

MANAGEMENT OF MEGA INFRASTRUCTURE PROJECTS IN THE UNITED ARAB EMIRATES

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**A thesis submitted in fulfillment of the requirements for the degree of
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Moza Tahnoon Al Nahyan

DEDICATION

To my first role model and the man who illuminated my way,
the man who took me to the highest levels of knowledge.
He taught me how to face difficulties, he inundated me with love
and compassion, the man of whom I am very proud and who extended
unlimited support to me.
My resort after Allah the almighty.
To my beloved father, I dedicate this modest work.

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Glossary of Terms Used

Acronym	Description	Acronym	Description
AED	Emirati Dirham	MBTA	Massachusetts Bay Transportation Authority
ASCE	American Society of Civil Engineers	MCP	Mega Construction Projects
BCG	Boston Consultancy Group	MPW	Ministry of Public Works
BOT	Build, Operate and Transfer	OECD	Organization for Economic Cooperation and Development
CALTRANS	Californian Transport	OIC	Organization of the Islamic Conference
CCA	Corporate Cultural Approach	PERT	Program Evaluation and Review Technique
CPM	Critical Path Method	PCA	Principal Component Analysis
CSC	Context Sensitive Construction	PPC	Permanent Projects Committee
CSD	Context Sensitive Design	PMMM	Project Mgmt Maturity Model
DAB	Design Award-Build	PPP	Public Private Partnership
DB	Design Build	QPP	Quality Project Plan
DBB	traditional Design-Bid-Build	SUE	Subsurface Utility Engineering
DFH	Dubai Fujairah Highway	SWOT	Strength, Weakness, Opp, Threat
DOT	Department of Transport	TIP	Transportation Infrastructure Projects
EVM	Earned Value Management	TQM	Total Quality Management
FHWA	Federal Highway Administration	UAE	United Arab Emirates
GCC	Gulf Cooperation Council	VDOT	Virginia Department of Transportation
H.H	His Highness	VE	Value Engineering
I/D	Incentive/Disincentive	VFM	Value for Money
IMF	International Monetary Fund	VTRC	Virginia Transportation Research Council
JAIA	Jebel Ali International Airport	WBS	Work Breakdown Structure
KM	Knowledge Management	World Bank	International Bank for Reconstruction and Development

ABSTRACT

Since it became a Federation in the early 1970s, the United Arab Emirates (UAE) has developed rapidly with substantial investments in infrastructure generally and transportation projects in particular. Reports in the local media highlighted growing concerns relating to project cost and time overruns, compensation claims, and client dissatisfaction. The need for improved management processes has been clearly identified as an issue of major concern that needs to be addressed.

An examination of Transportation Infrastructure Projects (TIPs) in the United Arab Emirates (UAE) was conducted for this PhD research program. The overarching aim of this research program was to investigate the key factors for the effective management of TIPs in the UAE to ensure their future success. Based on a review of the relevant literature, three objectives for the research were outlined and six major research questions were developed for investigation.

From stakeholder theory, five major stakeholders were identified (sponsors/clients, Government Agencies, management Firms, consultants and contractors) and three dimensions of stakeholder influence (power, urgency and legitimacy) were nominated. Management processes of interest included communication, coordination, decision-making and knowledge-sharing. A conceptual model for management of a TIP was developed incorporating three levels, namely: (i) the various construction stages, (ii) stakeholder importance, and (iii) management processes, all impacting on the four nominated project success indicators.

A qualitative research program was employed involving four research phases. In Phase I, interviews were conducted with 20 key stakeholders from a variety of construction projects completed in the UAE over recent years. This phase found that the construction stages of design and planning were of primary importance in ensuring a successful project outcome. Major weaknesses in communication, coordination, decision-making and knowledge-sharing amongst the key stakeholders were also shown to be problematic for success.

Phase II involved an in-depth examination of a mega Transport Infrastructure Project, namely the Dubai Fujairah Highway (DFH), focusing specifically on the design and planning construction stages. Phase II included document examination, interviews with 10 key stakeholders involved

with the DFH Project, a site visit with interviews with site engineers, a focus group discussion session with key stakeholders, and finally interviews with the Minister and Director-General of the Ministry of Public Works. Among other findings, these results highlighted the complexity of this mega TIP and the influence that the major stakeholders can have during the life-cycle of the project and the range of measures used in defining project success.

In Phase III of the program, all the findings from Phases I and II were summarised and nine principle factors were identified as key elements in effective management processes, leading to a successful project outcome. These included effective leadership, good stakeholder and staff selection, management education and training, accurate budgeting, proven administrative procedures, adoption of international standards and systems, definition of project success indicators and clear roles and responsibilities, and effective communication and coordination mechanisms.

Finally in Phase IV, a preliminary framework was outlined for assessing TIP outcomes, focusing on its practical application for both the planning and design stages of a TIP. Another focus group discussion session with key stakeholders and a questionnaire survey were conducted to provide the ordinal data required for developing the framework. While this preliminary framework still requires further research and development, it has the potential to be used for assessing project success across the construction stages, stakeholder importance, and management processes. The framework incorporates stakeholder theory and stakeholder influence in terms of power, urgency and legitimacy involved throughout the various stages of mega TIP construction.

