

**ASSESSING PROJECTS' PERFORMANCE OF
IRANIAN CONSTRUCTION COMPANIES
THROUGH APPLICATION OF A MATURITY
MODEL**

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IRANIAN CONSTRUCTION COMPANIES THROUGH
APPLICATION OF A MATURITY MODEL**

by

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DEDICATION

To:

My Father and my Mother

My Love; Mehrnoush

My Sisters

My Lecturers

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LIST OF ABBREVIATIONS & ACRONYMS

Symbols	Description
BS	Balanced Scorecard
BPMM	Business Process Maturity Model
BPR	Business Process Re-engineering
CII	Construction Industry Institute
CMM	Capability Maturity Model
CMMI	Capability Maturity Model Integration
CP	Contract Period
CPI	Continuous Process Improvement
DTA	Deputy of Technical Affairs
EFQM	European Foundation for Quality Management
EP	Execution Period
FAA-CMM	Federal Aviation Administration Integrated Capability Maturity Model
IDEAL	Initiating, Diagnosing, Establishing, Acting, and Learning
IIL	International Institute for Learning
ISO	International Standards Organization
DV	Dependent Variable
IV	Independent Variable
JIT	Just-in-Time
KMO	Kaiser-Meyer-Olkin
Kerzner	Kerzner Project Management Maturity Model
K&M	Knapp and Moore Project Management Maturity Model V2.4
MBP	Management by Projects
MSP	Managing Successful Programs
NIOC	National Iranian Oil Company
OGC	Office of Government Commerce
OPM3	Organizational Project Management Maturity Model
OPMG	Program domain of OPM3
OPMJ	Project domain of OPM3

Symbols	Description
OPMT	Portfolio domain of OPM3
PCM	Professional Construction Management
PDCA	Plan, Do, Check, Act
PCMM	People Capability Maturity Model
PM	Project Management
PMBOK	Project Management Body of Knowledge
PMI	Project Management Institute
PMMM	Project Management Maturity Model
PMRDC	Project Management Research and Development Center
PMS	PM Solution's Project Management Maturity Model
P3M3	Portfolio, Program, and Project Management Maturity Model
(PM)2	The Berkeley Project Management Process Maturity Model
PC	Cost Component of Project Performance
PQ	Quality Component of Project Performance
PS	Client Satisfaction Component of Project Performance
PT	Time Component of Project Performance
PRGC	Control Stage of Program Domain
PRGI	Continuously Improve Stage of Program Domain
PRGM	Measure Stage of Program Domain
PRGS	Standardize Stage of Program Domain
PRJC	Control Stage of Project Domain
PRJI	Continuously Improve Stage of Project Domain
PRJM	Measure Stage of Project Domain
PRJS	Standardize Stage of Project Domain
PRTC	Control Stage of Portfolio Domain
PRTI	Continuously Improve Stage of Portfolio Domain
PRTM	Measure Stage of Portfolio Domain
PRTS	Standardize Stage of Portfolio Domain
QIP	Quality Improvement Paradigm
RBV	Resource Based View
ROI	Return on Investment

Symbols	Description
RP	Revised Price
Sig	Significant
SEI	Software Engineering Institute
Std. Beta	Standardized Beta
SPSS	Statistical Package for Social Science
TP	Tender Price
TQM	Total Quality Management
VIF	Variance Inflation Factor
WTO	World Trade Organization

PENILAIAN PRESTASI PROJEK SYARIKAT PEMBINAAN IRAN MELALUI APLIKASI MODEL KEMATANGAN

ABSTRAK

Dewasa ini, syarikat pembinaan berkembang pesat selari dengan perubahan teknologi serta persaingan yang sengit, dalam mencari kecemerlangan untuk berjaya. Masalah syarikat pembinaan biasanya berkisar tentang prestasi projek, terutamanya dari segi kos, masa, kualiti serta kepuasan klien, yang boleh memberi kesan terhadap kebolehsaingan syarikat-syarikat berkenaan. Oleh itu, syarikat pembinaan perlu menggunakan kaedah, peralatan, atau teknik yang sesuai, yang dapat membantu mereka mengatasi masalah yang wujud, menilai serta meningkatkan prestasi projek mereka. Kajian ini bertujuan menetapkan perkaitan di antara faktor model kematangan yang sesuai dan prestasi projek. Dalam kajian ini, suatu model kematangan yang sesuai untuk syarikat pembinaan Iran dipilih bagi menentukan kesan daripada faktornya terhadap prestasi projek syarikat pembinaan Iran. Model yang dipilih ialah Model Kematangan Pengurusan Projek Organisasi (Organizational Project Management Maturity Model, OPM3) dan factor-faktornya digunakan untuk menentukan perkaitan mereka dengan prestasi projek melalui tiga hipotesis utama.

