

FACTORS THAT AFFECT THE SUCCESS OF
INDUSTRIALPROJECTS IN MALAYSIA

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DEDICATION

This research project is dedicated to my grandfather, my parents and my aunt with love.

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ABSTRACT

Today, industrial projects are seen as part of a manufacturing and engineering firm's competency. The total industrial projects approved in 2011 were valued at RM 56.1 billion. Financially, it increased 18.8% as compared to RM 47.2 billion in the year 2010 (MIDA, 2012). The approved industrial projects include new products development; purchase and installation of capital equipment which reflects the growth of Malaysia's economy. Thus, it is important to identify the most influencing factors that lead to the successful implementation of industrial projects. Although researchers have concluded that different factors affect the success of industrial projects, there are limited researches that look into the relationship among those factors. The purpose of this study is to determine the relationship between those factors, and to identify the most influencing factors that can lead to the success of industrial projects. Results of this research will allow an organisation to use their limited resources to improve the important areas and increase the possibility of running industrial projects successfully.

In this study, as part of the literature review, a meta-analysis was performed. Six factors were found to be the most influencing factors that lead to the success of industrial projects. Then, a questionnaire was developed and sent to various respondents in charge of industrial projects in Malaysia to determine the relationship between these six factors and the success of Malaysia industrial projects. Using SPSS, or quantitative analysis method, the data collected was analysed. The results of this study show that three out of six factors are the most influencing factors in the Malaysia industrial context. Therefore, the organisation shall consider focusing their resources to improve on these three key areas. The factors identified to be significant in Malaysia are organisational project management maturity, realistic project schedule and budget, project team member competency and continuity.

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Companies use project team to achieve specific and unique organisational goals by forming a cross-functional team (PMI, 2008). This kind of industrial project team usually comprise members from various functional departments to work on organisational goals such as commissioning purchase new equipment, developing new products, establishing a new manufacturing line.

Based on a report from Malaysian Investment Development Authority (MIDA) in October 2013, Malaysia has approved 428 industrial and manufacturing projects, which value to RM28.3 billion investments during the January to September period. The total RM28.3 billion investment of which RM18.2 billion (64.3%) were foreign investments while RM10.1 billion (35.7%) domestic (MIDA, 2013).

As more organisations come to rely on project structures and tools, and to ensure the success of industrial projects, it is essential to determine factors that lead to better project management practices for sustainability and viability (Latonio & Garcia, 2007). In this study, factors affecting industrial projects performance have been analysed to identify areas that may affect the success of industrial projects within an agreeable goal on time and on budget. This study is aim to identifying critical factors which increase the possibility of industrial project success.

The result of this research will be useful for an organisation to identify the key driving factors that lead to industrial projects success. This will allow the organisation to focus on their limited resources on the most important driving factors to enhance the possibility of success and quality of industrial projects output.

1.2 Research Background

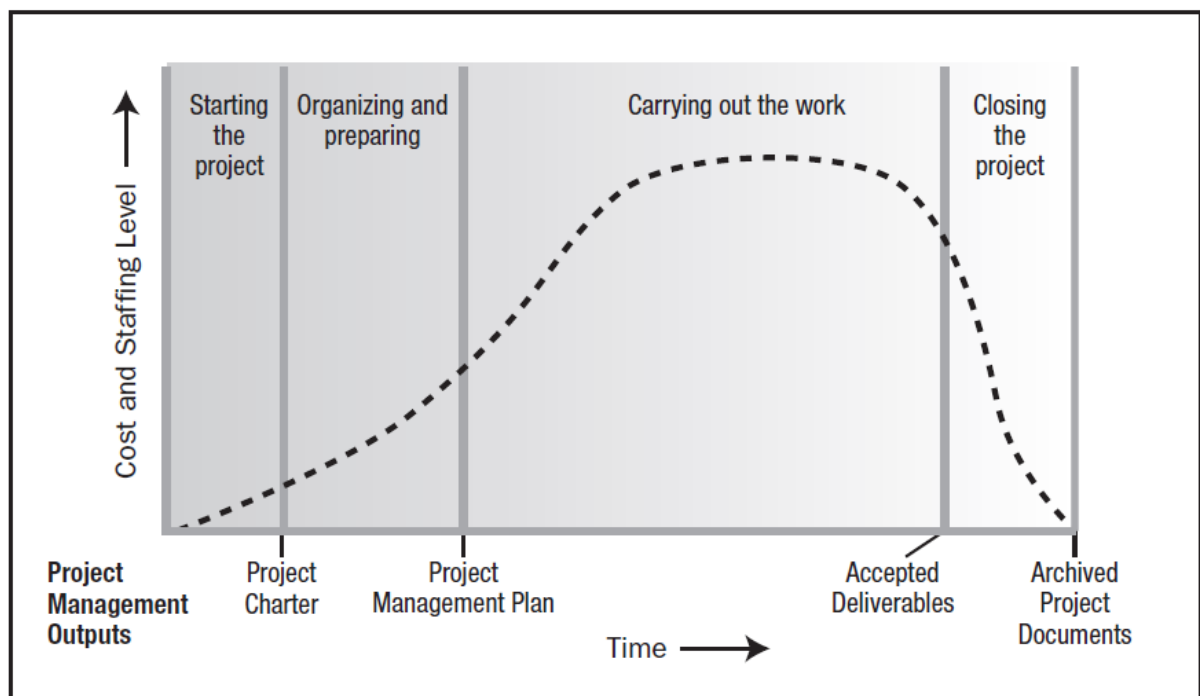
A project is a temporary endeavour undertaken to create a unique product, service, or result and the application of knowledge, skills, tools, and techniques to meet the project requirements is project management (PMI, 2008). In most of the industrial sectors worldwide, a project team is a cross-functional team that consists of specialists from multiple areas to accomplish a specific and unique goal. Therefore, the process of successful implementation and completion of industrial projects has drawn the attention of top management and researchers (Moretti & Oscar, 2009).

Generally, every industrial project is surrounded by three constants: quality, time and budget (PMI, 2008). The relationship among these factors is such that if any one factor changes, at least one other factor is likely to be affected. For example, if the schedule is shortened, often the budget needs to be increased to add additional resources to complete the same amount of work in less time. If a budget increase is not possible, the scope or quality may be reduced to deliver a product in less time for the same budget (PMI, 2008). Hence the aims of all industrial projects are to deliver the project scope on time and within the budget.

The challenges of all industrial projects are on how to monitor and control the change and risk that come along. The knowledge that is used to monitor and control change and lead the cross-functional team is called project management. According to Project Management Institution (PMI), project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements (PMI,

2008). In detail, it is accomplished through the appropriate application and integration of the 42 logically grouped project management processes comprising the five process groups are have been identified as project life cycle, that includes initiating, planning, executing, monitoring and controlling, and closing. These five phases define the general characteristics of projects and ways to manage them.

Figure 1: Project Life Cycle and Cost Level



Note: Adpated from PMI. (2008). *A guide to the project management body of knowledge : PMBOK guide* (4 ed.). Newtown Square, Pa: Project Management Institute.

Most organisations form project teams to accomplish a specific goal that requires expertise from multiple areas which cannot be done by any single functional department only. As the market changes rapidly form day to day, an organisation need to change itself to suit to new market trends, and buying patterns. This increases the need of industrial projects to handle special assignments that are non-repeating, each having different objective and targeted timeline (Chan, Zailan, & Fernando, 2009).

In companies, the sustainability of business based on the main good or service that a company provides. Therefore, for a normal industrial project, the cross-functional team is formed by staff from various functional departments who have their own daily work rather than specially selected just to work on single project (Stewart, 2010). This forms some kind of matrix in the organisation structure that requires certain staff to report to two leaders and work in two or more teams. This new trend can be found in lots current organisations and this is targeted area to be analysed in this study.

1.3 Problem Statement

Today, the globalized market is changing fast. In order to suit the new buying pattern and market trends, companies use project team to develop new and specific task such as develop new business area, commissioning of equipment and establishing a new production line. Based on the report from Malaysia Investment Development Authority, the total investment in industrial projects from January to September 2013 have already exceeded RM 28 billion and continue to increase. This strong demand on industrial projects strengthens the need to ensure successful of industrial project implementation. However, usually the project team or cross-function team in an organisation comprises a project manager and members from various functional departments and few outside vendors (or client). In this case, it forms a matrix in the organisation structure where by members are now reporting to two or more managers at the same time leading to an increased the workload of each member thus with greater risk of failure. (Stewart, 2010).

Besides, industrial projects are usually characterised by having stakeholders at the top management level. With multiple industrial projects been running at the same time, sustaining the business of companies is usually not the industrial projects itself but the normal production of good or providing servicing. Hence companies need special response team to solve non-repeating and special objective tasks. As a result,

companies which form project teams may not be a project-orientated company. For example car manufacturer make money by making and selling car and developing a model is an investment which does not directly make money. This means project team members are required to perform daily normal production work duties and project tasks at the same time. This is in the light of the misconception that sustaining a completing finish special industrial project but more engaging in day-to-day repeating activities. This has increased the difficulty in implementing industrial projects successfully (Emami & Talebi, 2011).

The objectives of project teams in companies are to develop potential business and create new opportunities. The approval of industrial projects is usually via business case presentation to the board of directors to determine the possible return of investment, strategy time to complete the industrial project and budget been given to industrial project. All industrial projects serve the purpose to create new businesses that are aligned with the long term strategy of company. Hence, industrial project have very high constraints such as the requirements to finish within a strategic time regardless of its feasibility, having a highly limited budget in order to reduce capital as much as possible, and lastly, risking a change in the scope of projects due to market change (Chan, Zailan, & Fernando, 2009). Such, financial and commercial constraints presented to project teams are very challenging.

On another hand, as the need of industrial project grow, both the popular business and research literature regarding project management have grown significantly since the field has become a point of professional focus in the 1950s. There have been great advances in the contributions to the project management body of knowledge. There are over 500 books on project management topics, and a few thousand books on closely related subjects (Moretti & Oscar, 2009). However, the occurrences of industrial project failures, delays, continue to happen with most projects failing to meet time and budget goals and many industrial projects have been forced to change the original project scope. Incomplete requirements, lack of user involvement, lack or resources, unrealistic expectations, lack of executive support,

changing requirements and specifications, lack of planning, functionality no longer needed and others are reason that result in failure of industrial project (Stewart, 2010).

Table 1: Projects approved by major industry in Malaysia January to September 2013

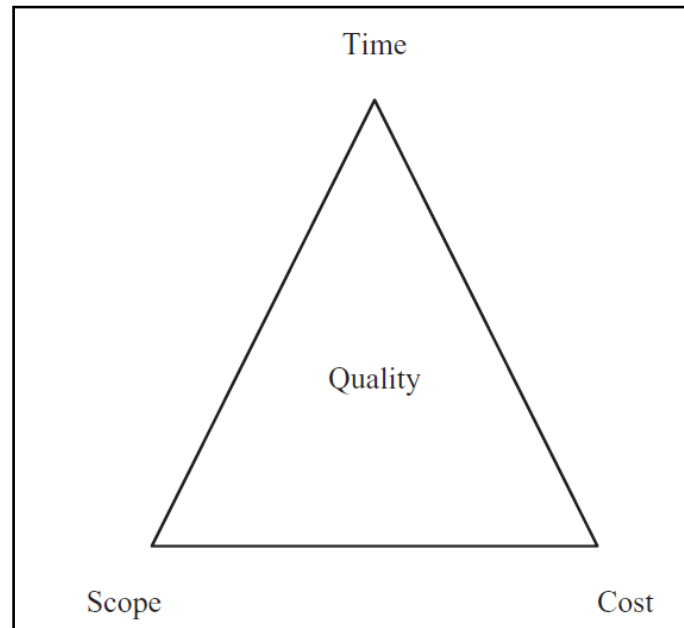
	January – September 2013			2012		
	Domestic Investment	Foreign Investment	Total Capital Investment	Domestic Investment	Foreign Investment	Total Capital Investment
Electronics & Electrical Products	842,924,439	7,489,986,106	8,332,910,545	734,646,522	3,251,983,817	3,986,630,339
Basic Metal Products	766,733,291	4,026,414,436	4,793,147,727	1,859,052,914	1,934,001,846	3,793,054,760
Petroleum Products	2,308,750,000	2,319,460,000	4,628,210,000	4,660,582,788	1,376,849,350	6,037,432,138
Food Manufacturing	1,613,155,584	1,991,724,901	3,604,880,485	2,281,438,768	1,118,046,785	3,399,485,553
Transport Equipment	2,253,035,275	1,120,991,661	3,374,026,936	5,931,898,186	1,923,806,353	7,855,704,539
Chemical & Chemical Products	1,661,383,298	669,521,162	2,330,904,460	766,307,156	5,671,152,008	6,437,459,164
Non-Metallic Mineral Products	857,400,314	1,040,182,509	1,897,582,823	321,858,996	310,042,930	631,901,926

Note: Adpated from MIDA. (2013, Dec). Projects approved by major industry, January to September 2013. Retrieved from Malaysian Investment Development Authority (MIDA) Official Web Site: [http://www.mida.gov.my/env3/uploads/FactsFiguresPDF/JanSep2013/by Industry .pdf](http://www.mida.gov.my/env3/uploads/FactsFiguresPDF/JanSep2013/by%20Industry.pdf)

Besides, most of the previous researches focusing on relationship between successful project implementation and single or multiple independent variables. Results of these researches were only proving that whether there is any significant relationship between each independent variables and successful project or not. Organisations and companies are not able to draw conclusion on those reports to say which the most important area is they should be improving.

As summary, purpose of this study is to determine the relationship between six independent variables and success of industry projects in Malaysia. Result of this study shall allow organisations will then be able to focus their limited resources to improve themselves on the most critical areas.

Figure 2: General measurement of project success



Note: Adapted from Huffman, B. J., & Kilian, C. M. (2012). The Flight of the Phoenix: Interpersonal Aspects of Project Management. *Journal of Management Education*, 36 (4), 568-600.

1.4 Research Objectives

The objective of this study is to identify the factors that most influence to industrial project output or industrial project success. By identifying all these factors, it allows organisation, future industrial project leaders and management to focus their limited resources to improve on the most influencing factors which lead to the success of industrial project completion.

The following objective will be analysed in following chapter:

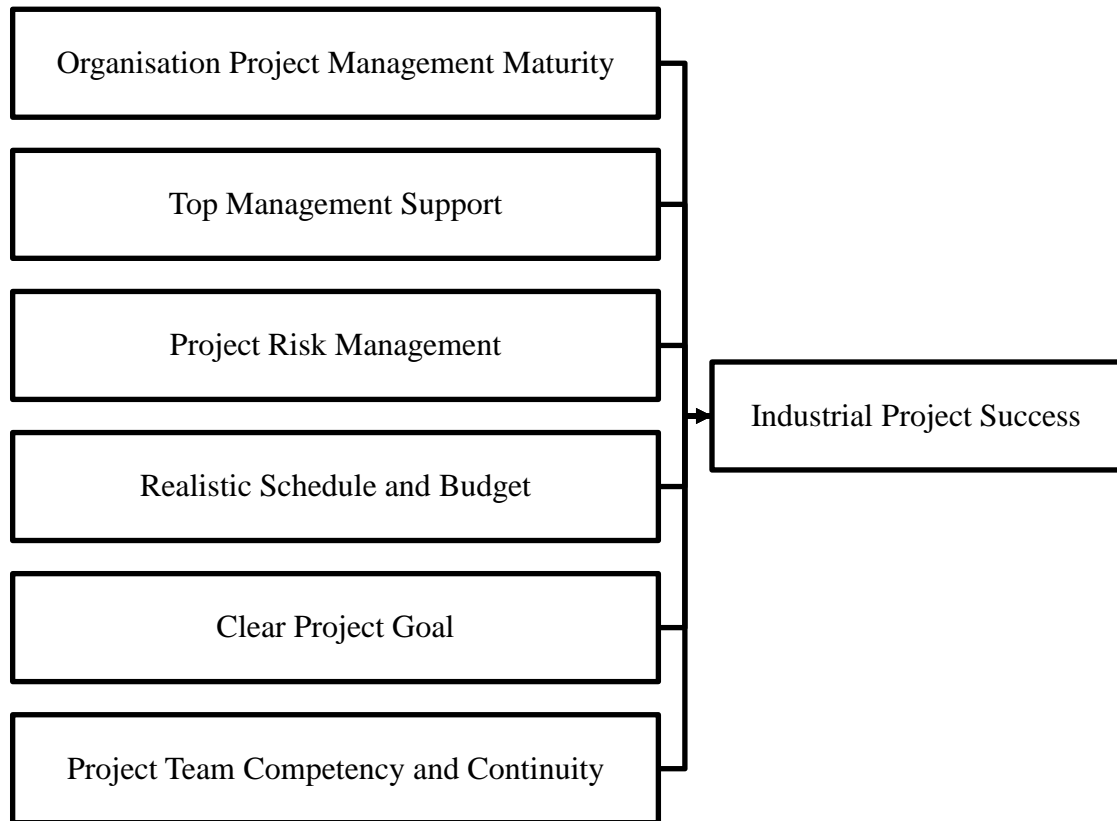
- Study the relationship between levels of organisation project management maturity and success of industrial projects
- Identify the relationship between level of top management support and success of industrial projects
- Identify the relationship between project risk management and success of industrial projects
- Identify the relationship between realistic schedule and budget and industrial project output
- Identify the relationship between clear project goals and success of industrial projects
- Identify the relationship between project team competency and continuity and success of industrial project

1.5 Research Questions

The following research questions will be discussed in following chapter:

- How does the level of organisation project management maturity affect the success of industrial projects?
- How does the level of top management support affect the success of industrial projects?
- What is the relationship between project risk management and the success of industrial projects?
- How does realistic schedule and budget help to lead to industrial project success?
- What is the relationship between clear project goals and success of industrial projects?
- What is the relationship between project team competency and continuity and the success of industrial projects?

Figure 3: Research Framework



1.6 Hypotheses

The following hypotheses have been defined by assuming that the success of a project is delivered to an agreed scope on time and within budget (Kloppenborg, 2009).

H₁ = There is a positive relationship between level of organisation project management maturity and success of industrial projects.

H₂ = There is a positive relationship between degree of top management support and industrial project success

H₃ = There is a positive relationship between project risk management and industrial project success.

H₄ = There is a positive relationship between setting realistic budget and schedule and industrial project success

H₅ = There is a positive relationship between clear project goals and industrial project success

H₆ = There is a positive relationship between project team competency and continuity and industrial project success

1.7 Significance of the Study

In world of industry, it is mandatory for a project team to deliver specific organisational goal and form cross-functional team by gathering experts from various area. The purpose of this industrial project may not to sustain organisational business directly but more to develop potential business and creating new opportunities (Chan, Zailan, & Fernando, 2009 and Emami & Talebi, 2011 and Stewart, 2010). Successfully delivering industrial project goal on time and within budget has drawn the attention of recent research and management to minimize loss due to industrial project failures. Furthermore, most of the previous researches only focusing of whether significant relationship presented between potential factors and success of industry projects. Therefore, determining the significant factors and level of significance of each factor is important so that the management can narrow down the area of focus and ensure the success of industrial projects.