The research program makes a number of important theoretical and practical contributions in the field. Theoretically, it contributes: (i) a three-level hierarchical conceptual model for examining TIPs, (ii) confirms the relevance of stakeholder theory in understanding how key stakeholders influence in terms of their power, urgency and legitimacy in a successful TIP, and (iii) identifies the principle factors that impact on management processes and hence on infrastructure outcomes generally. The practical contributions from the research include the preliminary framework for assessing TIP project outcomes when applied to the design and planning stages. The thesis ends with a number of recommendations made for improving the success of mega Transportation Infrastructure Projects in the UAE and suggestions for future research.

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PUBLICATIONS RESULTING FROM THIS RESEARCH PROGRAM

1. To date, there has been one paper published on this research program in an international journal:

Moza T. Al Nahyan, Amrik S. Sohal, Brian N. Fildes, and Yaser E. Hawas, (2012), "Transportation infrastructure development in the UAE: Stakeholder perspectives on management practice", *Construction Innovation: Information, Process, Management, Vol. 12 Iss: 4* pp. 492 – 514

2. There has also been a Chapter accepted for publication in a book entitled *Risk Management in Engineering and Construction*:

Moza T. Al Nahyan, Amrik S. Sohal, Brian N. Fildes & Yaser E. Hawas, "Infrastructure development in the UAE: communication and coordination issues among key stakeholders", in Ogunlana, S. and Dey, P., *Risk Management in Engineering and Construction*, Taylor and Francis (in press).

3. One conference paper was presented at the Global Business and Technology Association (GBATA) 13th Annual International Conference, held in Istanbul on July 12-16, 2011:

Moza T. Al Nahyan, Amrik S. Sohal, Brian N. Fildes & Yaser E. Hawas (2011). Transportation Infrastructure Project Management in the United Arab Emirates: current practice and improvement opportunities, Track Management Stream, GBATA 13th Annual International Conference, Istanbul.

CHAPTER 1

INTRODUCTION

1.1 Statement of the Problem

The United Arab Emirates (UAE) is one of the Gulf countries in the Middle East, bordering with Oman to the East, Saudi Arabia to the South, and Qatar to the West. The UAE first gained independence from Britain in 1971 and became a federation of seven Emirates; Abu Dhabi, Ajman, Dubai, Fujairah, Ras al-Khaimah, Sharjah, and Umm al-Quwain. It has both a state and national hereditary governance, controlled by local Sheikhdoms. It is rich in oil reserves (CIA, 2011, claimed it has the seventh largest world reserves) and possesses one of the most developed economies in Western Asia. IMF (2007) noted the UAE has the thirtieth-largest economy in terms of market exchange rates.

From its early tribal beginnings, the United Arab Emirates has quickly undergone a profound transformation towards becoming a modern society with a high standard of living. The fluctuations in national income from oil, the government looked for diversifying the economy resources with more emphasis on the non-oil sectors (UAE 2011). The current economic agenda focuses on the economic liberalization, diversification, as well as promoting the role of the private sector.

Such diversification policy had a tremendous impact on the infrastructure development of the country, mostly to serve tourism, commercial sectors, oil services, industrial sectors, real estate, etc. The UAE expansion to non-oil sectors was indeed a reaction to the variations of oil prices in the 1970's and 1980's, and the quota restrictions on oil production by OPEC. This expansion is growing with unexpectedly high rates, with high demand on all infrastructure projects taking place in various economic aspects.

By 2006, new infrastructure projects in the region had grown by an amazing 50%, primarily from favorable energy prices and the increasing role of the private sector in infrastructure development. Investments in new infrastructure projects in the Gulf Cooperation Council (GCC) countries reached a total worth of US \$ 44.3 billion in 2005. (Augustine, 2006). With this economic boom, the UAE struggled to provide the necessary professional project planning,

design and management personnel and hence were forced to depend heavily on foreign countries to accommodate the tremendous developments in all dimensions that have since taken place. Consequently, the diversity of labor sources, although favorable in creating an international working environment, has had a major impact on the homogeneity, expertise and the quality of the work performed in recent years.

Several articles in local media have addressed the general concerns over infrastructure development in the UAE. Kazimi (2005) reported on the significant rise in compensation claims due to the boom in construction projects. Local groups were reportedly unfazed by project delays (Ditcham, 2006) or reported serious problems with major UAE transportation projects (Ditcham, 2007). Nazzal (2005) noted substantial delays in ceramic pavement work on UAE projects leading to unnecessary cost and time delays. Ahmed (2007) reported client problems with contradictory contractors leading to unnecessary and large delays and costly overruns in mega transportation construction projects in UAE. Consequently, the diversity of labor sources, although favorable in creating an international working environment, has had a major impact on the homogeneity, expertise and the quality of the work performed in recent years. Clearly, there is scope for substantive improvement in infrastructure development in the UAE, most notably in mega transportation projects.

