptual stage till the completion of the project. In the past, availability of qualified contract management professional in the industry was an issue, which was not anymore now.

Conclusion: Contract management-related factors are not significant for the project performance of the construction companies in Malaysia.

RQ1g. Conclusion on - Do externally-related factors significantly impact project performance?

From the regression analysis results shown in table 4.26, the externally-related factors do impact significantly on quality performance of the overall construction industry.

This finding is consistent with the previous research studies by Belassi and Tukel (1996), Shrnhur et al. (1997), Kaliprasad (2006), Alaghbari et al. (2007) and Marzook and El-Rasas (2014), that externally-related factors are among the most significant factors for project success and delays of construction projects. Similarly, these findings are consistent with the findings of Khoiry et al. (2012), Tawil et al. (2013), where they found that, externally related causes such as lack of communication, weather conditions, interruptions from the public and delay in building permit approval are some of the causes for construction project delays. From the above results, it can be seen that externally-related factors are significant only for quality performance in the overall construction. This is supported by the industry observation that external factors, such as weather conditions (rain &flood) significantly impact the quality of the construction activities in the entire construction sector. Malaysia being a tropical country experiences heavy rains and monsoon floods almost every year, which impacts the quality performance of the construction projects in all the sectors. Similarly, Government policies such as introduction of GST, weaker currency (Ringgit to USD) and regulations such as implementation of quality assessment system in construction (QLASSIC) significantly impact quality performance of the projects in the overall construction industry.

Conclusion: External-related are significant for the quality performance of the overall construction companies in Malaysia.

RQ1h. Conclusion on - Do project management tools/techniques-related factors significantly impact project performance?

From the regression analysis results shown in table 4.26, project management tools/techniques-related factors do significantly impact project performance of construction companies in terms of time for overall construction companies, in terms of cost for multi-discipline construction sector and in terms of quality and safety for overall construction industry and civil, building and infrastructure construction sector. The findings of this study are consistent with previous research studies in this area by White and Fortune (2002), where they found that usage of less project management tools/techniques is one of the main reasons for poor project performance of construction companies. From the above results, it can be seen that project management tools/techniques-related factors significantly impact project performance in terms of time for the overall construction industry. This is further explained by the fact that most of the construction companies today use planning & scheduling software, such as Microsoft

Project and Primavera, to plan their project activities and project duration and to achieve the time performance of each project. Similarly, project management tools/techniques significantly impact cost performance of the multi-discipline construction projects. This can be explained by the fact that organizations engaged in multi-discipline construction projects will not be able to get the right cost of the projects without the application of necessary software tools due to the diverse nature of the projects. Greater application of ERP software in construction companies in recent years can explain the importance and impact of project management tools/techniques in this sector. Wider application of ISO 9001 quality management systems, PQP, WCS and QCMS in the construction industry explains the impact of project management tools/techniques-related factors on quality performance. Similarly, the wider application of OHSAS in the construction industry is a proof on the significant impact of safety in the construction industry in Malaysia.

Conclusion: Project management tools/techniques related factors are significant for all the overall construction companies, civil, building and infrastructure and multi-discipline construction sectors in Malaysia.

5.3.2 Conclusion on research question two (RQ2):

Which are the organizational-related factors such as leadership, organizational culture, innovation and learning organization that significantly impact project performance in terms of time, cost, quality, safety and financial performance of Malaysian construction companies?.

Four organizational-related factors and five project performance dimensions are researched in this study. Additionally, with respect to construction companies, the overall construction companies, civil, building and infrastructure construction sector, marine construction sector, oil and gas construction sector and multi-discipline construction sector are also individually studied in this research to determine which organizational-related factors significantly impact project performance. In order to understand the impact of each of the organizational-related factors and its unique impact on project performance, question RQ2 on organizational-related factors is further sub-divided into four sub-questions from RQ2a to RQ2d, each representing one organizational-related factor. The result of this research study for each of this research question is explained and concluded in the following pages.

RQ2a. Conclusion on - Do leadership-related factors significantly impact project performance?

From the regression analysis results shown in table 4.26, the leadership-related factors do not significantly impact project performance in all the construction sectors, except for the marine construction sector's quality performance and multi-discipline construction sector cost performance.

This finding on the importance of leadership for project performance is consistent with the findings of previous researchers, Turner and Muller (2005) and Nixon et al. (2012), that leadership roles and competency of the project managers do not have a significant impact on project performance due to the unique temporary nature of the projects. They also found that no single leadership style is suitable for the entire life cycle of the project; hence, leadership is not significant for project performance in construction companies.

However, the findings of this study is inconsistent with the previous research findings by Belassi and Tukel (1996), Westervel (2003), Belout and Gauvreau (2004), Nilsson and Urban (2005), Kaliprasad (2006), Anantamula (2010), Oliveria et al. (2012) and Saunila (2014), where all these researchers found that leadership has a significant role in achieving project success.

From the results shown in Table 4.26, it is evident that leadership-related factors have a significant impact only on quality performance of the marine construction sector. This finding is consistent with the research findings of Nam and Tatum (1997), that effective leadership is essential for construction innovation and for special construction projects. The marine construction sector is a special construction sector, in which skills-sets, labor and equipment and material have a significant impact on quality performance of the project. In order to achieve the desired quality levels, leaders (project managers) of the projects need to consistently monitor, liaise with the consultants and guide the project management team and contactors to follow the best practices of construction. Without such leadership involvement, chances are things can go wrong and projects may face quality and subsequently time-related issues in the projects. Similarly, leadership-related factors are significant for the cost performance of multi-discipline construction sector. This finding is consistent with the industry observation, where for multi-discipline construction companies, employees need to have multi-skills to cater to the needs of the multi-discipline projects. The cost associated for having multi-skilled employees are relatively higher when compared to single skill sets. In addition, due to multi-discipline construction projects execution, the challenges will be multi-fold as compared to conventional projects. In order to achieve the desired cost performance under the above setting, effective leadership is important and the role of such efficient leader will significantly impact the cost performance.

Conclusion: Leadership-related factors are significant for marine construction sector's quality performance and multi-discipline sector's cost performance.

RQ2b. Conclusion on - Do organizational culture-related factors significantly impact project performance?

From the regression analysis results shown in table 4.26. the organizational culture-related factors have a significant impact on project performance of construction companies. As can be seen from the overall construction industry sector and civil, building and infrastructure construction sector, organizational-related factors are significant for all the dimensions of project performance, i.e., time, cost, quality, safety and financial performance. Also, organizational-related factors are significant for oil and gas construction sector's time and cost performance.

This finding is consistent with the previous researchers, Westervel (2003), Abdul et al. (2003), Belout and Gauvreau (2004), Henri (2006), Kaliprasad (2006), Anantamula (2010), Oliveria et al. (2012), Nixon et al. (2012) and Saunila (2014), that organizational culture is significant for the success of projects.

From the above results, it can be concluded that organizational culture significantly impacts project performance of construction companies in Malaysia in terms of time, cost, quality, safety and financial performance. This is supported by the industry observation that a positive culture in an organization leads to positive contribution from employees, and hence, improved results in all the areas. On the contrary, if the organizational culture of an organization is negative (not conducive) for the employees, obviously, the contribution of the employees and the overall performance of the organization drops. The same is applicable to construction companies. The above results also show that organizational culture has a significant impact on time and cost performance of the oil and gas construction sector. This is consistent with the industry fact that oil and gas construction involves high cost capital equipment and working in off-shore locations, which is many times costlier compared to onshore construction activities. Additionally, this is consistent with the research findings of Abdul et al. (2003), that organizations with a positive culture with higher employee commitment levels are able to plan and execute the projects in an efficient manner, when compared to organizations with a negative culture with lower employee commitment levels, resulting in timely completion of the project with cost savings, which leads to better time and cost performance. It can be seen from the results that, organizational-related factors are not significant for marine and multi-discipline construction sector. This is consistent with the industry observation that, marine construction sector is relatively small and specialized, which is very different from conventional construction projects. Thus, organizational culture is not significant. Similarly, for multi-discipline construction sector, due to the diverse nature of the projects it handles, the employee turnover will be relatively higher as compared to other construction sectors, which results in changing organizational culture depending on the nature of the project.

Conclusion: Organizational culture-related factors are significant for overall construction industry, civil, building and infrastructure construction sector and oil and gas construction sector.

RQ2c. Conclusion on - Do innovation-related factors significantly impact project performance?

From the regression analysis results shown in table 4.26, innovation-related factors have a significant impact on the oil and gas construction sector's financial performance and for all the other sectors, innovation-related factors are not significant.

This findings are consistent with the previous researchers, Dubois and Gaddie (2002), Sodurland (2004), Huang and Liu (2005), Pounder (2009), Hashi and Stojcic (2013) and Saunila (2014), where they found that innovation is not given the attention it deserves in the construction industry due to the temporary nature of the projects. Innovation capability of organizations, however, has a significant impact on project/organizational performance. It is seen from the results that innovation-related factors have a significant impact on financial performance of the oil and gas construction sector. This can be explained by the fact that, all the construction activities related to oil and gas projects are costlier in nature due to the nature and off-shore location of the projects. Innovative ways of carrying our construction activities as well as materials and methods used in these projects will lead to substantial savings, which will lead to improved financial performance. Due to the above, oil and gas construction companies today, use the latest equipment and advanced technologies in construction, which result in improved productivity, quality and less safety hazards, which results in improved financial performance.

Conclusion: Innovation-related factors are significant for oil and gas construction sector.

RQ2d. Conclusion on - Do learning organization-related factors significantly impact project performance?

From the regression analysis results shown in table 4.26, the learning organization-related factors have a significant impact on project performance of construction companies. As can be seen from the overall construction industry sector, learning organization-related factors are significant for all the dimensions of project performance, i.e., time, cost, quality, safety and financial performance, besides having a significant impact on project performance of sector-wise construction sectors for some of the dimensions.

The findings of this research study are consistent with previous research studies by Gordon (1992), Argyris et al. (1994), Elkjaer (2001), Davies (2002), Brady and Davies (2004), Nilsson and Urban (2005), Kaliprasad (2006) and Pounder (2009), where they found that learning organizations have a significantly positive relationship with project/organizational performance. The findings can be further explained by the research findings by Calvert et al. (1994), that learning organizations will reduce mistakes in their operations and will yield better overall performance. Thus, the results concur with the learning organization theory. For the civil, building & infrastructure construction sector, learning organization-related factors have a significant impact on time, cost, quality and financial performance of the projects but not safety. This can be explained by the fact that safety requirements for every project in the civil, building and infrastructure construction sector differs. Also, different people work in each of these projects and hence learning cannot be effective. For the marine construction industry, learning organization-related factors significantly impact the quality and financial performance of the projects. This is consistent with the industry observation, where due to the special nature of the marine projects, lessons learned from previous projects are implemented in the subsequent projects to improve the overall project performance, which ultimately lead to quality and financial performance in this sector. This is consistent with the research findings of Garvin (1985), that learning from past experiences and learning from best practices of others leads to better financial performance.

In the case of the oil and gas construction sector, learning organization-related factors impact significantly on time and safety performance. This can be explained by the fact that the oil and gas professionals are highly skilled and they apply the lessons learnt in previous projects in the following projects to improve project completion schedules and safety performance. Similarly, learning organization has a significant impact on financial performance in the multi-discipline construction sector. This can be explained by the fact that organizations engaged in the multi-discipline construction sector continuously learn and try to control time, improve quality using their past experiences and their best resources, which ultimately lead to improved financial performance in projects. This finding is consistent with the research findings by Carrillo (2005), that many construction organizations uses lessons learned from previous projects to improve the performance of future projects.

Conclusion: Learning organization-related factors are significant for all the construction sectors and for the overall construction industry.

5.3.3 Conclusion on - Size of the organization as control variable and its significant impact on project performance

From the regression analysis results shown in table 4.26, it is evident from the results that the control variable (size of the organization) does significantly impact project performance of construction companies in Malaysia. This has not been studied so far in the Malaysian construction industry's context, and hence, is a new contribution. The above results show that size of the organization has a significant impact on project performance of the overall construction companies, civil, building and infrastructure construction, marine construction, oil and gas construction and multi-discipline construction sectors, in terms of time, cost, quality and safety performance. Only on financial performance, size of the organization does not emerge as significant. This can be explained by the industry observation that irrespective of the size of the organization, completion of the projects on time, within the cost and with quality and safety, are contractually important between the construction companies and clients as against financial performance of the construction companies.

The results are also consistent with the regression analysis results of small and medium construction companies, where the results vary when compared to large and very large construction companies as shown in Table 4.26, summary of regression analysis.

This can be explained by the fact that small and medium companies can complete the small and medium sized projects within the agreed time and cost and with less safety issues, which is not economical for the large and very large construction companies. On the other hand, small and medium construction companies will not be able to take and complete large and very large construction projects as these companies do not have the required resources, funds, capabilities and support to complete such big projects, which are the forte of large and very large construction companies. With respect to safety performance, it can be understood that small and medium construction companies in the civil, building and infrastructure construction sector do not pay importance to safety when compared to large and very large construction companies.

Similarly, size of the organization has a significant impact on time, cost, quality and safety performance of marine construction projects. This can be explained by the industry observation on marine construction projects that, due to the specialized technical and costly nature of marine projects, small and medium construction companies cannot compete with the large and very large construction companies.

In the case of the oil and gas construction sector, once again, due to the special nature of the oil and gas projects due to its off-shore locations and high level of safety/quality requirements, small and medium construction companies cannot compete with large and very large construction companies, in terms of timely completion of the oil and gas projects.

In the case of the multi-discipline construction sector, size of the organization has a significant impact on quality and safety performance. This can be explained by the industry observation that, both small and medium, large and very large construction companies uniquely carry out the projects with respect to their sizes in terms of quality and safety. For example, a small construction company can complete a small project with good quality without any safety issues, which is not economical for a large company to do, and vice versa. This is consistent with the research findings by Hansen and Wernerfelt (1989) that firm performance vary significantly with respect to size.

From the regression analysis results shown in table 4.26, it is evident that for small and medium construction companies, project-related factors have a significant impact on time, quality, safety and financial performance; whilst organizational factors have a significant impact on all project performance dimensions. Similarly, it is evident that for large and very large construction companies, project-related factors have a significant impact on quality and safety performance; whilst organizational factors have a significant impact on all project performance dimensions. From the above results of small and medium, large and very large construction companies, it can be seen that the factors which are significant for project performance vary in many areas of project performance dimensions in relation to the size of the organization.

Conclusion: Size of the organization has significant impact on project performance of construction companies in Malaysia.

5.3.4 Summary of conclusions on research questions

The below table 5.1 shows the summary of discussions on research questions of this research study. Impact of project-related factors and organizational-related factors on project performance are summarized. Similarly, consistency of these research findings with the previous research studies are also summarized.

Table 5.1
Summary of conclusions on research questions

Research Question	**Variable/Factors**	**Impact on project performance**	**Consistency with previous research**
RQ1	**Project-related factors**		
RQ1a	Client-related factors	Significant	Consistent
RQ1b	Contractor-related factors	Significant	Consistent
RQ1c	Consultant-related factors	Significant	Consistent
RQ1d	Material- related factors	Significant	Consistent
RQ1e	Labor & equipment-related factors	Not significant	Inconsistent
RQ1f	Contract management-related factors	Not significant	Inconsistent
RQ1g	Externally-related factors	Significant	Consistent
RQ1h	Project management tools/ techniques-related factors	Significant	Consistent
RQ2	**Organizational-related factors**		
RQ2a	Leadership-related factors	Significant	Consistent and Inconsistent
RQ2b	Organizational culture-related factors	Significant	Consistent
RQ2c	Innovation-related factors	Significant	Consistent and Inconsistent
RQ2d	Learning organization-related factors	Significant	Consistent
CV	**Control variable**		
	Size of the organization	Significant	New contribution

RQ – Research question, CV – Control variable.

5.3.5 Conclusion on - Relative importance of studied variables

In addition to the research questions conclusions, the RII analysis of the factors used in this research study were also concluded to determine their importance and the results are summarized in Table 5.2

Table 5.2
Summary of conclusions on relative importance index analysis

Variable	Factors	Relative Importance on project performance
IV1	**Project-related factors**	
	Client-related factors	Less important
	Contractor-related factors	Most Important
	Consultant-related factors	Most Important
	Material- related factors	Less Important
	Labor & equipment-related factors	Most Important
	Contract management-related factors	Less important
	Externally-related factors	Less important
	Project management tools/ techniques-related factors	Less important
IV2	**Organizational-related factors**	
	Leadership-related factors	Most important
	Organizational culture-related factors	Most important
	Innovation-related factors	Less important
	Learning organization-related factors	Most important
DVs	**Project performance dimensions**	
	Time performance	Less important
	Cost performance	Less important
	Quality performance	Most important
	Safety performance	Most important
	Financial performance	Most important

IV – Independent variable, DV – Dependent variable.

The above analysis clearly indicates the relative importance of project-related factors, organizational-related factors and project performance dimensions. Table 5.3 below summarizes the most important factors for project performance of construction companies in Malaysia.

Table 5.3
Summary of conclusions on relative importance index analysis – most important factors

Relatively important factors	Most important factors
Project-related factors	Contractor, consultant and labor & equipment-related factors.
Organizational-related factors	Learning organization, organizational culture and leadership-related factors
Project performance dimensions	Safety, financial and quality-related dimensions.

Unlike past research studies, in this research study, safety performance of the construction projects came as the first most relatively important performance dimension, followed by financial and quality performance. Time and cost-related performance of the projects are relatively the least important performance dimensions in today's project performance context, which is an interesting finding from this study. This is supported by the industry observation that, most of the clients are paying increased attention to safety and quality of the construction projects carried out by the contractors, over timely completion. Extension of time and change orders provided by the clients to contractors enables the contractors to carry out quality construction works in a safe manner with the desired financial performance. Another important observation in this study is that, the relative importance of factors varies with respect to the size of the organization. The set of factors, relatively important to small and medium size construction companies varies to that of the large and very large construction companies in Malaysia.

5.3.6 Open questions feedback from respondents

As discussed in Chapter four, section 4.12, the survey of project managers included two open questions on most commonly used project management tools/techniques and recommendations for improvement in the construction industry.

The data analysis for the first question (most commonly used project management tools) reveals that a diverse range of project management tools/techniques are used in the construction industry. There are 64 different types of project management tools/ techniques being used in the construction companies of Malaysia. Among the 64, the most common ones are Primavera, MS project, Excel, ISO 9001 Quality management systems, GANTT charts, electronic data management systems, work breakdown structure, critical path method, welding control software and ERP software. The results show a lack of standardization, lack of awareness on application of appropriate project management tools and lack of intervention of regulatory bodies in promoting appropriate standard mechanisms for project management measurements and controls, which can lead to better project performance in the construction industry. This is supported from the expert panel discussions on this topic.

On the second question, suggestions for improvement of the Malaysian construction industry, 165 responses and 372 suggestions were received. The key suggestions for improvement in the construction industry are in the areas of skills improvement, government policies and support, price standardization, use of latest technologies, better coordination and communication between all the stakeholders, quality improvement, timely payment from clients, elimination of bribery, learning from other countries, realistic project schedules from clients, finalization of extension of time and variation orders on time by the clients, building competent project management teams, application of relevant project management tools/techniques, reduced documentation requirements from clients, productivity improvement, adoption of early start techniques by clients and contractors, proper planning by clients and contractors and need for fair competition among the construction industry players. The above suggestions clearly show that the Malaysian construction industry needs more skilled local workforce and to adopt latest technologies from other countries. In addition, government intervention is needed on standardization and on curbing of corruption in the construction industry.

All the suggestions from the respondents are categorized with respect to project-related factors, organizational-related factors and project performance related dimensions used in this study. The categorizations of suggestions are shown in Appendix-C and it reveals that, the selected variables of this research study are very much important and relevant for the project performance of construction companies in Malaysia.

5.4 Implications of the research study

From the above research findings, this research study provides theoretical as well as practical contributions to the existing body of knowledge in the field of construction companies' project performance vis-à-vis project and organizational-related factors and their impact on project performance.

5.4.1 Theoretical implications of the research study

The first theoretical contribution of this research study is in the area of organizational factors and their impact on project performance. Four aspects of organizational-related factors, i.e., leadership, organizational culture, innovation and learning organization were studied and the results of the analysis are provided. This is a contribution to the existing body of knowledge as there have not been many studies conducted in these areas.