Kajian ini melibatkan 103 responden dalam kalangan syarikat pembinaan Iran yang bergred 1 dan 2. Keputusan kajian yang dianalisis melalui analisis regresi menunjukkan bahawa ketiga-tiga hipotesis utama berkenaan tidak ditolak. Dapatan menunjukkan bahawa terdapat perkaitan yang positif dalam kalangan 4 peringkat penambahbaikan proses. (pempiawaan, pengukuran, pengawalan, dan penambahbaikan berterusan) pada domain projek, program, dan portfolio untuk

proses pengurusan projek sebagai pemboleh ubah bebas dan kos, masa, kualiti, dan kepuasana klien sebagai pemboleh ubah bersandar.

Dapatan menunjukkan bahawa penpiawaian proses pengurusan projek boleh merendahkan variasi serta ketidakpastian dan kebolehamalan proses yang tinggi. Tambahan pula, ukuran proses pengurusan projek membolehkan keupayaan, kelemahan dan kekuatan proses dapat dikesan. Selanjutnya, kawalan proses pengurusan projek membolehkan syarikat pembinaan mencapai proses yang lebih stabil. Di samping itu, penambahbaikan proses pengurusan projek boleh memaksimumkan keberkesanan proses. Implikasinya, apabila proses pengurusan projek diawasi secara berkesan, diukur dengan jelas, dikawal secara jujur, dan domain projek, program, dan portfolio ditambah baik secara berterusan, maka prestasi projek pembinaan dapat dipertingkatkan.

ASSESSING PROJECTS' PERFORMANCE OF IRANIAN CONSTRUCTION COMPANIES THROUGH APPLICATION OF A MATURITY MODEL

ABSTRACT

Construction companies in today's business environment of rapidly changing technology and fiercely competitive world seek excellence to succeed. Construction companies' problems usually revolve project performance in terms of cost, time, quality and client satisfaction and may affect their competitiveness. It is vital for construction companies to adopt suitable methods, tools, or techniques that can help them to reduce these problems, assess and improve their project performance. This study aimed at establishing the relationship between the factors of a suitable maturity model and project performance. In this study, a suitable maturity model for Iranian construction companies has been selected to determine the effect of its factors on project performance of Iranian construction companies. The maturity model selected is Organizational project management maturity model (OPM3) and its factors were used to determine their relationship with project performance through three main hypotheses.

The study was conducted on 103 respondents among grade 1 and 2 Iranian construction companies. The results of the study analyzed through regression analysis showed that the three main hypotheses were not rejected. The findings indicated that there is a positive relationship among four process improvement stages (standardize, measure, control, and continuously improve) at project, program, and portfolio domain for project management processes as independent variable and cost, time, quality, and client satisfaction as dependent variables.

The findings indicated that standardization of project management processes can result in lower variation and uncertainty and higher predictability of processes. Moreover, measurement of project management processes cause better recognition of capability, weaknesses and strengths of processes. Furthermore, control of project management processes enables construction companies to achieve the stable processes. In addition, improvement of project management process would result in maximum efficiency of process. The implications are when project management processes effectively standardized, clearly measured, faithfully controlled, and continually improved at project, program, and portfolio domains, then project performance of construction projects would improve.

CHAPTER ONE

INTRODUCTION

1.1 Introduction

The activities in construction industry are discontinuous, dispersed, diverse, and distinct, i.e. the four “Ds” that are different with other industries (Tay, 1994). Wegelius-Lehtonen (2001) indicated that each project in construction project is unique although every building, road, bridge or process has a similar set of process stages. However, he elaborated that the construction industry is a project-oriented industry. The effect of construction projects on national economy not only are on the value its output and number of persons employed in its activities but also are in the function of its products which provide the foundation for industrial production (Donald *et al.*, 1991). According to Maseri *et al.* (2008) construction projects face many problems that are universal. They indicated that problems are mostly in the project performance of the construction projects. According to Aubry *et al.* (2007) project performance is sometimes evaluated using success criteria. In this regard, Cooke-Davies (2002) mentioned that performance predicts success and success factors affect performance. While Iyer and Jha (2005) stated that, measuring construction project performance in terms of success or failure is, in fact, a very complex process although it looks simple. Project success is considered almost the ultimate goal for every project (Chan & Chan, 2004). However, they indicated that different people consider different things for assessing project success. Some researchers noted that time, cost, and quality are predominant criteria, while others suggested that success is something more complex (Chan & Chan, 2004).

The definition of success often changes from project to project. Chan *et al.* (2002) mentioned that project success has been ambiguously defined in the construction industry. On the other hand, Parfitt and Sanvido (1993) claimed that success criteria are commonly developed to assess the performance of a project. Traditionally, success is considered as meeting project goals and expectations. Success should be viewed from different perspectives and variety of elements, including technical, financial, educational, social, and professional issues (Parfitt & Sanvido, 1993; Lim & Mohamed, 1999).

Traditional performance measures such as profitability, the Return on Investment (ROI), utilization, and others were used by many companies in the construction industry (Love *et al.*, 2005). Navarre and Schaan, (1990) considered the project duration, monetary cost, and project performance as success criteria for measuring performance at the project level. Time, cost, and quality are the critical criteria of the success of a project. They are defined and considered in almost every article on project success, such as that of Belassi and Tukel (1996), Hatush and Skitmore (1997), and Walker (1995, 1996). Project success as a goal, is achievable through the objectives of budget, schedule, and quality (Edmond *et al.*, 2007) while, projects have a set of goals to be accomplished.