Given the need for greater attention to infrastructure development, especially related to transportation, this study sets out to examine management practices and stakeholder involvement in mega transportation projects generally in the UAE.

1.2 The Research Program

The overall aim of this research is to investigate the key factors for the effective management of transportation infrastructure projects (TIPs) in the UAE to ensure their future success. The transportation and infrastructure sectors represent considerable portions of the UAE economy, and better management of mega transportation infrastructure projects (TIPs) is expected to have a positive impact on the development of the country's economy. This research program addresses a number of key issues including the management stakeholder topology, communication and coordination among the project stakeholders, effectiveness of decision-making and knowledge-sharing and the implications of such managerial issues on the project

success as measured by stakeholder satisfaction, schedule overruns, cost overruns and quality performance.

1.3 Objectives and Research Plan

In keeping with the overall aim of understanding what are successful management practices relevant for enhancing Transport Infrastructure Projects in the UAE, three related research objectives were set out for the program:

1. To develop a better understanding of Transportation Infrastructure Project (TIP) management practices and challenges in the UAE;
2. To understand how the various stakeholders and management processes impact on project success throughout the different stages of project execution; and
3. To summarise the findings and develop a preliminary framework for quantifying future project success of TIPs in the UAE.

The research program planned here involves a series of scientific qualitative research methods to address the three objectives above. To help guide the research effort, a number of research questions were formed from the information gathered during the literature review, namely:

1. What is the current state-of-the-art of UAE mega Transportation Infrastructure Project management?
2. What are alternative international theories for managing infrastructure projects that could be relevant for the UAE environment?
3. What are the key factors necessary to enhance UAE TIP management practice?
4. What are the key impediments to the successful completion of the projects in the UAE for each stakeholder and for the whole network in the UAE?
5. How can the success or failure of TIP projects in the UAE be judged and what measures best describe success or failure in the region?
6. What are the data and system needs to help ensure successful TIP management practices in the UAE?

The research questions were formed from the findings of the international literature review reported in Chapter 3. Details on the methods used to address these research objectives and questions are outlined in Chapter 4 and the evidence of how they were addressed and the findings are summarised in Chapter 8.

1.4 Thesis Structure

The thesis contains eight Chapters. **Chapter 1** provides an overview of the research program, undertaken as the major requirement for a PhD qualification in the Department of Management, the Faculty of Business and Economics, Monash University in Melbourne.

Chapter 2 outlines the important challenges and difficulties in conducting infrastructure projects in general and transportation projects in particular in the UAE, given the unique cultural environment that exists in the region. It provides a brief insight on UAE political, social, and economic development that has been taking place in the country. In addition, it discusses the challenges and barriers that the UAE is experiencing in respect to project management implementation in handling infrastructure projects in particular.

Chapter 3 reports on a major literature review that outlines the findings from international research on the state-of-the-art management methods adopted in different countries, along with identifying the advantages and disadvantages of each approach. It includes issues of project management such as the impact of coordination, communication, decision-making, and knowledge-sharing on project success. It also highlights the stakeholder theory and its applications in the context of managing infrastructure projects. It also presents the review on technical management issues of the project stages: planning, design, scoping, scheduling, tendering, and implementation. The literature review also presents the various measures used for assessing the project success and identified research direction, data collection methodologies and analysis tools to be used in this research program.

Chapter 4 provides an overview of the research design and methods adopted in executing this research work. It highlights the conceptual model of the study, and discusses its key elements. It presents an overview of the stakeholders' network of transportation infrastructure projects in UAE and highlights some of the management aspects with relevance to TIP's in UAE. The chapter also reviews the research objectives, questions, and design. The various research phases are demonstrated in details including: Phase I: the exploratory interview, Phase II: in depth research, including an analysis of a case study, Phase III:, and Phase IV: the development of the framework.

Chapter 5 is the first experimental chapter of the research program. It describes the procedure and results of the Phase I interviews. The data comprised 20 interviews involving five major

stakeholder groups identified based on Stakeholder Theory. Such analysis was used to identify the key stakeholders in TIPs in the UAE, the critical stages of TIPs, and any obvious managerial deficiencies. The analysis enabled the assessment of the importance of communication, coordination, decision-making, and knowledge-sharing, as well as project success indicators and factors causing time and cost overruns. The two stages of planning and design of a project life cycle were identified by the interviewed stakeholders to be the most critical stages.

Chapter 6 contains the procedure, results and some discussion of Phase II research. This phase contained a number of research tasks, including (i) the selection and in-depth evaluation of a case study (the Dubai-Fujairah highway project - DFH), (ii) follow-up interviews and focus group discussions with key project stakeholders, (iii) exploration of historical records on past and current performance, (iv) visits to the site and discussions with site personnel about various aspects of the DFH project, and (v) interviews with the Director General and the Minister of Public Works on various aspects of this project. The diversity of the data collected enabled a comprehensive review of the managerial aspects in-depth. Participants involved in this phase were selected on the bases of having the attributes of legitimacy, power and urgency in both the planning and the design stages of the Dubai-Fujairah highway (DFH) project.