The second theoretical contribution of this research study is that the previous studies on construction companies' project success/performance predominantly studied project performance in terms of time and cost only. Very few studies have discussed the iron triangle (time, cost and quality) to measure project performance. In this research, five dimensions (time, cost, quality, safety and financial dimensions) of project performance were researched and the results are explained. Surprisingly, three dimensions of project performance (safety, financial and quality dimensions) emerge as the most important project performance factors, which is a contribution to the existing body of knowledge.

The third theoretical contribution of this study is the RII analysis findings, which for both project as well as organizational-related ranking, has not been done before. The top three most important project-related factors that determine project performance are contractor, consultant and labor and equipment-related factors. Similarly, the top three most important organizational-related factors that determine project performance are learning organization, organizational culture and leadership-related factors. Similarly, the top three project performance dimensions, which determine project performance, are safety, financial and quality performance dimensions. This is another contribution to the existing body of knowledge.

The fourth theoretical contribution of this study is on the identification of project and organizational-related factors which have a significant impact on sector-wise construction companies' project performance. This is another contribution to the existing body of knowledge.

The fifth theoretical contribution is on the use of various theories, such as the transaction cost economics, leadership, organizational culture, innovation and learning organization theories, to strengthen the existing loosely coupled project management theory. These theories are used to develop the research framework used in this study. As the performance of construction projects is dependent on the associated transaction costs, leadership skills of the project managers, organizational culture of the construction companies, innovation and learning initiatives adopted, application of these theories for construction companies' project performance is another contribution to the existing body of knowledge.

5.4.2 Practical implications of the research study

The findings of this research study will be helpful to the construction industry practitioners. These practitioners are clients, contractors, consultants, material suppliers, labor and equipment providers, contract management professionals, project management tools/techniques providers, government policy-makers and project professionals in the industry. The project directors, project managers, construction managers, cost control managers, planning managers, quality managers, safety managers and finance managers can now focus on the various project-related factors and organizational-related factors, which impact project performance in terms of time, cost, quality, safety and financial dimensions. This will help them to do appropriate planning beforehand and to ensure that the projects are handled well.

The second practical contribution is that this research study provides a detailed analysis of project and organizational-related factors, which impact project performance in the civil, building and infrastructure, marine, oil and gas and multi-discipline construction sectors separately. Hence, project professionals can be better informed on the factors to pay attention to, and to take the necessary precautionary measures to prevent shortfalls in project performance.

The third practical contribution of this research study is that there is a large number of small and medium construction companies in Malaysia, which actively pursue and compete in the industry. This study provides a good guidance for small and medium, large and very large construction companies to comprehensively understand the importance of the related project and organizational factors which impact project performance of the construction industry.

The fourth practical contribution of this study is that organizations engaged in the construction industry can understand the various types of project management tools/ techniques used by other construction firms and can decide on suitable project management tools/techniques for their respective organizations.

The fifth practical contribution of this study is that the 372 suggestions provided by the construction industry professionals specifically for the construction industry's improvement of performance can be utilized accordingly. By using these recommendations, organizations engaged in construction, professionals and policy-makers can take the necessary actions to improve project performance.

The sixth practical contribution of this study is the detailed analysis provided on the RII analysis of project-related and organizational-related factors on project performance. By making use of the above analysis, industry practitioners can focus on those factors, which are critical for the better performance of their projects.

The above contributions are useful for planning and providing the necessary training to the construction industry professionals, identifying and applying suitable project management tools/techniques and strategizing manpower recruitments for the construction industry to enhance project performance.

5.5 Recommendations for future research studies

The researcher would like to recommend the following for future research studies in this area.

5.5.1 Overall construction companies' project performance

Similar types of studies may be conducted in other parts of the world, especially in developed and developing countries with project and organizational factors of interest to contribute further to this field. This will help academicians and practitioners of the industry to understand the importance of project and organizational-related factors in different parts of the world to achieve the desired project performance.

5.5.2 Sector-wise construction companies' performance

This research study attempts to shed light on the construction companies' project performance and the factors affecting performance in the various construction sectors. Similar studies may be conducted in other parts of the world and within Malaysia with a bigger sample to ascertain the research findings of this study. As Malaysia is considered as a major regional oil and gas player as well as one of the top oil and gas exporting countries, further studies on oil and gas-related project performance factors will strongly help the industry players, policy-makers as well as academicians to understand the functioning of the oil and gas construction industry.

5.5.3 Stakeholders' impact on project performance

As discussed in section 1.6, (scope and limitations of this research study), this study suffers limitations in terms of small representation from stakeholders, such as clients, consultants, suppliers and others, such as regulatory officials, end users of the project and the public, compared to the more than 80% contractor participation. Future researchers can increase the representation of the other stakeholders in this kind of study.

5.5.4 Diverse project and organizational-related factors

Open questions feedback analysis of this research study found many interesting recommendations for improving the construction companies' project performance in Malaysia. The recommendations are in the areas of communication, risk management, standardization, government regulations, dependence on foreign labor, lack of skills levels, welfare schemes of the present construction industry, government policies and planning infrastructure development. Future researchers can focus on some of these areas for studies on project performance in the construction industry.

5.5.5 Research findings

Finally, this research study points out that amongst the project-related factors, contractors, consultants and project management tools/techniques-related factors are highly significant in determining project performance of the construction companies in Malaysia. Similarly, with regards to the organizational factors, organization culture and learning organization-related factors are found to be significant. The above results do not concur in totality with previous research results. In some of the past research results, leadership is found as significant and in some other research, innovation is found as an important factor. The reasons for the contradicting results of this research study may be examined in future research to find out why and how these factors differ in this study in comparison to the other studies.

5.6 Conclusion

In conclusion, this research study achieved its research objectives by examining and investigating the various project and organizational-related factors which significantly impact project performance of the overall construction industry and for the major construction sectors, i.e., civil, building and infrastructure, marine, oil and gas and multi-discipline construction sectors. The findings of this study provide a comprehensive understanding on the various project and organizational-related factors, which are essential for achieving the desired project performance in different construction sectors of Malaysia. The findings of this study emphasize the need to focus on organizational-related factors, such as organizational culture, learning organization, leadership and innovation along with the project-related factors such as contractors, consultants, material, labor and equipment and project management tools/techniques for successful project performance. This is due to the industry observation that, the old paradigms on project management are changing rapidly due to technological developments happening in the industry.

Further to the above, this study shows that, size of the organization plays an important role in determining the project success in construction companies in Malaysia. This is supported by this research finding that, the significant and relative important factors for small and medium construction companies are different than that of the large and very large construction companies. The most important project-related factors for small and medium size construction companies are contractor, consultant and material-related factors. But for large and very large construction companies, the most important project-related factors are consultant, material and project management tools/technique-related factors. However, with respect to the most important organizational-related factors, for both small and medium, large and very large construction companies, the significant and most importance factors are learning organization, organizational culture and leadership-related factors. Additionally, this research study found that, safety, financial and quality performance dimensions are significantly important over time and cost performance in all the construction sectors of Malaysia. This, in a sense, is a paradigm shift from the traditional way of focusing on time and cost for project performance in the construction industry, which needs to be relooked into.

REFERENCES

Abdul Rashid, Z., Sambasivan, M., & Abdul Rahman, A. (2004). The influence of organizational culture on attitudes toward organizational change. *Leadership & Organization Development Journal*, *25*(2), 161-179.

Abdul Rashid, Z., Sambasivan, M., & Johari, J. (2003). The influence of corporate culture and organizational commitment on performance. *Journal of Management Development*, *22*(8), 708-728.

Alaghbari, W., Kadir, M.R.R., Salim, A., & Ernawati. (2007). The significant factors causing delay of building construction projects in Malaysia. *Journal of Engineering*, *Construction and Architectural Management*, *14*(2), 192-206.

Anantamula, V.S. (2010). Project manager's leadership role in improving project performance. *Engineering Management Journal* (EMJ), *22*(1), 13.

Andersen, E.S. (2016). Do project managers have different perspectives on project management?. *International Journal of Project Management*, *34*(1), 58-65.

Angus, G.Y., Flett, P.D., & Bowers, J.A. (2005). Developing a value-centered proposal for assessing project success. *International Journal of Project Management*, *23*(6), 428-436.

Antonakis, J., Avolio, B. J., & Sivasubramaniam, N. (2003). Context and leadership: An examination of the nine-factor full-range leadership theory using the Multifactor Leadership Questionnaire. *The Leadership Quarterly*, *14*(3), 261-295.

Argyris, C., & Schön, D.A. (1997). Organizational learning: A theory of action perspective. *Reis*, 345-348.

Argyris, C., Bellman, G.M., Blanchard, K., & Block, P. (1994). The future of workplace learning and performance. *Journal of Training & Development*, *48*(5), 12.

Armstrong, J.S., & Overton, T.S. (1977). Estimating non-response bias in mail surveys. *Journal of Marketing Research*, 396-402.

Assaf, S.A., & Al-Hejji, S. (2006). Causes of delay in large construction projects. *International Journal of Project Management*, *24*, 349-357.

Atkinson, R. (1999). Project management: Cost, time and quality, Two best guesses and a phenomenon, it's time to accept other success criteria. *International Journal of Project Management*, *17*(6), 337-342.

Bank Negara Malaysia. (2015). Household debt to GDP, the 2014 Bank Negara Malaysia Annual Report. *retrieved on-line on November, 2015*. www.bnm.gov.my.

Belassi, W., & Tukel, O.I. (1996). A new framework for determining critical success/failure factors in projects. *International Journal of Project Management*, *14*(3), 141-151.

Belout, A., & Gauvreau, C. (2004). Factors influencing project success: The impact of human resource management. *International Journal of Project Management*, *22*, 1-11.

Bentley & Borman. (2001). Project management quotes collection. 960. *retrieved on-line on November, 2016.* http://2020projectmanagement.com/2015/02/top-25-project-management-quotes/.

Brady, T., & Davies, A. (2004). Building project capabilities: From exploratory to exploitative learning. *Journal of Organization Studies*, *25*(9), 1601-1621.

Bronte, S.M. (2015). Beyond the Iron Triangle: Evaluating Aspects of Success and Failure using a Project Status Model. *Journal of Computing & Information Systems*, *19*(2).

Burati Jr, J. L., Farrington, J. J., & Ledbetter, W. B. (1992). Causes of quality deviations in design and construction. *Journal of construction engineering and management*, *118*(1), 34-49.

Burns, J.M. (1998). Transactional and transforming leadership. *Leading organizations*, 133-134.

Bursa Malaysia. (2015). Malaysian construction sector 2015 outlook, Bursa Malaysia Stock Market Analysis Digest. *retrieved on-line on November, 2015*. www.klse-online.blogspot.com.

Calvert, G., Mobley, S., & Marshall, L. (1994). Grasping the learning organization. *Journal of Training & Development*, *48*(6), 38.

Carrillo, P. (2005). Lessons learned practices in the engineering, procurement and construction sector. *Journal of Engineering, Construction and Architectural Management*, 12(3), 236-250.

Cheung, S.O., Suen, H.C., & Cheung, K.K. (2004). PPMS: A web-based construction project performance monitoring system. *Journal of Automation in Construction*, *13*(3), 361-376.

Chong, H.Y., & Low, T.S. (2014). Accidents in Malaysian construction industry: Statistical data and court cases. *International Journal of Occupational Safety and Ergonomics*, *20*(3), 503-513.

Cicmil, S., & Hodgson, D. (2006). New possibilities for project management theory: A critical engagement. *Project Management Journal*, *37*(3), 111.

CIDB Malaysia. (2015). Lembaga Pembangunan Industri Pembinaan Malaysia, Directory of registered contractors. *retrieved on-line on November, 2015.* www.cidb.gov.my.

Construction industry transformation program (2015), Construction Industry Development Board, Malaysia. *retrieved on-line on November, 2015.* http://www.cidb.gov.my/cidbv5/index.php/warga-cidb.

Davies, C.T. (2002). The ‘‘real’’ success factors on projects. *International Journal of Project Management*, *20*, 185-190.

De Oliveira, M.A., Oliveira, L.V.D.V., & Possamai, O. (2012). Forecasting project performance considering the influence of leadership style on organizational agility. *International Journal of Productivity and Performance Management*, *61*(6), 653-671.

De Valence, G. (2010). Innovation, Procurement and Construction Industry Development. *Australian Journal of Construction Economics and Building*, *10*(4), 50-59.

Diugwu, I.A., Mohammed, M., & Baba, D.L. (2015). Towards effective infrastructure development in Nigeria: Theoretical considerations from a project management perspective. *American Journal of Industrial and Business Management*, *5*(04), 172.

Dubois, A., & Gadde, L.E. (2002). The construction industry as a loosely coupled system: Implications for productivity and innovation. *Journal of Construction Management and Economics*, *20*(7), 621-631.

Elcosh. (2012). Health and safety aspects, Rate of deaths from injuries in construction, selected countries, *retrieved on-line on October, 2015*. https://www.google.com/search?q=rate+of+deaths+from+injuries+in+construction,+selected+countries.

Elkjaer, B. (2001). The learning organization: An undelivered promise. *Essential readings in Management Learning*, *32*(4), 437-452.

Endut, I. R., Akintoye, A., & Kelly, J. (2009). Cost and time overruns of projects in Malaysia. *retrieved on-line on August, 21, 2015*, 243-252.

Fernandes, C.I., Ferreira, J. J.M., & Raposo, M. (2013). Drivers to firm innovation and their effects on performance: An international comparison. *International Entrepreneurship and Management Journal*, *9*(4), 557-580.

Fichtner, C. (2012). Project management quotes. r*etrieved on-line on November, 2016*. http://sourcesofinsight.com/project-management-quotes/.

Garvin, D.A. (1985). Building a learning organization. *Organizational Development & Training*, 274.

Gerwick, C. (2002), *Construction of marine and offshore structures*. CRC press.

Ghazimoradi, M., Kheyroddin, A., & Rezayfar, O. (2016). Diagnosing the success of the construction projects during the initial phases. *Decision Science Letters*, *5*(3), 395-406.

Global Construction Report 2020. (2009). *retrieved on-line on November, 2015*. http://www.building.co.uk/Journals/Builder_Group/Building/13_November_2009/attachments/global_construction2020.pdf.

Gordon, J. (1992). Performance technology: Blueprint for the learning organization?. *Journal of Training and Development*, *29*(5), 27.

Gross domestic product. (2015). Malaysia statistics. *retrieved on-line on January, 2016.* www.worldbank.org.

Hair, J. F., Anderson, R. E., Babin, B. J., & Black, W. C. (2010). *Multivariate data analysis: A global perspective* (Vol. 7). Upper Saddle River, NJ: Pearson.

Hamzah, N., Khoiry, M. A., Arshad, I., Wan Badaruzzaman, W. H., & Tawil, N. M. (2012). Identification of the causes of construction delay in Malaysia. In *Proceedings of World Academy of Science, Engineering and Technology* (No. 72, p. 614). World Academy of Science, Engineering and Technology (WASET).

Hansen, G.S., & Wernerfelt, B. (1989). Determinants of firm performance: The relative importance of economic and organizational factors. *Strategic management journal*, 10(5), 399-411.

Hardless, C., Nilsson, M., & Nuldén., U. (2005). 'Copernicus': Experiencing a failing project for reflection and learning. *Journal of Management Learning*, *36*(2), 181-217.

Hashi, I., & Stojčić, N. (2013). The impact of innovation activities on firm performance using a multi-stage model: Evidence from the Community Innovation Survey 4. *Research Policy*, *42*(2), 353-366.

Haniff, A., & Ogunlana, S.O. (2012). Strategic alignment within a TMO: Perceptions of project success.

Henri, J.F. (2006). Organizational culture and performance measurement systems. *Journal of Accounting, Organizations and Society, 31*(1), 77-103.

Hinze, J., & Tracey, A. (1994). The contractor-subcontractor relationship: the subcontractor's view. *Journal of Construction Engineering and Management*, *120*(2), 274-287.

Hsich, T. (2014). Project management quotes. *retrieved on-line on November, 2016.* https://www.pinterest.com/wriketeam/project-management-quotes/.

Huang, C.J., & Liu, C.J. (2005). Exploration for the relationship between innovation, IT and performance. *Journal of Intellectual Capital*, *6*(2), 237-252.

Hussein, B.A., Ahmad, S.B., & Zidane, Y.J. (2015). Problems associated with defining project success. *Procedia Computer Science, 64*, 940-947.

Hyvari, I. (2006). Success of projects in different organizational conditions. *Project Management Journal*, *37*(4), 31.

Ifast (2014). 2015 Outlook for Malaysia. Research Report. *retrieved on-line on November*, *2015.* http://www.fundsupermart.com.my/.

Jabatan Laut Malaysia. (2015). List of Malaysian containers, oil tankers and fishing ports. *retrieved on-line on November, 2015*. www.marine.gov.my. www.mot.gov.my.

Jagboro, G.O., & Aibinu, A.A. (2002). The effects of construction delays on project delivery in Nigerian construction industry. *International Journal of Project Management*, *20*(8), 593-599.

Jha, K. N., & Iyer, K. C. (2006). Critical factors affecting quality performance in construction projects. *Total Quality Management and Business Excellence*, *17*(9), 1155-1170.

Jugdev, K., & Müller, R. (2005). A retrospective look at our evolving understanding of project success. *Project Management Journal*, *36*(4), 19-31.

Jardine, R., Chow, F., Overy, R., & Standing, J. (2005). *ICP design methods for driven piles in sands and clays* (p.112). London: Thomas Telford.

Kaliprasad, M. (2006). The human factor II: Creating a high performance culture in an organization. *Journal of Cost Engineering, 48*(6), 27-34.

Khan, F.I., & Amyotte, P.R. (2002). Inherent safety in offshore oil and gas activities: a review of the present status and future directions. *Journal of Loss Prevention in the Process Industries,* 15(4), 279-289.

Khang, D.B., & Moe, T.L. (2008). Success criteria and factors for international development projects: A life-cycle-based framework. *Project Management Journal*, *39*(1), 72-84.

Kim, B.C. (1989). Project scope and project performance: The effect of parts strategy and supplier involvement and product development. *Journal of Management Science, 35*(10), 1247-1263.

Klein, P.G., & Shelanski, H.A., 1996. Transaction cost economics in practice: Applications and evidence. *Journal of Market-Focused Management*, *1*, 281-300.

Kometa, S.T., Olomolaiye, P.O., & Harris, F.C. (1994). Attributes of UK construction clients influencing project consultants' performance. *Construction Management and Economics Jounal*, *12*(5), 433-443.

Krejcie, R.V., & Morgan, D.W. (1970). Determining sample size for research activities. *Educ psychol meas*.

Koops, L., Coman, L., Bosch-Rekveldt, M., Hertogh, M., & Bakker, H. (2015). Public perspectives on project success – influenced by national culture? *Procedia-Social and Behavioral Sciences*, *194*, 115-124.

Koskela, L., & Howell, G. (2002). The theory of project management: Explanation to novel methods. *In-Proceedings 10th Annual Conference on Lean Construction*, IGLC-10 (Vol. 6, No. 8).

Kotter, J. P. (2001). What leaders really do? *Harvard business review*, *68*(3).

Kuen, C.W. (2007). Factors influencing the success of project management amongst manufacturing companies in Malaysia: A conceptual framework. *7th Global Conference on Business and Economics.*

Lee, G., Benoit-Bruyan, J., and Johnson, T. P. (2011). ‘Survey Research in Public Administration: Assessing Mainstream Journals with a Total Survey Error Framework’, *Public Administration Review*, 72(1), 87-97.

Lim, C.S., & Mohamed, M.Z. (1999). Criteria of project success: An exploratory re-examination. *International Journal of Project Management, 17*(4), 243-248.

Ling, F.Y.Y., Low, S.P., Wang, S.Q., & Lim, H.H. (2009). Key project management practices affecting Singaporean firms' project performance in China. *International Journal of Project Management*, *27*(1), 59-71.

Lua, W., Zhang, L., & Pan, J. (2014). Identification and analyses of hidden transaction costs in project dispute resolutions. *International Journal of Project Management,* in press.

Malaysia household debt to GDP. (2013). *retrieved on-line on November, 2015.* https://www.google.com/search?q=bank+negara+malaysia+household+debt.