A number of authors revealed the fact that there is also a need for considering additional project success criteria like profitability, business success, and meeting expectations which satisfy all stakeholders of a project (Agarwal & Rathod, 2006; Dewit, 1998; Turner, 1999). Liu and Walker (1998) indicated satisfaction as a criterion of success. In this regard, Torbica and Stroh (2001) believed that the end-

users satisfaction can be measured as a successful completion of a project. Client satisfaction has been considered as an important measure in the last decade (Cheung *et al.*, 2000; Sanvido *et al.*, 1992). Block (1983) pointed out two important areas. They are, firstly, the necessity to satisfy the needs of the users of the project and, secondly, the aspect of the quality of the system.

Recently, both the academics, and industries have developed various management techniques, tools, concepts, and principles (Kao *et al.*, 1996). A number of studies discuss on a large body of literature the role, importance and contribution of different management techniques, and tools in assessing and improving performance (Armstrong & Schultz, 1993; Becker & Gerhart, 1996; Brooksbank, 1991; Delaney & Huselid, 1996; Ittner & Larcker, 1997; Kao *et al.*, 1996). The project management maturity models as new concepts are important assessment tools (Jugdev & Thomas, 2002) to identify organizational strengths and weaknesses. Also, they provide benchmarking information (Jugdev & Thomas, 2002). In addition, Ibbs and Reginato (2002) suggested that, when an organization obtains a better project management performance at a lower cost, its project management becomes more mature.

There is an absence of global standards in the practice of managing projects in multi-national or global organizations (Crawford, 1998, 2002; Morris, 2001, 2003). Exactly, the same thing can be said to maturity models that the absence of a generally accepted definition of what is involved inevitably inhibits the value of any maturity model to the whole organization (Cooke-Davies, 2004a). A number of researchers have expressed their concerns over this proliferation of project

management maturity models. According to Cooke- Davies *et al.*, (2001) unfortunately, there is no consensus as to the contents of an organizational project management maturity model, or even the principles on which such a standard is constructed. More importantly, there is a growing base of research that supports a relationship between higher levels of maturity and improved performance (Herbsleb *et al.*, 1997). However, there is a lack of understanding concerning the relationship between the overall organization performance and maturity of an organization. According to researchers, the effect of project management maturity on the overall performance of the organization is an area with no strong evidences so far (Hakamiyan & Sobhiyah, 2005; Kevin *et al.*, 2006; Supic 2005). However, there are number of indications that such a link exists (Bendinskas *et al.*, 2005; Dooley *et al.*, 2001; Fincher & Levin, 1997; Harter *et al.*, 2000; J. Herbsleb *et al.*, 1997; Ibbs & Kwak, 2000; Ibbs & Reginato, 2002; Ibbs & Reginato, 2002a; Jiang *et al.*, 2004; Kwak & Ibbs, 2002; Kwak & Ibbs, 2000; Remy, 1997; Schiltz, 2003; Sonnekus & Labuschagne, 2004; Soares, 1998; Subramanian *et al.*, 2007; Williams, 1997).

This study investigates the relationship between project performance (time, cost, quality, and client satisfaction), and factors of a suitable maturity models. The following section deals with the background of the study, statement of the problem, justification for selection of suitable maturity model, research questions, objectives, significance of the study, research scope, definition of important terms, and organizations of remaining chapters.

1.2 Background

It is a fact that the construction industry is vital for the development of any country. The development of physical infrastructures such as buildings, roads, and bridges is an indicator of economic growth in any nation (Takim & Akintoye, 2002). The construction industry is a project-based organization. In contrast to manufacturing products, the deliverables of these projects, with very few exceptions, are very always unique. However, common questions arising in every type of project concerning performance (Cleland & Ireland, 2002: 4) including:

- i. How much does it cost?
- ii. How long does it require to finish?
- iii. What technical performance capability does it provide?
- iv. How well does the project's results fit into the (long and short term) design and execution of organizational strategies?

Pheng and Chuan (2006) indicated that project performance has always been considered an important issue in the construction industry. Ozorhon *et al.*, (2007: 800) indicated that "project performance is the extent to which the predefined project objectives are realized in terms of schedule, cost, quality, and client satisfaction". Project performance should be judged against a specific objective to see whether the objective is achieved. Without an objective, a company would have no criterion for choosing among alternative investment strategies and projects (Armstrong, 2000; Eccles, 1991).

Performance measurement is an important issue in the area of project performance. Neely (1999) stated that more than 3600 articles were published on performance measurement from the year 1994 to 1996. Performance measurement describes the feedback or information on activities with respect to meeting customer expectations and strategic objectives. Moullin (2004: 249) defined performance measurement as “evaluating how well organizations are managed and the value they deliver for customers and other stakeholders”. According to Lam *et al.* (2006) each project is based on set of goals to accomplish, which use as a standard to measure performance. They indicated that project success as a goal is achievable through the objectives of budget, schedule, and quality. There have been many past studies on project success and factors affecting project success. Performance in the concept of the project management can be considered meeting the stakeholders' needs and their expectations of a project. It is based on focusing attention to three major project elements i.e. time, cost, and quality (Project Management Institute, 2004). In today's highly competitive environment, clients as the major stakeholder always aims to achieve their goals and objective in terms of cost, quality, time, money value for their investments, minimal exposure and early confirmation of design and price or cost, and a faster project delivery with an early start of construction work (Centre for Construction Strategic Studies, 1998).