1.8 Summary

Organisations worldwide use project management to “enable innovative processes, to plan, organize and control strategic initiatives, to monitor enterprise performance, analyse significant deviations and forecast their impact on the organisation and project(s)” (Latonio & Garcia, 2007). This study focuses on industrial projects than lead by project manager within the organisation itself to accomplish unique organisational goal for development purpose or complete a special and non-repeating event. Hence, identifying the critical factors that may affect the success of industrial projects is important for the project leader and management to ensure that industrial project can be accomplished on time and within the budget.

CHAPTER 2

LITERATURE REVIEW

Today, project management is key element in organisations. It has drawn the attention of senior management toward the success of industrial project which directly affects business profitability (Belout & Gauvreau, 2004). From the 1960s, project management specialists and researchers started to discover the key driving factors that lead to the success of industrial project and found wide range of result on different type of projects (Cooke-Davies T. , 2002). At the beginning stage of project management research, researchers identified people-related factors and project-technical-related factors as the drivers of success of project (Scott-Young & Samson, 2008). These finding only conclude there is significant relationship between various analysed factors and success of industry projects; but it is almost impossible for organisation to improve on all areas. Thus, more in-depth examination of relationship among factors identified is required to determine which the most influencing factors are. The purpose of this research is to review the findings of recent researches and determine the relationship of those factors and success of industry projects.

2.1 Concept of Project Management

2.1.1 Project Management and General Management

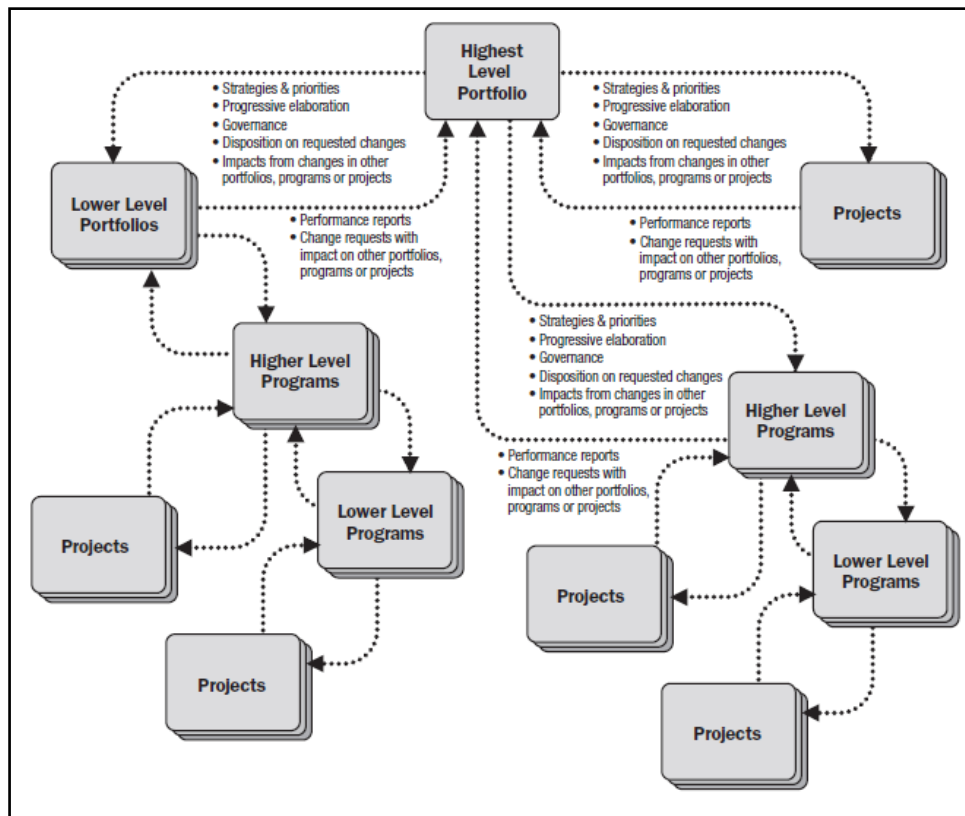
Management encompasses all the decision, actions and activities carried out by one or more persons for the purpose of planning, predicting and controlling the actions and decisions of others in order to achieve an objective or complete a task that could not

be achieved by the others acting independently. This include planning, organizing, staffing, directing, delegating and controlling the process of achievement of the goals (Madic, Trujic, & Mihajlovic, 2011). This can be further classified into different discipline such as strategy management and risk management. One of the management activities include project management which was one of those which started at the early stage of the 20th century when, during the World War I, the first Gantt chart created. Project management was emerged in 1950s with total project management techniques (TPM), critical path method (CPM) and program evaluation and review technique (PERT) methods and product data management (PDM) method invention.

The concept of project management was officially accepted as a special management discipline in the 20th century. Today, in large and mature project management organisations, project management exists in a structured context led by portfolio and program management with portfolios being the highest level that controls overall organisational strategies and priorities. Program management is the second level that controls multi projects under a single program.

Under project management office, as shown in Figure 4, it can be further divided into three levels which are portfolios management, programs management and project management. Portfolios is a collection of projects and programs that are grouped together to facilitate effective management that work to meet overall organisational and business strategy. Whereas programs is a group of related projects managed in a coordinated way to obtain benefit and to control individual projects. Lastly, project is the final portion of overall projects created directly under portfolios or programs which consists of multiple components (Kloppenborg, 2009). Organisational planning will create impact to projects by means of project prioritization based on resources, the organisation's strategic plan and others which an organisation can prioritize by direct the funding, support, resources based risk assessment (Maylor, 2005).

Figure 4: Relationship between portfolios, programs and projects management



Note: Adpated from PMI. (2008). *A guide to the project management body of knowledge : PMBOK guide* (4 ed.). Newtown Square, Pa: Project Management Institute.

2.1.2 Use of Project Manager and Project in Organisation

The project manager is the person appointed by portfolios or top management to lead, achieve and execute the project goal. The role and function of the project manager is different from functional managers or operation managers who run day-to-day activities and oversee production or core business operation (Kloppenborg, 2009). The project manager may report to the functional manager or portfolios manager who ultimately is responsible for the overall strategy execution and programs management. He is responsible to form and lead the project steering team, report to sponsor or stakeholders and control project change. This person ideally should be a flexible, facilitating type of leader who is responsible for the project budgeting, schedule and has a large role in deciding when project tasks need to be completed.

In every organisation, there are functional departments performing the day-to-day business. They manage the execution of activities that provide service or physical product that sustain business. These include production floor, sales teams and others. However, developing new product and specific organisation goal is a need and is important for the development of a long term business, profitability, survival in competition and growth of many services and manufacturing (Emami & Talebi, 2011). Having the capability in developing and starting new products or services that can compete in current and future markets is a competitive advantage of successful companies. This often requires a special cross-functional team or project team to achieve it.

Though temporary in nature, industrial projects can help to achieve the organisational goals, development of new product or any specific goal when they are aligned with the organisation's strategy. Organisations and companies may change their operation method, products specification, or systems to create strategic and suitable business initiatives which then require project management while running operations require business management or operations management (PMI, 2008). Industrial projects can intersect with daily operations at various points during the product life cycle, For example, when a product is in the phase out stage, developing an alternative product or upgrading existing product, improvement of current operations processes is carried out. At each point, deliverables and knowledge are transferred between the industrial project and operations to facilitate execution and implementation of the delivered work. This occurs by transferring industrial project resources and ultimate deliverables to operations towards the end of the industrial project, or through a transfer of operational resources and technical know-how to the industrial project at the start.

2.1.3 Characteristic of Projects and General Practice

Industrial projects can be varying in size and complexity, but generally, each project consists of five stages (or some call project life cycle). Recommended by Project

Management Institution as best practice, each stage consists of various process groups which tell the project leader when to do what as shown in Table-2. This is useful to manage industrial project and communicate or report to top management the progress of industrial project.

- a) The first stage is project initialization where the project scope baseline is determined, the necessary resource identified and organisational resource and stakeholder sign off. At the first stage, cost and staffing level are very low but stakeholder influence and uncertainty are relatively high; it is important for all parties to understand the project scope baseline and possible risk.
- b) The second stage is planning where overall project plan and budget are developed, and the project chapter formed. Team members' responsibilities are clearly defined in this stages and the potential risk will be handle.
- c) The third phase is project execution where the actual development work started and staffing level is high. Cost of change at this stage will be very high and the influence of the stakeholder will be lower since project framework is existed.
- d) The final stage of project closure, where development had been tested and passed on to the customer or functional team to continue. Resources assigned are terminated followed by project review meeting.

Table 2: Project Management Process Groups

Knowledge Areas	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring and Controlling Process Group	Closing Process Group
Project Integration Management	Develop Project Charter	Develop Project Management Plan	Direct and Manage Project Execution	1. Monitor and Control Project Work 2. Perform Integrated Change Control	Close Project or Phase
Project Scope Management		1. Collect Requirements 2. Define Scope 3. Create WBS		1. Verify Scope 2. Control Scope	

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Project Time Management		1. Define Activities 2. Sequence Activities 3. Estimate Activity Resources 4. Estimate Activity Durations 5. Develop Schedule		Control Schedule	
Project Cost Management		1. Estimate Costs 2. Determine Budget		Control Costs	
Project Quality Management		Plan Quality	Perform Quality Assurance	Perform Quality Control	
Project Human Resource Management		Develop Human Resource Plan	1. Acquire Project Team 2. Develop Project Team 3. Manage Project Team		
Project Communications Management	Identify Stakeholders	Plan Communications	1. Distribute Information 2. Manage Stakeholder Expectations	Report Performance	
Project Risk Management		1. Plan Risk Management 2. Identify Risks 3. Perform Qualitative Risk Analysis 4. Perform Quantitative Risk Analysis 5. Plan Risk Responses		Monitor and Control Risks	
Project Procurement Management		Plan Procurements	Conduct Procurements	Administer Procurements	Close Procurements

Note: Adpated from PMI. (2008). *A guide to the project management body of knowledge : PMBOK guide* (4 ed.). Newtown Square, Pa: Project Management Institute.

2.2 Research Focus

Organisations sustain their own business through day-to-day operation that provides good and service. However, in order to ensure long run success and growth of organisation, developing and commercializing new product are critical factors. To achieve the specific goal or to complete a development, an organisation will form a project team or cross-functional team and appoint a project manager to lead people from various functional area or even external support by using limited amount of resources and completing it within a limited time frame (Emami & Talebi, 2011).

As more organisations come to rely on project structures and tools, ensuring the success of industrial projects and determining factors that lead to better project management practices have become essential to sustainability and viability (Latonio & Garcia, 2007). However, each organisations or company will only have limited resources to develop limited items; thus, it is important for organisations, especially organisations which are new to projects, to know the most influencing factors that can increase possibility of industrial project success. By knowing what to focus on, organisations can then focus their limited resources to strengthen the important area.

Hence, this research is aimed at determining the influencing factors of industrial project outcome and key success factors of industrial projects. Before collecting the primary data; a review on previous researches was done. The result of this meta-analysis is shown in Table-3 where seven factors were identified as most commonly identified in previous researches. Among these seven factors, organisational project management maturity level, project risk management, realistic schedule and budget, clear and frozen project goal, top management support, and project team competency are factors that companies or organisation are able to control. The last factor – leadership of project manager is a personal factor that is controlled by the individual project leader. Thus, this research will only focus on the first six factors.

Table 3: Meta-Analysis

NOTE: “√” mean that factor was a influencing factor toward success of project in the relevant research.

	Organisation Project Management Maturity Level	Project Risk Management	Realistic Schedule & Budget (Realistic Planning)	Clear and frozen project goal	Top Management Support	Project Team Competent and Continuity	Leadership of Project Manager
Scott-Young & Samson, 2008				√	√		
Belout & Gauvreau, 2004					√		
Chan, Zailan & Fernando, 2009				√	√		
Young & Jordan, 2008					√		
Milosevic & Patanakul, 2005	√						
Parker & Skitmore, 2005						√	
Bakker, Boonstra & Wortmann, 2010		√					
Cooke-Davies, 2002	√	√					
Rad & Levin, 2003	√						
Jia, Chen, Xue, Chen, Cao, & Tang, 2011	√						
Cooke-Davies & Arzymanow, 2003	√						
Swink, 2003				√			
Khan, Gul, & Shah, 2011						√	
Nasir & Sahibuddin, 2011a	√	√	√	√	√	√	√
Chan, Zailan, & Fernando, 2009				√	√	√	
Nasir & Sahibuddin, 2011b			√	√	√	√	
Li, Lu, & Peng, 2011				√			
Latonio & Garcia, 2007	√					√	√
Stewart 2010	√	√					
Al-Husseini & Abdel-Mahdi, 2006							√
Nwagbogwu & Chukwuemeke, 2011				√			

Jones & Deanice, 2008							√
Moretti & Oscar, 2009	√		√	√	√	√	√
Dvir & Lechler, 2004			√	√			
Bakker, Boonstra & Wortmann, 2012		√					
Dvir, Rax, & Shenhar, 2003			√	√			
Verburg, Bosch-Sijtsema, & Vartiainen, 2013						√	
Jiang, Klein, Wu, & Liang, 2009				√			
Yang, Huang, & Wu, 2011							√
Pinto & Slevin, 1987			√	√	√	√	
Davis, 2008							√

2.3 Dependent Variable - Success of Projects

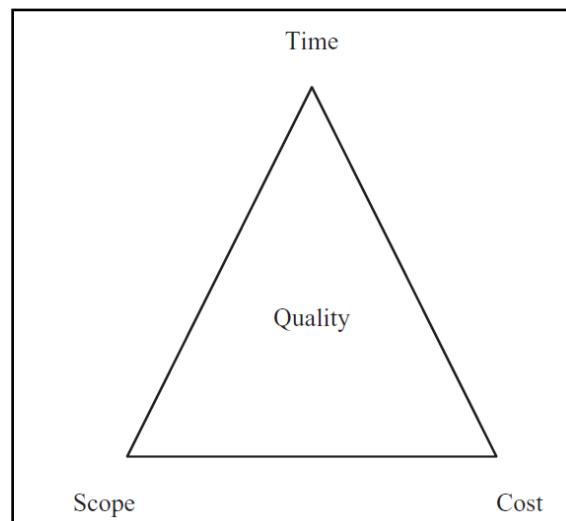
A distinction needs to be made before examining the findings of different researches between industrial project success criteria (how to measure project success) and industrial project success factors (elements that lead to project success). Industrial project success criteria (or measurement of project success) are the measures by which success or failure of an industrial project will be judged but industrial project success factors are those inputs from company management system or controllable sources that lead directly or indirectly to the success of the industrial project (Cooke-Davies T. , 2002).

Industrial project success criteria have been defined from different perspectives. In the research of Milosevic D. (2005), industrial project success is measured by the degree of industrial project success operational as multi-item construct aggregating the degree of projects accomplished on schedule, budget, deliverables quality and customer satisfaction goals. In traditional approaches, industrial project success was evaluated from the golden triangle which includes time, cost and quality perspective as shown in Figure 5 (Zanjirchi & Moradi, 2012). Furthermore, today's industrial

project success is, also, measured through many other aspects such as stakeholders' satisfaction, organisational objectives, project's sponsors or customers' benefit, future potential to companies, and others (Scott-Young & Samson, 2008).

Generally, most of the studies have focused on the factors influencing industrial project success and on the ways in which it is measured. Since the objectives of the industrial project are different and are influenced by sets of success factors, the various stakeholders perception of the project success and success factors are different too. For the purpose of this research, industrial project success is defined as the golden triangle in which industrial project is completed on time, within the set budget and within project baseline scope.

Figure 5: Project Golden Triangle



Note: Adapted from Huffman, B. J., & Kilian, C. M. (2012). The Flight of the Phoenix: Interpersonal Aspects of Project Management. *Journal of Management Education*, 36 (4), 568-600.

2.4 Independent Variable Affecting Project Success

A meta-analysis completed to review previous research on factors that affect industrial project performance and output. Among all driving factors, six factors that are identified by most researchers are selected for future study in this research. All these six driving forces are factors that companies are capable of controlling to increase the possibility of successful industrial project implementation.

2.4.1 Organisation Project Management Maturity

According to Dragan Milosevic and Peerasit Patanakul, the degree of organisation maturity level in project management (or so call standardization of project practices) will influence the chances of industrial project success (Milosevic & Patanakul, 2005). This standardizing process makes organisation more mature in project management by providing a guide to all project leaders and setting up standard practices on how industrial project should be carried out. Furthermore, the international body of project management (project management institution) has issued a new standard, the organisational project management maturity model; this further explains the importance of maturity and the influence of maturity level on the chances of industrial project success (Organizational Project Management Maturity Model (OPM3), 2008).

Although all organisations have the capability to run varying sizes of industrial projects, not all organisations are familiar with projects. “Maturity Level of Organisation in Project Management” can be used to determine and measure the effective project management policies and procedures in each organisation (Latonio & Garcia, 2007). Besides, by having standardized practice and procedure does not necessarily mean that a project management has matured; a distinction should be made between having procedures in office without enforcing it and practiced according to the existing procedures on a regular basis (Rad & Levin, 2003)

Besides, the organisation project management maturity level can be used to assess the effectiveness of the prevailing project management procedures and policies, particularly on how well and how regularly the project management personnel follow the established policies and procedures. The established ranking scale of a maturity model will provide plateaus for the purposes of continuous improvement of project management capabilities (Rad & Levin, 2003).

According Rad & Levin (2003) and Latonio & Garcia (2007), the organisational maturity model can be explained by using a one to five scale or five levels of maturity, as shown in Table 4, to assess the organisation's establishment and use of formal project management practices and the integration of these practices within the organisation. Level one companies reported no formal processes and practice project management on an ad-hoc basis and do not have formal project management procedures resulting in inconsistent practices and infrequent project performance predictability (Rad & Levin, 2003). These companies may experience cost overruns, schedule delays and defective deliverables projects. On the opposite side, in Level five company, project management office have greater responsibility in supporting day-to-day business and implement a high level of standardized project management procedures to ensure effective project implementation and exemplifies project management success as a norm and concentrates on continuous improvements (Rad & Levin, 2003).

The higher maturity level of project management in organisation indicated that the organisation is well-prepared in project management procedures. This culture is widely accepted by all members whom would be helpful for the project manager to run a project smoothly and lead to the success of industrial projects. Project Management Maturity will be able to help organisations to improve the effectiveness of their project management processes, in terms of an evolutionary path from ad-hoc, unstructured processes to mature, well organised project management processes (Chan, Zailan, & Fernando, 2009).

Table 4: Organisational Project Management Maturity Model

Maturity Level	Description of Organisation
Level 5 Optimizing with a Focus on Continuous Improvement	In Level 5 organisations, project management is consistently applied efficiently and effectively, resulting in project success. Project management is viewed as a critical business process and efforts are made to continuously improve the project process.
Level 4 Comprehensive or Integrated	In Level 4 organisations, the project management culture is widely accepted and adherence to project processes result in successful projects.
Level 3 Integrated or Structured	Level 3 organisations have integrated, documented, and standardized project management methodologies, tools, and techniques.
Level 2 Consistent or Repeatable	In Level 2 organisations, project management has been introduced and efforts are being made to gain wide acceptance of methodologies, tools, and techniques.
Level 1 Ad-hoc or Basic	Level 1 organisations do not have formal project management procedures, resulting in inconsistency and unpredictable project performance.