Malaysia oil and gas report. (2016), *retrieved on-line on November, 2015.* https://community.ump.edu.my/ecommstaff/sites/default/library/subfolders/12780/1/BMI_Malaysia_Oil__26_Gas_Report_Q12016.pdf.

Marzook, M.M., & El-Rasas, T.I. (2014). Analyzing delay causes in Egyptian construction projects. *Journal of Advanced Research*, *5*(1), 49-55.

Maserang, S. (2002). Project Management: Tools & Techniques. *Retrieved on November*, *15,* 2013.

Memon, A.H., Rahman, I.A., Abdullah, M.R., & Aziz, A.A.A. (2014). Factors affecting construction cost performance in project management projects: Case of MARA large projects. *International Journal of Civil Engineering and Built Environment*, *1*(1), 30-35.

Memon, A.H., Rahman, I.A., & Aziz, A.A.A. (2012). Time and cost performance in construction projects in southern and central regions of Peninsular Malaysia. *International Journal of Advances in Applied Sciences*, *1*(1), 45-52.

Mišić, S., & Radujković, M. (2015). Critical drivers of megaprojects success and failure. *Procedia Engineering*, *122*, 71-80.

Munns, A.K., & Bjeirmi, B.F. (1996). The role of project management in achieving project success. *International Journal of Project Management*, *14*(2), 81-87.

Murphy, A., & Ledwith, A. (2007). Project management tools and techniques in high-technology SMEs. *Management Research News*, *30*(2), 153-166.

Nixon, P., Harrington, M., & Parker, D. (2012). Leadership performance is significant to project success or failure: A critical analysis. *International Journal of Productivity and Performance Management*, *61*(2), 204-216.

Nam, C.H., & Tatum, C.B. (1997). Leaders and champions for construction innovation. Journal of Construction Management & Economics, 15(3), 259-270.

Northouse, P.G. (2011). Introduction to leadership concepts and practice, Entrepreneurial leadership questionnaire: 18-item version. *Sage Publications Limited*.

Odeh, A.M., & Battaineh, H.T. (2002). Causes of construction delay: Traditional contracts. *International Journal of Project Management*, *20*(1), 67-73.

Oil prices. (2015). Brent crude oil prices daily chart. *retrieved on-line on October, 2015.* https://www.google.com/search?q=oil+price+chart.

Oisen, R.P. (1971). "Can project management be defined?". *Project Management Quarterly*, *2*(1), 12-14.

Olaniran, O.J. (2015). The effects of cost-based contractor selection on construction project performance. *Journal of Financial Management of Property and Construction*, *20*(3), 235-251.

Orlitzky, M., Schmidt, F.L., & Rynes, S.L. (2003). Corporate social and financial performance: A meta-analysis. *Journal of Organization Studies*, *24*(3), 403-441.

Over budget projects in comparison, New York Times. (2015). *retrieved on-line on November, 2015*. www.google.com/search?q=over+budget+construction+projects&espv.

Pinto, J. K., & Slevin, D. P. (1988, June). Critical success factors across the project life cycle. *Project Management Institute.*

PMI. (2000). A guide to the Project Management Body of Knowledge (PMBOK). *Project Management Institute*, *4*(1), 4.

Pollack, J. (2007). The changing paradigms of project management. *International Journal of Project Management*, *25*(3), 266-274.

Ports in Malaysia. (2015). *retrieved on-line on November, 2015.* http://www.mot.gov.my/en/maritime/ports-in-malaysia.

Pounder, T. (2009). Using action learning to drive organizational learning and performance. *Strategic HR Review*, *8*(3), 17-23.

Puspadevi, S. (2015). Obstacles to construction growth, The Star Online, Business news. *retrieved on-line on November, 2015*. http://www.thestar.com.my/Business/Business-News/2015/01/02/Obstacles-to-construction-growth.

Rate of deaths from injuries in construction, selected countries. (2005). *retrieved on-line on November, 2015*.

https://www.google.com/search?q=global+construction+accident+statistics&espv.

Raza, T., & Michaelb, E. (2001). Use and benefits of tools for project risk management. *International Journal of Project Management*, *19*(9), 17.

Report on survey of construction industries. (2014). Key indicators of construction sector, 2012 and 2013. *retrieved on-line on November, 2015*. www.statistics.gov.my.

Reiss, G. (2013). Project management quotes pipe, 728. *retrieved on-line on November, 2016.* http://www.slideshare.net/GeoffatPerformancePeople/project-management-quotes-pipe-975906.

Rogers, E.M. (1983). Diffusion of innovation. *New York Free Press*, *18*(20), 271.

Rolstadås, A., Pinto, J.K., Falster, P., & Venkataraman, R. (2015). Project decision chain. *Project Management Journal*, *46*(4), 6-19.

Sadkowska, J. (2016). Stakeholders' risk in project management: Case study of Polish family firms. *Journal of Labour Productivity and Outsourcing*, *17*(6), 257-271.

Sambasivan, M., & Soon, Y.W. (2007). Causes and effects of delays in Malaysian construction industry. *International Journal of Project Management*, *25*(5), 517-526.

Sambasivan, M., Deepak, T.J., Ali, S., & Ponniah, V. (2016). Analysis of delays in Tanzanian Construction Industry: Transaction Cost Economics (TCE) and Structural Equation Modelling (SEM) approach. *Engineering, Construction and Architectural Management*, ABDC/ERA – A*, Scopus, ISI – Accepted and forthcoming.

Saunila, M. (2014). Innovation capability for SME success: Perspectives of financial and operational performance. *Journal of Advances in Management Research*, *11*(2), 163.

Schein, E.H. (1990). Organizational culture. *Journal of American Psychological Association*, *45*(2), 109.

Sekaran, U., & Bougie, R. (2003). Research methodology for business.

Shrnhur, A.J., Levy, O., & Dvir, D. (1997). Mapping the dimensions of project success. *Project Management Journal*, *28*(2), 5-13.

Söderlund, J. (2004). Building theories of project management: Past research, questions for the future. *International Journal of Project Management*, *22*(3), 183-191.

Song, J.H. (2009). The Dimensions of Learning Organization Questionnaire (DLOQ): A validation study in a Korean context. *Human Resource Development Quarterly*, *20*(1).

Subramaniam, A., Othman, R., & Sambasivan, M. (2010). Implicit leadership theory among Malaysian managers: Impact of the leadership expectation gap on leader-member exchange quality. *Leadership & Organization Development Journal*, *31*(4), 351-371.

Tawil, N. M., Khoiry, M. A., Arshad, I., Hamzah, N., Jasri, M. F., & Wan Badaruzzaman, W. H. (2013). Factors contribute to delay project construction in higher learning education case study UKM. *Research Journal of Applied Sciences, Engineering and Technology*, *5*(11), 3112-3116.

Teas, R.K. (1993). Expectations, performance evaluation and consumers' perceptions of quality. *The Journal of Marketing*, 18-34.

The research advisors (2006). Sample size table. *retrieved on-line on November, 2015*. www.research-advisors.com.

Trigo, V., Calapez, T., & Santos, M.D.C. (2009). SMEs and internationalization: An empirical study of SMEs in Portugal. *Economia Global e Gestão*, *14*(3), 9-24.

Truman, D. (2014). Assessment of problems associated with poor project management performance. Long International Inc. *International Project Management Arbitrator's Handbook*, 1-34.

Turner, J.R., & Müller, R. (2005). The project manager's leadership style as a success factor on projects: A literature review. *Project Management Institute*.

van Berkel, F.J., Ferguson, J.E., & Groenewegen, P. (2016). Speedy delivery versus long-term objectives: How time pressure affects coordination between temporary projects and permanent organizations. *Journal of Long Range Planning*.

van Offenbeek, M.A., & Vos, J.F. (2016). An integrative framework for managing project issues across stakeholder groups. *International Journal of Project Management*, *34*(1), 44-57.

Westerveld, E. (2003). The Project Excellence Model®: Linking success criteria and critical success factors. *International Journal of Project Management*, *21*(6), 411-418.

Winch, G., 1989. The construction firm and the construction project: A transaction cost approach. *Journal of Construction Engineering and Economics*, *7*(4), 331-345.

White, D., & Fortune, J. (2002). Current practice in project management: An empirical study. *International Journal of Project Management*, *20*(1), 1-11.

Williamson, O.E. (1989). Transaction cost economics. *Handbook of Industrial Organization*, *1*(135-182).

William, W. (2012). Top 10 project management quotes. *retrieved on-line on November, 2016.* http://sourcesofinsight.com/project-management-quotes/. .

World GDP growth rate. (2015). *retrieved on-line on November, 2015*. http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG.

Wu, T.C., Chen, C.H., & Li, C.C. (2008). A correlation among safety leadership, safety climate and safety performance. *Journal of Loss Prevention in the Process Industries*, *21*(3), 307-318.

Xiao, H., & Proverbs, D. (2002). The performance of contractors in Japan, the UK and the USA: An evaluation of construction quality. *International Journal of Quality & Reliability Management*, *19*(6), 672-687.

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
	Project related factors and its impact on project performance - literature review				
1	Kim, B. C. (1989), Project scope and project performance: The effect of parts strategy and supplier involvement and product development, Journal of Management Science.	Objectives: 1) To examine the impact of project scope with project performance. H1) There exist a relationship between project scope and project time, cost.	No instrument used. 29 major new vehicle development projects in 20 companies from US, EU & Japan. Secondary data from new vehicle development projects on parts development, scope, time, cost, performance. SPSS software used to perform regression, correlation etc.	1) Scope impacts lead time and productivity. 2) Different structures and supplier relationships exists in US, EU & Japan. 3) The different structures lead to different project performance in these countries. 4) Scope differs significantly in the industry even for comparable projects.	1) Little studies were conducted on the effect of unique parts strategies on development. 2) To explore further on the project scope variation and its impact on project cost and time.
2	Belassi, W., & Tukel, O. I., (1996), A new framework for determining critical success / failure factors in projects, International Journal of Project Management.	New scheme that classifies the critical success factors and describes the impacts of these factors on project performance. Also, emphasis is given to grouping of success factors and their interactions. Classification on grouping of success factors and studying the impact and interactions.	Primary data - Survey – Questionnaire. 200 project managers. Pilot study, instrument validation and final research. SAS - Descriptive statistics and frequency analysis.	A new scheme developed by the researcher to represent critical factors for project success in a systematic way. Many neglected factors identified in the study such as 1) Project manager's management skills. 2) Team member's commitment and their technical background. 3) Project attributes and environmental factors. 4) MIS.	1. Cause and effect relationship between critical factors and on measurement techniques. 2) New technological changes happening today could change the identified critical success factors.

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
3	Munns, A. K., & Bjeirmi, B. F., (1996), The role of project management in achieving project success, International Journal of Project Management.	Objectives: 1) To identify the overlap between the definition of project and project management and their relationship. 2) To identify the individuals involved in project and project management and their influence on project success. Research Question: Is there a relationship between project success and project management?. 1. Project and project management are distinctive to each other. 2) Project management and project success are interrelated.	No instrument used. Secondary data from scholarly articles on project and project management. Number of articles referred is 15. Scholarly review of literature related to project, project management and project success. Theoretical analysis of various project management concepts and their relationships.	The author concludes as below: 1) There is an overlap between project and project management. 2) The objectives of project and project management are different. 3) PMT is not fully responsible for the project success / failure. 4) Client should take an increasing role in the project & project management. 5) Project management role should be appreciated in the project. 6) Successful project management techniques will help to achieve project success. 7) Selecting the right project and dropping the potentially unsuccessful projects is the key to project success.	1. Limited articles were analyzed (15). 2) The concept of increased appreciation for project management is a good indicator. 3) Application of successful techniques for project success in another area which can be studied further. 4) Role of clients in project success is another area, which can be studied further.
4	Shrnhur, A. J., Levy, O., & Dvir, D., (1997), Mapping the dimensions of project success, Project Management Journal.	Objectives: 1) To study the existing dimensions of project success and to explore additional dimensions in project management. Research question: Is the available project success dimensions exhaustive and covers sufficiently or not?. H1) Project success has 3 different dimensions.	Structured survey questionnaire (Quantitative research study). 127 projects from Israel. 182 project managers issued with questionnaires and 127 (70%) responses received. 7 point Likert scale with 13 measures of success in the questionnaire stating "very low" to "very high". SPSS - Factor analysis	1) Study suggests a multi-dimensional framework to assess project success with four primary dimensions such as project efficiency, impact on the customers, direct and indirect business success and preparing for the future. 2) Management must specify project objectives as early as possible even before the project starts.	1. The four dimensions developed may change over time, hence, to generalize this multi-dimensional model, application of this model in a wide range of projects is necessary. 2) Project success criteria and its linkages to the organizational short term and long term goals should be studied further for meaningful exploration of this concept.

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
			technique, Pearson's correlation, ANOVA.		
5	Atkinson, R. (1999). Project Management: Cost, time and quality, the two best guesses and a phenomenon, it's time to accept other success criteria, International Journal of Project Management.	New framework to consider project success criteria. Success criteria for projects other than Time, Cost & Quality.	Scholarly analysis of related literature. Secondary data from project management journals. New framework / model design to assess project success criteria (The square root model). No analysis techniques used.	Author suggests other than the Iron Triangle (Time, Cost, Quality), to look into other project success criteria such as "stakeholders" and "benefits to the stakeholders" as new criteria to measure project success.	1) It's not an empirical study and hence data are not available. 2) There could be other project success criteria as well which need to be explored.
6	Lim, C. S., & Mohamed, M. Z. (1999). Criteria of project success: an exploratory re-examination, International Journal of Project Management.	Objectives: 1) To explore what and who determine project success?. 2) To explore the issues from different perspectives of people looking at the project and its success. H1) Individuals perspectives vary on project success. H2) There exists macro and micro views on project success.	Unstructured interviews (Qualitative case study). 40 experienced project professionals. Opinion survey using unstructured questions, open ended questions, casual discussions. Compilation of data collected through logical arrangements and grouping as factors for project success. Three frameworks developed for better understanding on project success and on different perspectives.	1) Preliminary finding from the exploratory studies re - enforced the observation that project success is dependent upon perspectives. 2) There are two view points for project success (macro and micro). 3) Macro view point covers completion criteria and satisfaction criteria, whilst, micro view point covers only completion criteria.	1) To explore the criteria models and factor models further to find more efficient ways to improve projects and project performance. 2) Project considered as success as one party will be treated as failure by another party for various reasons, which need to be studied further.
7	Cooke - Davies, T. (2002). The "real" success factors on projects, International Journal of Project	1) What factors lead to project management issues?. 2) What factors lead to successful projects?.	Primary data - Survey - Questionnaire. 136 projects from23 organizations. Identification of most	12 major factors leading to project success. Eight factors are hard factors and four factors soft factors. Hard Factors are, 1) Adequacy of	1. Human factors are not considered in this research as the research is basically focused on what people do in projects rather than focusing on their interactions, decision making

Appendix A – Literature review matrix

Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
Management.	3) What factors lead to consistently successful projects?. H1) Factors leading to project management issues. H2) Factors critical to project success.	important project management issues and factors leading project success. Co-relation analysis.	companywide education on the concept of risk management. 2) Maturity of an organization's processes for assigning ownership of risks. 3) Adequacy with which a visible risk register is maintained. 4) Adequacy of an up-to-date risk management plan. 5) Adequacy of documentation of organizational responsibilities on the project. 6) Keep project (or project duration) as far below three years (one year is better). 7) Allow changes to scope only through a mature scope change control process. 8) Maintain the integrity of the performance measurement baseline. The soft factors are, 1) The existence of an effective benefits delivery and management process that involves the mutual co-operation of project management and line management functions. 2) Portfolio and programme management practices that allow the enterprise to fully a suite of projects that are matched to the corporate strategy and business objectives. 3) System of project metrics for projects performance and success. 4) Learning from experience on	styles and motivation. 2) Study is limited to European projects. 3) Study mainly focused on risk management in projects.

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
				project and continuous improvement.	
8	White, D., & Fortune, J. (2002). Current practice in project management - an empirical study, International Journal of Project Management.	Objectives: 1) To identify the reasons for the mismatch between the promise offered by the project management methods and techniques and the outcomes delivered. Research Question: How effective are the project management tools and techniques?. H1) Project management tools and techniques influence project success.	Survey questionnaire (Quantitative research study). 995 project managers from 620 organizations. Response rate 23.7%. Pilot study (30 project managers), instrument validation and final research. Simple statistical analysis like average, mean, median, mode, histogram.	1) Most respondents used only small number of methods, tools & techniques with project management software and Gantt charts. 2) Half of them reported drawbacks on the tools and techniques that they used. 3) Other than time, cost and specification (quality), two other criteria emerged in the study (fit between the project and the organization & the consequences of the project for the performance of the business). 4) 65% do not use risk management tools. 5) Organization side effects due to projects and its impact were also studied.	1. Application, efficiency & effectiveness of project management tools / techniques can be further studied in other parts of the world. 2) Critical examination of the failure of project management software and in-house developed project management solutions could be another research area.
9	Jagboro, G. O., & Aibinu, A. A. (2002). The effects of construction delays on project delivery in Nigerian construction industry, International Journal of Project Management.	Objectives: 1) To identify and evaluate the effects of delays on building project execution in Nigeria. 2) To assess the effects of delay on completion cost of building projects. 3) To assess the effects of delay on completion time of building projects. 4) To investigate how effects of delays can be minimized. H1) There exist a	Questionnaire. (Quantitative research). 61 Nigerian building projects (200 questionnaires issued and 102 responses received). 51% response. Self-administrated survey on practitioners. Chan and Kumarasamy's relative importance index (RII), SPSS software for linear regression, correlation.	1) Cost overrun and time overrun are the two important factors for delay in construction projects of Nigeria. 2) Delay had significant impact on project duration. 3) Loss, expense claims during delay period significantly effect cost overrun. 4) Acceleration programs are not successful in Nigeria due to client's project management procedures. 5) Contingency budgets estimated at the pre contract stage are not adequate to	1) The model relating delay and actual project duration provided a benchmark for future research work in the study of project management in Nigeria. 2) Similar comparative empirical studies can be conducted in other parts of the world too.

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
		relationship between construction delay and cost of the project. H2) There is a relationship between client influence and project completion with cost and time.		cover the cost overrun or losses.	
10	Westerveld, E. (2003). The project excellence model: Linking success criteria and critical success factors, International Journal of Project Management.	Objectives: 1) To establish a new concept to link the CSF and project success. 2) To relate CSF and project success criteria. H1) There exists a relationship between CSF and project success.	No instrument used. 15 articles related to CSF & project success. Scholarly review of the journals. Research and analysis of CSF and project success in details.	1) New project excellence model linking CSF and project success developed. 2) Applied the newly developed model in practice and the results were analyzed. 3) Found the following six CSF are critical for project success (leadership and team, policy and strategy, stakeholder management, resources, contracting, project management features such as scheduling / budget / organization / quality / information / risks).	1) To apply the project excellence model in all the projects. 2) To study the conflict between project goals and organizational goals and its impact on organizations / project (policy & strategy). 3) To study further on linking organizational areas to project result areas.
11	Jugdev, K., & Muller, R. (2005). A retrospective look at our evolving understanding of project success, Project Management Journal.	The purpose is to present a retrospective look at project success in literature over the past 40 years and to provide an understanding on project success. Research Question: What are the critical project success factors across the project and project life cycles?. Project management is	Scholarly analysis of related literature. Secondary data from project management journals approximately 30 articles. A new concept - strategic project management to identify CSF holistically. Strategic analysis of 40 years of project success literature to conclude strategic management concepts for project success.	Project success is a complex and ambiguous concept and it changes over the project. They suggest the following: 1) Think about CSFs as a guide and develop appropriate indicators of project success. 2) Take stakeholders interest in project success as part of your project success. 3) Develope and maintain good relationship with project sponsors. 4) Consider product life cycle as part of project life	1. Continue to identify CSFs holistically with product life cycle as part of project life cycle. 2) Think strategically on project success taking stakeholders and project sponsors critically as part of project success. 3) Review done on articles before year 2005 only after 2005, there is no analysis done. 4) Review done on 30 articles, not exhaustively covered.