According to Bay and Skitmore (2006) organizations wishing to be successful in today's competition, need to produce a high standard of performance. Similarly, in the area of project management, it is important for project managers to learn and adopt best practices to achieve the excellence in project management. In connection to this, Kerzner (2001) highlighted that one approach is through

successful application of strategic planning. Any management of project requires careful strategic planning. This means that for each organizational environment a suitable customized standard methodology for a project management must be developed (Kerzner, 2001). Project management maturity models, as a subset of strategic planning for project management, provide mechanism for identifying key steps, the tasks that need to be accomplished, and the sequence of events needed for the realization of meaningful and measurable results (Bay & Skitmore, 2006). Most of all, the maturity models provide a framework for improving business objectives of an organization by assessing the project management strengths and weaknesses of the organization, enabling comparisons to be made with similar organizations, and acting as a measure of the correlation between the level of project management of an organization and its actual project performance (Combe, 1998; Hartman, 1997; Ibbs & Kwak, 2000b).

The number of maturity models for organizations are increasing both directly and indirectly in order to assess how mature an organization is (Cooke-Davies, 2004a). Another interesting aspect about organizations is the question of how best project performance can be measured, especially in areas related to governance, portfolio management and with enterprise-wide project management (Egberding & Cooke-Davies, 2002 cited in Cooke-Davies, 2004a). Therefore, it should be possible to assess how mature a project-based organization is by taking into consideration a combination of various aspects of project performance or project management practices to be measured, and to find out the results of these measurements (Cooke-Davies, 2004b).

Jugdev and Thomas (2002) mentioned that over the past decades, much has been mentioned in the literature that maturity models provide real, tangible ways of assessing aspects of project management maturity of a company. By considering these maturity models, companies can compare clearly their competence at the project and program level relative to a standard. Maturity models have made a significant contribution to the field of performance improvement. They have raised awareness on measurement of ability. Thus, they have succeeded in proposing an initial pattern to assess organizations and their project management maturity. The growing emphasis on maturity models also reflects an increasing desire to link project management competency to corporate achievements (Cabanis, 1998; Cooke-Davies & Arzymanow, 2002; Dorling, 1993).

Peterson (2000), Rosenstock *et al.* (2000), and Soares (1998) indicated that various statements are said about the benefits that organizations have obtained by using different maturity models. According to Peterson (2000), and Soares (1998) these organizations should be able to:

- i. manage all the projects effectively (Soares, 1998)
- ii. improve continually the performance of all projects (Peterson, 2000)
- iii. develop communication between the project management community and the organization's top management (Peterson, 2000).

According to Supic (2005), the concept of project management maturity models is new and has become part of the project management development process. Furthermore, project management maturity models are used to assess and strategically plan the project management development and the required resources in

an organization (Supic, 2005). He also indicated that another benefit of the maturity models can be used as a performance benchmark among different organizations and industries.

1.3 Statement of Problems

The construction industry is dynamic due to the increasing uncertainties in technology, budgets, and development processes (Acharya *et al.*, 2006). Construction projects are a continuing activity across the globe. In most countries, construction activity constitutes 6 — 9 % of the Gross Domestic Product (GDP) and constitutes more than half of the fixed capital formation such as infrastructure and public utilities capital works required for economic development (Chitkara, 1998). In addition, the construction industry has been long recognized as having problems in its structure and particularly in its performance (Egan, 1998; Latham, 1994). There are also other issues such as political, economic and other considerations as well as competitive pressure within the industry that are forcing the construction industry to strive to assess and improve its performance (Anumba *et al.*, 2000).

Pheng and Chuan (2006) indicated that project performance is an important issue in the construction industry. According to the Aubry *et al.*, (2007) performance is always the ultimate dependent variable in the literature on organizations in general and on the subject of project management in particular. They pointed out that the aim is to establish a reliable relationship between performance and other variables at a comparable level of analysis. However, Love *et al.* (2005) indicated that only a few studies have been conducted in regards to performance which are operating in