Chapter 7 summarises the findings from Phases I and II and leads to the development of a discrete number of principle factors for project success. Based on these research findings, a preliminary framework was then developed for managing TIP's in the UAE. Additional ordinal data were required to identify and weight their relative importance of the factors, and these were established from a second focus group discussion and a survey of key stakeholders. Further development of this preliminary framework is required which could be the topic of a future research program.

Chapter 8 is a summary of the overall research outputs, illustrating how the research has addressed the research objectives and questions, the theoretical and practical contributions from the research, strengths and limitations of the program, and recommendations for further research. The chapter concludes with a number of specific recommendations that can help concerned stakeholders and decision-makers to achieve better and more successful project outcomes.

CHAPTER 2

THE UNITED ARAB EMIRATES POLITICAL, SOCIAL, ECONOMIC AND CULTURAL ASPECTS FOR INFRASTRUCTURE DEVELOPMENT

Chapter 2 sets out to provide an overview on UAE cultural background of relevance to the research program. It examines the political development and its implications on the infrastructure sector, discusses aspects on the social development and its implications on project management, highlights economic development, with emphasis on transportation infrastructure sector, and finally highlights major challenges to the management of infrastructure projects in the UAE.

2.1 United Arab Emirates Geographical Location

The UAE is located along the south-eastern tip of the Arabian Peninsula, close to the entrance of the Arabian Gulf; sharing boundaries with Qatar, Saudi Arabia and Oman. Figure 2.1 shows the geographical location of UAE. The UAE is a country that uniquely blends the traditional values within a modern and advanced society.



Figure 2.1: UAE Political Map (Source: Mapsales, 2008)

2.2 Political Development and Current Regime

The UAE is located along the south-eastern tip of the Arabian Peninsula, close to the entrance of the Arabian Gulf; sharing boundaries with Qatar, Saudi Arabia and Oman. It is a constitutional federation of seven Emirates: Abu Dhabi, Dubai, Sharjah, Ajman, Umm al-Qaiwain, Ras al-Khaimah and Fujairah. The country has uniquely blended the traditional values within a modern and advanced society.

The size and complexity of each Emirate has a direct effect on the federation rules and legislations. Table 2.1 below represents the total geographical area of each Emirate and as a proportion of the overall area of the federation.

Table 2.1: Area of the Seven Emirates in the UAE
(Source: Annual Census Book, 2004)

Emirate	% of the UAE Federation Area	Square Miles	Square Kilometers
Abu Dhabi	86.7%	26,000	6,734
Dubai	5%	1,500	3,885
Sharjah	3.3%	1,000	2,590
Ajman	0.3%	100	259
Umm Al-Qiwain	1%	300	777
Ras Al khaimah	2.2%	650	1,683
Fujeira	1.5%	450	1,165
Total	100%	30,000	77,700

The federation was established on 2nd of December 1971, following its independence from Great Britain (Annual Census Book, 2004). The UAE joined the Arab League and became a member of the United Nations following the declaration of independence. UAE is also a member of the International Bank for Reconstruction and Development (World Bank), the International Monetary Fund (IMF), the Organization of the Islamic Conference (OIC), and the Gulf Cooperation Council (GCC).

2.2.1 UAE and Current Political Regime

The UAE is currently ruled by Sheikh Khalifa Bin Zayed Al Nahyan who was elected President on November 3rd, 2004 following the death of Sheikh Zayed Bin Sultan Al Nahyan (who held the post from the foundation of the federation on December 2nd, 1971 until his death on November 2nd, 2004).

The UAE has a federal government with overall responsibility for the region, and local governments within each Emirate. The complexity of each local government differs according to the size and population of the respective Emirate. Generally, each has a municipality and various departments to oversee local developments and programs. The relationship between the Federal and local governments is laid down in the constitution, and it allows for a degree of flexibility in the distribution of authority (Annual Census Book, 2004).

The Federal Supreme Council of the union comprises the rulers of each of the seven Emirates. The council is constitutionally authorized to manage the supreme affairs of the country and take the relevant strategic decisions. Other details fall within the powers of the Heads of State and the Executive Authorities. The Council of Ministers (the Cabinet) is headed by the Prime Minister, the executive authority for the federation. The Cabinet is regarded as a most important stakeholder affecting the construction of federally-budgeted mega projects. It has the authority to approve the budget for such local infrastructure projects.

The Federal National Council has both a legislative and supervisory role in the running of the country. It is a member of the International Parliamentary Union, as well as the Arab Parliamentary Union. The Supreme Court nationally has overall responsibility for the UAE legal system and works in conjunction with the lower courts. It is based on Islamic law, but also incorporates elements of Western legal systems in some areas such as commercial law. Many legal disputes are decided by local customary practice under the supervision of the ruler of each Emirate. It is worth mentioning that *traditional practice* plays an important part in the government of the UAE. The institution of the “majlis” (or “majalis”) maintains an essential role in ensuring that the people have free access to their rulers. This practice may sometimes have implications on the course of project execution or resolving disputes in mega transport infrastructure projects.