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
		an operational concept without strategic value. Project management success and project success are not the same.		cycle.	
12	Angus, G. Y., Flett, P. D., & Bowers, J. A. (2005). Developing a value centered proposal for assessing project success, International Journal of Project Management.	Objectives: To provide a different dimension to measure project success (a product based and value based approach). Research question: Are the current measurements of project success adequate to address the value stream point of view?. H1) There exists value based approach to measure project success.	No instrument used. 37 scholarly articles on project success and value addition related were studied. Scholarly review of the journals. Accounting and financial calculations such as NPV, ROI, and CBA were used to analyze the concept.	1) Study proposes a product oriented and value centered scheme for project success (Net project execution cost - NPEC and net product operation value - NPOV concept). 2) 12 possible project outcomes were outlined based on the values of NPEC and NPOV (value generated from 12 different options were studied and compared for decision making).	1) Full scale case studies of this approach have not been done so far, hence this will be an area for future research empirically. 2) NPEC, NPOV will vary for different type of projects and hence, it will be interesting to study the NPEC / NPOV of different types of projects for cost benefit analysis (CBA). 3) This new approach could be used practically for project abandonment or selection decision making process, which need to be tested empirically in future research.
13	Assaf, S. A., & Al-Hejji, S. (2006). Causes of delay in large construction projects, International Journal of Project Management.	Objectives: 1) To identify the causes of delay in construction projects in Saudi Arabia. 2) To test the importance of delay between the parties such as contractors, clients and consultants. 3) To study the different perceptions of delay. H1) Causes influence delay in construction projects. H2) Perceptions on delay varies between	Questionnaire (Quantitative research). 23 contractors, 19 consultants & 15 owners. Self-administrated survey. SPSS software is used to test Spearman's correlation, severity index (SI) & importance index (IMP.I) were also analyzed.	1) 73 causes were identified during the research. 2) The average time overrun is about 10 to 30% of the original schedule. 3) Most common cause for the delay is due to change order. 4) 70% projects experienced time overrun. 5) Labor-related factors are significant for the project success. 5) Study indicated that, awarding the project to the lowest bidder is the highest frequent factor of delay.	1) Similar studies can be conducted in other parts of the world. 2) Different types of projects such as infrastructure, dams could be studied. 3) Effect of financing, cash flow problems and its impact to project delay can be studied.

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
		stakeholders in projects.			
14	Sambasivan, M., & Soon, Y.W. (2007)., Causes and effects of delays in Malaysian construction industry, International Journal of Project Management.	The main purpose of the study is to identify the delay factors and their impact (effect) on project completion. Specific causes lead to project delays & specific effects on Project delays.	Primary data - Survey – Questionnaire. 150 respondents. Convenience and snow ball sampling (non-probability sampling technique). Identification of most important causes and effects of project delays. Demographic analysis / RII Analysis on causes / Ranking of causes / Spearman's correlation analysis.	Ten most important causes delays are: 1) Contractor's improper planning. 2) Contractor's poor site management. 3) Inadequate contractor experience. 4) Inadequate client's finance and payments for completed work. 5) Problems with subcontractors. 6) Shortage in materials. 7) Labor supply. 8) Equipment availability and failure. 9) Lack of communication between parties. 10) Mistakes during the construction stage. Six most important effects are: 1) Time overrun. 2) Cost overrun. 3) Disputes. 4) Arbitration. 5) Mitigation. 6) Total abandonment.	1) Similar studies can be conducted in other parts of the world. 2) Some causes and effects may be unique to certain countries. 3) Limited sample (only 150 respondents)
15	Alaghbari, W., Kadir, M. R. R., Salim, A., & Ernawati. (2007). The significant factors causing delay of construction projects in Malaysia, Journal of Engineering, Construction and Architecture management.	Objectives: 1) To identify the major factors causing delay in construction projects of Malaysia. Research questions: 1) What causes the delay in construction projects?. 2) Who are responsible for the delays in construction projects?. H1) Contractors, owners, consultants and	Questionnaire (Quantitative research). 450 questionnaires issued and 78 responses received. Random sampling and feedback from consultants, contractors, clients, subcontractors, engineers, developers and architects. SPSS software is used for analyzing descriptive statistics, correlation, regression.	1) Financial problem is the main factor causing delay in construction projects in Malaysia. 2) The second important factor is the coordination problems causing delay. 3) Contractor related factors, owner related factors, consultant related factors and external factors were the four main factors which were causing delays in the construction projects of Malaysia. 4) The study also	1) The study was conducted only in Klang valley of Malaysia and hence it is geographically limited. Further study can be extended to other parts of Malaysia. 2) The study was conducted mainly on building construction projects and hence, the scope is limited. Further studies can be conducted in other type of construction projects for better understanding. 3) Impact of financial problems (lack of financial support) and technical problems (lack of technical support) on project performance could be another area of research to reinforce

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
		external factors are positively associated with project delay.		found overall there are 31 factors contributing to the delay, which can be attributed to contractors, owners, consultants and external factors.	the findings of this study.
16	Pollack, J. (2007). The changing Paradigms of project management, International Journal of Project Management.	Objectives: 1) To examine the evidence of influence of hard paradigmatic factors on project management as well as the influence of soft paradigms. Research question: 1) Is there a relationship between hard paradigm and project management. 2) Is there is link between soft paradigm and project management. 1) Hard paradigm influence project management. 2) Soft paradigm influence project management.	No instrument used. Secondary data from 84 scholarly articles on project and project management. Scholarly review of literature related to hard paradigms, soft paradigms and project management. Theoretical analysis of influence of hard paradigms and soft paradigms on project management.	1) Traditional PM is deeply rooted to the hard paradigm. 2) Influence of soft paradigm on PM is less substantial, but growing. 3) Theoretical framework on PM research is expanding. 4) Newer paradigms are evolving in PM. 5) One paradigm is dependent upon the other.	1) Limited to traditional PM and does not cover nontraditional PM areas. 2) Paradigmatic expansion on PM is anticipated for further contribution in this area.
17	Chan, W. K. (2007). Factors influencing the success of project management amongst manufacturing companies in Malaysia: A conceptual framework, 7th Global conference on Business & Economics.	Objectives: 1) To identify factors which contribute to the successful implementation of project. 2) To identify the factors relative importance as the project journeyed throughout its life cycle in Malaysian	No instrument used. 38 scholarly articles related to project success and factors influencing project success. Scholarly review of articles and critical analysis of factors influencing project success. Critical evaluation of project success influencing factors and suggesting Pinto's project	Manufacturing today executes large number of projects and it is important to understand the factors influencing project success to avoid cost, time and other potential issues that may arise. 2) It is also important to understand the factors influencing project success during various life cycle of projects to take	1) The study is a conceptual paper and not supported by empirical study to prove the usefulness of the framework suggested. Hence, to study the usefulness of the framework in Malaysian context empirically and in other parts of the world too.

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
		context. Research questions: 1) What are the criteria used to measure the success of a manufacturing based project?. 2) What are the significant factors, which leads project success in manufacturing sector?. H1) A clear project mission is positively related to project success in manufacturing. H2) High support from the top management is positively related to project success in manufacturing. H3 to H10) Pinto's factors (factor 3 to 10) for project success are set as hypothesis as positively related to project success in manufacturing sector.	success model for application in manufacturing related projects.	actions that may be necessary to ensure project success.	
18	Khang, D. B., & Moe, T. L. (2008). Success criteria and factors for international development projects: A life-cycle based framework, Project Management Journal.	Objectives: 1) To identify the CSF for not for profit international projects in developing countries. Research Questions: What are the CSF for non for profit projects in developing countries. H1) There exists specific CSF for non	Survey questionnaire (Quantitative research study). Selected south east Asian countries (Vietnam & Myanmar). 1000 questionnaires distributed. Response received 368 (37%). Progressive research phase wise using different set of questions for each phase. SPSS software used to analyze reliability,	A new framework is developed for non for profit projects in international projects in developing countries. The following are the workable phases for such projects. 1) Success judgment by stakeholders. 2) Conceptualization phase. 3) Planning phase. 4) Implementation phase. 5) Closing phase. Additionally,	1) The new framework, identification of CSF for phase wise (project life cycle) project success is tried only in non for profit organizations. Need to study further in conventional for profit projects too. 2) The study was conducted only in Vietnam and Myanmar and similar studies can be conducted in other parts of the world too.

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
		for profit projects.	correlation, factor analysis, regression analysis.	success criteria and factors for each of the above phase are identified in the research. Project partners such as planners, designers, consultants are important for project success in addition to project manager.	
19	Ling, F. Y. Y., Low, S. P., Wang, S.Q., & Lim, H. H. (2009). Key project management practices affecting Singaporeans firms' project performance in China, International Journal of Project Management.	Objectives: 1) To study the PM practices of Singaporean AEC firms doing projects in China. 2) To recommend best PM practices for project success in China. Research question: What are the factors which affects project success of Singaporean AEC companies in China?. H1) There are specific CSF factors that are relevant for projects handled by foreigners in China.	Survey questionnaire (Quantitative research study). 200 questionnaires send to 130 consultants and 70 contractors. 33 responses received (17%). Pilot study, instrument validation and final research. SPSS software used to analyze significance, correlation, and linear relationship between variables. ANOVA was also analyzed.	The most important factors that affect the project success of Singaporean AEC companies in China are: 1) Scope management. 2) Quality of the contract document. 3) Quality of response to perceived variations. 4) Extent of changes to the contract. The above factors are the most predominant factors in the pool of 60 identified factors from scope, time, cost, quality, risk, HR, communication, procurement, integration management areas.	1) Limited response for this study and hence, the study can be extended to other countries with similar approach. 2) Study was conducted at few locations in China and hence cannot be generalized. 3) The study was conducted only on Singaporean firms and the same can be extended to other companies from other countries too.
20	Truman, D. (2014). Assessment of problems associated with poor project management performance, International Project Management Arbitrators Handbook.	Objectives: To explain the methodology adopted in assessing the problems associated with poor project management performance. Research question: What are the causes for poor project	No instrument used. Review of mediation, arbitration and court cases related to project performance management handled by Long International. Scholarly review of PMI / CII guidelines on project	The study concluded the following reasons for project failure: 1) Failure of the PMT to adequately plan and execute the project. 2) Failure to provide adequate human resources. 3) Failure to develop accurate planning schedules and achieving those	1) Project success does not end at the project completion, it will also be measured at the time of disputes in the projects. Further research can focus on how disputes are handled successfully in the projects. 2) The other area of future research is cause and effect relationship of various issues in projects.

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
		management performance?. H1) Sound project management principles have influence on project performance.	management. Comparative analysis of PM concepts and actual practice at project management companies with respect to each problems, causes and effects.	schedules. 4) Failure to control cost and changes throughout the project.	
21	Memon, A. H., Rahman, I. A., Abdullah, M. R., & Aziz, A. A. A. (2014). Factors affecting construction cost performance in project management projects: Case of MARA large projects, International Journal of Civil Engineering and Built Environment.	Objectives: 1) To investigate the procurement strategies adopted in MARA (Majlis Amanah Rakyat) large construction projects. 2) To identify various factors affecting construction cost performance of MARA large construction projects. H1) Procurement strategies influence cost overrun in projects. H2) Various factors influence cost overrun in MARA construction projects.	Questionnaire & Interviews. 36 participants from MARA projects. Self-administrated survey & interviews. SPSS software is used to analyze descriptive statistics, reliability.	1) Fluctuation in price of raw materials, cash flow and financial difficulties faced by contractors, shortage of site workers, lack of communication between parties, incorrect planning and scheduling by contractors are most severe factors. 2) Frequent design changes and owner interference are least affecting factors.	1) The study was conducted only on MARA projects and hence extension of this study to other sectors / types of projects will give further insight on this subject.
22	Marzouk, M. M., & El-Rasas, T. I. (2014). Analyzing delay causes in Egyptian construction projects, Journal of advanced research.	Objectives: 1) To study the causes of construction delays in Egyptian construction projects. H1) There exists a relationship between the causes of delay and its effect on project success.	Personal interviews and survey questionnaire. 33 construction professionals including clients, consultants and contractors). Self-administered survey. SPSS software, ANOVA, Correlation, Frequency index, Severity index,	Findings: 1) Owner responded causes are: ineffective planning & scheduling, inability to finance the project by contractors, change management related causes, poor site management, low productivity, sub soil conditions, shortage of materials, unqualified	1) Similar studies can be conducted in other parts of the world too. 2) The study is limited to less number of respondents and the study can be extended to a large number of samples to ascertain the findings.

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
			Importance index analyzed.	workforce, delay by subcontractors. 2) Contractor responded causes are: delay in payment by client, delay in approvals of scope changes, design mistakes, stoppage of work, owner interference, slow decision making, and type of contract (lowest price). 3) Consultant responded causes are: A combination of (1) and (2) mentioned above by owner and contractor respondents.	
23	Olaniran, J. (2015). The effects of cost-based contractor selection on construction project performance, Journal of financial management of property and construction.	Objectives: 1) To study the impact of cost based contractor selection of project performance. H1) There is an impact on cost based contractor selection on project performance.	Quantitative research questionnaire. 54 construction practitioners. Online survey. Frequency, Severity and Importance index analysis.	Findings: 1) Choosing contractors solely based on the cost may cause poor performance. 2) There are project delays and non-compliance to standards in projects due to cost based contractor selection. 3) The major reason for the above delay and non-compliance to standards is due to reduced margins for contractors.	1) Similar studies can be conducted in other parts of the world where bigger population. 2) Bigger sample can be considered to firm up the findings of this research.
24	Hussein, B. A., Ahmad, B. A., & Zidane, Y. J. T. (2015). Problems associated with defining project success, International conference on project management.	Objectives: 1) To examine the scope of the potential threats and challenges influencing the initial definition of project success criteria. 2) To examine and analyze the correlations between these problems and other factors that usually	Quantitative research questionnaire. 155 respondents. Web based survey. Descriptive and analytical statistics for reliability, validity and correlation.	Findings: 1) Problems related to the definition of project success criteria at the initiation phase are correlated with each other and could be attributed to poor stakeholder identification and involvement. 2) Top management support could be improved by taking measures to include success criteria that embody both project management and project success and concurrently balancing the expectations to avoid unrealistic criteria. 3) Alignment in	1) The study was conducted with a small sample in Norvey. Similar studies can be conducted in other parts of the world with larger sample size.

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
		arises during execution and evaluation phases. H1) There is a correlation between the problems of defining success criteria and the following factors: a) Lack of top management support. b) Lack of alignment in the project organization to project success criteria during execution phase. c) Subjectivity of measuring the achievement of the targeted success criteria at close out and evaluation phase.		the project can be improved by establishing realistic targets to create a sense of believe and trust in the project.	
25	Rolstadas, A., Pinto, J. K., Falster, P. & Venkataraman, R. (2015). Project decision chain, Project Management Journal.	Objectives: 1) To analyze the different type of decisions and the associated decision making techniques in project management. 2) To analyze how these can be conceptualized to improve project performance. H1) There exists a relationship between decision making in projects and project success.	No instrument used. 53 scholarly articles on decision making and project success. Scholarly review of decision making techniques and linking the decisions to project success. Theoretical and conceptual analysis of decision making styles, supply chain and project performance.	1) A well-established decision analysis process integrated into the overall project management process is vital for improving project performance. 2) Authors proposed a project decision chain framework (similar to a supply chain) that will that decisions made at each stage of the project life cycle add value to project performance.	1) To apply the newly developed project decision chain framework in the projects in the decision making processes and to measure the project success in comparison to the projects which did not use the project decision chain.
26	Haniff, A. &	Objectives: 1) To	Case study (semi	Findings: 1) Lack of strategic fit is	1) Further empirical studies

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
	Ogunlana, S. O. (2015). Strategic alignment within a TMO: Perceptions of project success, Conf. paper, 31st Association of Researchers in construction management.	identify the source of tensions in the alignment of organizational strategies by investigating how various organizational actors' measure success on a single construction project. H1) There exist varied perceptions among organizational actors within an organization on project success.	structured interviews) and literature review. One project (11 samples) and 42 scholarly articles. Scholarly review of related articles on project success perceptions and application in a project. Theoretical analysis and practical application in a project.	inherent in construction projects. 2) TMO organization members will focus short term project management objectives and likely to priories completion of the project as key success factor as compared to cost and quality. 3) Clients at corporate level perceive project success as different considering their long term strategic benefits of the investment. 4) Lack of integration to the procurement processes inherent within the construction industry. 5) Perception of project success will vary between hierarchical levels, business units, departments and within the client system.	need to be conducted in highly complex client systems, where single point leadership of a TMO is challenged. 2) To study further with multifaceted organizational structure with varied internal stakeholders.
27	Sadkowska, J. (2016). Stakeholders risk in project management - case study of polish family firms, Journal of entrepreneurship and management.	Objectives: 1) To identify and describe risks generated by stakeholders for family firms. 2) To identify the relationship among the type of stakeholders risk, the sector (production, trade, services) and size of the family firm. H1) There exists a relationship between stakeholder generated risks and family owned business type and company size.	No instrument used. 30 scholarly articles on project stakeholder's risks and project success. Scholarly review of project success, project stakeholder's risks and family businesses. Theoretical and conceptual analysis of related data.	Findings: 1) Family businesses are same as other business entities operating in the market, increasingly manage projects. 2) Family businesses are aware of stakeholder presence in their environment, who may be active both in supporting operational activities of family businesses as well as aiming to destruct particular projects. 3) Acceptance of stakeholders, or at least maintaining their "neutral approach" to projects implemented by the company can significantly affect the success of the project.	1) Limited articles were reviewed and hence further studies can be continued in this area. 2) Only 50 family owned businesses were studied in the research, which can be extended to more number of organizations to ascertain the results. 3) To extend this study to other parts of the world too.
28	Freek, J. F. W., Van Berkel., Ferguson, J. E. & Groenewegen, P.(2016). Speedy	Objectives: 1) To analyze how time pressure affects coordination between	Case study, Descriptive survey research and interviews. 111	Findings: 1) Time pressure generated difference in work pace. 2) Project teams were accustomed to fast way of working while permanent	1) To expand the study in other parts of the world. 2) To study how trans active memory can affect

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
	delivery versus long term objectives: How time pressure affects coordination between temporary projects and permanent organizations, Long range planning journal.	temporary projects and permanent organizations involved in projects. H1) Time pressure affects the coordination between temporary project teams and permanent organizations.	responses. Qualitative analysis. MAXQDA software for iterative process.	organization teams are not. 3) Coordination problems exist as permanent organization members trans active memory is low and knowledge is locked up with individuals. 4) Political interference amplifies the time pressure and coordination on project teams. 5) Temporary projects plays an important role in achieving the objectives of the permanent organizations.	relationship between temporary project teams and project organizations.
29	Marjolein, A. G., Van Offenbbek. & Vos, j. F. J. (2016). An integrative framework for managing project issues across stakeholder groups, International journal of project management.	Objectives: 1) To analyze the linkages between the stakeholders and the issues they bring in projects. H1) There is a relationship between stakeholders management and their issues on project performance.	Quantitative research questionnaire + interview. 20 participants. Self-administered survey. Deductive coding method, Semantic analysis, Communality analysis.	Findings: 1) New frame work developed to analyze stakeholder issue connections from a knowledge perspective. 2) This framework helps to identify the stakeholder issues in a landscape format, which enables to understand the issues and solve them accordingly. 3) Large complex projects with multiple stakeholder groups need proper stakeholder identification and issues management.	1) To try this framework in all types of projects. 2) Impact of this framework on project performance could be another interesting area to study.
30	Ghazi, M., Kheyroddin, A. & Rezayfar, O. (2016). Diagnosing the success of the construction projects during the initial phases, Decision science letters.	Objectives: 1) To provide a model to forecast the level of realization of success criteria according to the level of realization of success factors at the initial phase. H1) There exists project success criteria according to the level	Quantitative research questionnaire + interview. 189 participants. Exploratory research. Scholarly review, semi structured interviews and Delphi method, regression, propagation neutral network.	Findings: 1) A model based neural networks was developed for anticipation of the success of construction projects depending on the level of realization of success factors during the initial phase of a project. 2) Using this model anticipated project success can be determined by the stakeholders about the	1) The model is developed based on the criteria and factors related to Iran's conditions. Similar studies can be conducted in other countries construction sector. 2) Application of this model can be tried as such in other countries as well.