construction industry. It was discovered that in today's competitive global market, organizations are forced to improve their performance in order to achieve sustained success (Morris & Pinto, 2004). Furthermore, it is obvious that both practitioners and researchers have dealt with the issue of shortening construction time, reducing cost, and improving the performance in their works (Okuwoga, 1998; Tam *et al.*, 2002). According to Takim, and Akintoye (2002) when compared to other industry, the construction industry is generally considered to have underperformed. In this regards, Maseri *et al.* (2008) mentioned that construction projects have major problems in achieving their targeted budget, time, and standard of quality expected. Furthermore, Wei (2006) indicated that 33% of architect/engineering project could not achieve their cost and time targets. This type of problems would result in construction delay, cost overrun, difficulty in resolving claims, litigation and a win-lose climate (Moor & Birknshaw, 1998). Other researchers have also concluded that construction industry is facing problems in terms of project performance on construction projects with respect to time, cost, quality, and client satisfaction of their products (Aibinu & Jagboro, 2002; Al-Moumani, 2000; Arditi *et al.*, 1985; Assaf & Al-Hejji, 2006; Blichfeldt & Eskerod, 2008; Chan & Kumaraswamy, 1997; Dlakwa & Culpin, 1990; Koushki *et al.*, 2005; Mansfield *et al.*, 1994; Mezher & Tawil, 1998; Odeh & Battaineh, 2002; Ogunlana & Promkuntong, 1996; Okpala & Aniekwu, 1988; Sambasivan & Soon, 2007; Semple *et al.*, 1994; Lo *et al.*, 2006; Williams *et al.*, 2003). They conducted various studies in the different countries and concluded that construction projects were underperformed. They highlighted that most of the construction projects were not completed on time, within budget, good quality, with client satisfaction.

In Iran, similar problems can be detected and reported. The followings are some evidence concerning projects performance problems in Iran which were reported by government of Iran and a number of researchers.

The annual turnover of construction industry in Iran is US\$ 38.4 billion which is one of the most important sectors in the country (Asnaashari *et al*, 2009). According to Shafie (2007), Asgharizadeh (2008), Kheirandish (2008), Bakhtiyari (2009), and Ghazizadeh (2010) Iranian construction projects have financial and budget problems. Insufficient funds and not having enough budgets are among the most important problems of the 31% of big construction projects and 58% of small construction projects in Iran (Majidi, 2002). Furthermore, Adab (2005) indicated that the reasons for projects budget problems of Iranian construction projects are as follows:

- i. delay in payment to contractors by clients
- ii. inaccuracy in estimation of total time and total cost of the projects in the tender process
- iii. selection of contractor based on lowest bid price offered by contractor
- iv. lack of support by banking and insurance services
- v. high rate of inflation

The banking system, which is complex and incompatible with other international banking system, causes delay in approving the projects. In international tenders documents are normally considered for opening letter of credit (LC) 1.5 to 3

months. However, in practice the average of 2 years is now normal in opening the LC for industrial projects in Iran. It should be mentioned that the total project completion period is normally considered about 3 years and in fact this procedure will cause a big problem (Abka, 2005).

One of the most important factors in each project is the budget, which should be considered at the beginning of each project. Unfortunately, there is not too much attention given on budget of projects in Iran. It delays the projects, causes over cost, and may stop the project completely. In the recent years, stopping a new project before finishing the previous one has been considered as a main factor in the annual government budget estimation (Abka, 2005). However, in practice it has never happened. Another factor is the foreign financiers, which play an essential act in industrial projects. In fact this parameter depends on the general economical relations of the foreign country with Iran (Abka, 2005).

Furthermore, government reports showed that 45.8% delays in projects is related to the budget. Projects' budget which normally should be considered by government for the big projects, in most cases is not sufficient (Abka, 2005). It does not only cause delay for the whole project but also increase the cost of the project. In addition, inflation makes budget worse in a way that even initial budget cannot cover the expenses of the project and will lose its economical explanations (Abka, 2005).

In addition, Asnaashari *et al*, (2009) indicated that the process of construction projects is very slow and expensive in Iran and is subject to delay. The average period of project completion has increased from 8.6 years in 1995-2000 to 9.5 years

in 2000-2005 and to 11.3 years in 2005-2006 (Alef, 2007). Furthermore, the Deputy of Technical Affairs (DTA) (2006) reported the following evidence concerning the delay in Iranian construction projects.

- i. by the end of 2002, about 68.1% of the projects were not completed on time
- ii. the completion duration for most of the projects was 8.1 years
- iii. statistics has showed that the most important reasons for delay of construction projects are financial sources (45.8%), execution systems (13.8%), contractors (7.6%), and other factors (16.4%);
- iv. only 38.4 % projects were completed on time in 2005
- v. during 2000 to 2005, around 61.6 percent of big projects and 29.8% small projects had delay

In summary, the reports concluded that an average completion of 3 to 5 years has been considered at the beginning of the projects but many projects are not completed on time.

There are some studies that show delay and the reasons for delay in the Iranian construction projects. Zarabady and Najafzadeh, (2005) highlighted that reasons of delay in the airport networks are poor financial rules, poor technical programming, incorrect financial estimation, improper design, contractor weakness, poor project management, payment delay, insufficient flow charts. In another study, Zarabady and Najafzadeh (2005) found the factors which caused delay in the dam of Karon III were lack of technical and engineering knowledge in this area, poor project management, no previous experience in this filed, improper contractor selection, improper work description between contractor, environmental problems, insufficient

feasible study, no proper Co-operation between employer, contractor and consultant, simultaneously in the design and erection, no proper equipment.

Khoshgoftar (2006) indicated that the ten most important causes of construction delays in Iranian construction projects are finance problems, improper planning, site management, contract management, lack of communication between the parties, subcontractor, equipment availability and failure, shortage in material, inadequate contractor experience, change orders.