The UAE government has a particular focus on national infrastructure, and the provision of government facilities to (i) develop and improve the services in all of the seven Emirates; (ii) to facilitate interconnection among the Emirates; and (iii) to enhance the educational standards and the living standard of the people.

The federal and local governments do not have well-defined procedures to facilitate mutual understanding and cooperation in respect of strategic development decisions. Although the relationship between national and state governments is shaped by the constitution, the high level of flexibility given to local governments includes many aspects not specifically defined in detail. Such undefined flexibility has occasionally led to conflicting activities or decisions that were not always useful to overall federal plans or directions, and has led to conflicting decisions that have resulted in overrun of infrastructure project cost and time.

2.2.2 The Federal Budget

The constitution stipulates that each Emirate must contribute to the federal budget. In practice, however, Abu Dhabi was the only contributor in the 1970's; and Dubai only began to contribute in the early 1980s. In 1991, for instance, Abu Dhabi provided 77.5% of the federal budget and Dubai 8.5% (Annual Census Book, 2004). The other five Emirates benefited from federal expenditures on defense, infrastructure, education, and social services, but they draw up their own budgets for municipal expenditures and industrial projects which are seldom published.

The revenue and spending estimates for the UAE's first five-year plan (from 1981 to 1985) were based on strong oil revenues of the late 1970's. However, petroleum revenues fell during the early 1980's, rendering many of the planned goals unattainable. Consequently, the Federation suffered its first budget deficit in 1982, of AED 3.9 billion (Library of Congress, 1993). Since that time, government planners have adopted a more flexible and conservative approach to account for oscillations in the oil market. The sudden drops in oil revenues have repeatedly forced the government to put new projects on hold and to freeze current projects.

After suffering budget deficits during most of the 1980s, the UAE enjoyed budget surpluses in 1990 and 1991 as oil revenues improved. In 2001, government revenues were around AED 29.7 billion, with expenditures about AED 22.9 billion (Embassy Report, 2003). In the 2006 fiscal year, the federal budget reached a balance between its revenues and expenditures from an

increase in the number and the capital of public joint stock companies. In addition, the contribution of other Emirates to the federal budget had increased, allowing more financial allocations to education, health, and projects sector (Federation of UAE Chambers of Commerce & Industry, 2006). It is worth noting that three main objectives have guided federal government spending, including strengthening the federation's physical infrastructure and social services network, diversifying the economy, and expanding trade (UAE Year Book, 2007).

By 2010, the approved federal budget was AED 43.6 billion. In line with the government's strategic goal of achieving a balanced development across all Emirates, a total of AED 7.6 billion (17%) was allocated to federal infrastructure development projects and programs such as roads and transport, medical facilities, housing and government facilities (Kumar, 2010). The following year, the federal budget slightly decreased to AED 41 billion but only 4 percent of the total budget was allocated for roads and public works to complete projects already undertaken by the federal government. This proportion was essentially budgeted again for 2012 (Kippreport, 2011).

2.2.3 Impact of Political Development on Management

The rapid development in the UAE has led to the challenge of having sufficient, well qualified and specialized management systems in place with quick effective solutions. Furthermore, since the establishment of the federation, the UAE has signed a number of trade agreements and political treaties with many other countries, further stretching managerial capacity among UAE nationals (UAE MPW Media Report, 2008).

In 2004, the UAE government emphasized the importance of partnerships with the private sector, and the privatization of some economic sectors (UAE Year Book, 2007). More recently, the UAE has engaged the private sector in long-term contractual agreements, particularly in the area of capital-intensive projects. Public Private Partnerships (PPP) have emerged as an effective approach for delivering more economical infrastructure projects in recent years (Zheng, Roehrich and Lewis, 2008). If a PPP is properly formulated and managed, it can provide many benefits such as alleviating the financial burden on the public sector, allowing risk-sharing between the public and the private sector, and increasing the value for money spent for infrastructure services by providing more efficient, lower cost, and reliable services (Kwak, *et al.*, 2009).

Needless to say, it is important for the public client and the private bidders to assess all the potential risks through the whole life of the project (Smith, and Telford, 1999). These recent trends of project delivery methods have helped in developing the managerial skills in the country to handle such infrastructure projects.

Due to the UAE's open political strategies, the state has been influenced by international modern management systems and practices, such as those in China, Singapore and Canada. This is reflected in hiring international management experts from all over the world to apply the most advanced management systems and practices that suit the UAE environment.

Moreover, UAE universities have signed agreements with a number of international universities so that local students can study the best management systems and practices that could be applicable in the UAE market and which contribute to the wider development goals of the region (Mohoney, 2007).

2.3 Social Development in the UAE

The UAE's population reached over five million people for the first time during 2009 (UAE Interact, 2009). In 2011, The Center for National Census announced that the UAE population had reached 8.264 million in July 2010. Of these, however, only 947,900 (11.5%) were UAE nationals, the remaining being expatriates from many different parts of the world (Emarat Elyoum, 2011).

To account for the expected population growth in the UAE over the next 20 years, the Urban Planning Council of Abu Dhabi developed and adopted a strategic plan to develop the Emirate's most dynamic economic sectors (the Urban Structure Framework of Abu Dhabi 2030 Plan). The plan includes inter-city train network and metro lines, specifies land uses, building heights and transportation plans for Abu Dhabi. (Salama, 2007).