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
		of realization of success factors.		viability of the project.	
31	Sambasivan, M., Deepak, T. J., Ali, S., & Ponniah, V. (2016). Analysis of delays in Tanzanian construction industry: TCE and structural equation modeling (SEM) approach, Journal of Engineering, Construction and Architecture management.	Objectives: 1) To develop theoretical underpinnings using TCE. 2) Run the analysis and advanced tool such as SEM. H1) There exists a relationship between caused and effects of delays in construction industry and TCE. H2) SEM is a good tool to analyze the complex relationship between variables.	Quantitative based survey. 308 respondents. Self-administered survey. Structural equation modeling.	Findings: 1) Cost overrun can be explained by consultant and material related factors. 2) Disputes can be explained by cost overrun. 3) Arbitration can be explained by consultant related, cost overruns and disputes factors. 4) Litigation can be explained by client related, disputes and arbitration factors. 5) Abondment can be explained by consultant related, external related, disputes, arbitration and litigation factors. 6) TCE can be used to understand the impact of causes on effects and delays. 7) SEM application and its usefulness in analyzing the complex relationship between causes and effects of delays have been demonstrated.	1) Researchers and practitioners in other parts of the world can use the approach to understand and deal with delays in construction industry. 2) Number of samples are less and hence studies with larger samples can be conducted.

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
	Organizational related factors and its impact on project performance - literature review				
1	Garvin, D. A. (1985). Building a learning organization, Organizational Development & Training	Objectives: 1) To define what is a learning organization. 2) To define the processes involved in a learning organization. H1) Is there a relationship between organizational learning and organizational performance.	No instrument used. Four successful US companies and their experience on learning organization (Analog devices, Chaparral steel, Xerox, GE). Scholarly review of experiences of the four giant companies and their experiences. Theoretical and case study analysis of learning organization and organizational performance.	1) Many of the continuous improvement programs in organizations fail. 2) Three critical issues must be addressed by organizations for success as a learning organization. They are, well grounded definition of a learning organization, clear operational guidelines for practice, and better tools for measurement of organizational learning. 3) Five main activities are identified for successful learning organization concept implementation. They are: systematic problem solving, experimentation with new approaches, learning from past experience, learning from the best practices of others and transferring the knowledge quickly and efficiently throughout the organization.	1) Learning organization concept implementation in project management companies can be studied. 2) Contribution of learning organization to project success can be studied further.
2	Gordon, J. (1992). Performance technology: Blueprint for the learning organization, Training.	Objectives: 1) To determine the human performance problems which are seen as organizational problem. 2) To review	No instrument used. Literature related to learning organization. Scholarly review of related literature. Theoretical and	1) Performance technology (PT) is often focused on individual performance. 2) Training managers (Performance technologists) should	1) Organizational objective is to achieve team performance. Hence, learning organization and its impact to organizational performance could be further studied. 2) Causes for human

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
		critically training and learning as tools to address the human performance problems and to facilitate organizational performance. H1) There exist a relationship between organizational learning and organizational performance. H2) Learning organization influence the employee performance behaviors.	comparative analysis of learning organization concepts and theories.	treat the employees as their clients for improved performance delivery by the training division as well as improved performance from the employees. 3) Employees in a learning organization should master the following five principles such as systems thinking, shared vision, learning, personal mastery and mental models. 4) Employees in a learning organization should have, common purpose, common language, common processes, resources needed and authority to make decisions to enhance organizational performance.	performance problems in an organization and its impact to organizational performance can be further studied.
3	Argyris, C., Bellman, G. M., Blanchard, K., Block, P., & al, e. (1994). The future of workplace learning and performance, Training & Development.	Objectives: 1) To assess the future of workplace learning and its relationship to performance of individuals as well as organizations. H1) Learning influences individual and organizational performance.	No instrument used. Qualitative research. 15 leading consultants and trainers of corporate companies (Tom peters, Noel Tichy, Chris Argyris, etc.). Scholarly discussion on learning, training, learning organization, future of learning and its impact on individuals and organizations. Critical evaluation of the	1) Learning is inevitable in the future as changes are happening so fast in the organizations and work places. 2) Learning is to achieve performance and it will become part of our culture in the coming days. 3) Technology and the rate of change are making jobs dysfunctional. 4) Workplace learning will change the way the business operates in the	1) Impact of technology on individuals and organizations with respect to learning could be another area of research. 2) What are the factors which triggers learning needs of organizations today could be another area of study? 3) Role of training as part of learning organization could be another area of study.

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
			future of training, learning, learning organizations and their contribution to individuals and organizations.	years to come. 5) Experience, learning and training will become more important factors for individual and business performance in the coming years. 6) Organizations will become like universities training and imparting learning will become culture of the organizations. 7) Organizations are becoming intelligent with lavish communications and a confederation of entrepreneurial units, which demands learning as part of the culture for creative working.	
4	Calvert, G., Mobley, S., & Marshall, L. (1994). Grasping the learning organization, Training & Development.	Objectives: 1) To explore the beliefs, values and perceptions of real life practitioners of learning organization on what they feel about learning organizations. Research questions: 1) What definitions of learning organizations make sense?. 2) What does learning organizations look like and how it can be measured?. H1) Individual learning	No instrument used. Qualitative research. 50 practitioners from various leading US companies such as Apple, HP, GE, Universities etc. David Bohm's concept of dialogue and collection of inputs from participant's inquiry (Focus group discussions). Collection of concepts, inputs, experiences from real life and analyzing them for critical relationships	1) Many of the practitioners know a lot about learning organizations, but many do not know how to apply it. 2) Learning organizations are work in progress both conceptually and practically. 3) Learning organizations employ distinctive set of learning strategies and tactics, which differ from other organizations and achieve improved business performance in terms of efficiency, productivity	1) Learning organization interventions and its impact on organizational profitability is an interesting area of research. 2) Role of HRD managers in implementing learning organization interventions could be another area of interest to study.

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
		and organizational learning are distinctly different to each other. H2) Training and development specialists play an active role in establishing learning organizations.	related to learning organization concepts.	and in achieving goals.	
5	Kotter, J. P. (2001). What leaders really do?., Harvard Business Review.	Objectives: 1) To explain the differences between managers and leaders. 2) To compare and contrast between managers and leaders. H1) There exists relationship and differences between manager and leader.	No instrument used. Three Harvard business review journal articles. Scholarly review of related literature. Theoretical and case study analysis of management versus leadership.	1) Leadership and management are two distinctive and complimentary systems of action. 2) Both leadership and management are necessary for success. 3) Most of the organizations are over managed and under led. 4) Management is about coping with complexity and leadership is about coping with change. 5) Motivation and inspiration energize people. 6) Successful well-led businesses tend to recognize and reward people who successfully develop leaders.	1) Impact of PRMs management and leadership qualities on project success can be studied further. 2) Different management and leadership qualities required for different type / sector projects could be another interesting area for research.
6	Elkjaer, B. (2001). The learning organization: An undelivered promise, Management learning.	Objectives: 1) To understand the reasons for the failure of learning organization initiatives of an organization, which	No instrument used. Qualitative research. Administrative case consideration (ACC), a Danish public enterprise. Case study	1) Learning organization initiatives will not succeed, if the top management level changes are not taking place. 2) Learning does	1) Employee perception on learning organization concepts would be an interesting area for further study. 2) Employees commitment and its impact on learning organization success

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
		tried learning organization concepts for five years with their employees. H1) Training programs influence organizations to become learning organizations. H2) Learning organization influence organizational change process and facilitates to achieve organizational goals.	(personal interviews with the employees of ACC). Observations on the organizational learning process of ACC. Real life case study and analysis of causes and effects of learning organization initiatives and outcomes.	not end with only employees. 3) Managerial structures, work practices should also change alongside employees training in a learning organization. 4) Personal mastery inducts learning culture on individuals and hence, learning organization is a result of learning by individuals. 5) Management's sincerity in building a learning organization is vital for the success of learning organization initiatives. 5) Employees participation with full commitment is vital for the success of the learning organization concepts in an organization.	could be another area of research. 3) Effect of training program / design and its impact on learning organization outcome could be another area of research. 4) This is a case study done on a single organization, perhaps extending this study empirically to many organizations would help to validate the results of this study and to understand the learning organization concepts and its impact on individuals as well as organizations.
7	Dubois, A., & Gadde, L. E. (2002). The construction industry as a loosely coupled system: Implications for productivity and innovation, Construction management and economics.	Objectives: 1) To analyze the operations and behavior of firms as a means to deal with complexity. H1) There exist uncertainty factors in construction industry, which impacts innovation. H2) There is a relationship between interdependencies and complexity of the project.	No instrument used. 35 journal articles related to construction and innovation. Scholarly review of related literature. Theoretical review, analysis of available coupling systems and its impact on innovation and learning in construction industry.	1) Pattern of couplings studied and concluded that, construction industry's pattern of coupling seems to favor short term productivity, while hampering innovation & learning. 2) Authors conclude construction industry as a loosely coupled system as the firms engaged in this line of business behave differently from one another. 3) Complexity of	1) Study is mainly on a house building project and hence limited. Future research can be extended to other type of projects too. 2) The study can be further extended empirically to find out the relationship of tight and loose coupling nature of the construction industry and its impact on innovation and learning.

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
				the project needs tight coupling as well as loose coupling systems to deal effectively the projects. 4) Project organization does not promote learning and innovation due to its temporary nature. 5) Government regulations and industry standards too hamper innovation.	
8	Abdul, R. Z., Sambasivan, M., & Johari, J. (2003). The influence of corporate culture and organizational commitment on performance, Journal of Management Development.	Objectives: 1) To examine the influence of corporate culture and organizational commitment on financial performance of Malaysian companies. Research question: What type of corporate culture lead to organizational employee's commitment?. H1) There exist a relationship between corporate culture and organizational commitment. H2) Corporate culture and organizational commitment influence financial performance.	Questionnaire (Quantitative research). 202 managers of Malaysian public listed companies. (1,036 questionnaires sent and 202 responses received). Self-administrated survey. SPSS software used to test 1) Descriptive statistics. 2) Pearson correlation. 3) Multivariate analysis of variance (MANOVA). 4) Reliability. 5) Regression and ANOVA.	1) There is a significant relationship between corporate culture and organizational commitment. 2) Both corporate culture and organizational commitment has influence on the financial performance of the companies.	1) Further research is needed to examine the effects of organizational factors such as age, size, activity, sectors and managerial factors like job involvement, job satisfaction, job motivation and job performance with corporate culture and organizational commitment. 2) The study can be extended to other geographic locations and also on project management companies.
9	Belout, A., & Gauvreau, C. (2004). Factors influencing project success: the impact of human	Objectives: The paper attempts to re test the conclusions of Pinto and Prescott, which states human resource	Questionnaire. (Adapted version of Pinto and Prescott's PIP). Pro test - 15 project management	1) Though there was a link between project success and the personnel factor, this factor does not have a significant impact	1) To improve the construct validity of the personnel variable by improving the psychometric properties of the questionnaires used in PM concept. 2) There is

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
	resource management, International Journal of Project Management.	management plays a marginal role in PM with the "Personnel factor". H1) The personnel factor will have a significant role on the project success. H2) The relationship between the independent variables and project success will be affected by the project life cycle stages. H3) Project structure has moderating effect on the relationship between the IVs and project success. H4) Project sectors will have a moderating effect on the relationship between IVs & DV.	experts in more than ten Canadian companies. Final questionnaire sent to 212 respondents and 142 responses received. Questionnaire based on project life cycle with 7 point Likert scale (conception, planning, execution and completion). 1) Pearson correlation analysis. 2) Multiple regression analysis. 3) Degree of association between IVs. 4) Multi collinearity checking. 5) Regression analysis.	on project success. 2) Relationship between the independent variables and project success will vary according to life cycle stage. 3) Three different structures (functional, project based and matrix), top management's support and trouble - shooting variables were significantly related to project success. 4) There exists a moderation effect between independent variables and project success depending upon the sector studied. 5) HRM in project context is very rudimental.	multi collinearity problem in excess in the use of PIP. 3) Does HRM in project management context is different than traditional HRM?. 4) PIP instrument shortcoming need to be carefully removed and improved. 5) Project success should be measured from sponsor's view, project manager's view and sponsor as project manager's view.
10	Sodurlund, J. (2004). Building theories of project management: past research, questions for the future, International Journal of Project Management	Objectives: 1) To discuss on emerging perspectives within the project field. 2) To identify, why project organizations exist, how they behave and why they differ ?. Research Question: Basis of project management research - Too narrow and does not have middle range theories?. H1) The current research trends	No instrument used. 66 articles related to project management theories. Scholarly review of the journals. Research and analysis of project management concepts, existing line of research, critical analysis of current research and questions for future research.	Five basic questions were asked to and researched in details (they are: Why do project organizations exist?. Why do project organizations differ?. How do project organizations behave?. What is the function or value addition by the project management unit ?. What determines the success or failure of project organizations?.) Additional findings are,	1) To explore further on innovation and its impact to project management / project success. 2) To analyze further why projects and project organizations differ?. 3) Behavioral aspects of project organizations need to be researched further. 4) To study further on knowledge and technology value addition from projects to project organizations. 5) Social embeddedness dynamics need to be explored further.

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
		on project management contributes to the body of knowledge on new and emerging trends on project management. H2) The project management research questions are adequate.		1) Innovation as a concept and its impact to project success has not studied so far. 2) Industry and corporate issues of project management not studied in details. 3) Limited knowledge on how do project organizations behave?. 4) Value addition by project on project organization due to technology and knowledge base is not researched in details. 5) CSF does not give real life knowledge on project success.	
11	Abdul, R. Z., Sambasivan, M., & Abdul, R. A. (2004). The influence of organizational culture on attitudes towards organizational change, Leadership & Organization development journal.	Objectives: 1) To investigate the influence of organizational culture on attitudes towards organizational change in Malaysian companies. H1) There is an association between organizational culture and attitudes toward change.	Questionnaire (Quantitative research). 258 companies listed in the Federation of Malaysian Manufacturing directory. (1,965 questionnaires sent and 281 responses received. 258 responses used for analysis). Self-administrated survey. SPSS software used to test 1) Descriptive statistics. 2) Pearson correlation. 3) Multivariate analysis of variance (MANOVA). 4)	1) There is an association between organizational culture and the cognitive, affective and behavioral tendency of attitudes toward organizational change. 2) Different type of organizational culture has different levels of acceptance of attitudes toward organizational change. 3) Cultural typology was related / associated with each type of attitudes toward change. Example: Mercenary culture has strong attitude towards change.	1) A longitudinal study of the relationships between various dimensions of attitudes toward organizational change, organizational culture and organizational strategy will help. 2) To study further on the relationship between organizational culture and attitudes toward organizational change and its impact on financial performance will be of help. 3) Impact of organizational size, type, industry / sector on the variables will be of further interest.

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
			Reliability. 5) Regression ANOVA.		
12	Brady, T., Davies, A. (2004). Building project capabilities: From exploratory to exploitative learning, Organization studies.	Objectives: 1) To explore the organizational learning with 2 distinctive perspectives such as project led learning (learning from projects) and business led learning (strategic learning). H1) Project led learning (exploratory learning) has influence on organizational performance. H2) Business led learning (Exploitive learning) has influence on project performance.	No instrument used (Qualitative study). Companies studied are C & W, Ericcson Telecommunication Limited., Scholarly analysis of learning perspectives of projects and organizations from two selected companies. Cross case analysis (case study). Inductive study.	1) A new learning model named PCB (Project capability building model) was developed to explain the firm's learning processes such as project led learning and organization led learning. 2) The model explains organizations learn from project's experience (exploratory learning) and try to implement in other projects (exploitive learning). 3) The model can help to understand the position of a firm against their learning.	1) Model is studied on limited sampled companies and hence the study can be extended to other organizations, sectors, types to ascertain the outcome.
13	Turner, J. R., & Muller, R. (2005). The project manager's leadership style as a success factor on projects, a literature review, Project management institute.	Objectives: 1) To determine, whether the competence, including personality and leadership style of the project manager is a success factor for projects. 2) Different competence profiles are appropriate for different project types. H1) Leadership style and competence of PRMs influence project success. H2) PRMs competence profiles influence	No instrument used. 69 articles related to CSF and leadership. Scholarly review of related literature. Theoretical analysis of leadership, project success factors literature. Comparative analysis of various leadership styles and theories.	1) Previous studies on CSF for project success ignored the PRMs leadership role and its importance in project success. 2) The leadership style and competence of PRMs do not have significant impact on project success due to the unique, novel and temporary nature of the project.	1) This study is a theoretical study and do not support the proof that, PRMs leadership styles and competence do not have significant impact on project success. 2) Empirical studies should be conducted to evaluate this finding in real life projects in diverse conditions.

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
		project outcomes.			
14	Hardness, C., Nilsson, M., & Urban Nulden. (2005). Experiencing a failing project for reflection and learning, Management Learning.	Objectives: 1) To facilitate experience sharing, discussion and reflection with the intention of improving project management practices both at the individual level and at the organizational level using PIER (Problem based learning, interactive multimedia, experiential learning and role playing) approach. H1) There exists a relationship between learning interventions and organizational development.	Questionnaire used with 19 open ended questions. One multinational corporation involved in project management business in Sweden. 84 members of the organization were sampled in this study. Empirical and interpretive case study and the overall research approach was action research. Descriptive statistics, Logical reasoning.	1) PIER supported organizational maintenance failed to promote organizational change. 2) Unsuccessful projects can be considered successful If the failed project provided opportunity for the organization to learn the mistakes and avoids risk of committing the same mistakes in the future projects. 3) Learning through reflection is significant, when we use PIER approach. 4) Perceptions about learning and it's outcomes to individual / organizational performance varies between individuals. 5) Learning interventions should be structured to promote learning organization culture and organizational performance. 6) Organizational changes are possible only with the support of structural changes by the top management and not by learning interventions alone.	1) Differences between individual learning and organizational learning could be an interesting area to study. 2) Role of top management and type of structural changes that reflect organizational learning and resulting in organizational performance could be further studied.

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
15	Huang, C. J., & Liu, C. J. (2005). Exploration of the relationship between innovation, IT and performance, Journal of Intellectual Capital.	Objectives: 1) To explore the relationship between innovation, IT and performance. Research questions: 1) Do the investments of innovation capital and information technology (IT) capital have a non-linear relationship with firm performance?. 2) Does the interaction between innovation capital and IT capital have synergy effects on firm performance ?. H1) There exist a relationship between innovation capital and firm's performance. H2) There exist a relationship between IT capital and firm's performance. H3) There exists a positive relationship between innovation, IT and firm's performance.	Questionnaire. (Quantitative research). 1000 companies in Taiwan. Self-administrated survey. Multiple regression models to explore the nonlinear relationship between innovation, IT and firm performance.	1) Innovation capital has a non-linear relationship (inverted U shape) with firm performance. 2) IT capital has no significant impact on firm performance. 3) Innovation capital and IT capital has positive effect on firm's performance. 4) More investment in intellectual capital is not good.	1) To extend the study with more data (secondary) to explain the relationship between intellectual capital and firm's performance. 2) Future research to consider interaction effects of other perspectives of intellectual capital to understand further on firm's performance. 3) To study further on different types of IT investments and its impact on firm's performance.
16	Hyvari, I. (2006). Success of projects in different organizational conditions, Project Management Journal.	Objectives: To evaluate the critical success / failure factors in PM and to examine the relationship between CSF and organizational background variables.	Survey on members of the PMA – Finland. 78 company members and 368 individual members from various organizations. 54 Questions with 14 open ended questions. Correlation and	1) Results indicate the importance of communication related to the project size, organization type and project manager's work experience. 2) Communication is the most important factor in	1) Fewer attempts made to study the relationship of softer human elements of PM. 2) Relationship between CSF and measurement techniques and human elements could be studied in future research. 3) Organizational behavior and organizational factors of PM can be of interest for future research. 4)

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
		H1) There is relationship between CSF and organizational variables.	reliability using SPSS & Karl Pearson Chi Square test. Utilized the results of previous qualitative & quantitative study results to compare results.	all the phases. 3) CSF ranking vary for different organizations in different sectors based on organizational conditions.	Only 25 responses analyzed and hence, larger response can have different results. 5) Study was conducted in Finland, can extend the study to other parts of the world. 6) Role of effective communication can be studied further. 7) Knowledge and information management in an organization for effective communication can be further studied.
17	Cicmil, S., & Hodgson, D. (2006). New possibilities for project management theory: A critical engagement, Project Management Journal.	Objectives: 1) Broader engagement with the conceptual considerations of project and project management. 2) To study deeply on concepts of project, project management, project performance, individual skills & competencies and social arrangements involved in projects. H1) Does alternative theoretical approaches and its implications influence project and project organizations.	No instrument used. 105 articles related to projects, project management, project success and so on. Scholarly review of the journals. Critical evaluation of intellectual foundations of project management for innovative research to create knowledge.	Six basic questions such as, 1) What projects are and how projects evolve. 2) Concepts of project, project management & project success. 3) Implications of the main stream definition of project, project management, project based organizing work and management. 4) Consequences of project organizing for project managers and workers. 5) Alternative perspectives beyond mainstream project management. 6) Whose interests are being served by the reproduction of the status quo in this field?. Based on the above questions, the following alternative assumptions were established. 1) Middle range theory on projects	1) To explore critically, the sensitivity to possible oppression and exploitation in projects due to pressurized environment. 2) To explore further critically performativity of the project body of knowledge (to consider other indicators such as health & safety, economy, ethics as measurement of success). 3) To consider studying the experiences of project actors (various practitioners involved in the project) rather than only on project managers.