Note: Adapted from Rad, P. F., & Levin, G. (2003). Is your organisation friendly to projects. *AACE International Transactions*, 41-46.

In the research of Milosevic & Patanakul (2005), maturity level has been further proven as helpful in increasing the possibility of industrial project success in the study; seven project management maturity tools are identified in this research which have proven to influence project successes. These are standardized PM tools, leadership and process, standardized PM organisation, information management system and metrics; and culture of organisation project management maturity (Milosevic & Patanakul, 2005).

Besides, in the research of Papke-Shields, Beise & Quan (2010), they support the assumption between high organisation project management maturity level (use of project management standard practice) and increased industrial project success. In this research, industrial project success is significantly influenced by the adoption of formal project management practice, where organisations promote project management standard and individual practitioners improve their own knowledge through project management certification (Papke-Shields, Beise, & Quan, 2010)

Furthermore, by analysing the mega projects run by multiple companies, it is proven that the organisation project management maturity level can improve the effectiveness and capability of organisations while integrated program management organisation maturity model can improve effectiveness of projects run by multiple cooperation (Jia, Chen, Xue, Chen, Cao, & Tang, 2011).

2.4.2 Top Management Support

Top management is one of the key stakeholders of industrial project; they often play an important role in project team success by aligning the industrial project support with the company development and resources plan (Nasir & Sahibuddin, 2011). Besides, top management support can also be defined as “the willingness of top management to provide the necessary resources and authority for industrial project success” (Belout & Gauvreau, 2004).

In the research of Scott-Young (2008), it is suggested that top management shows a high degree of influence to industrial project success by measuring five dimension statements. These are: top management is responsive to request for additional resources; top management shares the responsibility to ensure project success; top management gains sufficient authority; top management support team in crisis and top management supports decision made by project team. Besides, top management

support plays a critical role in project team success by providing essential political backing and aligning the resource to project need.

Swink (2003) suggests effective top management provides a clear vision of market concept which leads to explicit goals thought to help resolve design conflicts and to keep industrial project on track. More important explicit communication help to accelerate industrial project progress by providing guidance as project leader seek to rationalize activities and reduce industrial project scope to save time. This ultimately led to success in industrial project deliverables (Swink, 2003).

Top management support, as a significant predictor of industrial project success, is also a necessary condition for carrying on with subsequent operations in terms of the operating means to be implemented (Belout & Gauvreau, 2004). Besides, Belout and Gauvreau (2004) found that this element is more important during the planning stage to ensure that industrial project is designed in a correct structure and able to communicate the industrial project's mission clearly during the planning stage.

Besides, Young & Jordan (2008) found that top management support is not simply one of the many success factors needed for industrial project success but is the most important factor. In their research, top management support is realigned in the approach and reconsidered from the perspective of the most relevant stakeholder. It is to study how important top management support is and what constitute effective top management support (Young & Jordan, 2008).

Furthermore, Chan, Zailani and Fernando (2009) measure top management support by providing sufficient authority and resources for the approved industry project, be part of the project team and share the responsible with project team, communicating with project team members and project stakeholders; and supporting the project team in time of crisis. In their research, top management support is playing significant roles in ensuring a successful project outcome (Chan, Zailan, & Fernando, 2009).

As summary, top management support shows significant influence power over project outcome. It can be measured by the degree of management willingness to share responsibility, support during crisis, communicate and monitor the project team progress and provide the team sufficient authority to run the mission.

2.4.3 Project Risk Management

A risk is an uncertain event that if it occurs, has an effect on at least one project objectives which can include schedule, cost and scope or quality (Atika, 2011). A risk may have one or more causes and impacts if it occurs which can bring negative or positive impact to overall project; where risk which brings negative impact to a project is defined as threats and risk and where it brings positive impact called opportunity (PMI, 2008). Carrying out proper risk management along the project from starting until project closure could be a critical factor that affects the success of a project.

Table 5: Probability and Impact Matrix

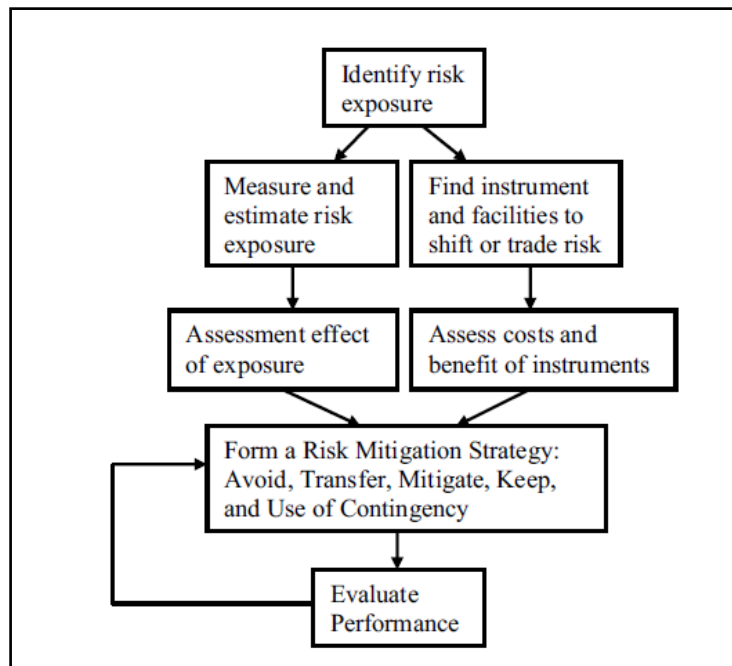
		Threats					Opportunities				
		Very Low	Low	Medium	High	Very High	Very High	High	Medium	Low	Very Low
*Impact	Probability	0.05	0.10	0.20	0.40	0.80	0.80	0.40	0.20	0.10	0.05
	Very High 71-90%	0.90	0.05	0.09	0.18	0.36	0.72	0.72	0.36	0.18	0.09
High 51-70%	0.70	0.04	0.07	0.14	0.28	0.56	0.56	0.28	0.14	0.07	0.04
Medium 31-50%	0.50	0.03	0.05	0.10	0.20	0.40	0.40	0.20	0.10	0.05	0.03
Low 11-30%	0.30	0.02	0.03	0.06	0.12	0.24	0.24	0.12	0.06	0.03	0.02
Very Low up to 10%	0.10	0.01	0.01	0.02	0.04	0.08	0.08	0.04	0.02	0.01	0.01

Note: Adapeted from Probability and Impact Matrix. (2011). Retrieved from Power Project: <http://powerproject.ca/help/glossary/probability-and-impact-matrix/>

Project risk management includes the actions of conducting risk management, risk identification, impact analysis, alternative actions, contingency response planning, and monitoring and control on a project. It aims to reduce the probability of negative event and its impact if occur; and increase the probability and impact of positive events (PMI, 2008). As recommended in PMBOK (2008), one of the common methods used in risk management is to quantify the risk probability of happening and impact if it occurs and to categorise risks into different ranking. As in Table 5, dark grey area (with the largest numbers) represents high risk, the medium grey area (with the smallest numbers) represents low risk; such risk-ranking table enhance the visibility and allow management focusing on high ranking risk.

In the research of Stewart (2010), project risk was measured by people-related risk and process-related risk. He defines people-related risk that includes poor human resources knowledge level, weak communication between members, lack of participation of stakeholder; and process-related risk that includes lack of documented requirements, no change control process, ineffective schedule planning and others. This shows that the presence of proper risk management and availability of previous risk management document or procedures will bring a high degree of influence on project success (Stewart, 2010).

Figure 6: Risk Management Process



Note: Adapted from Atika, J. A. (2011). Barriers to Effective Project Risk Management. *Universiti of Calgary*.

As reported by Atika (2011), the importance of risk management is that all stakeholders should have a clear and common understanding of what risk management should accomplish and also, the emphasis on taking a proactive approach to risk management. Besides, political, social and ethical dimensions should not be neglected (Atika, 2011).

Decision making depends on individual perceptions, organisational setting, prevailing situations, intuition and judgments, and as such, these factors affect how risk is perceived, assessed, evaluated and dealt with as shown in Figure 6. Therefore, it is important for the project manager to understand how risk is determined and understanding intent and risk behaviours (organisational/individuals) and managing expectations of project stakeholders. This requires the project manager perspective toward risk and reaches a common understanding with all members in the project team (Atika, 2011).

Bakker, Boonstra and Wortmann (2010) carried out a meta-analysis on risk management that shows that although risk management is an instrument to deal with the success of project by identify the potential technical risk factors and organisational risk factors are critical. Furthermore, project risk management contributes to success of industry projects because, while being particle, projects' stakeholders are aware of the fact that there are potential negative events and risks under uncertain situation; with this finding, they will be able to take early preparation or never adjust their requirements, expectations and behaviour accordingly (Bakker, Boonstra, & Wortmann, 2010).

In a later risk management study done by Bakker, Boonstra and Wortmann (2012), risk management activities on project success are indicated by the number of individual stakeholders. This shows that a risk management activity that was used on project has contributed to the project success of industry projects; the number of statement from individual stakeholders in which they indicate how a risk management activity contribute to project success; and the type of effect that stakeholders attribute to the use of risk management. The study concluded that risk identification by all stakeholders is considered to be the most influential risk management followed by risk reporting, risk registration and risk allocation, risk analysis and risk control (Bakker, Boonstra, & Wortmann, 2012).

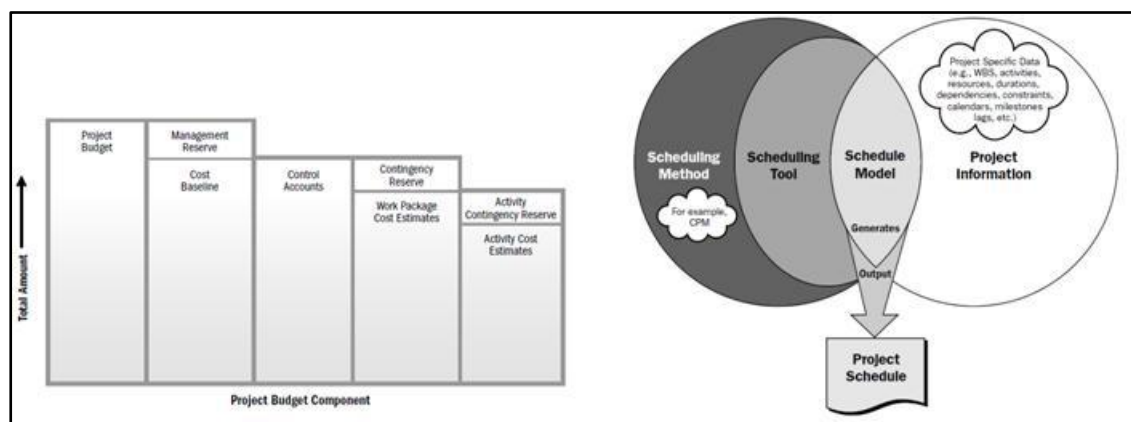
To sum up, risk management is an element that allows the project leader to identify and manage uncertainty and eliminates the gap between stakeholders (Jiang, Klein, Wu, & Liang, 2009). Thus, increase the degree of control power over the project and leads to project success.

2.4.4 Realistic Schedule and Budget

Each project life cycle consists of project initiation, planning, execution, monitoring and controlling; and project closure. Project planning is the second stage of project to

define what would be done and how things will be done in the later stages. One of the project management professional bodies – project management institute defines this planning stage as project management plan. This is a process of defining, preparing and coordinating all subsidiary plans and integrates them into a comprehensive plan including ultimate project deliverable (be called as project scope baseline in PMBOK), project budget and project schedule (PMI, 2008).

Figure 7: Project Budgeting and Scheduling Elements



Note: Adaped from PMI. (2008). *A guide to the project management body of knowledge : PMBOK guide* (4 ed.). Newtown Square, Pa: Project Management Institute.

Project schedule and budget, as output of project planning, have become a standard of measurement; and the quality and importance of project planning has been considered a major deliverables of each successful industry project (Dvir & Lechler, 2004). Project Management Institute establishment in 1969 has further strengthened this notion in the project management body of knowledge by strongly advocating the importance of project planning. Important of project planning is also supported by studies which corroborates it as one of the critical element that influences the success of a project.

During the planning stage, a realistic project plan, including realistic project schedule and project budget, serve as a guide for the team to work toward project success. A

project with a plan does not guarantee success but a project without plan will probably guarantee failure (Dvir, Rax, & Shenhar, 2003).

Realistic project planning allows the team to work toward the project goal and work against any changes that might happen during the execution stage (Dvir & Lechler, 2004). In study by Dvir and Lechler (2004) on 448 projects, they analysed the interaction between project planning variables, quality of planning, project scope and goal changes, project plan-changes during execution and project success. The degree of realistic planning or quality is measured by seven factors include entire task was structured in work packages, every work package was allocated within a specific time allowance and the team knew which activities contained slack time or slack resources. All work packages had a predecessor and successor where a detailed budget plan, and precise demand for key personnel was specified. The results clearly show that the most influencing element over project success is project planning variable.

A study done by Dvir, Rax, Shenhar (2003) examined the relationship between project planning and project success by considering planning which include three aspects which are: requirements definition, development of technical specification and project management processes and procedure. Their findings suggest that project success is positively correlated to the requirements definition and development of technical specification. This further proves that the importance of including all requirements into project plan is important for project success. Ignoring detail or minor requirements to reduce project budget or shorter the project schedule only creates unrealistic plan which will not lead to project success (Dvir, Rax, & Shenhar, 2003).

A Delphi Study done by Nasir, Sahibuddin (2011) in project critical success factor found that realistic schedule and budget play a critical driving factor toward the success of project. It is a must for the team to present a realistic schedule and resources that are required by project scope. Any negotiations on scope, budget, staffing should be performed in public with minutes of meeting to prevent project

leader from privately acquiescing to unrealistic plan from management or client which would lead to project failure. This study also points out that it is important for the project leader to determine the resources it needs to do the work to meet client's business and product goals; this ensures the project is able to deliver the product within realistic resources and plan (Nasir & Sahibuddin, 2011).

To sum up, project plan uses a baseline and guide for all projects. This realistic plan is important especially when risks or unexpected events happen during the execution stages and allows the project to control the changes within a manageable range and then meet the client's goal.

2.4.5 Clear Project Goal

Project goal refer to the results or deliverables set by stakeholders or requirements of board or clients (as defined in business case) that project team want to achieve. Each project may have single or multiple goals that are sorted and prioritized. Goals include the general project philosophy or general mission of the project (Pinto & Slevin, 1987). Besides, the project manager and team members need to clearly understand and focus on their goals for each project so they will be able adopt the appropriate bundles of project team practices which will be able facilitate their goal achievement(Scott-Young & Samson, 2008).

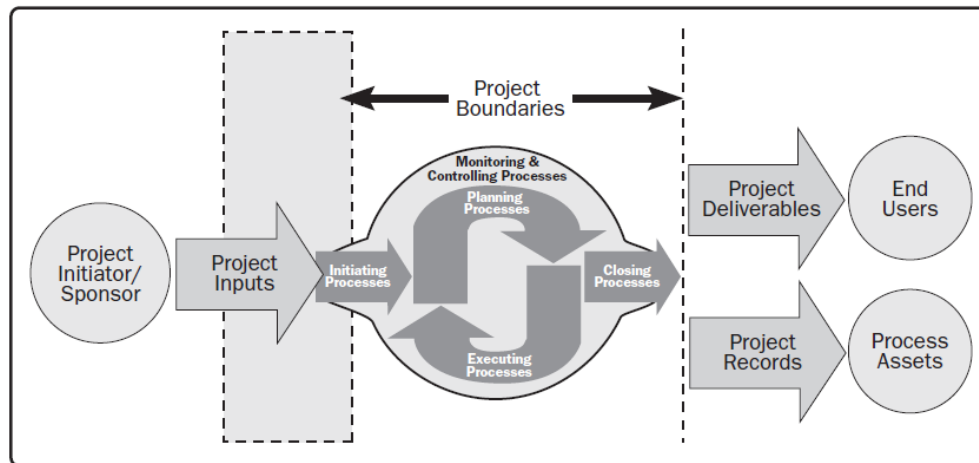
In organisational behaviour study, goals are thought to have positive influence power on the motivation and cognition of project team members. A robust finding of the organisational behaviour research is that goal tends to significantly increase individual performance. In the research of Scott-Yong and Samson (2008), they mentioned clear goals as important in orienting teams towards common objective leading to improved project performance. This research also shows that setting clear project goals in collaboration with the project team reduces cycle time in completing a project.

A study done by Swink (2003) shows that explicit goals related to that vision are thought to help resolve design conflicts between members and able to keep the project on track. Clear goals are more important, especially, in an accelerated project environment because clear communication provides guidance as the project manager seeks to rationalize activities and further reduce project scope in order to save time. It is clear that clear goals would bring benefit to the team through increased effort and persistence. They stimulate the development of specific strategies to attain the goal, and greater commitment in the execution.

In the research of Dvir, Raz and Shenhar (2003), they look into the relationship between the amounts of effort invested in defining the goals of the project and the result of functional requirements or technical specification of the product. Not surprisingly, the relationship with overall success is also positive and significant. The clearer and more specific the goals are, the higher the chances that the project will be successful, especially in the eyes of the end-user. The research propose that each project leader should properly define the project goals and the project deliverables at the initial stage; they also recommend to involve the end-user or clients at this stage to ensure that clear and common understand goals are defined to ensure the success of project (Dvir, Rax, & Shenhar, 2003).

Clear goals and objectives are proven to have significant positive significance toward project success in the Delphi Study done by Nasir, Sahibuddin (2011). They suggest that project goals should be briefed to the entire team. The goals should be clarified, revised and agreed by all members, senior management and relevant stakeholders. In this way, the entire team is made aware of the goals (and constraints), resulting in a better alignment and more realistic assessment of the feasibility of meeting the goal which then leads to project success (Nasir & Sahibuddin, 2011).

Figure 8: Project Goal (called project scope in PMBOK) Defining



Note: Adpated from PMI. (2008). *A guide to the project management body of knowledge : PMBOK guide* (4 ed.). Newtown Square, Pa: Project Management Institute.

The project goal should be defined in the initial stages based on the requirements of clients or stakeholders and the resources committed. This is recorded in the project charter that is agreed and approved by the clients or stakeholder to help to define project boundaries. This also helps to align the requirements and plans with the stakeholders’ expectations. Defining the goal gives all project members and stakeholders the vision of the project – what is needed to be accomplished and how their participation in the project can ensure their expectations are achieved (PMI, 2008)

2.4.6 Project Team Competency and Continuity

Project team members are the driving forces of the entire goal. Quality, continuity and competency of project team members are found to be a critical factor that leads to the success of project. The importance of selecting and, if necessary, training project team members. An important but often overlooked aspect is the nature of personnel involved. In many situations, the personnel selected to be parts of the project team are chosen with less-than-full regard for the skill necessary to actively and continuously

contribute to the successful implementation. It is important that the implementation be well managed by team members who understand it. They must be equipped with adequate technical knowledge to support the project and ensure they stay with the team until project closed (Pinto & Slevin, 1987).