2.3.1 Impact of Social Development on Management

The social development in the UAE was accompanied by enhancements of the management skills and education to cope with the country's needs and its social structure. Management education in the UAE has become a main component of its educational system and training is also provided for directors of agencies, ministries and governmental bodies to enhance their

performance, management skills and organizational roles (Federation of the UAE, 2006). Management education in the UAE takes many different forms. Instead of focusing on Administrative Management Education or even General Management Education, there is a tendency in the UAE to focus on specialized management education such as management education for hospitals, airports, oil rigs, etc. This also includes the specialized management education for the management of specific infrastructure projects (UAE Year Book, 2007).

Over the past three decades, there has been a strong relationship between the social structure and development and the advancement of the management skills and needs in the society. This is evident through the following observations:

1. The increase in the role of women in management. Ground breaking women such as Sheikha Lubna Al Qasimi, Minister of Economics, and women's contribution in the 2011 UAE parliament are just few examples for the role of women and their contributions in management;
2. The increasing demand for high standards and skilled managers in various areas;
3. The inclination towards team management rather than individual decision-making (the move from centralized to decentralized decision-making structures);
4. The increasing number of nationals engaged in both the private and public sectors and the implications of this on human resources management;
5. The existence of significant numbers of expatriates living in the UAE resulting in the development of a multi-cultural community and the adoption of world class management practices to execute projects; and
6. The interaction between different cultures in the UAE helped in establishing flexibility in the management practice to account for the differences in work place practices.

2.4 UAE Economic and Infrastructure Development

Shihab (2011) noted that up until the 1970s, the UAE was one of the least developed countries of the world. Today, it has achieved an income level comparable to that of the industrial nations. The UAE did not pass through the hypothetical development *stages* that most developed

countries seem to have experienced. The oil revenues have enabled the UAE to short-cut the difficult and lengthy process necessary for economic development. The following sub-sections discuss economic growth in the UAE with particular emphasis on infrastructure development.

2.4.1 Economic Growth and Infrastructure Development

The term *infrastructure*, as used here, refers to roads, bridges, railways, facilities, and building structures. In a broader sense, it may also refer to the relations and skills that help organizations and institutions achieving their goals. Infrastructure in its comprehensive essence includes all the constructional projects that enable the system of the local economy to provide its services to the beneficiaries.

The Economist recently reported that with trillions of projected investments over the next decade, infrastructure spending is becoming the “biggest investment boom in history” (The Economist, 2008). In a recent report by the Organization for Economic Cooperation and Development (OECD, 2007), the expected spending to update the infrastructure in emerging economies is estimated to be \$53 trillion between 2007 and 2030. It also expects the developed nations to invest at least 2.5% of their GDP in infrastructure. In the USA alone, the American Society of Civil Engineers (ASCE) valued the cost of restoring US infrastructure to good condition at \$1.6 trillion over five years (Wachs, 2005). The investment required to realize the trans-European transport network was estimated to be more than €235 billion for priority projects (van den Broek *et al*, 2007).

The UAE is undergoing a profound transformation towards a modern state. The fluctuations in the national income during the 1970’s and the 1980’s (strongly dependent on oil prices) motivated the government to adopt an approach of diversifying the economy's resources with more emphasis on the non-oil sectors (UAE Year Book, 2007). The current economic agenda focuses on economic liberalization and diversification, as well as promoting the role of the private sector. The diversification policy had a tremendous impact on infrastructure development of the country, mostly to serve tourism, commercial sectors, oil services, industrial sectors, real estate, etc. The UAE expansion to non-oil sectors has been growing rapidly resulting in high demand on infrastructure projects for the various economic aspects (Elewa, 2007).

The output in the construction sector grew at an average annual rate of 11%, rising from AED 14.5 billion in 1996 to AED 25.4 billion in 2004. The average growth rate during 2002-2004 exceeded 16% per annum. As a result of this consistent growth, the share of construction activities in the country's GDP rose from 8.6% in 1996 to 11% in 2004. The drivers of this growth, which began mainly in 2001, are the rise in public spending on infrastructure, the remarkable boom in private housing, and expansion of commercial and tourism activities (Annual Census Book for the Emirate of Abu Dhabi, 2004).

In 2007, the Federal Government's Strategy to boost development in UAE was approved. The strategy aimed at the achievement of a balanced and sustainable development, defining the government's priorities and improving the performance in various sectors to meet international standards (Anand, 2007). The Ministry of Public Works, as part of this federal strategy, is responsible for developing such sustainable policies, priorities and performance improvement in infrastructure, roads, water and electricity networks, in addition to the environmental policies and preservation of water and natural resources.

The infrastructure boom is wide-spread across the GCC countries. In 2006, projects in the region increased by 50% (Augustine, 2006). This significant growth was attributed to the economic boom driven by the increasing role of the private sector in infrastructure development. Investments in new infrastructure projects in the GCC countries reached a US\$44.3 billion in 2005 (Augustine, 2006). The GCC economy grew over the past few years, driven mainly by the strong infrastructure investments and the gradual recovery in private sector activities (Shuaa Capital, 2011).