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
				according to different selection criteria. 2) Human interactions in projects comparative case studies. 3) Project is a temporary organization with aggregate of individuals temporarily acting for a common cause.	
18	Henri, J. F. (2006). Organizational culture and performance measurement systems, Accounting, organizations and society.	Objectives: 1) To test the relationships between organizational culture and two attributes of performance measurement systems (PMS) namely diversity of measurement and nature of use. Research questions: 1) To what extent do control and flexibility values influence the measurement diversity. 2) To what extent do control and flexibility values influence the nature of use of the PMS by top managers?. 3) To what extent is the relationship between control and flexibility values and the measurement diversity mediated by the use of PMS?. H1) Top	Questionnaire (Quantitative research). 383 Canadian firms. Pilot study, instrument validation and final research. ANOVA, Structural equation modeling (SEM), validity, reliability, confirmatory factor analysis (CFA).	1) Organizational culture has a direct effect on PMS diversity of measurement and indirect effect through the use of PMS. 2) Flexibility value firms are associated with greater diversity of measurement than control value firms. 3) Organizational culture is an important factor in all the interactions of an organization. 4) Depending on the nature and intensity of use of PMS, the diversity of measurement will vary.	1) The study has limitations in terms of internal and external validity. 2) Study is primarily based on one dimension of organizational culture, that is PMS. Other dimensions of organizational culture should be studied for improved validity and reliability. 3) The study is static. That is, the study used PMS as such and did not use the evaluation of PMS. 4) Use of PMS for strategic decision making could be further studied. 5) Organizational values, diversity of measurement and use of PMS to improve organizational performance could be further studied.

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
		management teams of firms reflecting a control dominant type tend to use PMS for monitoring to a greater extent than firms reflecting a flexibility dominant type. H2) Top management teams of firms reflecting a flexibility dominant type tend to use PMS for attention focusing to a greater extent than firms reflecting a control dominant type. H3) Top management teams of firms reflecting a flexibility dominant type tend to use PMS for strategic decision making to a greater extent than firms reflecting a control dominant type. H4) Top management teams of firms reflecting a control dominant type tend to use PMS for legitimization to a greater extent than firms reflecting a flexibility dominant type.			
19	Kaliprasad, M. (2006). The human factor II: Creating a high	Objectives: 1) To explore the three major deterrents to	No instrument used. 15 articles related to organizational	1) Team work, global thinking, dynamic leadership and focus on	1) Cost of establishing high performance culture in an organization and the ROI can be an

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
	performance culture in an organization, Cost Engineering.	sustain high performance culture in an organization. H1) Human factor has relationship to organizational performance. H2) Organizational culture has significant impact on high performance organizations.	performance. Scholarly review of organizational performance and high performance organizations. Critical review of literature and suggesting a new model for high performance in organizations.	solutions are some of the key factors for high performance culture in an organization. 2) Stronger the culture is, higher the resistance to change. 3) Organizational performance is influenced by leadership, organizational culture, structures and processes of the organization as well as external factors. 4) Sustaining high performance in an organization is it's competence to learning and to adopt to the learning organization concepts. 6) The three deterrents to organizational performance are senior management's lack of understanding on the market conditions, leadership issues of an organization and organizational systems and processes does not support organization's vision and goals.	area of study. 2) Factors influencing organizational performance could be another area for future studies. 3) Learning interventions, outcomes of learning interventions in organizational learning, influence of learning organization on high performance culture could be another interesting area for study.
20	Pounder, T. (2009). Using action learning to drive organizational learning and performance, Strategic HR Review.	Objectives: 1) To argue that action learning can contribute to organizational learning and increased organizational performance. H1)	No instrument used. Two UK companies who implemented action learning such as Alliance healthcare (formerly Unichem), Hiscox. Case study	1) The action learning approach can help create a dynamic culture of innovation and collaboration in which individuals and groups adopt a mindset of	1) Action learning and its impact on ROI (Return on investment) could be an interesting area of study. 2) Impact of action learning on learners of the organization as well as the facilitators and level of learning organization enhancement

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
		Action learning influences organizational performance.	(Qualitative research). Critical evaluation of action learning and its impact to organizational performance.	questioning and sharing the problem solving process. 2) Action learning helps to solve complex problems, which is difficult to solve using traditional methods. 3) Action learning is a powerful tool of organizational learning. 4) Real solutions for problems emerge from action learning. 5) Action learning improves organizational performance directly.	can be studied further.
21	Subramaniam, A., Othman, R., & Sambasivan, M. (2010). Implicit leadership theory among Malaysian managers: Impact of the leadership expectation gap on leader - member exchange quality, Leadership & Organization development Journal.	Objectives: 1) To examine the implicit leadership theory (ILT) among Malaysian managers and the impact of the gap between the ILT and actual behavior on leader member exchange (LMX) quality. H1) Individuals from various ethnic groups are associated with different ILT. H2) Differences in ethnic background have an effect on leadership expectation gap. H3) There is an impact of leadership expectation gap on LMX quality. H4) Duration of	Questionnaire (Quantitative research). Five Japanese companies operating in Malaysia and 137 Malaysian managers working under Japanese & Malaysian superiors. Self-administrated survey. SPSS software was used to test 1) Descriptive statistics. 2) One way ANOVA., 3) Factor analysis.	1) There is a distinct Malaysian ILT. 2) There are differences in ILT among different ethnic groups in Malaysia. 3) There is no significant difference in the leadership expectation gap among managers reporting to superiors from the same background, when compared to the superiors from different nationality and ethnic background. 4) Duration of manager's relationship have a moderating effect on the relationship between leadership expectation gap and LMX quality.	1) Future studies could be carried out to examine the differences in the level of leadership expectation among managers reporting to superiors from other nationalities. 2) GLOBE standard instrument is sued in this study, which has limitations on reflecting ILT related to local culture, this need to be noted and studied further using other instruments. 3) This is a cross sectional study, further research could be a longitudinal research to get finite assessments.

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
		manager's relationship have a moderating effect between the leadership expectation gap and LMX quality.			
22	De Valence, G. (2010). Innovation, procurement and construction industry development, Australian Journal of Construction economics and building.	Objectives: 1) To look at the R & D intensity and level of innovation that characterizes the construction industry, and relates these to the procurement systems and market structure in the industry. H1) What drives the R & D in construction industry ?.	No instrument used. 43 journal articles related to innovation & construction. Scholarly review of related literature. Theoretical review, analysis of available models etc.	1) Procurement methods used for building and construction projects are the determining factor for innovation in the construction industry. 2) Generic technologies such as IT and telecommunications have also impacted the building and construction process. 3) Innovation can be strategic option for complex projects. 4) Incentive systems can bring in many innovative ideas in construction projects execution. 5) Innovation at the tendering stage are not accepted by the clients so far and or the concepts are used by the clients to recall tenders.	1) To study further on the impact of procurement innovation in various sectors of construction and the value benefit analysis to the projects. 2) To extend this study empirically to prove that procurement innovation is the key factor for project innovation by and large in construction sector.
23	Anantamula, V. S. (2010). Project manager leadership role in improving project performance, Engineering management journal.	Objectives: 1) To identify a set of people-related project performance factors and to understand how these factors interact with one another. Research questions: How do the leadership	Questionnaire survey, personal interviews. 69 project management professionals representing senior management (SM), project managers (PRM), managers	1) A new project manager model and a project performance model developed. 2) Study concludes defining project processes and roles is the foremost thing for project success. 3) Project managers should	1) The study was conducted in a limited number of samples in a US setting. Further studies can be conducted in other parts of the world. 2) Different type of projects / industry can be tried with this new project manager, project performance model. 3) Study can be further extended to

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
		qualities of project managers impact project performance?. H1) There exist a relationship between leadership qualities of project managers (PRMs) and project performance. H2) There exists a relationship between people related factors and project performance.	(MGR) & consultants. Interpretive structural modeling (ISM) , Quantitative research. ISM results analysis. Relationship analysis between various people-related factors and its relationships.	establish trust with their teams for project success. 4) Defining and monitoring project outcomes is another important factor to achieve project success.	geographically dispersed project teams, cultural diversity, communication challenges etc.
24	De Oliveira, M. A., Luiz Veriano Oliveira, D. V., & Possamai, O. (2012). Forecasting project performance considering the influence of leadership style on organizational agility, International Journal of Productivity and Performance Management.	Objectives: 1) To analyze the influence of leadership style and factors associated with organization agility on project performance. H1) Leadership styles influence project performance. H2) Organizational agility influence organizational performance.	Questionnaire (35 questions) + interviews. Leading corporation involved in innovative projects. 96 respondents. Case study on a single organization. SPSS software for correlation, regression analysis, Bayesian Networks (BN) model is employed as a modeling tool to enable inferences and sensitivity analysis and also visualization and quantification of the propagation of effects between variables.	1) Combination of leadership style, agility and organizational factors lead to highest project performance. 2) Transactional leadership fails significantly in performance in innovative projects. 3) Transformational leadership has significant influence on performance of innovation projects. 4) Project performance is influenced by all agility factors such as continuous improvement, communication, continuous delivery, flexibility and team maturity. 5) Maximum project performance can be achieved when combining leadership factors and organizational	1) To extend this study with more number of participants to validate the perspective. 2) To extend this study to various types / sectors projects to see the relationships and impacts.

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
				factors.	
25	Nixon, P., Harrington, M., & Parker, D. (2012), Leadership performance is significant to project success or failure: A critical analysis, International Journal of Productivity and Performance Management.	Objectives: 1) To explore how performance of leadership in project management determines project success. H1) Leadership is crucial to a project success / failure.	No instrument used. 49 scholarly articles related to leadership and project success / failure. Scholarly review of articles and critical analysis of leadership and its impact on project success / failure. Critical evaluation of literature related to leadership, project success / failure and providing suggestions for better project performance.	1) No single leadership model is suitable throughout the life cycle of the project. 2) Leadership styles and models should be modified to suit the project performance requirements based on situations. 3) Project managers need to prioritize training in leadership skills for project success and must continuously improve to sustain project success. 4) Project failures are caused by two aspects: One is internal processes such as implementation of project itself, team's performance, meeting budgets, deadlines etc. and external processes such as measures of effectiveness made by the client and others. 5) Leadership performance management is crucial for project success through KPQ (Key performance questions) & KPI (Key performance indicators).	1) Performance management of project leadership is little researched so far and this could be one potential area for research. 2) This research was a theoretical analysis and an empirical study will further contribute validity to this study. 3) KPQ & KPI for project leadership and its impact on project performance (success / failure) could be another area of study.
26	Fernandes, C. I., Ferreira, J. J. M., & Raposo, M. (2013). Drivers to firm	Objectives: 1) To analyze the drivers to company innovation and their effects on the	Questionnaire (Quantitative research). Sample of 61 companies from	1) There were significant differences in terms of both drivers and inhibitors of innovation in	1) Innovation and its effect on financial performance of project organizations could be an extension to this research. 2)

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
	innovation and their effects on performance: An international comparison, International Entrepreneurship and Management Journal.	financial performance. H1) There exists a relationship between innovation and organizational financial performance.	Portugal & Spain. (Intentional convenience sampling). Self-administrated survey. Linear regression & univariate analysis was used to analyze the importance of innovation types between Portugal & Spain.	both Portugal and Spain. 2) Introduction of products to new markets proved significant in Spain. 3) Innovation in both products and processes are considered significant in both countries. 4) Innovative companies tend to record better financial performance. 4) Financial issues, difficulty in predicting market demand, unqualified employees, and difficulty in organizing innovation are the inhibitors to innovation. 5) Cooperation with suppliers, clients, universities, existence of business risk, innovation friendly climate and infrastructure are some of the drivers of innovation.	Factors of cooperation and existence of cooperative activities that promote innovation activities will be another area for future research. 3) The study is limited to only 61 companies in two countries in EU and studying the same in other countries with additional number of companies could benefit further in this body of research.
27	Hashi, I., & Stojčić, N. (2013). The impact of innovation activities on firm performance using a multi-stage model: Evidence from the Community Innovation Survey 4, Journal of case network studies & analysis.	Objectives: 1) To study the relationship between innovation and its impact on firm performance. 2) To compare the determinants of the innovation process in mature market economies and the transition economies. H1) The higher the innovation in an	Questionnaire (Quantitative research). 90,000 firms from 16 West and East European countries. Self-administrated survey. Four equation model of Crepon et al., is used to link innovation and firm's performance. SPSS software for correlation and	1) There is a positive relationship between innovation activities and productivity of the firm. 2) There is a relationship between size of the firm and its innovation activities. 3) Intensity of competition motivates firms to innovate. 4) Financial and knowledge factors hampers innovation. 5)	1) Impact of innovation on firm's KPIs could be an interesting area of research. 2) Relationship between business performance sustainability and innovation could be another area for future research.

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
		organization, the higher the performance.	regression analysis.	Productivity of the firm increases significantly with innovation. 5) Larger firms are likely to innovate more than smaller ones and innovation output decreases with firm size. 6) Regulatory and environmental issues contribute to higher level of innovation. 7) Product oriented innovations are mostly done in house in organizations.	
28	Saunila, M. (2014). Innovation capability for SME success: perspectives of financial and operational performance, Journal of Advances in Management Research.	Objectives: 1) To study the relationship between organizational innovation capability and firm performance. H1) Higher the firm's innovation capability, the greater the firm's financial performance. H2) Higher the firm's innovation capability, the greater the firm's operational performance.	Questionnaire (Quantitative research). 2,400 Finnish SME's. Random Sampling, Self-administered survey. SPSS software is used to analyze Descriptive statistics, ANOVA, validity, reliability, regression, factor analysis etc.	1) Three aspects of innovation capability namely ideation and organizing structures, participatory leadership culture, and know how development has some effect on different aspects of firm performance. 2) Innovation capability has more influence on financial performance than operational performance. 3) The paper suggests improving performance through development of innovation capability.	1) Relationship between a participatory leadership culture and financial performance was found to be negative in SME's. This needs further research to ascertain the results. 2) To what extent developing innovation capability leads to financial and operational performance, this need to be further studied. 3) It is worth to study the moderating effect of some of the aspects of innovation capability and firm's performance.
29	Koops, L., Coman, L., Rekveldt, M, b., Hertogh, M & Bakker, H. (2014). Public perspectives on project	Objectives: 1) To expose managerial view points on project success in different European countries. 2)	Qualitative study. 26 Dutch public project managers. Web based interviews. Q methodology.	Findings: 1) Language is a barrier to get the exact feedback from the participants. 2) The number of participants	1) To look for the outcome of the research and its viewpoints. 2) To conduct similar type of research in other parts of the world too.

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
	success - influenced by national culture?. Conf. paper, 28th IPMA worl congress, IPMA 2014.	Aims to indicate how cultural differences affect manager's perspectives on project success. H1) There exists a relationship between countries culture and viewpoints on project success.		who attended the interviews are smaller in number from each country. 3) Faced the problem of social bias during the research, when dealing with multinational respondents. 4) Outcome of the research is not concluded in this paper yet.	
30	Anderson, E. S. (2015). Do project managers have different perspectives on project management?. International journal of project management.	Objectives: 1) To find out if project managers have different perspectives on project management and their challenges differently. H1) Project managers have different perspectives on project management.	Quantitative research questionnaire. 180 project managers. Self-administered survey. SPSS statistical analysis for reliability, factor analysis, descriptive analysis etc.	Findings: 1) There exist two different perspectives on project management. One is organizational perspective and the other is task perspective. 2) Different project managers tend to have varied perspectives on project management. 3) Perspectives evolve during the project life cycle. 4) Radical changes on perspectives happen during the project. 5) People tend to shift their perspectives, when they move from one role to the other. 6) It is impossible to do planning. organizing, controlling of the project dominated by the organizational perspective the same way as task perspective of the project.	1) To extend the study to the project teams on their diverse perspectives on project management. 2) It would be interesting to study, why and what are the reasons for the different perspectives on project management.

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
31	Misic, S. & Radujkovic, M. (2015). Critical drivers of megaprojects success and failure, Procedia engineering (ORSDCE 2015).	Objectives: 1) To analyze and obtain critical factors that can affect megaprojects success or failure. H1) There exists critical factors, which determines the success and failure of megaprojects.	No instrument used. 41 literatures related to success and failure of mega projects + Real time data from practitioners. Scholarly review of related articles / data on megaprojects success / failure. Theoretical and practical analysis of data and literature related to megaprojects success / failure in research centers.	Findings: 1) Corruption, political influence and lack of experience and competence in project management act like failure factors. 2) Appropriate stakeholders management, respect for cultural differences and development of project management contribute to success in megaprojects. 3) Understanding of megaprojects success goes beyond iron triangle. 4) Main driver for each project is people and competent project manager is an important driver for megaproject success. 5) Megaprojects governance model developed.	1) Competence development and stakeholders management is a priority for the future research.
32	Stewart, M. B. (2015). Beyond the iron triangle: Evaluating aspects of success and failure using a project status model, Computing and information systems journal.	Objectives: 1) To establish a technique to visualize the key success criteria for important stages of the project. H1) There exists key success criteria for project success for important stages of the project.	No instrument used. 69 literatures related to success and failure of projects. Scholarly review of related articles on project success / failure criteria. Theoretical analysis of data and literature related to projects success / failure.	Findings: 1) The iron triangle provides a useful model to explore and clarify priorities, but does not demonstrate qualities or dynamics of project success. 2) A project status model (PSM) was developed to assess the project success criteria. 3) Findings suggest to go beyond time, cost and quality and to explore in areas such as benefits realization, risk management, stakeholder views, process implication and efficiency, team performance, methodology issues and lessons learnt.	1) To use the project status model (PSM) in real time projects to evaluate the success / failure of projects. 2) To analyze the applicability of the PSM in construction projects.
33	Diugwu, 1. A., Mohaamed, M. & Baba, D. L. (2015). Towards effective infrastructure development in	Objectives: 1) To identify factors that mitigate against successful completion of project. H1) There exists a positive	No instrument used. 45 literatures related to project management and success of projects in Nigeria. Scholarly review of related articles	Findings: 1) Good project conception and definition, project cost and budget management, adequate stakeholder management, appointment of competent project manager will address the problems	1) Factors which impede non adherence of project management principles in projects could be an interesting area to study.

Appendix A – Literature review matrix

	Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research
	Nigeria: Theoretical considerations from a project management perspective, American journal of industrial and business management.	relationship between project management principles and project success.	on project management principles and project success. Theoretical analysis of literature related to project success / failure in Nigeria.	associated with project success. 2) Study found the linkages of non-adherence of project management principles is the key reason for the failures of projects.	

Current research - project related factors and organizational related factors and its influence on project performance

1	Gopal, S. (2016). Impact of project and organizational factors on project performance of construction companies in Malaysia, Yet to be published.	Objectives: 1) To study the impact of project related factors on project performance. 2) To study the impact of organizational related factors on project performance. H1) Project related factors significantly impact project performance. H2) Organizational factors significantly impact project performance.	Questionnaire (Quantitative research). 360 respondents representing civil, building & infrastructure, marine, oil & gas and multi discipline construction projects in Malaysia. Self-administered survey. SPSS software for descriptive statistics, correlation, ANOVA, regression, validity, reliability etc.	Findings: 1) Organizational factors impact project performance significantly over project related factors. 2) Different project related factors and organizational related factors impact different sectors of construction such as C, B & I, marine, oil & gas and multidiscipline projects. 3) Other than iron triangle factors such as time, cost, quality, factors such as safety and financial are also equally important for project performance. 4) Relative importance index (RII) varies between and within project related factors and organizational factors for different sectors of construction.	1) Impact of skills, knowledge and competency of employees on project performance can be an interesting area of study. 2) Similar type of studies can be conducted in other parts of the world to ascertain the importance of organizational related factors on project performance.