In a global project team, project leader and team members may experience higher levels of diversity, would have differ in their dependence on electronic tools, and have different degrees of geographic dispersion. In this situation, it is more important that project managers are able to communicate effectively, and perform well in dealing with the internal team dynamics within their dispersed teams. Trust among team members, clear communication rules and competent team members are necessary to ensure that the project is able to move forward. The project leader who deals with the vital team should pay more attention to ensure the competency of team members and ensure that effective communication is available to increase project control (Verburg, Bosch-Sijtsema, & Vartiainen, 2013)

A study done by Chan, Zailan and Fernando (2009) projects in Malaysia among manufacturing companies concluded that competent project management personnel and project team member are having significant positive influence power toward success of industrial project. Competent project team consist of a project leader with its technical members from different functional background, who are recruited, trained and possess with specific skills, technical know-how, knowledge and experience to jobs required by the project. When the project is completed and ready to be being delivered and introduced to their clients, the ability of the project team members to demonstrate the deliverables to end-user; present and sell the benefits of the project are crucial to ensure that the project is readily accepted by the each projects' stakeholders and their clients.

In addition, the continuity of project team members and project leader appear to be a significant influencing factor. The study concluded that the continuity of the project team members reduces degree of information loss and keep team motivated; the

continuity of team members also reduces the need of team reforming, and “storming” which usually happen when new faces are working together. The high turnover rate of project team members or leader directly affects the project team performance and negatively disrupts project performance which potentially leads to project failure, delay or over budget (Parker & Skitmore, 2005).

2.4.7 Summary

Organisations sustain their own business by day-to-day operation by providing good and service. However, in order to ensure the long term success and growth of the organisation, developing and commercializing new product and services are critical factor (Emami & Talebi, 2011). To achieve the specific goal or to complete a development, an organisation should form a project team (or cross-functional team) and appoint a project leader to lead people from various functional area or even external support by using limited amount of resources and complete it within a limited time frame (Emami & Talebi, 2011). Therefore, it is important for organisation to understand the influencing factors that lead towards the success or positive outcome of project.

This research aims to determine the key success factors which are controllable by organisations in order to help companies to focus on their limited resources on the most influencing factors. This ensure positive project outcome and increase the chances of project success.

2.5 Development of Hypothesis

An industrial project is a temporary endeavour undertaken by a special team to create a unique product, service, or result. The application of knowledge, skills, technical

know-how, tools, and techniques to project activities to meet the project requirements is being called as project management (PMI, 2008). As more organisations come to rely on project structures and tools, ensuring the success of projects and determining the factors that lead to better project management practices become essential to sustainability and viability (Latonio & Garcia, 2007).

Every organisation or company can initiate industrial projects to accomplish specific organisational goals whenever there is a need of cross-functional teams to finish a temporary task. However, not every organisation has a complete and fully developed structure and system to support the project team and not all are project-orientated companies. Hence, the external forces from the organisation itself play a critical rule (Belout & Gauvreau, 2004).

The first area that affects the success of industrial project is the maturity of organisation in project function. In the research of Rad Parviz (2003), a classical research of organisation system toward project management, he analyses the friendliness of the organisation toward projects in a measurable method. Rab Parviz divided the level of maturity level or friendliness of organisation toward industrial projects into five levels by evaluating organisation's capabilities in managing the following project facets: scope, quality, cost, schedule, procurement, reporting, integration, risk, communication, team morale, vendor relations, and client relations. The levels of maturity define specific goals or objectives that are to be achieved. The goals or objectives at each maturity level are usually presented as results statements. These results statements describe observable milestones to verify whether or not an organisation has effectively implemented certain processes. Therefore, the first hypothesis of the research is focusing on the effect of maturity level of organisation toward project on the success of projects.

H₀: There is a no relationship between level of organisation project management maturity and success of industrial projects.

H₁: There is a positive relationship between level of organisation project management maturity and success of industrial projects.

Additionally, as the inevitable changes occur in industrial project environment, in client expectations, and in the manner by which the project results are created, the host organisation must be supportive of the industrial project needs. Such support would be manifested in a willingness to assign additional people to the industrial project, the readiness to modify the cash flow, and a tolerance for the unusual effects that the industrial project might have on the organisation (Rad & Levin, 2003). Top management support is also a necessary condition for carrying on with subsequent operations in terms of the operating means to be implemented (Belout & Gauvreau, 2004). Top management support needs be realigned in approach and reconsidered from the perspective of most relevant stakeholder to study how important top management support is and what constitute effective top management support (Young & Jordan, 2008).

Measure of top management support can be done by measuring the degree of providing sufficient authorities to the project team, gained necessary resources, be part of the team to share responsibilities with project team for the success of industrial project, and supporting the project team in time of crisis. Hence, the second hypothesis is the influencing power of top management support toward industrial project outcome.

H₀: There is a no relationship between degree of top management support and industrial project's success.

H₂: There is a positive relationship between degree of top management support and industrial project's success.

Besides, every industrial project will face uncertainty or the possibility of certain threats called risk. Risk management refer to the processes of conducting risk management planning, identification potential negative events, analysis the risk and potential impact to the project, developing alternative actions and contingency response planning, and monitoring and control on an industrial project. The objectives are to increase the probability of positive event and enhance the benefit if happened while reducing the probability of negative event to occur and develop necessary actions to minimize the impact of negative events in the industrial project if there is any (PMI, 2008). However, nowadays industrial project leader are faced with a lot of challenges due to the increasing complexity in the nature of industrial projects and the need to maintain a competitive edge. Some of these challenges arise from issues such as advancement in technology, high escalation in prices of raw materials, instability of the global economy, lack of well-defined performance systems and how to manage project risks. To accomplish the project goal successfully, managing project risks is a major challenge for company executives and it is regarded as a critical factor for industrial project success (Atika, 2011). Many industrial projects fail due to poor or non-implementation of project risk management which inadvertently results in adverse economic and social consequences for industrial project stakeholders (Atika 2011). Therefore, the third factors look at how earlier risk assessment and monitoring of risks would affect the success of industrial projects.

H₀: There is no relationship between perform project risk management and industrial project success.

H₃: There is a positive relationship between perform project risk management and industrial project success.

Project planning is the process of defining, preparing and coordinating all subsidiary work packages, plans and integrating them into a comprehensive plan including project budget and project schedule (PMI, 2008). Project schedule and budget, as output of project planning, have become a standard of measure where the quality of

deliverables and importance of project planning has been considered a major ingredients of each successful industrial project (Dvir & Lechler, 2004).

A realistic project plan, include realistic project schedule and project budget, serve as a guide for the team to work toward project success (Dvir, Rax, & Shenhar, 2003). The degree of realistic planning or quality was measured by seven factors as discussed in the earlier section. Besides, realistic project planning allows team to work toward project goal and work against any changes that might happen during the execution stage (Dvir & Lechler, 2004). Hence, the fourth hypothesis is there is relationship between realistic plan and meeting the project goals.

H₀: There is no relationship between setting realistic budget and schedule and industrial project success.

H₄: There is a positive relationship between setting realistic budget and schedule and industrial project success.

Project goal is the results or deliverables or general project philosophy or general mission to be completed by the project team. (Pinto & Slevin, 1987). The project manager and team members need to clearly understand and focus on their goals for each project so they can adopt the appropriate bundles of project team practices that will facilitate their goal achievement (Scott-Young & Samson, 2008). Clear goals are important to orienting teams towards common objective, and improving industrial project performance and reducing cycle time in industrial projects (Scott-Young & Samson, 2008).

Clear goals also provide detail and clear guidance for the project manager to rationalize activities and reduce project scope in order to save time. It is clear that clear goals would bring benefit to the team by increased effort and persistence, and stimulates the development of specific strategies to attain the goal, and greater

commitment in the execution (Swink, 2003). The clearer and more specific the goals are the higher the chances that the project will be successful, especially in the eyes of the end-user. Each project leader should properly define the project goals and the project deliverables at the initial stage; they also recommend to involve the end-user or clients at this stage to ensure that clear and common goals are defined to ensure the success of the project (Dvir, Rax, & Shenhar, 2003). Hence, the fifth hypothesis is

H₀: There is no relationship between clear project goals and successful industrial project.

H₅: There is a positive relationship between clear project goals and successful industrial project.

Studies show that the success of an industrial project depends on the competence of the project team member, which is the important ingredient for developing proper project plans and for the successful implementation of those plans. However, there are many requirements for a competent project leader; and the project team for which they must be equipped with necessary skill to handle new, innovative and cutting-edge technical challenges and response to changes in an environment that is constrained by a limited budget and a definitive delivery date. A competent project team consist of a professional project leader with its members, who are recruited, trained and possess the required technical know-how, knowledge, skills and experience to deal with the work load of the project. (Chan, Zailan, & Fernando, 2009).

Furthermore, the continuity of project team members and project leader appears to be a significant influencing factor. It reduces the degree of information loss and keeps team motivated. The continuity of team members also reduce the need of team forming, storming which usually happen when new faces are working together (Parker & Skitmore, 2005). Hence, the sixth hypothesis is that there is a positive

relationship between team competency and continuity toward the success of industrial projects.

H₀: There is no relationship between project team competency and continuity and industrial project success.

H₆: There is a positive relationship between project team competency and continuity and industry project success.

2.6 Research Framework

This research focuses on six significant factors, as shown in Figure 9, which affect the success of industrial project. These are defined as project success factors which focus on the project being delivered on time, within budget, and meeting the required goal (Kendrick, 2009). Hence, an analysis on the effect of each factors toward the success of project delivery and ultimately providing the project manager a better control of project.

H₁ = There is a positive relationship between the level of organisation project management maturity and success of industry projects.

H₂ = There is a positive relationship between degree of top management support and industry project's success

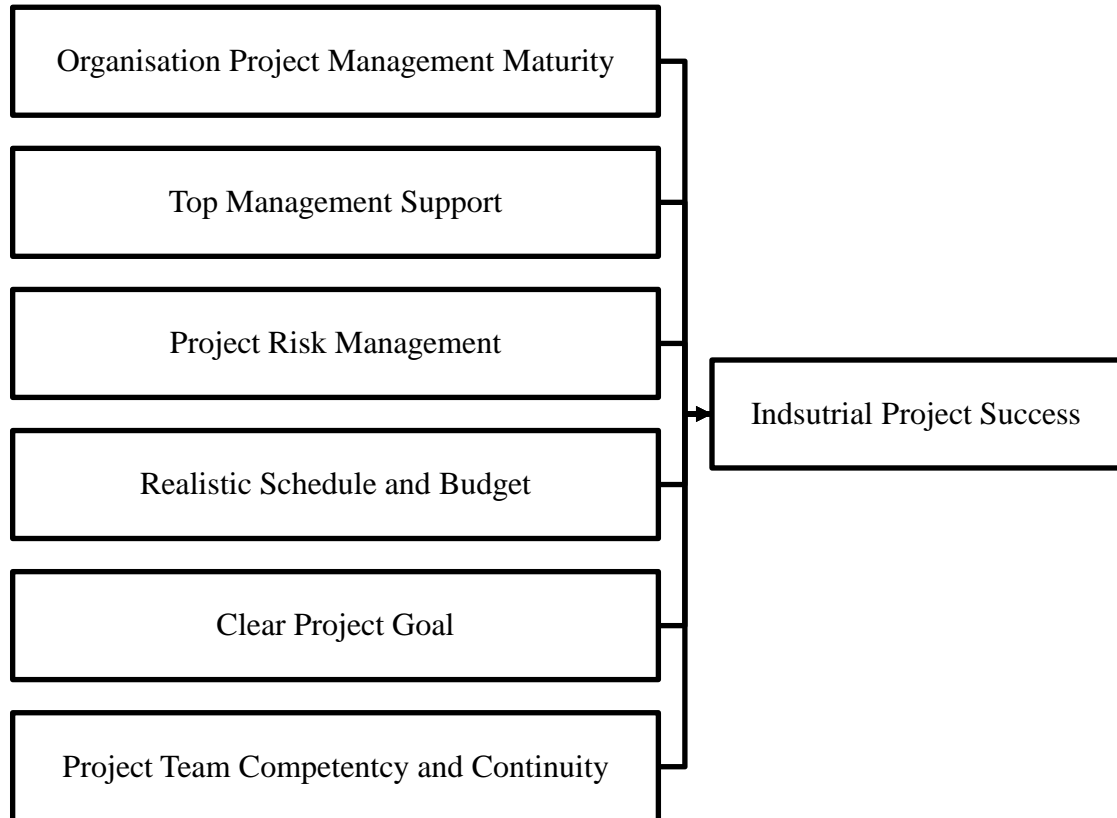
H₃ = There is a positive relationship between project risk management and industry project success.

H₄ = There is a positive relationship between setting realistic budget and schedule and industry project success

H₅ = There is a positive relationship between clear project goals and industry project success

H₆ = There is a positive relationship between project team members competency and continuity and industry project success

Figure 9: Research Framework



CHAPTER 3

RESEARCH METHOD

3.1 Introduction

In general view, industrial project is a temporary endeavour undertaken to create a unique product, service, or result and the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements is project management (PMI, 2008). In Malaysia, some business operation are project-orientated, for example, a construction company where each and single building has a start and end date with a specific goal and limited budget; however, some other projects are carried out in a non-project-orientated company concurrently with daily businesses such as new product development projects in a company (MIDA, 2012). As reported in a MIDA annual media conference 2012 also indicate that total investments approved in the manufacturing, services and primary sectors surged by 40.7 per cent from RM105.6 billion (4,368 projects) in 2010 to reach RM148.6 billion (4,964 projects) in 2011 with a total of 846 industrial projects valued at RM56.1 billion being approved in 2011. The approved investments in the manufacturing sector increased 18.8 per cent from RM47.2 billion recorded in 2010. These indicate the growth of industrial projects and importance of ensuring the success of those industrial projects.

In this chapter, the research method and targeted group will be introduced. The research is conducted based on quantitative methods with single dependent variable and six independent variables selected by meta-analysis. The aim of this survey is to

determine the relationship between the six influencing factors toward the single dependent variable – the success of industrial project. The result of this research will allow organisations to focus on their limited resources on the most critical factors to gain better control of projects implemented and to increase the possibility of industrial project success. Questionnaire development, targeted respondents and data collection method are discussed in this chapter.

3.2 Research Design

In this study, quantitative analysis using questionnaires are used as primary data collection tools to study the relationship between project successes and identified affecting factors. These affecting factors were identified by different researches in their own studies using exploratory or descriptive method to understand the phenomena of interest which an exploratory study is undertaken when not much is known about the situation or no information is available on how similar problems have been solved in the past (Sekaran & Bougie, 2011). A meta-analysis was conducted to select the most frequently mentioned affecting factors. This study is undertaken in order to ascertain and to describe the characteristics of the variables.

Besides, this research uses a correlation study instead of investigation types that can be separated into causal study and correlation study. Correlation study is for research that is interested in delineating the important variable (six independent variables) associated with the problem (project success). Besides, this is a cross-sectional study instead of a longitudinal study. The study was conducted to understand the phenomena at more than one point in time (Sekaran & Bougie, 2011).

To sum up, in this research on factors that affect the success of industrial projects, similar researches have been conducted on different types of projects under various conditions. Therefore, the purpose on this research is to determine the relationship

between project success and affecting factors to allow organisations to focus on their resources to improve the most influencing factors. Besides, this research narrows down the focus on Malaysia industry projects to determine the factors that may result in changing the success of it. Therefore, this research is conducted based on the descriptive and causal study concept. Besides, since the main objective is to find out the factors affecting all similar type of projects, research has been done on a cross-sectional basis on multi projects at the same time; instead of focusing on a few projects on a longitudinal basis.

3.3 Data Collection

Data collection is generally divided into two major types which are primary data and secondary data. Secondary data are results collected or summarized by other researchers in books or journals or other sources; where primary data is the first hand data collected from respondents via interviews or questionnaires that designed specifically for certain targets (Cooper & Schindler, 2011). To ensure accurate and reliable data, this research will collect primary data for analysis purpose. Hence, the survey questionnaire method was adopted in this study to gather needed information from the targeted respondents because it is easy to administer and transform the information into statistical information.

Primary data can be collected in qualitative or quantitative methods. (Zikmund, 2013). Quantitative method is applied in this study. This is a method often used to gather numerical data using structured questionnaires to measure the incidents of various views by obtaining data from a group of people. It is a predetermined written set of questions to which respondents record their answers. This is useful for efficient data collection when the researcher knows exactly what is required and how to measure the variable (Sekaran & Bougie, 2011).

This research is a descriptive research where the target respondents are individual project leaders. Predetermined variable as shown in chapter 2 are the interest of this research. To allow efficient data collection, questionnaire will be used as data collection method of this research to determine the significant level of variables that affect the success of industrial projects.

Secondary data refer to information gathered from sources that already exist or studied by others researchers on variables that may not be of direct interest for the specific purpose of a research. It can be internal or external to researchers' organisation and accessed through the database or published information. Sources of secondary data include books, government records, economic indication, census data, statistical abstracts and others sources which provide large amount of data for research and problem solving. It allows the researcher to save time and costs of acquiring information. However, it may not meet the specific needs of the particular situation (Zikmund, 2013). In this research, secondary data has been presented in Chapter 2 to serve as a platform of this research by providing a review of current projects and factors that may bring significant impact.

3.4 Sampling Approach

In research, it is very costly and almost impossible to collect data from the entire population; hence data will be only collected from few representatives of the entire population which is called sampling. Sampling is a process of selecting the right respondents, object or events as representative for the entire population (Sekaran & Bougie, 2011). It involves defining the targeted population and sampling frame. This is follow by setting the sampling unit and method. Hence, the researcher should define its targeted population for particular research, calculate the minimum sample size required and decide the sampling method.

3.4.1 Targeted Population

Population refers to the entire group of people, events or things of interests that the researcher wishes to investigate (Cooper & Schindler, 2011). In this research, the main objective is to determine the factors that affect the success of projects. Population of interest are project leaders of industrial project in the Malaysia Industry sector including electrical and electronics (E&E) industry, Machinery and Equipment Industry, IT industry, aerospace industry (MRO, machine aerospace structures), automotive Industry and similar development and manufacturing projects. The purpose of this research is to determine factors that give positive and negative impact to the success of those projects and provide future project leaders fundamental guidelines to ensure the success of similar industrial projects.

To ensure reliable data collected, it is important to collect responses from experienced project management personnel or project leaders. Thus, the questionnaire was forwarded to Malaysia members of an international institution – Project Management Institution (PMI). Most of the members of this institution are certified project management personnel with Project Management Professional (PMP) certification which require a minimum of 3 years of project management experience.