2.4.2 Infrastructure Development in the UAE

The UAE is fast becoming a central support and logistical hub for regional and global activities, given its increasing role in the Arab region, its strategic geographical location, and advanced infrastructure and communication facilities. This motivates the UAE government to plan for continuing infrastructure spending in collaboration with other developments taking place in other sectors of the economy (Annual Census Book, 2004).

According to Golden (2005), Abu Dhabi was expected to award more than AED 47 billion worth of construction projects by 2007. The total value of construction projects in the Emirate

increased by nearly 175% from AED 8.6 billion in 2005 to AED 23.12 billion in 2006. The peak of the Abu Dhabi government infrastructure spending was reached at AED 24.59 billion in 2008, followed by a slight drop in 2009 (The Global Enabling Trade Report, 2012). A considerable portion of such spending was directed to transportation projects. Within an initiative framework proposed by the Abu Dhabi government for comprehensive infrastructure development known as “*Abu Dhabi Vision 2030*”, the UAE Department of Transport (DOT) developed a multi-billion budget plan to develop roads, transportation and communications in the Emirate of Abu Dhabi (Al Bayan, 2007).

The Dubai Emirate municipality’s annual budget in 2006 exceeded AED 1.28 billion, with approximately 90% allocated to infrastructure development. In 2006, Dubai planned to invest over AED 22 billion in infrastructure-related projects in the medium-term development plan (Federation of UAE, 2006) with approval for AED 45 billion worth of transport service projects up to 2020 in the Emirate (Al Bayan, 2007). In addition, The UAE federal government is continuing investments in infrastructure projects in the Northern Emirates. Table 2.2 below shows the level of federal spending of over AED 6 billion on infrastructure projects relating on roads, telecommunications, housing, electricity, and dams in the Northern Emirates (UAE MPW Media Report, 2008).

Table 2.2: Total Value of the Infrastructure Works at Northern Emirates
(Source: *the MPW Media Report, 2008*)

Works	Value in AED
Fujairah	1,234,629,360
Ras Al Khaimah	2,390,629,000
Ajman	1,111,474,631
Umm Al Quwain	854,722,500
Sharjah	3,615,365,120
Federal Roads	2,643,300,000
New Cities	3,377,829,750
Dams	600,000,000
Sea Ports	391,818,000
TOTAL	6,219,768,361

By 2010, a total of AED 5 billion had been approved as an annual endowment for the Northern Emirates. The endowment is directed to the development of strategic infrastructure projects in the region with especial emphases on roads and transportation projects, to be executed through the Ministry of Public Works (Al Hannory, 2010).

There is a strong emphasis in the UAE on the quality of the infrastructure projects. The 2009-2010 International Competitive Report (Schwab 2009) ranked the UAE in sixth place among 133 countries with respect to quality competitiveness of infrastructure projects. This ranking reflects the continuous efforts exerted by both the government and by the Ministry of Public Works in executing high quality infrastructure projects (UAE MPW Report, 2011). H.H. Sheikh Hamdan Bin Mubarak Al Nahyan, the Minister of Public Works, considered this ranking a motivation to continue the efforts in executing more strategic development projects, especially in remote areas of the country (Emarat Elyoum, 2010).

2.4.2.1 Air Transportation Projects

In the year 2006, in a published article by the Federation of UAE Chambers of Commerce and Industries (Federation of the UAE, 2006) noted that the UAE's total investments on air

transportation over 20 years were expected to exceed AED 71 billion. These investments included the redevelopment of the Abu Dhabi International Airport at a cost of AED 25 billion, an expenditure of AED 15 billion on the ongoing expansion of Dubai International Airport, and AED 30 billion estimated for the new Jebel Ali International Airport (IAIA) development. In addition, Al-Ain International Airport underwent AED 75 million developments (Federation of UAE, 2006). More recently, the Emirate of Sharjah plans to spend AED 227 million on redevelopment of its international airport, Fujaira has pledged AED 183 million investments for expansion of its international airport terminal and associated structures, while the Ras Al-Khaimah government also plans to expand its airport (Federation of UAE, 2006). All these air transportation projects have started already, with some close to concluding.

2.4.2.2 Sea Transportation Projects

Sea transportation also occupies a sizable portion of the transportation infrastructure investments in the UAE. Current investment plans include the expansion of the Zayed port in Abu Dhabi, the Rashid port and the Jebel Ali port in Dubai, the Khalid and Khor Fakkan ports in Sharjah, and the Humairiah port of Ajman (Federation of UAE, 2006). Many of these projects have commenced for completion over the next few years.

2.4.2.3 Land Transportation Projects

Land transportation by road is the primary means of transportation in the UAE. Authorities are continuously engaged in developing major highway infrastructure projects funded by both local and federal governments. A considerable proportion of government expenditures was, and still is, allocated to highway infrastructure development. The Roads and Transport Authority of Dubai, for instance, allocated approximately AED 10 billion in 2008 for the development of land transport facilities over the following five years. Abu Dhabi authorities allocated more than AED 3 billion yearly for land transport projects (UAE Year Book, 2007).