According to Radan (2008) and Anasori (2005) Iranian construction companies have problems in performing their projects with regard to technical specifications, and standards. Ansari (2004) indicated that the reason of awarding contract to foreign construction companies is low quality of the projects, and delay in projects completion by Iranian construction companies.

According to Nikbin (2005) and Navabpour (2006) construction companies cannot satisfy client's expectations. Chitsaz (2005) pointed out that clients expect contractors to deliver the project on time, within budget and with good quality, however in the various construction projects the clients' expectations are not met. Thus, it may cause clients dissatisfaction and conflicts with contractors.

It can be summarized that construction companies have problems in their project performance especially in terms of cost, time, quality, and client satisfaction. As the construction projects plays an essential role in development of any nation especially in developing countries and they have the important effect in economic

growth of any country, it is very important to find ways that can help construction companies to assess their project performance, find their weaknesses and strengths of their processes, plan for performance improvement, and achieving their strategic goals and objectives.

1.4 Research Questions

This study attempts to answer the following questions.

- 1) What is the suitable maturity model for Iranian construction companies?
- 2) What is the relationship between factors of a suitable maturity model and project performance of Iranian construction companies?

1.5 Objectives

The purpose of this study is to select a suitable maturity model for Iranian construction companies and to propose and test a theoretical model consisting of factors of a suitable maturity model and project performance. In particular the present study aims:

- 1) To identify a suitable maturity model for Iranian construction companies
- 2) To determine the relationship between factors of a suitable maturity model and the project performance

1.6 Methodology

This research benefits from both qualitative and quantitative methodologies. The research methodologies are as follow:

- 1) A qualitative method for selection of a suitable maturity model (Chapter 3).
- 2) A quantitative method to determine the relationship between factors of a suitable maturity model and project performance of Iranian construction companies (Chapter 4).

1.7 Significance of the Study

Construction companies like other companies attempt to improve their project performance. Many studies have been done on project performance. From the point of view of previous research findings, it can be concluded that construction companies have been facing problems in terms of their project performance. It was hard to find construction projects that were completed on time, on budget, met quality expectations, and satisfied their respective clients.

Accordingly, it is important to search for new tools, techniques, methods, instruments, and ways to assess and improve project performance of construction companies. There are many models and tools for assessing and improving project performance. One of these tools is maturity models. Previous researchers assessed the effect of a number of maturity models like the capability maturity model (CMM), the Kerzner project management maturity model, and the Berkeley project management process maturity model (PM)² on performance. They concluded that when an organization shifts from one level to the next level then performance of that

organization would improve. They did not consider the effect of factors and principles of any model on project performance. These researches were conducted on software organizations mostly and in developed countries.

There are some theoretical significant for this research. There is no study on maturity models to find the suitable maturity model among them in general and particularly for construction companies. In addition, there is no research on the effect of factors and principles that constitute a suitable maturity model on project performance in general and in construction companies in particular. Thus, it is important to find the relationship between factors and principles that constitute a suitable maturity model, and project performance. Besides, this not only, enhances the validity for the model but also may allow us find new variables for assessing and improving project performance. Taking the importance of assessing of project performance into consideration, using the factors considered in a maturity model, is a new approach while the other authors did not consider this issue.

There are some practical significant for this research. There are many large, local, and foreign, companies working in construction projects in Iran. The Iranian construction companies need to assess and improve their capabilities and performance if they are to remain viable in the current competitive environment. They must also complete the projects on time, and within budget with good quality. Also, they have to earn more profits and fulfill the satisfaction of their clients. In this regards, the identification of the suitable maturity model among existing ones in terms of project management components, unique and special characteristics of construction projects is important. This will not only help construction companies to

assess themselves by the same model as the suitable one but also they can compare themselves with their competitors. This approach provides some benefits and advantages for clients and construction companies. Clients can compare situation of construction companies in terms of a unique model. Also construction companies can understand their maturity level and find their strength and weakness points. In addition, construction companies can improve their position to reach their strategic goals and objectives and facilitate their success by determining their strengths and weaknesses. Moreover, they can also identify practices, characteristics that are more important to be taking in consider during the process of assessment and improvement of their performance.

1.8 Research Scope

- 1) The area of this research is limited to construction companies of Iran with grade one and two. (This area is chosen since it covers big companies with vast facilities and also big companies are interested in these issues more than other companies and also they face variety of problems).
- 2) This study is focused on the maturity models that are most popular and released after the year 2000 which is quite a recent issue in this area.
- 3) The primary data will be collected by questionnaire and interviews of companies of grade one and two in Iran.

1.9 Definition of Important Terms

1.9.1 Time

Bubshait and Almohawis (1994) defined time as the degree to which the general conditions promote the completion of a project within the allocated duration. In this study time component of project performance is measured by schedule growth, construction speed, delivery speed, and time index. These items are in line with studies of Naoum (1994), Chan (1996), Konchar and Sanvido (1998), Molenaar and Songer (1998), Ling, (2004), and Debella and Ries (2006).