3.4.2 Sampling Size

Sample size is defined as the number of respondents collected in a survey or study. Sample size in the range of 30 to 500 is appropriate for most of the researches (Zikmund, 2013 and Roscoe, 1975). Besides, in calculating the required sample size, the general rule applied is $N > 50 + 8m$; where N is number of respondents needed to test for R-square and m is number of independent variables. As shown in the research framework, there are a total of 6 independent variables; hence the minimum respondents required is $N = 50 + 8m = 50 + 8 \times 6 = 98$ respondents. For testing of beta coefficient, the number of respondents required is $N > 104+m$; thus the minimum

respondents required for beta coefficient is $N = 104 + 6 = 110$ respondents (Tabachnick & Fidell, 2007).

3.4.3 Sampling Method

In the sampling process, there are two major types of sampling design which are probability sampling and non-probability sampling (Sekaran & Bougie, 2011). Probability sampling refers to the element in the population, non-zero chance or probability being selected as sample subject. This includes simple random sampling, systematic sampling, stratified random sampling and cluster sampling. It is used when representativeness of the sample is of importance in the interests of wider general population. Conversely in non-probability sampling, elements do not have predetermined probability of being selected as subject which includes convenience sampling, judgment sampling, quota sampling and snowball.

Besides, to determine how close the research estimate are to general population, the population parameter is based on the sample statistic known as confident level. It represents how certain study estimates will really hold true for the population. General acceptable confident levels are 90% confident level, 95% confident level and 99% confident level. In order to have a criterion-related validation study, the quantity of sample should be sufficiently large number. However, it would be costly and time consuming to have a large number of data that do not give better result or higher level of confident level. As a typical rule of thumb as suggested by Roscoe (1975) on sample size selection, sample sizes larger than 30 and less than 500 are appropriate where at 500 sample size, sample error will not exceed 10 percent of the standard deviation of about 98 percent of the time.

Hence, in this research, respondents will be any project management persons in the Malaysia industrial sector selected through probability sampling. To ensure

respondents with project experience, online questionnaires were created via Google Drive and forwarded to members of Project Management Institution Malaysia.

3.5 Questionnaire Design

The research objective is to prove the relationship between interested independent variables to the dependent variable as discussed earlier in chapter 2. Interested independent variables are:

- Organisation Project Management Maturity
- Top Management Support
- Project risk management
- Realistic and Proper Scheduling and Budgeting
- Clear (and Fix) Project Goal and Requirements
- Project Team Competent and Continuity

Dependent variable is the success of the project which been determined from three different measurements which are project completion time against schedule, project completion cost against budget, and project deliverable against baseline goal.

The questionnaire is designed to collect the project outcome and conditions of each independent variable that respondents experience in their “last completed project”. Each dependent and independent variable was measured by four to six questions developed by previous researchers for different students. Responses were recorded in 6-point Likert Scale; demographic data was collected as well.

3.5.1 Level of Measurement

The questionnaire is one of the most commonly used instruments in survey research. This is mainly because of the ability of questionnaire in collecting large amount of data at a reasonable cost and without geographical constraint. Moreover, questionnaire could provide a variety of statistics for data analysis because it allows researchers to collect and examine variables such as demographic information, attitudes and behaviour of the respondents (Zikmund, 2013). To examine the relationship on the variables of interest, the dimensions of variables are measured by scaling to differentiate it from one another. There are four type of scales used and these are nominal scale, ordinal scale, interval scale and ratio scale.

The nominal scale is one that allows the researcher to assign subject to certain categories by assigned code number. This gives the researcher an overview of frequency distributed. The ordinal scale not only categorizes the variable to differences among various categories but also prove rank-order of the categories in a meaningful way. Both nominal and ordinal scales are non-metric scale which can only be qualitatively distinguished. In this research, it will be used to collect demographic data to provide an overall picture of the respondents. The interval scale measures the variable in magnitude of the differences among respondents. The ratio scale is similar to the interval scale but it has an absolute zero point which is a meaningful measurement point that allows the researcher to tap the proportions differently. Both the interval and ratio scales are metric scales which can be quantitatively analysed. In this research, the variables are measured using the metric scale to determine the degree or magnitude of differences.

To scale the variables, the Likert Scale is used to examine how strongly the subject agree or disagree with the statement. The scale provides the flexibility to use as many point in the scale considered necessary and it is also possible to use different anchors. When a neutral point is provided, it is a balanced rating scale and when it is not, it is an unbalanced scale. The 6-point Likert Scale is used in the questionnaire. In this

research, measurement of dependent and independent variables was collected in the 6-point Likert Scale: 1 = Strongly Disagree, 2 = Moderately Disagree; 3 = Disagree, 4 = Agree; 5 = Moderately Agree, 6 = Strongly Agree. Demographic data was collected using of both nominal scales and ordinal scale depending on the variable.

3.5.2 Questionnaire Development

The questionnaire is aim to collect data on respondents’ last completed project on dependent and independent variable. The nature of the variable tapped subjective feeling or objective fact will determine kinds of questions are asked. Thus, previous researchers’ questions on each relevant variable were adapted to reduce degree of error due to feeling or leading questions.

The questionnaire was separated into eight sections to collect data on six independent variables, one dependent variable and demographic data including a cover letter that give respondents an introduction on the objective of this research and requesting him/her to provide feedback on their last completed project. Section 1 consists of five questions for the dependent variable to probe the outcome of the last completed project. Sections 2 to 7 consist of five to seven questions in each section to probe respondents on their experience on the same last completed project. The final section (section 8) collects demographic data from the respondents.

Table 6: Structure of Questionnaire

Section 1: Dependent Variable <ul style="list-style-type: none"> • Five question on project outcome of last completed project 	6-Point Likert Scaling Question 1 = Strongly Disagree 2 = Moderately Disagree 3 = Disagree 4 = Agree 5 = Moderately Agree 6 = Strongly Agree
Section 2to Section 7: Independent Variables <ul style="list-style-type: none"> • Five question on experience of last completed project (same project) 	6-Point Likert Scaling Question 1 = Strongly Disagree 2 = Moderately Disagree 3 = Disagree 4 = Agree 5 = Moderately Agree 6 = Strongly Agree

Section 8: Demographic Data <ul style="list-style-type: none">• Respondent experience• Education background• Organisation details	Non-metric Scale
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3.5.3 Pilot Test

It is important to pre-test the questionnaire to ensure that the questions are understood by respondents and there is no ambiguity in questions or problems with the wording or measurement. The pilot test involves the use of a small number of respondents to test the appropriateness of the questions and their comprehension. This helps to rectify any inadequacies before sending the questionnaire to actual and large number of respondents (Sekaran & Bougie, 2011).

Besides, a reliability test will be done on the pilot data set. Reliability of measurement is established by testing both consistency and stability. Cronbach's alpha is a reliability coefficient that indicates how well the items in a set are positively correlated to one another by computing the average inter-correlations among the items measuring concept. Furthermore, by selecting the function of "Cronbach's Alpha if Item Deleted", questionnaire can be improved if necessary (Sekaran & Bougie, 2011).

For the purpose of checking the questionnaire, a pilot test was conducted on ten respondents to find out any misleading question or perception bias or wording problem. This pilot test is planned to be done on using online questionnaire followed by face-to-face discussion to collect a more comprehensive and better feedback of questionnaire design and area of study

A reliability analysis on the ten set of pilot test data conducted and Cronbach's Alpha of 0.922 was measured. Furthermore, under column of "Cronbach's Alpha if Item Deleted", all measured results were above 0.91 with detail result shown in Appendix II for detail. This result is within the acceptable range of greater than 0.7 or at least 0.6 as discussed by Sekaran (2011). Changes after the pilot test also include restructuring the collection of demographic data in the first section to the last section and replacing technical term to general vocabulary. The conclusion from the pilot test found the questionnaire design suitable for testing with no major corrections requirements. The changes done on the questionnaire was relocating the demographic data collect from section one to last section (section 8).

3.6 Data Analysis

3.6.1 Data Entry and Pre-analysis Check

The research is based on the quantitative approach using online questionnaire (via Google Drive) to collect data from respondents on six independent variables and one dependent variable. The demographic data of respondents is to be collected as well. An official online questionnaire was forwarded to 1044 potential respondents on November 2013 and the questionnaire closed after 4 weeks. 122 respondents were collected with a total response rate of 12%.

After the data has been collected, Statistical Package for Social Sciences (SPSS version 17) software was used to analyse the data. The first step would be data entry and editing. Coding has been done in the questionnaire design by assigning number to the participants' responses allowing data entry to SPSS. Once data entry is completed, the second step will be frequency test. Frequencies refer to the number of times various subcategories of a certain phenomenon occur (Sekaran & Bougie, 2011). By

itself, it not only shows a percentage of overall responses but also allows the detection of outliers and allow data cleaning.

After the data has been filtered and checked, the next analysis required is Pearson Correlation test. This is a matrix that indicates the direction, strength and significance of the relationship among all variable with +1 indicating a perfect positive relationship and -1 indicating a perfect negative relationship. The basic rule is to ensure that the co-relationship between all independent variables are not high that 0.7 to prove that there are no inter-connection between them; if not, factor analysis is used to combine related factors into single variables (Sekaran & Bougie, 2011). Besides, it is important to ensure that the reliability test Cronbach's alpha shows a value higher that 0.7 (or least 0.6) to ensure the model is reliable for analysis (Sekaran & Bougie, 2011)

Each variable is tested by a few questions which give multi responses. After data cleaning, it is required to transform or group all questions for the same variable into a single variable either by sum or mean. In this research, it plans to transform data into mean value followed by a second test for analysis.

3.6.2 Pearson correlation

Pearson correlation is used when there is a need to explore the strength of the relationship between two continuous variables. This gives an indication of both the direction (positive or negative) and the strength of the relationship. A positive correlation indicates that as one variable increases, so does the other. A negative correlation indicates that as one variable increases, the other decreases (Zikmund, 2013).

The output is the size of the value of Pearson correlation which can range from -1.00 to 1.00 . This value will indicate the strength of the relationship between the two variables. A correlation of 0 indicates no relationship at all, a correlation of 1.0 indicates a perfect positive correlation, and a value of -1.0 indicates a perfect negative correlation (Pallant, 2005).

3.6.3 Multiple Regression Analysis

Multiple regression analysis is testing more than one independent variable to explain variance in the dependent variable by providing a means of objective assessing the degree and the character of the relationship between them. The regression coefficient indicates the relative importance of each of the independent variables in the prediction of dependent variable (Sekaran & Bougie, 2011).

This research focuses on six independent variables and one dependent variable. After data cleaning and transforming, multiple regression test will be done to determine the relationship between those variable as below

$$DV = \beta + x_1IV_1 + x_2IV_2 + x_3IV_3 + x_4IV_4 + x_5IV_5 + x_6IV_6$$

Since each independent variable was tested by five to seven questions, data transformation was applied. The mean of all questions is used to test the independent variable as the representing value of each independent variable.

$$\begin{aligned} DV_{Project\ Success} &= \beta + x_1.Maturity + x_2.Top_{Management} + x_3.Risk_{Mngt} \\ &+ x_4.Realistic_{plan} + x_5.Clear_{Goal} + x_6.Team_competency \end{aligned}$$

3.7 Summary

This research aims to determine the relationship between potential influencing factors (independent variable) and the success of project (dependent variable). A quantitative approach is used together with questionnaires to collect data from targeted respondents who are project leaders have participated in industrial projects. Pilot test was done on 10 persons followed by face-to-face discussion to collect comprehensive and complete feedback. The results of pilot test show an acceptable Cronbach's alpha value of 0.922. After the questionnaire was finalized, online questionnaire was then forwarded to 1044 potential respondents – members of the Project Management Institution of Malaysia for data collection. The research is designed using multiple regression analysis to determine the relationship between them.

CHAPTER 4

DATA ANALYSIS

4.1 Introduction

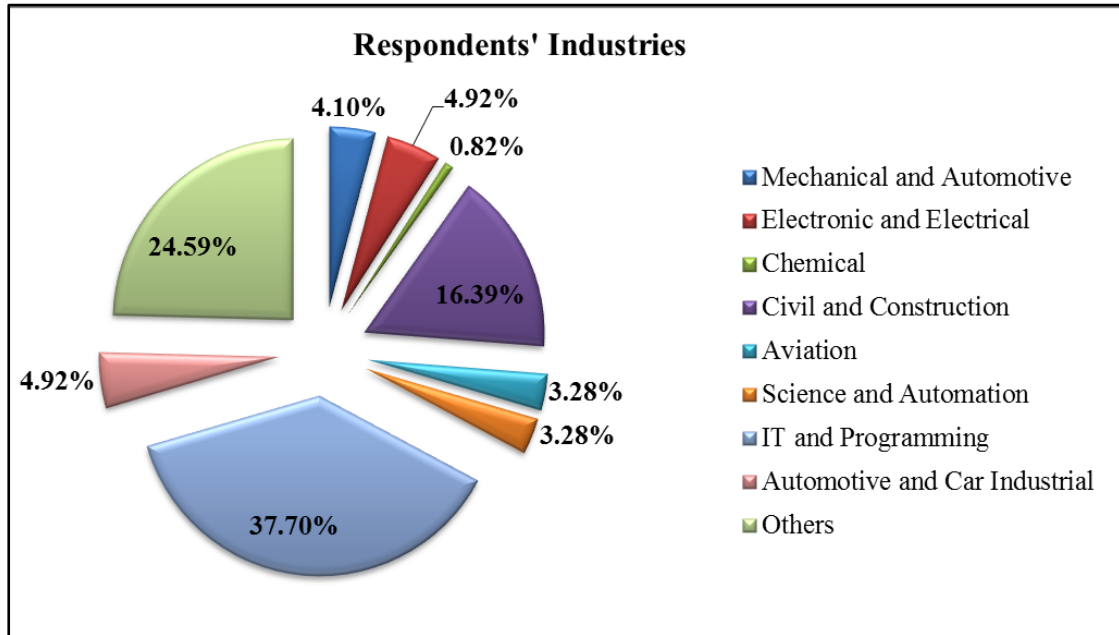
In this chapter, descriptive data and analysis that determine the factors that influence project outcome and project success are based on data collected from Malaysia industry project management personnel. First, descriptive analysis and reliability test, correlation between variables are discussed. Then multiple regression analysis is applied to determine the relationship between project success and each independent variable. Finally, the discussion on the result was presented.

4.2 Descriptive Analysis

Online questionnaire was forwarded to 1044 members of Project Management Institution of Malaysia. Members of this institution are assumed to be experienced project management personnel. The questionnaire was released on first week of November 2013 and closed at end of November 2013. 122 responses were collected with a total response rate of 12%.

Among those respondents, 37.7% are from the IT and Programming Industry, representing the largest project management industry in Malaysia; this is followed by 24.6% of other industries and 16.4% of the Civil and Construction Industry, as shown in Figure 10.

Figure 10: Respondents' Industries



As shown in Figure 11, Figure 12 and Figure 13, among respondents, most of the project being tested in this survey with average value size of more than MYR 330,000 to MYR 1,650,000 (or USD 100,000 to USD 500,000), representing 34% of the total responded data. Besides, the average project duration is 6 to 12 months or 44% of the total responded data. The average project size in the number of team member is about 5 to 10 persons and more the 15 persons; representing 34% and 26% of the total respondents.

Figure 11: Average Project Dollar Size

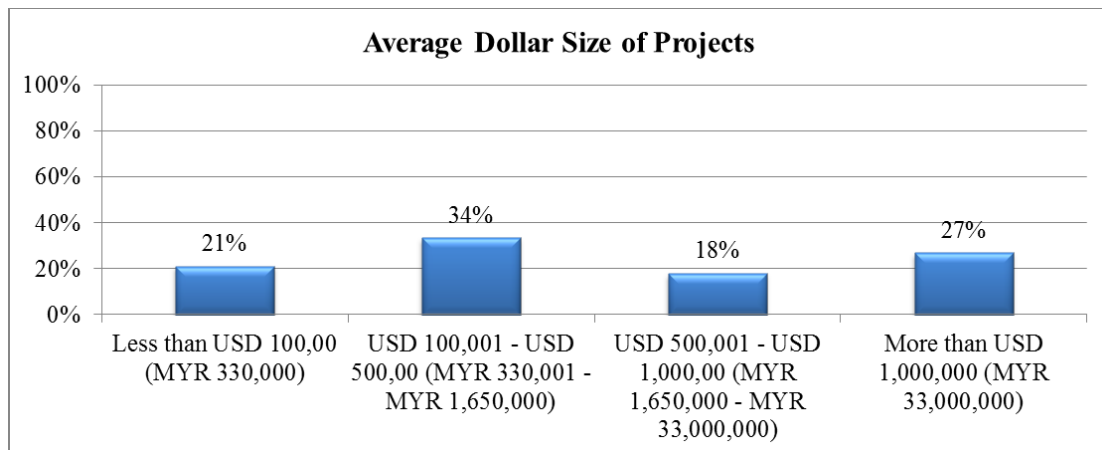


Figure 12: Average project duration

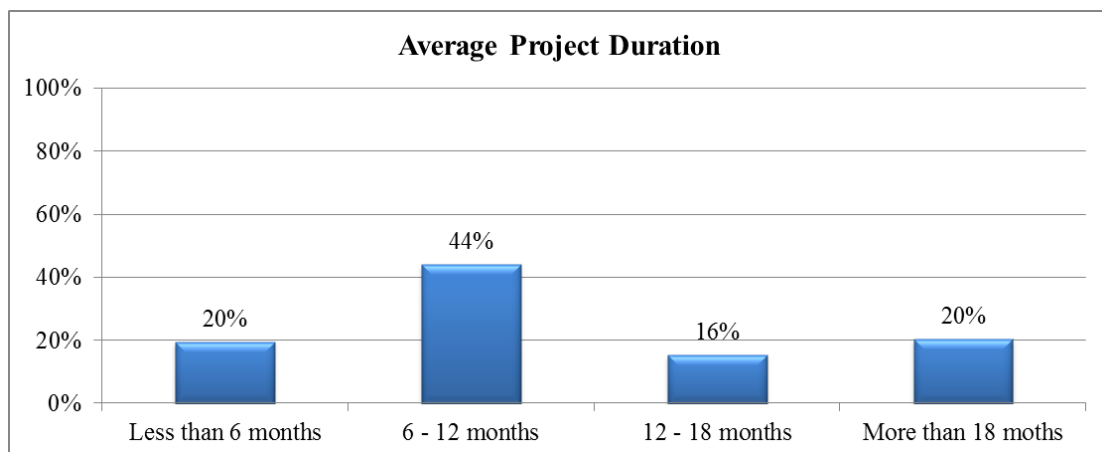
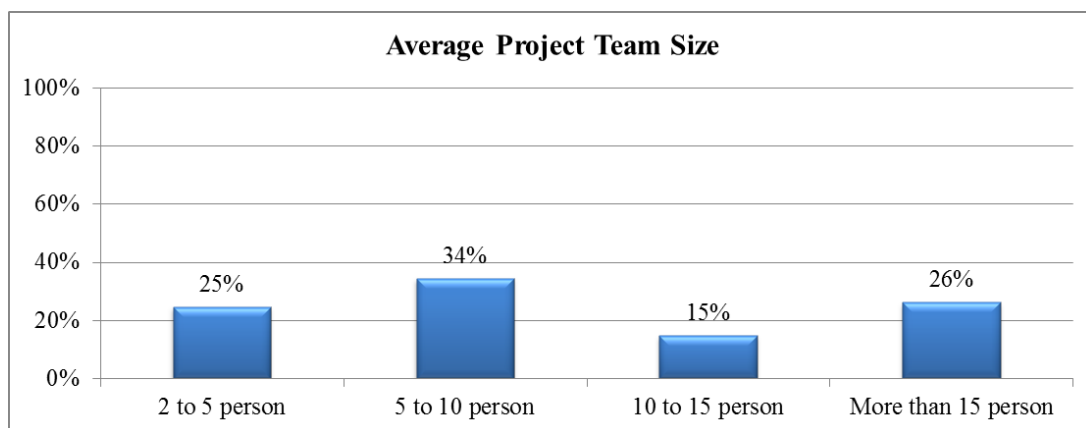


Figure 13: Average number of team members in project



More importantly, as shown in Figure 14, 66% of total respondents are Project Management Professional (PMP) certification holders and 63% of total respondents with more than 5 years of project management experience, as Table 7. Since the PMP mark as an industry standard qualification in project management field and experience in project management is important for professional reply, responses collected can be assumed to be reliable and professional.