Legend:

CSF	-	Critical success factors	GE	-	General electric company
PMT	-	Project management team	HP	-	Hewlett Packard
PM	-	Project management	KPQ	-	Key performance questions
HRM	-	Human resources management	KPI	-	Key performance indicators
PIP	-	Project implementation profile	SEM	-	Structural equation modeling
IV	-	Independent variable	RII	-	Relative importance index
DV	-	Dependent variable	ISM	-	Interpretive structural modeling

Appendix A – Literature review matrix

Author / year / Title / Journal	Research objectives / Hypothesis	Methodology – Instrument, Sample, Design &/ Analysis techniques	Results	Directions for future research

AEC	-	Architectural, engineering and construction	SI	-	Severity index
ANOVA	-	Analysis of variance	IMP. I	-	Importance index
SPSS	-	Software packages for statistical analysis	PRM	-	Project manager
LMX	-	Leader member exchange	US	-	United States of America
PMS	-	Performance measurement systems	EU	-	European union
CFA	-	Confirmatory factor analysis	PMI	-	Project management institute
ROI	-	Return on investment	ILT	-	Implicit leadership theory
TCE	-	Transactional cost economics	TMO	-	Temporary multi organization
C, B & I	-	Civil, Building & Infrastructure	O & G	-	Oil and Gas
PSM	-	Project system model	H	-	Hypothesis
NPV	-	Net present value	CBA	-	Cost benefit analysis
SME	-	Small and medium enterprises	IT	-	Information technology
R&D	-	Research & Development	UK	-	United Kingdom
PMA	-	Project management association	HRD	-	Human resources development
MARA	-	Majlis Amanah Rakyat	CII	-	Concrete industry institute
MIS	-	Management information system	HR	-	Human resources
AEC	-	Asean economic community.			

Appendix B: Research Questionnaire

UNIVERSITI UTARA MALAYSIA

Dear Sir / Madam,

We realize that your time is valuable, as you are busy with your work. However, your participation in this survey, which will require about 15 - 20 minutes of your time, is vital for the success of this study.

I am Sekar Gopal, a research student of the Doctor of Business Administration (DBA) program of Universiti Utara Malaysia. As part of the program, I am conducting a survey regarding, **"Impact of project and organizational-related factors on project performance of construction companies in Malaysia"**. The objective of this study is to identify the project and organizational factors that impact the project performance of construction companies. Please be assured that all your responses will be kept strictly confidential and your identity will remain anonymous. All the data will be aggregated and will be strictly used for academic purposes only.

I look forward to receiving your response in this regard and thank you in advance for your cooperation. By participating in this research survey, you will be eligible to get a copy of the research report after the completion of the study. Please indicate your interest, if you wish to receive the research report, which will help you and your organization to understand the factors which impact project performance. Should you have any queries related to this study, please contact me through email at gopalsekarkrishna@yahoo.in or call me at 012 - 2069950.

Sincerely

Sekar Gopal
Matric No. 95596,
DBA – 8th Semester Student
Universiti Utara Malaysia.

PART 1: DEMOGRAPHIC FACTORS (ABOUT YOURSELF)

Please fill or tick (✓) the appropriate box that corresponds to your answer to each of the questions below.

1. Name (Optional) : ______________________________
2. Position : ______________________________
3. Division (Please specify) : ______________________________
4. Department : ______________________________
5. Age (Please specify) : ______________________________ years
6. Gender

☐ Male
☐ Female

7. Race

☐ Malay
☐ Chinese
☐ Indian
☐ Others (Please specify):
____

8. Education Level

☐ Primary
☐ Secondary
☐ Diploma
☐ Graduate
☐ Post-Graduate
☐ Ph.D / DBA
☐ Others (Please Specify):
____

9. Number of years of experience in the construction industry (Please specify):

______________________________________ years.

10. Total projects handled (number of projects):

☐ 0 – 5 ☐ 6 – 10 ☐ 11 – 15

☐ 16 – 20 ☐ 21 – 25 ☐ Above 25

11. Specialized experience:

☐ Civil, Building & Infrastructure

☐ Marine ☐ Oil & Gas

☐ Multi-discipline ☐ Others: ________________

PART 2: ORGANIZATION DETAILS

1. Name of the organization :____
2. Year of establishment :____
3. Nature of business :____
4. Annual turnover (RM in millions) :____
5. Company status :

   ☐ Government ☐ Semi-Government

   ☐ Public listed ☐ Private

   ☐ Multinational

   ☐ Others (Please specify):__________________________

6. Total no. of employees :____

7. Organization size : (In terms of number of employees)

☐	Small scale (1 to 50)	☐	Medium scale (51 to 200)
☐	Large scale (201 to 500)	☐	Very large scale (More than 500)

8. Specialized in construction :

☐	Civil, Building & Infrastructure		
☐	Marine	☐	Oil & Gas
☐	Multi-discipline	☐	Others: ________________

9. Current Project :____

PART 3: PROJECT RELATED FACTORS

Here are some statements that describe the factors which impact project performance in construction companies of Malaysia. Please indicate how strongly you agree or disagree with the following statements by circling the items below on a scale of 1 to 5.

....

CLIENT-RELATED FACTORS:

Factors		Strongly Disagree	Disagree	Neither Agree / Nor Disagree	Agree	Strongly Agree
1.	Lack of Finance and payments of completed works	1	2	3	4	5
2.	Owner interference	1	2	3	4	5
3.	Slow decision-making	1	2	3	4	5
4.	Unrealistic contract duration and requirement imposed	1	2	3	4	5

CONTRACTOR-RELATED FACTORS:

Factors		Strongly Disagree	Disagree	Neither Agree / Nor Disagree	Agree	Strongly Agree
1.	Contractor's poor performance	1	2	3	4	5
2.	Contractor's poor site management practices	1	2	3	4	5
3.	Poor construction methods used in projects	1	2	3	4	5
4.	Improper planning by contractor	1	2	3	4	5
5.	Mistakes during construction stage	1	2	3	4	5
6.	Contractor's Inadequate experience	1	2	3	4	5

CONSULTANT-RELATED FACTORS:

Factors	Strongly Disagree	Disagree	Neither Agree / Nor Disagree	Agree	Strongly Agree
1. Contractor management	1	2	3	4	5
2. Preparation and approval of drawings	1	2	3	4	5
3. Quality assurance control	1	2	3	4	5
4. Waiting time for approval of tests and inspection	1	2	3	4	5

MATERIAL-RELATED FACTORS:

Factors	Strongly Disagree	Disagree	Neither Agree / Nor Disagree	Agree	Strongly Agree
1. Availability of materials	1	2	3	4	5
2. Availability of quality materials	1	2	3	4	5
3. Shortage of materials	1	2	3	4	5
4. On-time material delivery	1	2	3	4	5

LABOR AND EQUIPMENT-RELATED FACTORS:

Factors	Strongly Disagree	Disagree	Neither Agree / Nor Disagree	Agree	Strongly Agree
1. Labor productivity	1	2	3	4	5
2. Lack of appropriate skills	1	2	3	4	5
3. Equipment availability	1	2	3	4	5
4. Adequacy of equipment	1	2	3	4	5

CONTRACT MANAGEMENT-RELATED FACTORS:

Factors	Strongly Disagree	Disagree	Neither Agree / Nor Disagree	Agree	Strongly Agree
1. Change orders	1	2	3	4	5
2. Mistakes and discrepancies in contract document	1	2	3	4	5
3. Major disputes and negotiations	1	2	3	4	5
4. Inappropriate overall organizational structure linked to the project	1	2	3	4	5
5. Lack of communication between the parties	1	2	3	4	5

EXTERNALLY-RELATED FACTORS:

Factors	Strongly Disagree	Disagree	Neither Agree / Nor Disagree	Agree	Strongly Agree
1. Weather conditions	1	2	3	4	5
2. Regulatory changes	1	2	3	4	5
3. Problem with neighbors	1	2	3	4	5
4. Unforeseen site conditions	1	2	3	4	5

PROJECT MANAGEMENT TOOLS/TECHNIQUES-RELATED FACTORS:

Factors	Strongly Disagree	Disagree	Neither Agree / Nor Disagree	Agree	Strongly Agree
1. My organization supports the use of project	1	2	3	4	5

	management tools/ techniques in managing the projects.					
2.	My organization uses adequate and appropriate project management tools/ techniques to improve project performance results in terms of time, cost, quality, safety and financial.	1	2	3	4	5
3.	My organization effectively uses project management tools/ techniques to detect the problems/issues of the projects at an early stage and mitigate them accordingly.	1	2	3	4	5
4.	The project management tools/techniques employed in my organization have no limitations and fit well for all types of projects	1	2	3	4	5

5. What are the most commonly used project management tools/techniques in your organization currently?

____
____
____
____

What would you recommend to improve the performance of the Malaysian construction industry?

…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………

PART 4: ORGANIZATIONAL-RELATED FACTORS

LEADERSHIP-RELATED FACTORS

Please indicate how strongly you agree or disagree with the following statements by circling the items below on a scale of 1 to 5.

	Factors	Strongly Disagree	Disagree	Neither Agree / Nor Disagree	Agree	Strongly Agree
1.	Employees need to be supervised closely, or they are not likely to do their work.	1	2	3	4	5
2.	Employees want to be part of the decision-making process.	1	2	3	4	5
3.	In complex situations, leaders should let subordinates work problems out on their own.	1	2	3	4	5
4.	It is fair to say that most employees in the general population are lazy.	1	2	3	4	5
5.	Providing guidance without pressure is the key to being a good leader.	1	2	3	4	5
6.	Leadership requires staying out of the way of subordinates as they do their work.	1	2	3	4	5
7.	As a rule, employees must be given rewards or punishments in order to motivate them to achieve organizational objectives.	1	2	3	4	5
8.	Most workers want frequent and supportive	1	2	3	4	5

	communication from their leaders.					
9.	As a rule, leaders should allow subordinates to appraise their own work.	1	2	3	4	5
10.	Most employees feel insecure about their work and need direction.	1	2	3	4	5
11.	Leaders need to help subordinates accept responsibility for completing their work.	1	2	3	4	5
12.	Leaders should give subordinates complete freedom to solve problems on their own.	1	2	3	4	5
13.	The leader is the chief judge of the achievements of the members in the group.	1	2	3	4	5
14.	It is the leader's job to help subordinates find their "passion".	1	2	3	4	5
15.	In most situations, workers prefer little input from the leader.	1	2	3	4	5
16.	Effective leaders give orders and clarify procedures.	1	2	3	4	5
17.	People are basically competent and if given a task, will do a good job.	1	2	3	4	5
18.	In general, it is best to leave subordinates alone.	1	2	3	4	5

ORGANIZATIONAL CULTURE-RELATED FACTORS

Strongly disagree (1)	Disagree (2)	Neither Agree / Nor Disagree (3)	Agree (4)	Strongly agree (5)

1.	The group I am assessing (organization, division, unit team) knows its business objectives clearly.	1	2	3	4	5
2.	People genuinely like one another.	1	2	3	4	5
3.	People follow clear guidelines and instructions about work.	1	2	3	4	5
4.	People get along very well and disputes are rare.	1	2	3	4	5
5.	Poor performance is dealt with quickly and firmly	1	2	3	4	5
6.	People often socialize outside of work.	1	2	3	4	5
7.	The group really wants to win.	1	2	3	4	5
8.	People do favors for each other because they like one another.	1	2	3	4	5
9.	When opportunities for competitive advantages arise, people move decisively to capitalize on them.	1	2	3	4	5
10.	People make friends for the sake of friendship; there is no other agenda.	1	2	3	4	5
11.	Strategic goals are shared.	1	2	3	4	5
12.	People often confide in one another about personal matters	1	2	3	4	5
13.	People build close long-term relationships. Someday, they may be of benefit.	1	2	3	4	5
14.	Reward and punishment are clear.	1	2	3	4	5
15.	People know a lot about each other's families.	1	2	3	4	5
16.	The group is determined to beat clearly defined enemies.	1	2	3	4	5
17.	People are always encouraged to work things out flexibly as they go along.	1	2	3	4	5
18.	Hitting targets is the most single important thing.	1	2	3	4	5
19.	To get something done, you can work around the system.	1	2	3	4	5
20.	Projects that are started are completed.	1	2	3	4	5
21.	When people leave, co-workers stay in contact to see how they are doing.	1	2	3	4	5
22.	It is clear where one person's job ends and another person's begins.	1	2	3	4	5
23.	People protect each other.	1	2	3	4	5

INNOVATION-RELATED FACTORS

Factors		Strongly Disagree	Disagree	Neither Agree / Nor Disagree	Agree	Strongly Agree
1.	The company does not value an effective network of contacts towards innovation.	1	2	3	4	5
2.	The company does not reward its employees for their creativity, for accepting risk and for being entrepreneurs.	1	2	3	4	5
3.	The company is more interested in preserving resources than in taking risks to capitalize an opportunity.	1	2	3	4	5
4.	Resource management has a greater influence in the company strategy than the pursuit of opportunity.	1	2	3	4	5
5.	The employees are evaluated for how well they follow the rules rather than for the value they add to the company.	1	2	3	4	5
6.	The company prefers to follow formal procedures instead of modifying usual practices.	1	2	3	4	5
7.	There is a hierarchy and formal description of tasks and functions.	1	2	3	4	5
8.	The company does not give autonomy to the employee and allows him to express his personality and judgment.	1	2	3	4	5
9.	The company does not have a formal process of	1	2	3	4	5

	innovation and R&D defined with the participation of top managers.					
10.	In general there is not a formal process of identification of new ideas and opportunities and these are accidental.	1	2	3	4	5
11.	There are no partnerships with universities or other organizations in order to do research.	1	2	3	4	5
12.	In general, the company communicates with customers in an informal way and on a face-to-face basis.	1	2	3	4	5

LEARNING ORGANIZATION-RELATED FACTORS

	Factors	Strongly Disagree	Disagree	Neither Agree / Nor Disagree	Agree	Strongly Agree
1.	My organization provides a conducive climate to help each other to learn.	1	2	3	4	5
2.	Employees in my organization are allowed to take time to support learning for themselves and others.	1	2	3	4	5
3.	Employees in my organization are rewarded for learning.	1	2	3	4	5
4.	Employees in my organization are allowed to provide open feedback to superiors.	1	2	3	4	5
5.	Superiors in my organization often ask, what others think on matters of interest related to the company and its performance.	1	2	3	4	5

6.	Employees and managers in my organization often spend time building trust among themselves.	1	2	3	4	5
7.	Employees in my organization are given freedom to adopt goals for their responsible areas.	1	2	3	4	5
8.	In my organization, employees are encouraged to revise their thinking with relevant information pertaining to their responsibilities.	1	2	3	4	5
9.	Managers in my organization listen and act on our recommendations.	1	2	3	4	5
10.	In my organization, managers create measurement system for learning and performance.	1	2	3	4	5
11.	In my organization, information from lessons learned is available to all the employees to learn and adopt.	1	2	3	4	5
12.	My organization recognizes employees for taking initiatives.	1	2	3	4	5
13.	My organization measures the results of training provided to employees.	1	2	3	4	5
14.	In my organization, management gives control over resources for better performance and learning.	1	2	3	4	5
15.	In my organization, management supports calculated risk-taking by	1	2	3	4	5

	employees to promote learning.					
16.	In my organization, employees are given opportunity to be aware of global perspectives.	1	2	3	4	5
17.	Employees in my organization are encouraged to have diverse perspectives.	1	2	3	4	5
18.	Leaders and managers in my organization provide coaching and mentoring to employees.	1	2	3	4	5
19.	My organization provides opportunities to learn.	1	2	3	4	5
20.	In my organization, employees are encouraged to ensure consistent actions.	1	2	3	4	5

PART 5: PROJECT PERFORMANCE-RELATED FACTORS

Please indicate how strongly you agree or disagree with the following statements by circling the items below on a scale of 1 to 5.

TIME-RELATED PERFORMANCE

	Factors	Strongly Disagree	Disagree	Neither Agree / Nor Disagree	Agree	Strongly Agree
1.	My organization completes the projects within the agreed contract schedule with the clients.	1	2	3	4	5
2.	My organization achieves the critical milestone dates always on time.	1	2	3	4	5
3.	My organization is effective in getting EOT (Extension of Time) for change orders initiated by the client, which has an impact on the schedule.	1	2	3	4	5
4.	My organization is efficient in identifying delays and deploying mitigation plans/catch-up plans to avoid project delay.	1	2	3	4	5
5.	My organization always submits the project turn-over documents on time to the client.	1	2	3	4	5

OTHERS (explain) ____

Remarks:

____

____

____

COST-RELATED PERFORMANCE

Factors	Strongly Disagree	Disagree	Neither Agree / Nor Disagree	Agree	Strongly Agree
1. My organization completes the project within the cost/budget allocated to the project.	1	2	3	4	5
2. My organization is prompt in raising the cost claims for the works carried out in the project.	1	2	3	4	5
3. Our clients normally certify the claims on time and make timely payment.	1	2	3	4	5
4. My organization is prompt in documenting the change orders requested by the clients and raising cost claims on time to mitigate cost escalation.	1	2	3	4	5
5. My organization does not have disputes with the clients on project related costs/claims/retention sum.	1	2	3	4	5

OTHERS (explain) ____

Remarks:

____

____

____

QUALITY-RELATED PERFORMANCE

Factors	Strongly Disagree	Disagree	Neither Agree / Nor Disagree	Agree	Strongly Agree
1. My organization pays attention to quality and does not compromise quality.	1	2	3	4	5
2. Mistakes and defects are identified through periodic quality inspections and resolved on time.	1	2	3	4	5
3. There were no major quality issues and no major non-conformance reports (NCR) were raised by the client.	1	2	3	4	5
4. There were no quality rejection and reworks in our projects.	1	2	3	4	5
5. There were no customer claims on quality-related works in our organization.	1	2	3	4	5

OTHERS (explain) ____

Remarks:

____

____

____

SAFETY-RELATED PERFORMANCE

Factors	Strongly Disagree	Disagree	Neither Agree / Nor Disagree	Agree	Strongly Agree
1. In my organization, safety is given topmost priority.	1	2	3	4	5
2. Most of our projects are completed without accidents and LTAs.	1	2	3	4	5
3. Our company monitors safety statistics very closely and reports to authorities on safety statistics/incidents regularly.	1	2	3	4	5
4. Our company conducts safety-related training, education and campaigns regularly to promote safety awareness in projects.	1	2	3	4	5
5. In my company, safety inspections and audits are part of the system and employees are rewarded/ punished for safety performance.	1	2	3	4	5

OTHERS (explain) ____

Remarks:

____

____

____

FINANCIAL-RELATED PERFORMANCE

Factors	Strongly Disagree	Disagree	Neither Agree / Nor Disagree	Agree	Strongly Agree
1. In my company, most of the projects are successfully completed and profits are earned.	1	2	3	4	5
2. Our company achieves good Return on Investment (ROI) from the projects it has undertaken.	1	2	3	4	5
3. Our company achieves good Return on Assets (ROA) & Return on Equity (ROE) from the projects undertaken.	1	2	3	4	5
4. Our company's financial performance is strongly related to the project's performance.	1	2	3	4	5

Appendix C: Open questions feedback:

Question no. 2 – Recommendations for improvement in project performance of construction companies in Malaysia.