1.9.2 Cost

Bubshait and Almohawis (1994) defined cost as the degree to which the general conditions promote the completion of a project within the estimated budget. In this study cost component of project performance is measured by unit cost, cost growth, budget growth, intensity, and cost index. These items are in line with studies of Naoum (1994), Chan (1996), Konchar and Sanvido (1998), Molenaar and Songer (1998), Ling, (2004), and Debella and Ries (2006).

1.9.3 Quality

Bubshait and Almohawis (1994) defined quality as the degree to which the general conditions promote meeting of the project's established requirements of materials and workmanship. It is also expressed in terms of technical specification, function and appearance. In this study quality component of project performance is evaluated through turnover, system and equipment quality, and performing works according to the drawings, specifications and standards and number of repetition works. These

items are in line with studies of Konchar and Sanvido (1998), Molenaar and Songer (1998), Ling, (2004), and Debella and Ries (2006).

1.9.4 Satisfaction

Satisfaction describes the level of “happiness” of key project participants in a project, including clients, architects, contractors, various subcontractors, surveyors, and engineers, and end-users. Client satisfaction component is measured with the following items as mentioned by (Maloney, 2002; Luu *et al.*, 2007; Yang & Peng, 2008). These items are: client satisfaction on product, client satisfaction on service, and number of claims and litigations.

1.9.5 OPM3

The Project Management Institute (PMI) chartered organizational project management maturity model (OPM3) project to develop an organizational project management maturity model to be a global standard for organizational project management. Within the OPM3 process construct the five project management process groups (initiating processes, planning processes, executing processes, controlling processes, and closing processes) are combined, within each of the three domains (project, program, and portfolio), interacting with and progressing through the four stages (standardize, measure, control, and continues improve) of process improvement.

1.10 Organizations of Remaining Chapters

The following chapters in the present study will cover various important aspects. Chapter 2 touches on the past research and literature related to performance, success criteria, project management, program management, portfolio management, and maturity models. Chapter 3 discusses about Iran and Iranian construction projects. Chapter 4 focuses on methodology and research design including various variables, measurement and population sample in the research. Chapter 5 is about selection of a suitable maturity model for Iranian construction companies and a present concerning the selected maturity model. Chapter 6 continues with the hypotheses, description statistics and results of the analysis for the present study. Lastly, Chapter 7 comprises of discussion regarding implications, limitations, and overall conclusion for the present study. The Figure 1.1 illustrates the Outline of the thesis outline of the thesis.