Figure 14: PMP certified respondent and non-certified respondent

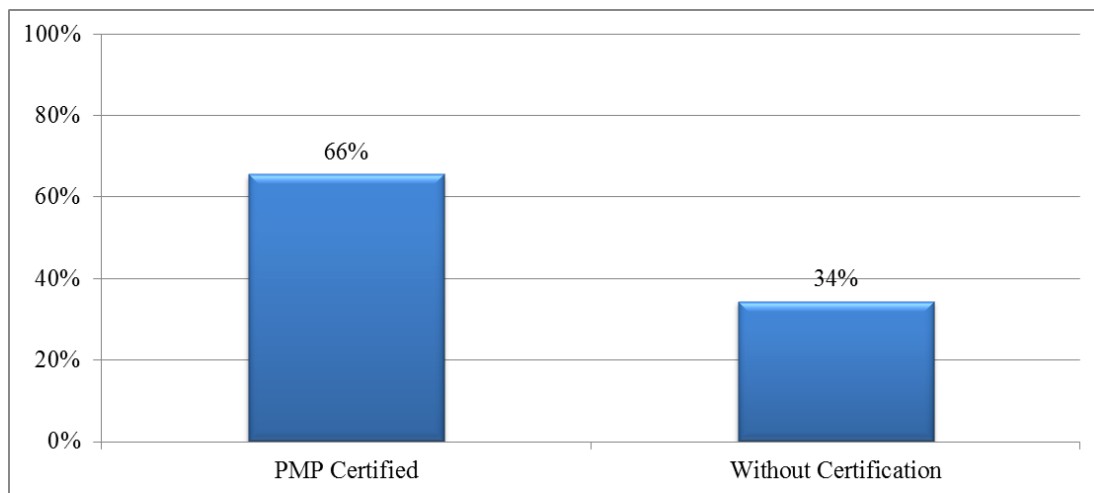


Table 7: Respondents years of experience in project management field

	Frequency	Percent
Less than 5 years	45	36.9%
5 to 10 years	55	45.1%
10 to 15 years	12	9.8%
More than 15 years	10	8.2%
Total	122	100%

The relationship between respondents and their organisation was recorded in this survey. As shown in Table 8 and Table 9, 86.8% of respondents work less than 10

years in current organisation and 46.7% of these organisation sizes are larger than 500 employees.

Table 8: Duration work with current employer

	Frequency	Percent
Less than 5 years	63	51.6%
5 to 10 years	43	35.2%
10 to 15 years	8	6.6%
More than 15 years	8	6.6%
Total	122	100%

Table 9: Number of employee in current organisation

	Frequency	Percent
Less than 50 employees	17	13.9
51 to 100 employees	20	16.4
101 to 500 employee	28	23.0
More than 500 employees	57	46.7
Total	122	100%

4.3 Data Transformation

Reliability is the degree to which measures are free from errors and therefore yield consistent results. The reliability test is to ensure the question asked is able to measure the variables. Reliability is indicated by Cronbach's Alpha. The value of alpha can take any value less than or equal to 1. Higher value of alpha is more desirable and it indicates a more reliable instrument used in the study with the general acceptable range of more than 0.7 being considered as reliable. (Zikmund, 2013).

Responses on a total of 122 questions collected in this survey measure one dependent variable and six independent variables. Prior to data transformation, a reliability test on data collected using 122 questions produce a value of Cronbach's Alpha of 0.955; thus the responses were acceptable. Since each variable was measured by five to seven questions, data transformation was applied to combine those responses into single measurement. The mean of those questions was used to represent the measurement of that variable. Then a reliability test was applied on transformed data.

The seven transformed data are the dependent variable – Project Success (represented by Prj_Outcome, independent variables – Organisation Project Management Maturity (represented by Org_Maturity), Top Management Support (represented by Top_Mngt_Support), Project Risk Management (represented by Risk), Realistic Project Schedule and Budget (represented by Realistic_Plan), Clear and Fix Project Goal (represented by Goal_Clear), and Project Team Competency and Continuity (represented by Team_Comp). Reliability Test result on these seven variable get a Cronbach's Alpha of 0.908 while all Cronbach's Alpha if Item Deleted above 0.90. Although the value of the Cronbach's Alpha result is lower than the pilot test result of 0.92, the sources are still above 0.7 and fall within acceptable ranges. Hence, this regression model is reliable.

4.4 Multiple Regression Analysis

4.4.1 Overview

Linear regression analysis was applied to determine the relationship between independent variables and dependent variable. A total of 122 cases were analysed with descriptive statistics as shown in Table 10, no missing data was found. Collinearity Test on each independent variable is shown in Table 11. Tolerance as an indicator of how much of the variability of the independent is not explained by the

other independent variables in the model of each variable. Since the tolerance value is higher than 0.1 (tolerance above 0.1 OR VIF below 10 is acceptable) (Zikmund, 2013), possibility of multi collinearity is low.

Table 10: Responds collected on each variable

		Mean	Std. Deviation	N
Dependent Variable	Project Success	4.1787	1.06695	122
Independent Variables	Organisation Project Management Maturity	4.1932	0.97617	122
	Top Management Support	4.1967	1.10715	122
	Project Risk Management	3.8525	1.09930	122
	Realistic Schedule and Budget	4.3082	1.02824	122
	Clear Project Goal	4.6213	0.94013	122
	Project Team Competency	4.2754	1.08280	122

Table 11: Collinearity test

		Tolerance	VIF
Dependent Variable	Project Success	-	-
Independent Variables	Organisation Project Management Maturity	0.324	3.086
	Top Management Support	0.491	2.035
	Project Risk Management	0.350	2.855
	Realistic Schedule and Budget	0.255	3.920
	Clear Project Goal	0.446	2.243
	Project Team Competency	0.538	1.860

4.4.2 Model Quality

The correlation test between dependent variable, Project Outcome, and other six independent variables shows a source of more than 0.3. This shows that there are some relationship among dependent variable and independent variables. Furthermore, the source of Pearson Correlation between independent variables is lower than 0.8 (except relationship between Realistic Schedule and Budget & Organisation Project Management Maturity is at critical value), suggests that there is not significant relationship among independents variables. Hence, the combinations of independent variables are not necessary. (Pallant, 2005)

Table 12: Collinearity diagnostics

	Project Success	Organisation Project Management Maturity	Top Management Support	Project Risk Management	Realistic Schedule and Budget	Clear Project Goal	Project Team Competency
Pearson Correlation Project Success	1.000						
Organisation Project Management Maturity	0.618**	1.000					
Top Management Support	0.300**	0.545**	1.000				
Project Risk Management	0.572**	0.678**	0.601**	1.000			
Realistic Schedule and Budget	0.650**	0.802**	0.608**	0.761**	1.000		
Clear Project Goal	0.434**	0.575**	0.636**	0.633**	0.626**	1.000	
Project Team Competency	0.567**	0.599**	0.356**	0.584**	0.586**	0.543**	1.000

** Significant Level, $p < 0.05$ (2-tailed).

Figure 15: Normal Probability Plot

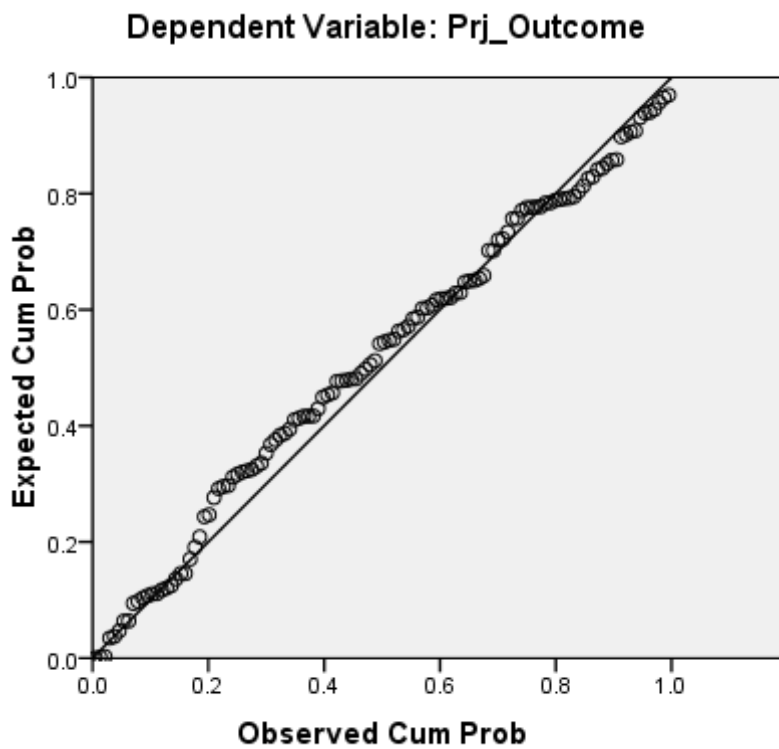
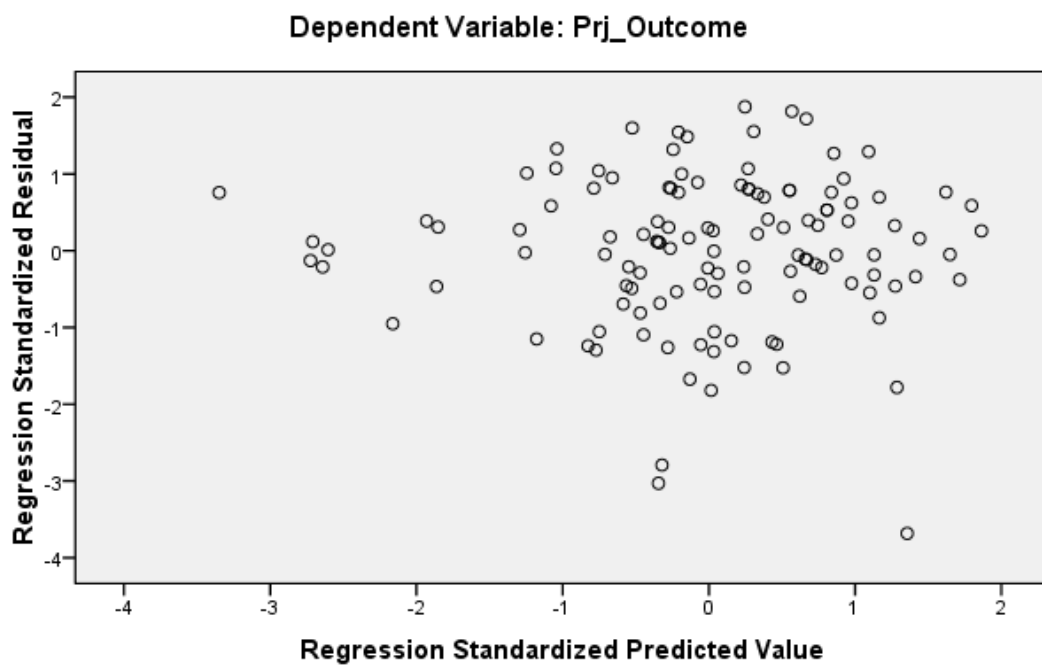


Figure 16: Scatter Plot of Regression Model



Besides, the normal probability plot of regression model shows points that represent the responses reasonably straight diagonal line from left bottom to right top corner. This suggests the existing linear relationship between the dependent variable and independent variables with no major deviation from normality.

Furthermore, the scatter plot diagram shows an evenly distributed diagram without any concentration area or any systematic pattern, proving that the data collected is normal distributed without bias or significant error.

However, in the scatter plot diagram, there are points that fall below the regression standardised residual value of less than -3.3 (or more than 3.3 if any). This suggests the presence of outlier. But the numbers of outliers are very few (case number 83 and case number 36 with standard residual of -3.4). Hence, it is not necessary to delete the outlier pair wise from the data set collected.

4.4.3 Multiple Regression Analysis Result

This model analyses the relationship between single dependent variable – project success and six selected independent variables based on result of meta-analysis. The value of Adjusted R Square for this model is 0.487. This means that 48.7% of project success is explained by this model which is in-line with research in Chapter 2, which indicates that various factors could affect the success of project. Furthermore, the analysis result of ANOVA was significant of 0.000 (or $p < 0.05$). This proves that the model is statistically significant.

Table 13: Regression R Value

Regression Model Tested	R	R Square	Adjusted R Square
	0.716	0.512	0.487

The regression result is shown in Table 14; a total of six independent variables was analysed against single dependent variable – project success. Out of the six independent variables, the largest beta standardized coefficients is Realistic Plan with a source of 0.390. Realistic Plan makes the strongest unique contribution to explain the dependent variable. Organisation Project Management Maturity and Team Competency are the second and third influencing factor with source of 0.217 and 0.209.

Among these three most influencing factors, both Realistic Plan and Team Competency are significant to the model at 95% confident level. But Organisation Project Management Maturity is only significant at confident level of 90%.

The Part correlation coefficient is an indication of the contribution of that variable by squaring the value itself to convert it into R squared. As shown in Table 14, Team Competency explained 4.7% of the model while Realistic Plan explained 6.9% and Organisational Project Managements Maturity explained 2.6%. Note that the total R squared value for the model does not equal all the squared part correlation values added up (.13+.09=.22). This is because the part correlation values represent only the unique contribution of each variable, with any overlap or shared variance removed.

Table 14: Regression Model

Factors		Unstandardized Coefficients		Standardized Coefficients	Correlations	
		Beta	Std. Error	Beta	Part	R ²
(Constant)	**	0.937	0.381			
Organisation_Maturity	*	0.217	0.125	0.198	0.160	0.026
Top Management Support	**	-0.196	0.090	-0.204	-0.200	0.040
Project Risk Management		0.141	0.107	0.145	0.122	0.015
Realistic Plan	**	0.390	0.134	0.375	0.262	0.069
Clear Goal		0.009	0.111	0.008	0.008	0.001
Team Competency	**	0.209	0.088	0.212	0.217	0.047
Note ** Significant relationship at 95% confident level * Significant relationship at 90% confident level						

To construct the regression equation, the unstandardized coefficient values listed as beta was applied. Regression model on the dependent variable - success of project is explained by the equation below:

Project Success

$$\begin{aligned}
 &= 0.937 + 0.217 * Organisation_Maturity + 0.39 \\
 &* Realistic_Plan + 0.209 * Team_Competency + (-0.196 \\
 &* Top_Management_Support)
 \end{aligned}$$

CHAPTER 5

DISCUSSION AND CONCLUSION

5.1 Introduction

In this chapter, a depth discussion on data collected and analysis result are presented. The research identified three most influencing factors that affecting the success of industrial project in Malaysia which companies and organisation shall consider to focusing their limited resources to enhance these key areas.

Project management is a growing industry whereby a company uses project management team to complete specific goals that allow the organisation to develop their skills or complete specific business goals. Hence, the need to understand what organisation can do differently to increase the opportunities of successful industrial project outcome is important.

This research examines the relationship between industrial projects output and key driving factors in Malaysia Industry. From meta-analysis on previous researchers; six key factors were identified to be the most influencing factors. A questionnaire survey was then developed to measure the relationship between industrial project outcome and these six factors using the respondent's last completed project as the basis.

To ensure reliability of data collected, questionnaires were forwarded to members of Malaysia Project Management Institution (PMI). Members of this institution are

professional project management personnel working in the engineering, banking, IT and other industries in Malaysia. Their working experiences help to ensure the reliability of responses.

A total of 122 responses were collected (out of 1044 emails be sent out) with the majority of the respondents being project leaders in the IT industry. Data collected in this research was presented in Chapter 4. In this chapter, discussion on result collected, trend in Malaysia project management industry, and research limitations are discussed.

5.2 Discussion

This regression model explained 48.7% of the relationship between industrial project success and influencing factors. Four out of six independent variables were identified as significant influencing factors. The rest of 51% of the model was explained by other independent variables identified in meta-analysis but not included in the questionnaire due to research resource limitation.

5.2.1 Result Overview

Data collected from project management personnel from Malaysia Industry was analysed using the linear regression test. The result of linear regression found that out of six tested independent variable, three independent variables were in line with previous researchers' finding and significantly influences the dependent variable - project success. These include H1 – organisation maturity, H4 – realistic plan, H6 – team competency. Two independent variables include H3 – project risk management and H5 – clear project goal, were in line with previous researchers' finding – positive relationship between independent variable and success of industrial project, but test results shown them having insignificant influence. However, for the fifth independent

variable, H2 – top management support, test result was different from previous researchers’ finding –positive relationship between independent variable and success of industrial project; the test result shows that top management support has negative influence power against project success. A summary of comparison between previous researchers’ findings and test result is shown in Table 15.

Table 15: Relationship of Independent Variables and Dependent Variable

Relationship with Dependent Variable (Project Success)				
Independent Variables		Previous Researches Result/Findings	Linear Regression Test Result	Unstandardized Coefficients
H1	Organisation Maturity	Positive	Positive, Significant	0.217* .
H2	Top Management Support	Positive	Negative, Significant	-0.196**
H3	Project Risk Management	Positive	Positive	0.141 .
H4	Realistic Plan	Positive	Positive, Significant	0.390**
H5	Clear Goal	Positive	Positive	0.009 .
H6	Team Competency	Positive	Positive, Significant	0.209**
Note	** Significant relationship at 95% confident level			
	* Significant relationship at 90% confident level			

5.2.2 Hypothesis 1: Organisation Project Management Maturity

Organisation project management maturity is a measurement tool to assess the organisation’s establishment and use of formal project management practices and the integration of these practices within the organisation (Organizational Project Management Maturity Model (OPM3), 2008). In the study by Rad & Levin (2003), organisation project management maturity is presented in five levels. Level one indicates low maturity where projects were run on an ad-hoc basis and do not have formal project management procedures. This results in inconsistent practices and infrequent project performance predictability with the high possibility of cost

overruns, schedule delays and defective deliverables projects. On the contrary, in Level Five company, project management office have greater responsibility in supporting day-to-day business and implemented a high level of standardized project management procedures to ensure effective industrial project implementation. It exemplifies project management success as a norm and concentrates on continuous improvements (Rad & Levin, 2003).