Recommendations from respondents
Client-related recommendations
➢ Clients need to provide more realistic schedules to contractors. ➢ Clients need to monitor closely the contractor's works. ➢ Clients need to have competent or experienced supervision team. ➢ Clients need to have enough staff on site. Specifically for quality inspection and to attend to contractor requests, to facilitate joint inspection of completed works. ➢ Client or his representative to make immediate decisions on contractor requests. Specifically for technical and commercial issues. ➢ Client need to approve submittals, such as method statements, Inspection and test plans and materials on time. ➢ Clients need to award projects based on technical and financial capabilities of contractors rather than political and/or other relationships. ➢ Clients need to monitor the subcontractors, who carry out substandard works at the site, to avoid defects and problems during defect liability period (DLP). ➢ Clients need to reduce heavy documentation requirements from the contractors. ➢ Clients and contractors need to take serious action on final design before starting the construction activities at site. ➢ Potential success review of each project needs to be examined by the clients. ➢ Clients delay the TOC (Table of contents) approvals for final documentation of the projects, which delays the compilation of project reports and handover. ➢ Timely payment from client to contractors will help in all stages of the project, such as purchasing, construction, equipment mobilization and wages payment on time. ➢ Clients need to establish proper prequalification exercise first to avoid project failures. ➢ Clients need to avoid imposing biased contract documents creating problems to contractors in completing the projects on time within the budget.
Contractor-related recommendations
➢ Need to have healthy competition among the contractors in the market. ➢ Contractors must do realistic planning of site activities. ➢ Contractors need to have competent or experienced supervision team. ➢ Contractors need to understand their scope of works, before the bidding process. ➢ Contractors need to ensure that their personnel (Project manager, Construction manager, Engineer, Supervisor, Quality assurance and quality control, Safety) are experienced and able to manage their works efficiently. ➢ Contractors need to ensure that their plant and equipment are in good working conditions all the time and the operators are trained. ➢ Contractors need to embrace quality and should not compromise quality for cost benefits.

- Selection of contractors should be transparent and should be based on their past experience/strong financial background.
- Malaysian contractors need to implement new construction technologies, particularly in oil & gas construction sector.
- Contractors needs to study the details at the site regarding site conditions with method of working and compare the duration given in the contract for confirmation, to avoid time and cost issues later.
- Contractors need to monitor the subcontractor's works at the site, to avoid defects and problems.
- Construction industry needs to have more specialized main contractors and lesser subcontractors.
- Construction industry should have more experienced main contractors and they should not try to get cheaper sub-contractors. Instead, they should try to get quality and efficient sub-contractors.
- Workers incentives can play a big role in construction productivity improvement. This needs to be looked into by the contractors.
- Delay in the payment of subcontractors due to improper submission of documents is a common problem. Subcontractors need to be educated on the documentation preparation and submission methodology to avoid delays in payments.
- Effective payments to subcontractors will help to improve project performance.
- Contractors need to focus on meeting the customers' expectations in each and every project.
- Contractors to ensure every instruction given by the client and consultant shall be in written form officially. Every correspondence submission to the client must have received acknowledgement to avoid disputes and legal issues later.
- For documents or drawings which require client's or consultant's reply or approval, it must be followed up and reminded by the contractors.

Consultant-related recommendations

- Consultants need to improve technical efficiency in construction sector.
- Consultants need to have design standardization for standard infrastructure projects.
- Consultants in Malaysia need to improve design engineering skills.
- Consultants need to approve submittals, such as method statements, Inspection and test plans and materials on time.
- Selection of consultants shall be based on their experience and sufficient manpower.
- Better and cheaper consultants for all trades should be available for the construction industry.
- The design drawings for the project must be prepared by the consultants at an early stage to avoid delays and modifications.
- Consultants have to be better knowledgeable than others in their respective jobs.

Material-related recommendations

- Need to curb lack of material and their availability.
- Malaysia needs to adopt to change to high-tech techniques in construction from the conventional method and to adopt state-of-the-art materials, methods and tools in construction industries.
- Need to control fluctuation of material prices used for construction.
- Government to control building material prices to ensure that property prices are reasonable and the demand is high.
- Construction industry to consider standardization of construction materials for a variety of construction works to ensure availability on time at reasonable prices and quality.
- Government to consider withdrawal of GST on materials.

Labor & equipment-related recommendations

- Country must have a systematic blueprint or planning for development in stages. All of a sudden, lot of mega-projects should not appear, for which resources like manpower, machineries, logistics and quarry products are in shortage with a need to import resources from overseas.
- Need to apply mechanization and modern equipment in construction.
- Contractors should have competent workers in their company. Currently, most of the workers employed are not competent and have less knowledge in the business.
- Construction companies need to use skilled manpower for construction activities.
- Construction companies need to focus on mechanization to face labor shortage.
- Government needs to enforce regulations for the related parties involved in construction to bring in a good experienced workforce for the projects.
- Malaysia needs to explore relevant plant and equipment available in other countries that would minimize human error and improve productivity with less manpower.
- The labor law of Malaysia needs to be modified. It is more favorable to employees and especially "Medical Check" is the main problem which causes work disruption in construction projects. Also, before and after the long holidays, many of the construction employees do not come to work without any information and no actions can be taken on them.
- Construction companies need to use professional teams to the maximum for construction activities rather than non-professionals.
- Give more incentives and better salary for skilled workers so that they stay in the industry.
- To encourage and train local employees to be more competent to meet the demands of the construction industry.
- Employee's welfare in construction industry needs to be looked into.
- To increase the salary levels of workers in the construction industry to attract local workers. This will help to improve the skill levels of local workforce and reduce foreign labor.
- Every construction work must be carried out with right workers and tools to avoid mistakes and reworks.

- Extra hours worked at site by the employees must be adequately compensated.
- Malaysian government needs to support the construction industry to get skilled local workers as early as possible for reducing the dependency on foreign labor.

Contract-related recommendations

- Contractual issues need to be sorted out during the execution of the project itself. Contractor's Extension of Time (EOT) claims need to be evaluated once contractor submits the claim. Not to wait and negotiate till the end of the project, which is very common in Malaysia.
- All claims, particularly Variation Orders (VO), should be evaluated based on the contract terms and conditions as and when they are submitted rather than waiting till the completion of the project.
- Construction industry needs to have standard contract terms and conditions.
- All parties involved in construction projects need to improve their understanding of the contract before signing.
- Contract document to clearly define responsibility of clients and their representatives, number of days they need to respond to contractors' enquiry on technical matters and letters.
- Understanding the scope of works and responsibility clearly in executing the project at all levels is important.
- Improve contractual awareness among all parties in construction industry to minimize disputes.

Externally-related recommendations

- Malaysia needs to introduce/implement new/better technology in construction methods.
- Malaysia needs to curb bribery and political influence in awarding projects.
- All parties involved in construction should be well-versed with government's regulations.
- Most of the suppliers and contractors are having racism issues in the construction projects, but never show it up-front. This needs to be avoided.
- To have effective communication across the board to minimize queries/ discussions, which will save time and cost.

Project management tools/techniques-related recommendations

- Malaysia is lacking in using proper planning and management tools for management of projects, when compared to foreigners.
- Construction companies should apply Lean, Six Sigma, Kaizen techniques to improve labor productivity.
- Companies need to have proper planners with good planning tools, not schedulers.
- Need to have proper planning during the initial stage of the project, especially on the method of construction and availability of equipment to compliment the construction.
- Construction companies need to enhance the knowledge in application of project management tools/techniques.

- Construction companies need to use enterprise resource planning (ERP) software and electronic data management systems (EDMS) to reduce mistakes.
- Planning tools, such as daily, weekly reports should be taken seriously by the site personnel to fill up the report. Most of the times, the reports lack information.
- Contractors need to practice two to three weeks' look-ahead planning, which is very important to manage the project.
- Construction companies to follow exactly the project management life cycle and project management concepts.
- Site work implementation team should strictly follow the project management tools/techniques deployed.
- Construction industry needs to adopt international standards such as ISO 9001, PMP (project management professional) and BMS (Building management systems) to improve project performance.
- More detailed planning and adequate preparations, including resources need to be exercised to get better project results.
- Improve project management by using project risk management tools/techniques.
- To implement PMP as a mandatory tool for projects with a value of more than RM 50 million.
- Construction companies to use updated planning software for tracking project performance.
- To conduct extensive training on the tools that are used to monitor project performance in the construction industry for all the construction sectors to improve performance.
- Effective and logical planning by experienced project control planners with suitable project management tools will help to overcome the problems in construction projects.
- Construction companies need to establish project management procedures (Project management must be concerned about communication, job assignments, handling problems, identifying and assessing the risks, performance measurement and limit of authority in the project).

Leadership-related recommendations

- Create more effective and reliable management teams to manage projects.
- Lack of professionalism is there in most construction sites in managing contractors.
- Quick actions needed from the management of construction companies regarding welfare of workers and staff to retain them in the projects.
- Construction companies need to have skilled project managers, who can manage the projects successfully, by planning materials, resources and equipment on time.
- Construction companies need to employ appropriate human resources for the project and to have good labor management styles in the project.
- Project managers need to have professionalism and project management skills to ensure right quality products at right cost in the projects.

Organizational culture-related recommendations

- Construction companies need to ensure optimum capital utilization by best operational and management practices.
- Construction companies must improve communication within the organization as well to avoid issues in the projects.
- Construction companies to disseminate all staff responsibilities clearly before engaging them in the projects.
- The construction industry should look into the method on how to introduce new/ advanced technology with friendly working environment.
- Proper planning and execution will improve project performance.
- Construction companies need to identify at the early stage of planning, all the loop- holes and a person from the project needs to be engaged to address the loopholes based on the complications of the project.
- Engage social activities to improve the relationship between workers and management.
- Companies should encourage existing staff to upgrade their skills and to provide opportunities.
- Hire professionals regardless of race or ethnicity as they can impart valuable lessons to juniors in the construction industry.
- Construction companies need to give reward/bonus to the staff and employees for success in projects.
- Construction companies need to establish a good organizational structure in the first place for the success of the project.

Innovation-related recommendations

- The industry needs to source, adapt, and where applicable, technological advancements from abroad, to improve productivity and quality.
- When comparing the Malaysian construction technology with other developed countries, Malaysia needs a major improvement to achieve 2020 development. This needs to be looked into.
- Construction organizations should provide a work environment that allows innovation and continual improvement.
- Construction companies need to adapt to change, innovation and wider thinking.

Learning organization-related recommendations

- Need to create more skills-related training to the subcontractor's staff engaged in construction projects.
- Malaysian construction industry needs to think out of the box and learn the knowledge from other countries.
- Construction companies need to implement the best practices of construction management in construction projects.
- Construction companies need to provide training for effective operations for construction employees.
- Malaysian contractors need to have training and partnership with international contractors and technology transfer to improve skills and efficiency in the value chain.

- Construction companies need to update employees on technical knowledge and company resources and other related skills to be outstanding and to get better results.
- Courses and training are very important to improve the organization's performance. Hence, construction companies need to focus on training of employees.
- Construction companies need to conduct in-house training events regularly to improve the individual skills to meet the requirements of the international standards.
- Training on issues, like respect, behavior and responsibility needs to be provided to the staff related to their work in the construction industry to enhance performance.
- Construction companies need to get advice or consultation from experienced companies in the trade for better performance of their projects.
- Construction management team needs to attend courses and training regarding construction planning and project management.
- Education and training on the job, guidance/coaching are necessary to improve competency of employees to carry out their job well and be effective in the construction sector. This needs to be practiced.
- Construction companies should put more effort in knowledge management as part of learning organization to reduce repetitive mistakes.
- Construction companies need to consider continuous training for project managers to keep them abreast of the developments in the industry.
- Construction industry should have knowledge sharing sessions between major players in construction to benefit the industry.

Time performance-related recommendations

- By implementing project charter tool, the organization will get clear approach on execution, minimize the risk and improve the deliverables within the time frame given. Construction companies need to adopt this.
- Adequate manpower loading and planning to be followed. Immediate mitigation for any delay should be practiced at project sites.
- Root cause analysis needs to be done for any delay or mistakes done and to overcome the problem in the future.
- Construction companies need to improve the procurement strategy to avoid delays.
- Malaysian construction industry needs to find ways to utilize time saving systems to avoid delays.
- Construction companies need to have well-planned construction schedule with room for unforeseen circumstances that may arise in the project to avoid delays in the projects.
- When there are design changes in the projects, need faster approval from clients to expedite works and to avoid delays.
- Clients and contractors should adopt early start of work practice to avoid delays.
- To estimate resources and create a resource plan to arrange resources to meet

project schedules on time.

- Construction meetings should be carried out with substance and solutions to problems need to be decided efficiently without delay to ensure progress.
- Malaysia needs to increase the usage of IBS (Industrial building systems) to save time.
- Construction companies to analyze the entire construction process in detail and to determine the barriers for improving productivity.
- Construction companies to do better planning to mitigate the impact of work changes and to eliminate unnecessary waiting time.

Cost performance-related recommendations

- To enforce cost control system in place for timely and accurate control of cost in projects.
- Construction companies need to estimate the right costing for the project during bidding sessions accurately in consultation with all the departments, who have expertise, to avoid bursting of budget later in the project.
- It is important that the construction industry begins to look into evolving construction from the conventional method to improve productivity and progress and at the same time reduce cost. Example: Using system work forms instead of conventional work forms to reduce wastage.
- Cost control and project progress shall be balanced in a project. If too much control is exercised in the projects, it will affect the quality and lot of reworks will happen and will delay the progress of the projects.
- In terms of cost, it is better to compare the quotation provided by the suppliers and service providers. Nowadays, though this is stated in the purchasing procedures, none of the companies is following due to the urgency in the project.
- Create a preliminary budget and summarize the planned expenses and revenues. This will help to avoid cost escalation in construction projects.
- To implement cost control, efficient problem solving and potential for innovative cost saving mechanisms in construction projects.
- In cost management, cash flow is the utmost factor in construction. Try to maximize credit terms in order to meet payment terms by the client.
- Construction companies should manage the projects within the given budget and time to be more competitive.

Quality performance-related recommendations

- Construction companies should use the right tools or equipment rather than manual. i.e., more automation and reduce manual works to improve productivity and better quality.
- Many clients and client representatives are not implementing ISO 9001 Quality Management Systems (QMS) for the projects. Implementation of ISO QMS will lead to good quality of work and systematic documentation of work.
- Inspection and test plans need to be discussed, agreed and approved by all parties before execution of the works.
- Construction companies must always conduct site meetings to find out quality problems at the site and to rectify them immediately.

- Priority should not be only on the construction progress. Companies should push for quality assurances without compromising engineering practices and code of ethics.
- Top management interference in quality-related issues brings down the quality of the project. Hence, this should be avoided.
- No importance to quality is given, when the project is delayed. Construction companies should stop this practice.
- No proper planning affects quality in the projects. Normal construction behavior in Malaysian construction industry might not bring newcomers to the industry and the industry will be nowhere, when compared to the global scenario.
- Serious training and enforcement of quality control and assurance with priority over project progress need to be practiced.
- Deteriorating levels of quality of works produced by the contractors and sub-contractors needs to be identified and actions need to be taken accordingly.
- Construction companies to provide good margins to contractors to improve quality of construction.
- Malaysia needs to implement quality assessment system in construction (QLASSIC) as the mandatory quality management system for all construction projects to improve overall quality.
- Companies should have in-house subcontractors or their own workers. This is for better quality and not relying on sub-contractors, who tend to perform poorly.

Safety performance-related recommendations

- Regulatory bodies, such as CIDB and NIOSH need to play a proactive role in providing advice and education on safety to construction companies in Malaysia.
- The government authorities must enforce health, safety & environment (HSE) practices to ensure that projects are running safely and complying with legal requirements.
- All construction sectors must practice safety awareness and tool box meetings and should train every single worker depending on the activity and work sequences.
- Construction companies must issue warning letters and penalties for safety non-compliance by employees and subcontractors.
- Every staff must come out with UCUA (you see, you act) suggestions for any unsafe working condition at project site to improve the safety performance of the project.
- Malaysian government to follow, what the Government of Singapore is doing to its construction industry for better performance and safety.
- Malaysian construction industry needs to focus more on safety engagement. Malaysian construction companies engage foreign labor, since they are cheap and locals do not want to work in the construction industry. Many accidents happen as the foreign workers do not follow safety procedures.
- Construction companies need to educate the employees on their behavior. Many site accidents happened because of employee's behavior.

Financial performance-related recommendations

- Construction companies need to use local products and reduce imports to improve financial performance.
- The construction contractors of Malaysia must realize that they need to change and improve the way they operate to remain profitable and be competitive globally.
- Construction companies need to provide better remuneration, facilities, application of lean thinking training courses for the construction industry professionals for financial performance improvement.
- Construction companies need to train the new employees on what productivity means to all employees and to show them how increased productivity leads to fewer hassles and greater profits to employer and employees.

Other recommendations

- Government must set limits of jobs for certain construction companies, so that the market will have a healthy growth. Certain companies should not monopolize the construction projects in the country.
- Too many construction activities in a short span of time results in quality and safety issues, which affect all stakeholders.
- Regulators need to speed up their approval process.
- Construction industry needs to nurture better working relationship between client, consultant and contractor. All should work towards the same goal and should avoid policing culture.
- Need to improve communication among clients, consultants, contractors and subcontractors.
- Construction companies need to practice an honest business relationship between client and contractor.
- Malaysia needs to impose necessary laws for construction industries.
- Construction companies need to employ knowledgeable and competent people.
- Malaysian institutions of higher learning/universities to provide industrial skills-related education to students to cater to construction industry needs.
- Construction industry should give more exposure to fresh graduates and should train them to meet the talent requirements in the industry.
- Project housekeeping (cleanliness) is a direct factor in productivity improvement. Construction industry needs to focus on cleanliness-related issues.
- Malaysia needs to compare the competitiveness of the industry and needs to take necessary actions to improve the levels.
- Major changes and improvements are needed in many aspects of the construction industry to be a well-recognized country in the world.
- Malaysia needs to practice fair competition, no bribery and transparency in awarding contracts.
- Malaysia needs to focus on exporting construction services and technologies to other countries to learn and to be competitive in the global construction market.
- The relationship between the consultant, client and contractor should be ethical and completely professional. It is highly impossible to have happy ending in this triangular love story, but at least, maintain the professional decorum in the job to

smoothen the path towards the completion of the project.

- Knowledge and professionalism are the most important aspects in improving the performance of the Malaysian construction industry,
- Each and every party involved in the construction field should contribute equally to the industry,
- Malaysian government needs to establish a penalty system for construction organizations that does not follow the rules in the construction industry.
- The policy-makers and industry players need to work together to help drive changes in the construction sector.
- Construction industry needs to identify the root cause of the problem and to counter it with necessary corrective action.
- Malaysia needs to provide industrial training to schools and vocational training institute's students to expose them on real scenarios about the industry.
- Malaysia needs to establish a comprehensive database of available workers with joint effort between CIDB, Public Works Department and other stakeholders to help the construction industry.
- Government to come up with standard guidelines for contractors and their construction performance.
- Tax incentives from Government for contractors who improve performance may boost the industry culture.
- Malaysian construction companies do not have adequate skills and experience. Incentives to be given to foreign companies who induce transfer of knowledge and skills to local companies.
- Government should provide incentives to local construction companies, who compete with foreign companies and ventures in other countries.
- To standardize all the requirements, such as engineering, procurement, construction and commissioning for all types of projects to have a common platform for the industry.
- Malaysian government needs to give overseas education to intelligent students and staff to get experience in construction technologies and methodologies.
- Malaysia needs to establish special skills education colleges to conduct or to focus on the specialty of works needed in the construction industry.
- Malaysia needs to explore new construction technologies, which are used in China and Japan. China is using pre-fabricated condominium units to save time in projects. We need to learn this technology.
- Malaysian government needs to make sure the implementation of building law and its enforcement.
- Construction companies needs to have a good filing and documentation system from the beginning of the project till completion and handover.
- Malaysia requires effective enforcement authorities to ensure regulatory compliance not in a punitive way, but working together via friendly enforcement.
- Great initiative needed to create an interest for youth. Requires brainstorming from experienced personnel as motivators to attract the youth into the construction industry.
- Construction companies to analyze construction process in details before starting the construction works.

- Government needs to fund all small and medium construction companies to learn new technologies in construction.
- Malaysia needs to consider establishing regulations by the Board of Engineers to enforce timely payment by the clients to contractors.
- Malaysia needs to consider establishing an authority to supervise engineers and to prevent interference of project owners on technical matters related to the project.
- Malaysian government needs to limit the number of Chinese EPC (engineering, procurement and construction) companies coming into Malaysia. Because of their poor quality works, some projects are getting delayed and some are having quality and technical issues.
- Government policies need to be simple for property development projects to boost development projects.
- Construction industry needs to have more experienced engineers and architects to facilitate the construction industry's growth.
- Government to consider establishing an agency to accredit and qualify all building contractors for their performance.
- Government should enforce competency levels for contractors.
- CIDB should keep track of reliable sub-contractors and should propose to main contractors.
- Like in Singapore, each personnel in contractor's organization shall compulsorily attend one technical or skill course per year. Learning center to be controlled by Malaysian Government or CIDB.