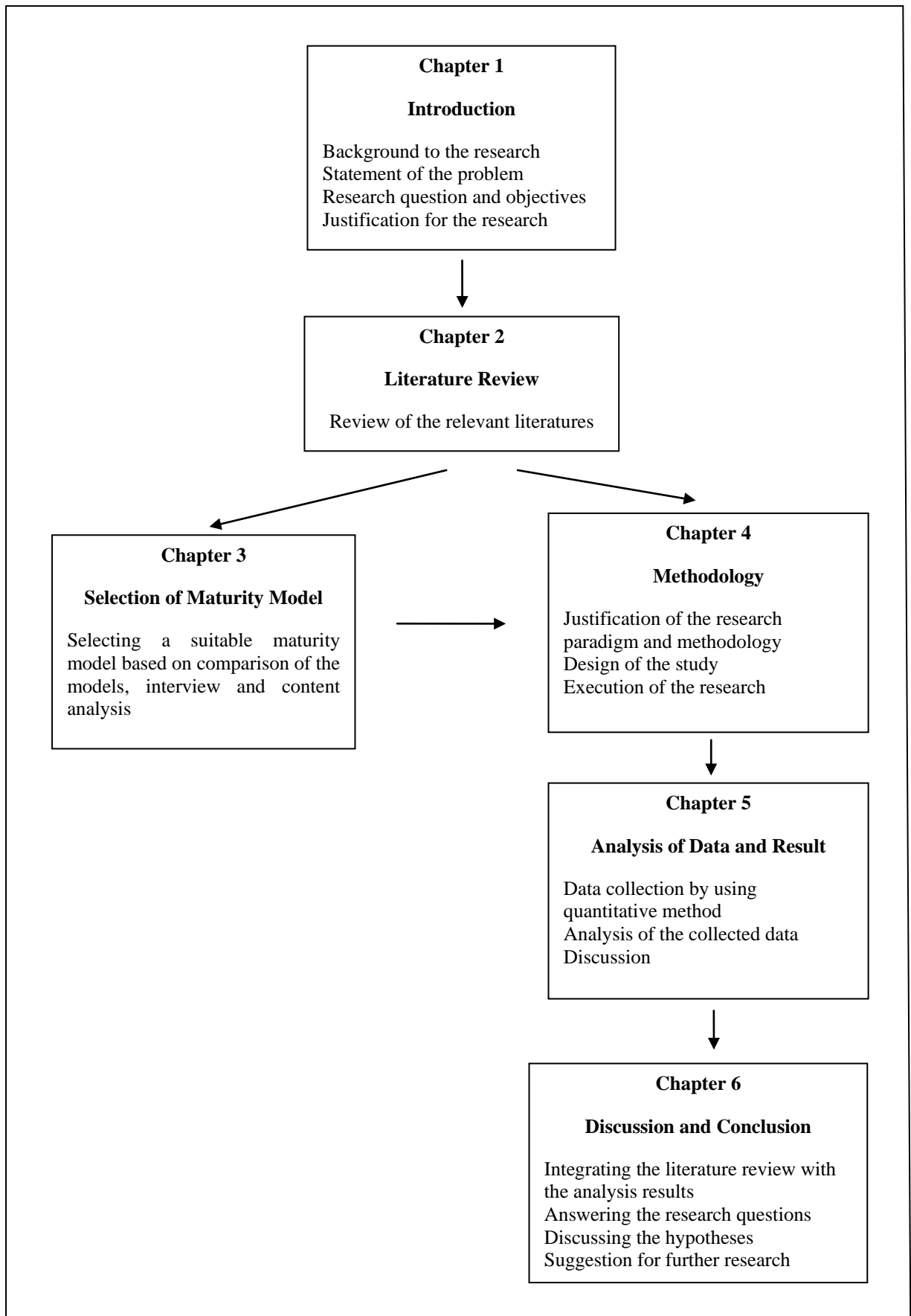


Figure 1.1: Outline of the thesis

CHAPTER TWO
AN OVERVIEW ON PROJECT PERFORMANCE AND MATURITY
MODELS

2.1 Introduction

This chapter deals with the review of the related literature and has four main sections. In the first section, Resource Based View (RBV) theory is reviewed. In the second section, performance will be discussed. Success criteria are covered in the third section. In the fourth section project, project management, portfolio management is reviewed. Maturity models are outlined in the final part with discussions of maturity, maturity measurement, project management maturity, project management maturity models, standardization, measurement, controls, and continuously improvement is discussed.

According to Beatham *et al.*, (2004) the construction industry environment is dynamic because of the increasing uncertainty in technology, budget and processes operating under a combination of many factors, events and interactions (Chan & Chan, 2004).

2.2 Resource Based View Theory

The conceptual framework of this study is defined by resource based view of the firm. RBV explains why some firms in the same industry perform better than the others. RBV has been explicitly adopted as a framework for assessing performance in international markets (Hooley *et al.*, 1996). The theory was first coined by

Wernerfelt (1984), however looking at firms in terms of their resources has a long tradition in economics and the roots of the theory can be found in the writings of Penrose (1959). The RBV has been further developed theoretically by Barney (1986, 1991), Dierickx and Cool (1989), Amit and Schoemaker (1993), Conner (1991), Peteraf (1993), and many others and has been applied empirically to large extent in different industrial and country settings bridging different disciplines of marketing, entrepreneurship and human resources (Barney, 1991). The basic logic of the resource-based view of the firm is relatively simple: the theory starts from the claim that the aim of the firm and desired outcome of managerial effort is sustainable competitive advantage as it allows firm to earn economic rents; taking this assumption, the theory deals with the problem, how the firm can achieve and sustain those advantages and it locates the answer to this question with certain key resources the firm has developed.

In 1991, Barney presented a more concrete and comprehensive framework to identify the needed characteristics of firm resources in order to generate sustainable competitive advantage. These characteristics include whether resources are: valuable (in the sense that they exploit opportunities and/or neutralize threats in a firm's environment), rare among a firm's current and potential competitors, inimitable, and non-substitutable (Barney, 1991). In this respect, many authors (Amit & Schoemaker, 1993; Mahoney & Pandian, 1992; Peteraf, 1993; Dierickx & Cool, 1989) have adopted and even expanded Barney's view to include: resource durability, non-tradeability, and idiosyncratic nature of resources.

2.2.1 Resource and Capability

Resources, in turn, comprise three distinct sub-groups, namely tangible assets, intangible assets and capabilities which also notes points. Firms can be conceptualized as a unique bundle of tangible and intangible resources and capabilities (Wernerfelt, 1984). Resources, which are the basic unit of analysis for RBV, can be defined as physical assets, intangible assets, and organizational capabilities that are tied semi-permanently to the firm (Wernerfelt, 1984). Resources as a source of heterogeneity of firm performance includes all assets, capabilities, financial, physical, human, commercial, technological, and organizational processes used by firms that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness (Barney, 1991; Daft, 1983). However, the theory claims that not all resources are of equal importance in terms of achieving competitive advantage and superior performance. Resources can be classified as tangible (financial or physical) or intangible (i.e., employee's knowledge, experiences and skills, firm's reputation, brand name, and organizational procedures).

Capabilities, in contrast, refer to a firm's capacity to deploy and coordinate different resources, usually in combination, using organizational processes, to affect a desired end (Amit & Shoemaker, 1993). They are information-based, intrinsically intangible processes that are firm specific and are developed over time through complex interactions among the firm's resources (Amit & Shoemaker, 1993). They can abstractly be thought of as 'intermediate goods' generated by the firm to provide enhanced productivity of its resources, as well as strategic flexibility and protection for its final product or service.