Besides, similar researches point out that the degree of project management methodology used and application of standardized project management practices will increase project performance and hence lead to project success. Studies support the assumption between high organisation project management maturity level (use of project management standard practice) and increased project success. In this research, project success is significantly influenced by the adoption of formal project management practice, organisation promoting project management standard and individual practitioners who improve their own knowledge through project management certification (Milosevic & Patanakul, 2005).

In this research, test result of linear regression shows the same result, hypothesis 1 - organisational project management maturity also is identified as significant influencing factors. Null hypothesis was rejected with 90% confident level.

H_1 = There is a positive relationship between level of organisation maturity in project management and success of industrial projects.

Value of beta is 0.217 contributing 2.6% influencing power on industrial project success. Organisational Project Management Maturity reflects the environment within organisation itself; and it can be classified into five different levels as discussed in chapter 2. Organisation with low maturity level focus heavily on functional department and day-to-day business while running project on an ad-hoc basic without proper project management guideline; but high project management maturity provides supportive environment to project team by giving priority on project work instead of

day-to-day business. It documents lesson learnt and encourages projectized structure or strong matrix organisational structure. These organisations provide a healthy environment for project team which lead to better project control and increase the opportunity of industrial project success.

5.2.3 Hypothesis 2: Top Management Support

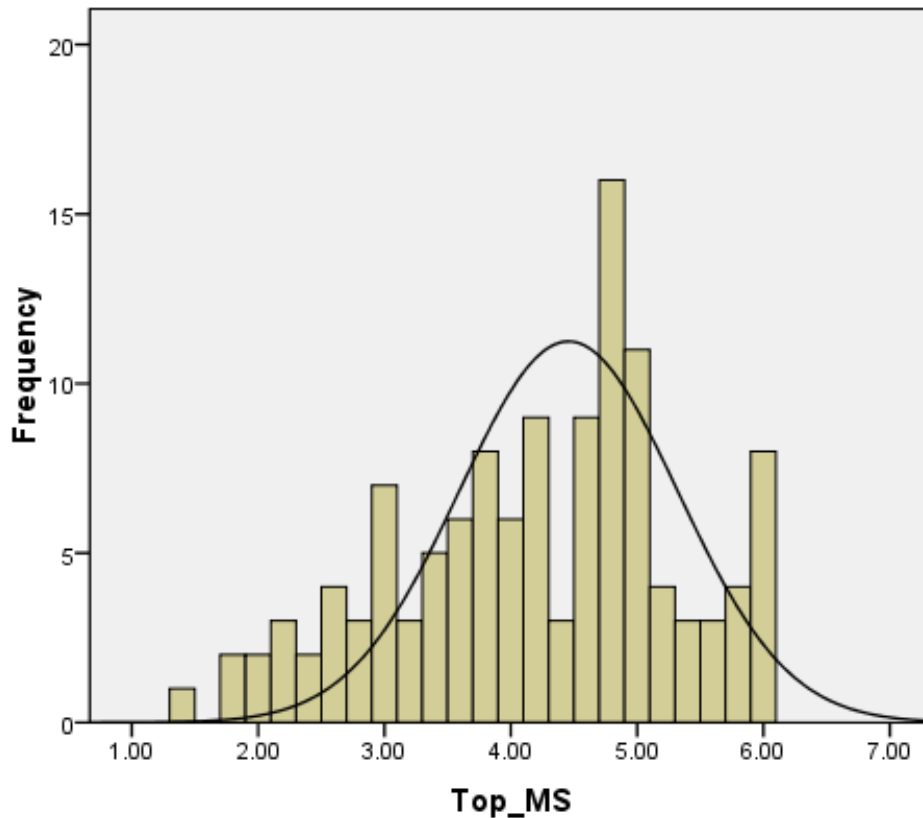
Top management support is defined as “the willingness of top management to provide the necessary resources and authority for project success”(Belout & Gauvreau, 2004) and researchers suggest top management has a high degree of influence to industrial project success by being responsive to request for additional resources when the need arises. It provides clear vision of the market concept which leads to explicit goals that help resolve design conflicts and keep project on track (Chan, Zailan, & Fernando, 2009). There exists a positive relationship between top management support and industrial project success.

Belout and Gauvreau (2004) suggests top management support is more important during the planning stage to ensure that the project is designed in the correct structure and is able to communicate the project’s mission clearly during the planning stage. More importantly explicit communication helps to accelerate project progress by providing guidance as the project leader rationalizes activities and reduces project scope to save time which ultimately leads to the success in project deliverable (Young & Jordan, 2008 and Swink, 2003).

However, the test result from the data collected from this study show different results from previous researches – positive relationship between top management support and success of industrial project. It shows that there is a negative relationship between top management support and industrial project success with coefficient of -0.196. This means the level of top management support negatively influencing the success of industrial project. All previous studies show top management support having a

positive relationship with project success. However, in this current study, a negative relationship is found.

Figure 17: Histogram of independent variable - top management support



Based on the responses collected, most of the projects in Malaysia industry are supported by top management or gained sufficient resources, as Figure 17. However, despite strong support given by management, projects are still failing to deliver within budget and schedule. As result, a regression test run on data collected shows the presence of high level of top management support but relatively low average of project success.

To sum up, the negative relationship found in the test does not mean top management support will bring negative influence toward industrial project success but because top management support itself is not a guarantee of success in industrial project. It also

shown that most of the current projects run in Malaysia industry are highly supported by top management with sufficient resources gained and authorities provided, but the tendency of industrial project to succeed does not increased with the present of top management support.

5.2.4 Hypothesis 3: Project Risk Management

Previous studies have defined project risk management as an important element factoring the success of industrial project because it proposes that all stakeholders should have a clear and common understanding of what risk management should accomplish and also, the emphasis on taking a proactive approach to risk management (Atika, 2011). Hence, stakeholders are aware of the fact that there are risks on the basis of which they adjust their expectations and behaviour accordingly (Bakker, Boonstra, & Wortmann, 2010).

Besides, previous studies have concluded that project risk management is an element that allows the project leader to identify and manage uncertainty and eliminates the gap between stakeholders (Jiang, Klein, Wu, & Liang, 2009 and Stewart, 2010), which ultimately increase the degree of control power over the project and leads to project success. Thus, previous researchers concluded that there is a positive relationship between applications of project risk management and industrial project success.

In this current study, regression test result on data collected from Malaysia industry project management person shows that the application of project risk management given a positive influence toward industrial project success with coefficient value of 0.141. However, this influence is not significant. Null hypothesis was not rejected. Thus, this research concludes that there is no significant positive relationship between project risk management and industrial project successes.

This test was run on data collected from responses based on their “last completed project”. Based on Figure11, Figure12 and Figure13, most of the “last completed project” was relatively small in project size with more than 50% of the projects duration having less than 12 months with less than 10 team members. Since the industrial projects completed were relatively small, the boundary of industrial project is much easier to be defined and required resources were relatively lower. This make the independent variable – project risk management is not a significant influencing factor in this case.

Projects run under relatively small scale face less uncertainty and risk. Most of the boundaries were clearly and easily defined with very limited stakeholders’ expectation gap. Thus, project risk management does not playing a significant role in the success of industrial project. But project risk management should be taken into consideration as an element to move toward industrial project success. Larger industrial projects started with uncertainty or involved with new technology are often exposed to threats and unplanned change. Proper project risk management should still play an important role to overcome the challenges

5.2.5 Hypothesis 4: Realistic Schedule and Budget

The quality and importance of project planning, including both scheduling and budgeting, have been considered a major cornerstone of every successful project (Dvir & Lechler, 2004). The importance of project planning is also supported by the number of studies done as it is one of the critical elements that influence the success of projects. A realistic project plan serves as a guide for the team to work toward industrial project success. An industrial project with a plan does not guarantee success but an industrial project without plan will probably guarantee failure (Dvir, Rax, & Shenhar, 2003).

Furthermore, realistic project planning allows team to work toward project goal and work against any changes that might happen during the execution stage (Dvir & Lechler, 2004). Previous researchers also suggest that project success is positively correlated to the requirements definition and development of technical specification (Nasir & Sahibuddin, 2011). This further proves the importance of including all requirements into project plan for industrial project success. Ignoring detail or minor requirements and reducing project budget or shortening the project schedule only create unrealistic plan which will not lead to project success (Dvir, Rax, & Shenhar, 2003). Thus, previous researches suggest there is a positive relationship between realistic project schedule, budget and project success.

In this study, analysis on data collected from Malaysia industry project personnel is in line with previous researches findings. Test results show there is a significant positive relationship between realistic project schedule, budget and success of project. The null hypothesis is rejected under 95% confident level with an unstandardized coefficients of 0.39.

H₄ = There is a positive relationship between setting realistic budget and schedule and industrial project success

Test result also shows that realistic project schedule and budget are the most influencing independent variables among others. Realistic plan play an important role and explained this model the most. Hence, project management personnel should ensure the planning of each industrial project be done properly. They should ensure the approved plan is realistic and achievable based on the resources project owned.

5.2.6 Hypothesis 5: Clear Project Goal

Defined in previous studies, project goal are the results or deliverables set by stakeholders or requirements of the board or clients (as defined in the business case) that project team wants to achieve (Nasir & Sahibuddin, 2011). Each project may have single or multiple goals that are sorted and prioritized (PMI, 2008). Study shown that explicit goals related to that vision are thought to help resolve design conflicts and to keep the project on track. Clear goals would be more important in an accelerated project environment because clear communication provides guidance as the project manager rationalizes activities and reduces project scope in order to save time. It is clear that clear goal would bring benefit to the team through increased effort and persistence. These stimulate the development of specific strategies to attain the goal, and encourage greater commitment in the execution (Swink, 2003).

Besides, other researchers looked into the relationship between the amounts of effort invested in defining the goals of the project and the result of functional requirements or technical specification of the product. Not surprisingly, the relationship with overall success is also positive and significant (Scott-Young & Samson, 2008). Also, the clearer and more specific the goals are the higher the chances that the project will be successful, especially in the eyes of the end-user (Dvir, Rax, & Shenhar, 2003). Thus, based on previous studies, there is a positive relationship between clear project goal and industrial project success.

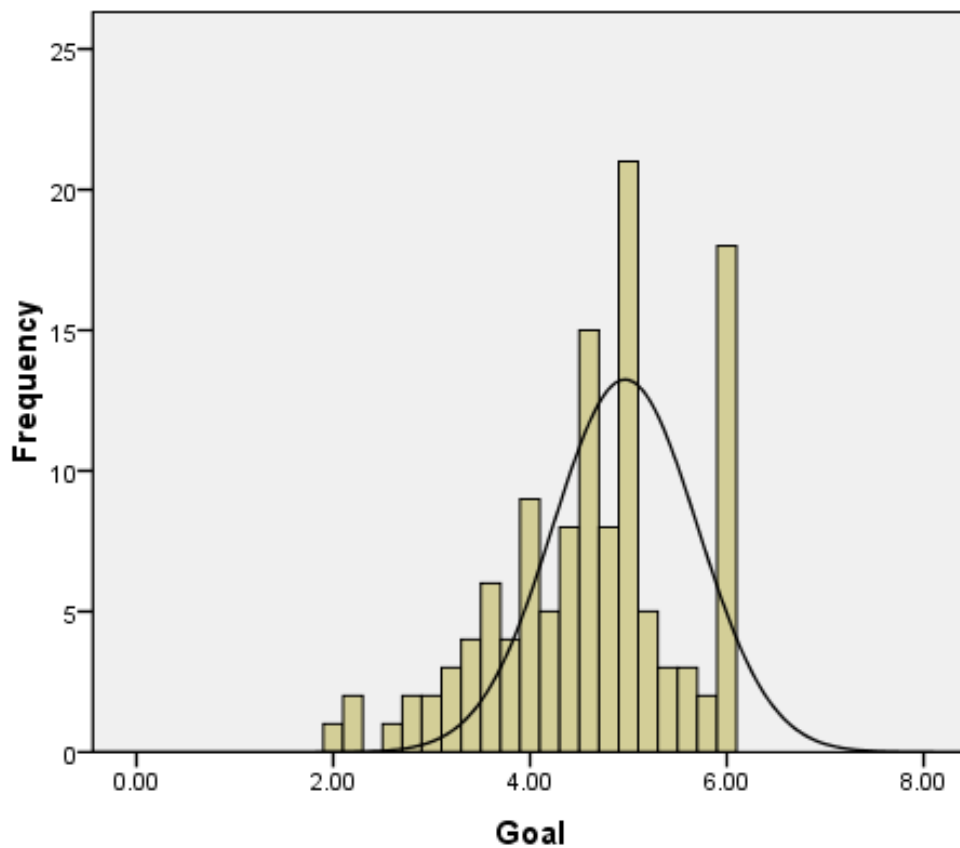
However, based on the regression test done on data collected from Malaysia industry project management personnel, there is no significant positive relationship between clear project goals and project success. Null hypothesis is not rejected. Clear project goal only explained minor parts of this model.

Data collected from respondents are based on the “last completed project” that respondent participated. Based on Figure-18, shows a histogram of data collected from respondents on clear project goal. It shows that most of the projects tested have clearly defined goal. The frequency of strongly clear project goal – 6 is relatively high.

Furthermore, based on Figure11, Figure12 and Figure13, most of the industrial projects tested in this research were relatively small industrial projects.

This means that the data collected from Malaysia industry project management personnel were from relatively small industrial project with clearly pre-defined goal and low uncertainty, low stakeholders expectation gaps. Thus, clear project goals do not play a significant role influencing failure or success of industrial project in the Malaysia industry environment. But this does not mean clear project goals are not important factors. The project leader should still properly define the project goals and the project deliverables at the initial stage, especially dealing with large size industrial project to ensure a clear and common understanding the goals for the success of industrial project.

Figure 18: Histogram of data collected for clear project goal



5.2.7 Hypothesis 6: Project Team Competency and Continuity

Previous researches concluded that quality, continuity and competency of project team members are found to be a critical factor that leads to the success of project. Past research findings show the importance of selecting and, if necessary, training project team members (Pinto & Slevin, 1987). Among team members, clear communication rules and competent team members are necessary to ensure that the industrial project is able to move forward. The project leader who deals with members from different background or vital team should pay more attention to the competency of team members as well as ensure the availability of effective communication channel to increase project control (Verburg, Bosch-Sijtsema, & Vartiainen, 2013)

Besides, past research findings suggest that a competent project team comprises a project leader with its members, who are recruited, trained and in possession of the required skills, knowledge and experience to handle the demands of the project. When the project is completed and later introduced to the clients or end-users, the ability of the team members to convince and sell the benefits of the project is important to ensure that the project are readily accepted by the clients (Chan, Zailan, & Fernando, 2009). Hence, previous studies suggest there is a positive relationship between project team competency and industrial project success.

The regression test carried out on data collected shows that project team competency and continuity are significant toward industrial project success. The null hypothesis rejected under 95% confident level with an unstandardized coefficient of 0.209. This result is in-line with findings from previous researches that indicate team competency is crucial for the project task to be carried out accurately and within limited resources. Furthermore, competent team members will also be capable to rescue project from negative threats and unplanned change using minimum resources.

5.2.8 Application of Test Result

This study identified six most influencing factors on industrial project success using meta-analysis. Questionnaires were sent to Malaysia industry project management personnel to collect responses based on their “last completed project”. The questionnaires are designed to identify the influence power of these six factors on Malaysia industrial projects. The regression test was used for the analysis of the data with the results shown below.

$$\text{Project Success} = 0.937 + 0.217(\text{organisation project management maturity}) + 0.390(\text{realistic schedule and budget}) + 0.209(\text{project team competency})$$

This result shows that a realistic schedule and budget are the most influencing factors followed by project team competency and organisational project management maturity where all these factors are controllable by the organisation.

First, management should be careful in reviewing the project schedule and budget. Setting a high target for the project team and requiring the team to deliver project goal within a shorter timeline and using less budget without proper study might be the key factor point which leads to project failure. Realistic project plan not only serve as a guideline for the team to work toward project goal but also allows the project team to deal with unexpected change and negative threat. Management should ensure effort to be put in during the planning stage to setup a proper and realistic project plan.

Secondly, project team member competency is key tools that drive industrial project toward success. Competent team members are not only able to perform their task effectively using limited resources, but are also capable of handling unexpected issues, negative change, threats or technical difficulty without significant delay or over

spending. Thus, it is important for the company to appoint the right person or hire the correct persons to do the right job. Assigning new and incompetent team members to the project may seem to be less costly at the beginning of the project but this might lead to over spending or delay at the later stages of the project.

Third, organisation project management maturity is also proven to be a significant influencing factor in project performance. Organisations which encourage their project team to document lesson learnt, using standardized project management documents, standard project management methodology are able to manage project more effectively. Standardized project management methodology not only helps the management or project leader to manage the project better but also allows outsider to understand the project progress and implementation method. Thus, organisations should encourage the practice of standardized project management methodology and set up a project management office to increase the maturity level.

Lastly, although this study shows that top management support, proper project risk management and clear project goal are not significant influencing factors among current industrial projects; organisations should also recognize the importance of these factors. Most of the current projects running in the Malaysia industry sector are considered to be medium or small size projects with project boundaries and scope that are easily identified and pre-defined. However, when the industry sector grows, the need for large scale projects will soon emerge. Therefore top management support, proper project risk management and clear project goal would then be significant factors that can affect the industrial project success.

To sum up, to ensure industrial project success, organisations should focus their resources in setting up official project management office and encourage use of standardized project methodology in order to increase organisation project management maturity. In addition, organisation should ensure that the target set or project plan approved is realistic and achievable using current resources. This realistic project schedule and budget will then serve as a guideline for the project team to work

towards project goals and deal with unexpected changes. Lastly, organisations should appoint or hire competent personnel as project team members so that tasks can be completed effectively and team members are capable of handling unplanned issues.

5.3 Research Limitations and Suggestions for Future Research

This research gives an overview of the key drivers of Malaysia industrial projects. However, there are a number of limitations in this research. Future researchers are encouraged to choose into consideration.

Firstly, the number of respondents is relatively small and only focuses on members of the Project Management Institute (PMI). It would be better if the number of respondent can be increased to about 300 people. Furthermore, although the members of PMI are experienced project management personnel, most of the members are working executives. There are some companies which do not require their employees to join PMI. It is better if future research can consider contacting large organisations and forward the questionnaires to them directly when collect data.

Secondly, most of the respondents who participated in this research answer the questionnaire (questionnaire requested respondent to answer based on their “last completed project”) using relatively small or medium-sized projects where the project budget is within USD 500,000 and the team having less than 10 members. Factors that influence large size industrial project success could be directed at bigger projects such as offshore oil drilling project which involve more than USD 10 million with a team of 20 persons or above; construction projects hiring more than 20 vendors; marketing projects on new product development and others. Future researchers can consider extending the research coverage to large size industrial project it encounters more uncertainties, changes and risks in order to better understand the relationship between project successes and affecting factors.

Lastly, since the respondents of current research are from project management institution, most of these respondents are working personnel in proper setup companies with official project management office and specific staff to run industrial project. However, Malaysia is a country having lots of small and medium size enterprises which run industrial project randomly without proper structure or standard methodology. Projects running in this SME could be different from large companies and often require service providers to be more customer service orientated. Interviews can be considered to understand how small and medium size enterprise run industrial project and factors that drive projects to success.

5.4 Conclusion

In the industry sector of Malaysia, organisations are using project teams to achieve specific goals. According to the report from the Malaysian Investment Development Authority (MIDA) 2012; the total industrial projects approved in 2011 are valued at RM 56.1 billion. This is an increase by 18.8% as compare to RM 47.2 billion in year 2010. The investment in projects is expected to increase in future. As more organisations come to rely on project structures and tools, ensuring the success of projects and determining the factors that lead to better project management practices have becomes essential to sustainability and viability.

In this study, factors that play significant roles in projects have been analysed to identify areas of focus that may affect the success of industrial projects by delivering agreeable goals on time and within budget. This study is aimed at analysing factors that affect the success of industrial projects. Six factors were identified as potentially most influencing factors based on the result of meta-analysis on previous researchers. Questionnaire was developed to test the significant level of these six factors by collecting responses from Malaysia industry project management personnel.

Questionnaires were sent to members of Malaysia Project Management Institution where the members are professionals and experienced project management persons.

Test results of this research show that setting a realistic project schedule and budget, assembling a competent project team and ensuring team member continuity; and increasing organisation project management maturity are the key driving factors of industrial project success. These factors are controllable by companies and organisations. Industry leaders and management of companies should focus company resources in strengthening these areas to increase the possibility of industrial project success by delivering the project goal on time and within budget.

REFERENCE

- Al-Husseini, D., & Abdel-Mahdi. (2006). The impact of transformational leadership and empowerment on project management. *UMI Dissertations Publishing* .
- Atika, J. A. (2011). Barriers to Effective Project Risk Management. *Universiti of Calgary* .
- Bakker, K. d., Boonstra, A., & Wortmann, H. (2010). Does risk management contribute to IT project success? A meta-analysis of empirical evidence. *International Journal of Project Management* (28), 493-503.
- Bakker, K. d., Boonstra, A., & Wortmann, H. (2012). Risk managements' communicative effects influencing IT project success. *Internation Journal of Project Management* (30), 444-457.
- Bass, B. M. (1985). Leadership and Performance Beyond Expectations. *New York Free Press* , 256.
- Belout, A., & Gauvreau, C. (2004). Factors influencing project success: the impact of human resource management. *International Journal of Project Management*, 22, 1-11.
- Biehl, M. (2007). Success factors for implementing global information systems. *50* (1), 53-58.
- Chan, W. K., Zailan, S., & Fernando, Y. (2009). Critical factors influencing the project success amongst manufacturing companies in Malaysia. *African Journal of Business Management*, 3 (1), 016-027.

- Cooke-Davies, T. J., & Arzymanow, A. (2003). The maturity of project management in different industries: an investigation into variations between project management models. *International Journal of Project Management*, 21 (6), 471-478.
- Cooke-Davies, T. (2002). The real success factors on project. *International Journal of Project Management* (20), 185-190.
- Cooper, D. R., & Schindler, P. S. (2011). *Business research methods* (11th ed.). New York: McGraw-Hill.
- Davis, A. S. (2008, September). Leadership styles in project management: an analysis based upon the multifactor leadership questionnaire. *Capella University* .
- Dvir, D., & Lechler, T. (2004). Plan are nothing, changing plans is everything: the impact of changes on project success. *Research Policy* (33), 1-15.
- Dvir, D., Rax, T., & Shenhar, A. J. (2003). An empirical analysis of the relationship between project planning and project success. *International Journal of Project Management* (21), 89-95.
- Dzameshie, D. O. (2012, March). Leadership in project management: the behaviors of successful male project managers in information technology. *Capella University* , 1-166.
- Emami, A., & Talebi, K. (2011). Decision framing and critical success factors of new product development. *African Journal of Business Management*, 5 (15), 6233-6239.
- Huffman, B. J., & Kilian, C. M. (2012). The Flight of the Phoenix: Interpersonal Aspects of Project Management. *Journal of Management Education*, 36 (4), 568-600.
- Jia, G. S., Chen, Y. T., Xue, X. D., Chen, J. G., Cao, J. M., & Tang, K. W. (2011). Program management organization maturity integrated model for mega construction programs in China. *International Journal of Project Management* (29), 834-845.

- Jiang, J. J., Klein, G., Wu, S. P., & Liang, T. (2009). The relation of requirements uncertainty and stakeholder perception gaps to project management performance. *International Journal of System and Software* (82), 801-808.
- Jones, D., & Deanice, E. (2008). Project management leadership in the manufacturing industry. *UMI Dissertations Publishing* .
- Kendrick, C. D. (2009, December). Project success factors and information technology project success. *Capella University* , 1-144.
- Khan, S., Gul, S., & Shah, A. (2011). A review of literature on the role of trust and partnering in success of construction projects. *African Journal of Business Management*, 5, 13541-13549.
- Kloppenborg, T. J. (2009). *Project Management: A Contemporary Approach*. South-Western Cengage Learning.
- Larson, E., John, A., & Drexler, J. (2010). Project Management in Real Time: A Service-Learning Project. *Journal of Management Education*, 34 (4), 551-573.
- Latonio, & Garcia, M. A. (2007). Exploring the impact of organizational culture on project. *University of Phoenix* , 1-374.
- Li, Y., Lu, Y., & Peng, Y. (2011). Hierarchical structuring success factors of project stakeholder management in the construction organization . *African Journal of Business Management*, 5 (22), 9705-9713.
- Madic, B., Trujic, V., & Mihajlovic, I. (2011). Project portfolio management implementation review. *African Journal of Business Management*, 5 (2), 240-248.
- Maylor, H. (2005). *Project Management* (3 ed.). Harlow, England: Financial Times Prentice Hall.
- MIDA. (2013, October). *Malaysia approves 428 manufacturing projects, RM28.3bil investments*. Retrieved from Business News: <http://www.thestar.com.my/Business/Business-News/2013/10/03/Malaysia-approved-428-manufacturing-projects.aspx/>

- MIDA. (2012). *MIDA Annual Media Conference 2012*. MIDA, Minister of International Trade and Industry, Kuala Lumpur.
- MIDA. (2013, Dec). *Projects approved by major industry, January to September 2013*. Retrieved from Malaysian Investment Development Authority (MIDA) Official Web Site: <http://www.mida.gov.my/env3/uploads/FactsFiguresPDF/JanSep2013/byIndustry.pdf>
- Milosevic, D., & Patanakul, P. (2005). Standardized project management may increase development project success. *International Journal of Project Management*, 23, 181-192.
- Morett, D., & L., O. (2009). Project management critical success factors in the environmental remediation engineering and consulting industry. *UMI Dissertations Publishing* .
- Moretti, & Oscar, L. (2009). Project management critical success factors in the environmental remediation engineering and consulting industry. *Capella University* , 1-190.
- Nasir, M. H., & Sahibuddin, S. (2011). Addressing a critical success factor for software projects: A multi-round Delphi study of TSP. *International Journal of the Physical Sciences*, 6 (5), 1213-1232.
- Nasir, M. H., & Sahibuddin, S. (2011). Critical success factors for software projects: A comparative study. *Scientific Research and Essays*, 6 (10), 2174-2186.
- Nwagbogwu, D., & Chukwuemeke, D. (2011). The Correlation Between Project Management Effectiveness and Project Success. *UMI Dissertations Publishing* .
- Oren, R. A. (2009, August). Contributory success factors for projects with the project management profession: a quantitative analysis. *Capella University* , 1-215.
- Organizational Project Management Maturity Model (OPM3)* (2nd ed.). (2008). USA: Project Management Institute.
- Pallant, J. (2005). *SPSS Survival Manual* (2nd ed.). Crows Nest, Australia: Allen & Unwin.

- Papke-Shields, k. E., Beise, C., & Quan, J. (2010). Do project managers practice what they preach, and does it matter to project success? *International Journal of Project Management* (28), 650-662.
- Parker, S. K., & Skitmore, M. (2005). Project management turnover: causes and effects on project performance. *International Journal of Project Management*, 23, 205–214.
- Pinto, J. K., & Slevin, D. P. (1987). Critical factors in successful project implementation. *IEEE Transactions on Engineering Management*, 34 (1), 22-27.
- PMI. (2008). *A guide to the project management body of knowledge : PMBOK guide* (4 ed.). Newtown Square, Pa: Project Management Institute.
- Probability and Impact Matrix*. (2011). Retrieved from Power Project: <http://powerproject.ca/help/glossary/probability-and-impact-matrix/>
- Rad, P. F., & Levin, G. (2003). Is your organization friendly to projects. *AACE International Transactions* , 41-46.
- Roscoe, J. T. (1975). *Fundamental Research Statistics for the Behavioral Sciences*. New York: Holt Rinehart & Winston.
- Scott-Young, C., & Samson, D. (2008). Project success and project team management: Evidence from capital projects in the process industries. *Journal of Operations Management* , 26, 749-766.
- Sekaran, U., & Bougie, R. (2011). *Research Methods for Business* (5 ed.). March: Wiley.
- Selg, R. A., & Rihel, D. R. (2007). Successfully Managing One-Of-A-Kind Projects. *AACE International Transactions*, 4, 05.1-5.4.
- Stewart. (2010). The role of the project management office on information technology project success. *Capella University* (1), 1-155.
- Stewart, D., & S., J. (2010). The role of the project management office on information technology project success. *UMI Dissertations Publishing* .

- Swink, M. (2003). Completing projects on-time: how project acceleration affects new product development. *Journal of Engineering Technology Management*, 20, 319-344.
- Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed.). Boston: Allyn & Bacon.
- Verburg, R. M., Bosch-Sijtsema, P., & Vartiainen, M. (2013). getting it done critical success factors for project managers in virtual work settings. *International Journal of Project Management*, 31 (1), 68-79.
- Verburg, R. M., Bosch-Sijtsema, P., & Vartiainen, M. (2013). Getting it done: Critical success factors for project managers in virtual work settings. *International Journal of Project Management*, 31 (1), 68-79.
- Yang, L.-R., Huang, C.-F., & Wu, K.-S. (2011). The association among project manager's leadership style, teamwork and project success. *International Journal of Project Management*, 29 (3), 258-267.
- Young, R., & Jordan, E. (2008). Top management support: Mantra or necessity? *International Journal of Project Management*, 26, 713-725.
- Zanjirchi, S. M., & Moradi, M. (2012). Construction project success analysis from stakeholders' theory perspective. *African Journal of Business Management*, 6 (15), 5218-5225.
- Zikmund, W. G. (2013). *Business research methods* (9th ed.). Mason, Ohio: South-Western/Cengage Learning.

Appendix A

Research Questionnaire

Dear Sir, Madam, Project Leader, Participant,

I am LEW BENT FEI, currently pursuing a Master of Business Administration (MBA) at UniversitiTunku Abdul Rahman (UTAR). I am soliciting your co-operation to participate in this research project questionnaire entitled “Factors Influencing Success of Project in Malaysia Industrial” The purpose of this research is to find out critical factors that influence project outcome; to help project leaders and organisations to gain better control in projects management.

I would be most grateful if you could complete the enclosed questionnaire based on your genuine feelings. The validity of the study will highly dependent on your sincere and honest response. The questionnaire may take about 10 to 15 minutes to complete (which consist of 8 sections).

Please rest assured that your responses will be used for our research purposes only. All personal information shall be treated as strictly private and confidential. Should you have any queries regarding the questionnaires, please do not hesitate to contact the undersigned at bentfei@lutar.my or bentfei@gmail.com.

Thank you for your precious time and participation.

Yours sincerely,

Lew Bent Fei

MBA Student UTAR

Section 1: Project success

Thinking back to your **Last Completed Project**, to what extent:

	Strongly Agree	Moderately Agree	Agree	Disagree	Moderately Disagree	Strongly Disagree
1.1 This project was completed on schedule						
1.2 This project was completed within budget						
1.3 Technical requirements specified at the beginning of execution phase were met						
1.4 Project clients and/or product users were satisfied with the project outputs						
1.5 There were no quality problem related to project output						

Section 2: Organisational Project Management Maturity

Thinking back to your **Last Completed Project (same completed project)**, to what extent:

	Strongly Agree	Moderately Agree	Agree	Disagree	Moderately Disagree	Strongly Disagree
2.1 Documentation standards were used (progress/status reports, and time sheets, others.)						
2.2 Information on successful/unsuccessful project was readily available						
2.3 Job description for team roles have been made available to the team personnel in writing						
2.4 Project team personnel understand their role on the project team?						
2.5 The results (decisions made, information received and needed, others.) of planning meetings were published and distributed to applicable personnel.						
2.6 You use project template or project documents created by others (previous) project leaders						
2.7 Project review outcome become part of a discussion in project meeting						

Section 3: Top Management Support

Thinking back to your **Last Completed Project (same completed project)**, to what extent:

	Strongly Agree	Moderately Agree	Agree	Disagree	Moderately Disagree	Strongly Disagree
3.1 Top management is responsive to our requests for additional resources if the need arises						
3.2 Top management has granted us the necessary authority and will support our decisions concerning the project						
3.3 That project was continually or constantly being review to reevaluate the viability and potential success by management						
3.4 Top management share the responsibility with the project team for ensuring project's success						
3.5 Top management was supporting you in crisis						

Section 4: Project Risk Management

Thinking back to your **Last Completed Project (same completed project)**, to what extent:

	Strongly Agree	Moderately Agree	Agree	Disagree	Moderately Disagree	Strongly Disagree
4.1 Risk assessment procedures were established						
4.2 There are contingency plans in case the project is off schedule or off budget						
4.3 Project team conduct and update risk assessment on project along the progress						
4.4 The limitation of the project had been discussed with the clients at the initial stage or starting of project						
4.5 The clients were told whether or not their input was assimilated into the project plan						

Section 5: Realistic Schedule and Budget

Thinking back to your **Last Completed Project (same completed project)**, to what extent:

	Strongly Agree	Moderately Agree	Agree	Disagree	Moderately Disagree	Strongly Disagree
5.1 Detail plan and budget for the project are available						
5.2 Actual project progress is regularly compared with the project baseline						
5.3 Regular meetings to monitor project progress and provide feedback to the project team are conducted						
5.4 When the budget or schedule requires revision, input is solicited from the project team.						
5.5 Projects are subject to realistic deadlines and targets						

Section 6: Clear Project Goal

Thinking back to your **Last Completed Project (same completed project)**, to what extent:

	Strongly Agree	Moderately Agree	Agree	Disagree	Moderately Disagree	Strongly Disagree
6.1 The basic goals of the project are made clear to the project team						
6.2 Project goals are clearly defined at start-up						
6.3 Project goals are made clear to all participants						
6.4 Potential stakeholders / clients have been contacted about the usefulness of the project						
6.5 An adequate presentation of the project has been developed for clients stakeholders						

Section 7: Project Team

Thinking back to your **Last Completed Project (same completed project)**, to what extent:

	Strongly Agree	Moderately Agree	Agree	Disagree	Moderately Disagree	Strongly Disagree
7.1 The project team did not experience any significant personnel losses or transfers during the project's development						
7.2 The project technical people are competent						
7.3 Project team members are committed to the achievement of project goals						
7.4 Project team members takes ownership of project goals						
7.5 Project team members actively participate in decision-making regarding the achievement of project goals						

Section 8: Demographic Data

8.1 Please indicate your industry or profession where you have the most project management experience:

- Mechanical or Automotive
- Electronic and Electrical
- Chemical
- Civil and Construction
- Aviation and Aerospace
- Science and Automation
- IT and Programming
- Manufacturing
- Others

8.2 What is the average dollar value of the projects you manage?

- Less than USD 100,000 (Less than RM 330,000)
- USD 100,001 - USD 500,000 (RM 330,000 - RM 1,650,000)
- USD 500,001 - USD 1,000,000 (RM 1,650,000 - RM 3,300,000)
- More than USD 1,000,000 (More than RM 3,300,000)

8.3 What is the average duration of the projects you manage?

- Less than 6 months
- 6 months - 12 months
- 12 months - 18 months
- More than 18 months

8.4 What is the average size of your project teams (including yourself)?

- 2 to 5 person
- 5 to 10 person
- 10 to 15 person
- More than 15 person

8.5 Do you hold a Project Management Professional (PMP) certification or equivalent certification?

- Yes
- No

8.6 How many years have you managed projects though out you career?

- Less than 5 years
- 5 to 10 years
- 11 to 15 years
- More than 15 years

8.7 How many years have you been employed at your current organisation?

- Less than 5 years
- 5 to 10 years
- 11 to 15 years
- More than 15 years

8.8 Describe your company size in terms of number of employees

- Less than 50 employees
- 51 to 100 employees
- 100 to 500 employees
- More than 500 employees

8.9 Feedback or Comment (Optional)

Appendix B

Pilot Test Result

Table 16: Pilot Test Result, Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
On_Schedule	164.44	685.028	.710	.918
Within_Budget	164.22	669.944	.848	.917
Tech_Met	164.33	689.750	.520	.920
Client_Statisfied	164.11	668.611	.755	.917
No_Quality_I	164.33	664.500	.780	.917
Doc_Std	164.33	742.000	-.349	.925
Inform_Avail	164.67	745.500	-.250	.927
JD_Avail	165.00	704.500	.400	.921
Role_underst	164.78	683.194	.718	.918
Result_Publish	164.78	710.444	.355	.922
Prj_Template	164.56	683.528	.643	.919
Review_Output	164.11	680.111	.920	.917
TM_Resource	164.44	698.528	.379	.922
TM_authority	164.33	664.250	.885	.916
Review_TM	164.89	696.361	.421	.921
TM_success	165.00	662.750	.887	.916
TM_crisis	164.67	658.750	.871	.916
Risk_procedure	165.11	731.611	-.052	.925
Contigency	164.89	694.861	.476	.921
Risk_update	164.56	732.028	-.072	.924
Limitation	164.33	669.500	.758	.917
Input_client	164.11	702.111	.399	.921
Detail_Plan	164.33	699.750	.566	.920
Progress_baseline	164.44	707.028	.701	.920
Regular_meet	163.78	702.194	.609	.920
Solicited_team	164.44	697.778	.635	.920
Realistic_target	164.33	652.000	.896	.915

Clear_Goal	164.11	675.361	.904	.917
Clear_define	164.67	646.250	.938	.915
clear_team	164.44	656.278	.904	.915
SH_conacted	164.22	671.944	.976	.916
Present_SH	164.33	672.250	.827	.917
No_Loss	164.78	719.694	.091	.925
Competent	163.89	703.361	.384	.921
Committed	164.11	702.611	.359	.922
Onwership	164.00	698.000	.426	.921
Actively	164.11	696.611	.414	.921
Industrial	164.33	748.250	-.174	.936
Avg_Dollar_size	166.78	726.444	.080	.923
Avg_duration	167.00	752.500	-.583	.927
Avg_size	166.67	720.500	.144	.923
PMP	166.56	729.778	.000	.923
Yrs_project	167.33	737.000	-.310	.924
Current_org	167.33	737.000	-.212	.925
No_Employee	166.44	761.528	-.565	.929