The Federal Ministry of Public Works has been involved in constructing several “*strategic highway projects*” in the Emirates between the year 2005 and 2012 with an estimated budget of AED 2.3 billion. These roads include the Dubai–Fujairah highway, Emirates highway and El A’aber highway. In addition, the ministry has been a key stakeholder in the construction of several main roads between 2004 and 2012 with a total budget of AED 680 million.

Furthermore, road maintenance projects and highway upgrading of existing roads were also carried out by the ministry at different locations in the UAE (Ministry of Public Works, 2011).

2.4.2.4 Public Transport Facilities

In addition to the highway land transport facilities, other public transport projects are underway in the region. Among these is the Dubai Rapid Link transit system which was launched in 2009 to serve the public transportation sector in the Emirate of Dubai, involving almost 30 million passengers in its first year of service (Maktoob Business, 2010). Forthcoming projects include the Abu Dhabi Union Railway, which will connect the seven Emirates together as well as forming a part of GCC railway network. The rail network seeks to provide freight, and subsequently passenger services, to all the major ports and industrial areas. The construction cost for the first phase of the rail network is expected to be approximately AED 8.1 billion (Foreman, 2008), with the total cost of the project to be AED 30 billion (Abdulhaleem, 2009). The National Transportation Authority of Abu Dhabi signed the initiation contract with the Union Railway Company with a 70% of the capital to be contributed by the Emirate of Abu Dhabi and the balance by the federal government of the UAE (Abdulaziz, 2011). Such mega transportation projects are expected to have significant social and economical effect on the UAE.

Aside from these, there are no other rail transportation systems planned within any other Emirate. Al Bayan (2007) questioned whether railway developments would be effective, given the lack of the strategic and detailed planning expertise to develop such facilities in the Emirates and other modes of transportation choices. Bearing in mind these limitations, one might assume that the UAE will continue to depend heavily on its roads network as the primarily mean of transportation among and within the Emirates over the next decade (Abdulhaleem, 2009). This highlights the importance of further developing this choice transportation mode for UAE until there is a need and expertise to oversee further development of road transportation infrastructure.

It is important to note that such mega transportation projects require specialized management skills at the strategic and planning level, as well as at the development and the operational level. Such skills are needed to enhance the freight logistics, services and efficiency. Management skills are also needed to minimize the impact on city development and expansion plans, to use existing transportation corridors where possible, to minimize the environmental impacts, to

incorporate and coordinate the various stakeholders' inputs, and to minimize the costs and risks involved.

2.5 Labor Force Diversity in the UAE

As a new nation with a recognizably small population, the UAE depends heavily on foreign countries as a source of both skilled and unskilled labour to accommodate the tremendous developments currently taking place in all sectors. This has been a major factor behind the significant increase reported earlier in the size, variety, and quality of manpower available since the foundation of the federation. The diversity of labour sources, while necessary to create an international working environment, has had an impact on the homogeneity, expertise and as such quality of work. In addition, communication represents a major obstacle to creating a harmonized work force (Annual Census Book for Emirates of Abu Dhabi, 2004).

Expatriates from many different countries, cultures and political and economic experiences, comprise the majority of the UAE population. Therefore, as Anand (2007) noted, it is no surprise that their views and the likely future opportunities they seek will vary considerably. In 2007, approximately three million foreign workers were employed by 260,000 organizations representing more than 200 countries. More than 90% of the private sector labor force consists of expatriate workers, creating unique challenges for the UAE (Embassy of UAE, 2011). As with any complex society, new challenges and new problems are constantly arising, especially as demographics change (Abu Dhabi Chronicle, 2008). Hence, because of this cultural diversity in the UAE labor force, deciding which style of management is needed is a challenge (UAE Year Book, 2007). Even in organizations where there is minimal or no cultural diversity, it's a challenge to keep everyone aligned to the company's strategy and focused on one direction.

The UAE depends almost exclusively on other countries for setting standards, providing technology and for directing major consultancy works in all fields. There is no particular unified code or standard to use among the local or federal agencies in developing infrastructure projects or assessment of quality (Annual Census Book, 2004).

2.5.1 Infrastructure Management Education

As indicated earlier, to cope with the demands of infrastructure sector, the diversity in the labor force and the social structural changes occurring, management education in the UAE has become a core objective of the state. It is quite common that management training is provided for directors of agencies, ministries and bodies to develop performance, management skills and organizational roles needed to undertake the responsibilities of managerial positions.

National organisations that provide management of infrastructure projects have similar needs but generally have acquired competencies, potentials and expertise through on-the-job experiences. In spite of all efforts carried by the government to enhance management education of UAE nationals, it is important to mention that much is still needed to be done, most particularly in developing specialized curricula to fit the market needs (Mohoney, 2007). Importing such curricula from international schools might not offer the best solution, as it may not meet or fit the special UAE market code of practice and needs. Instead of focusing on administrative management or general management education, it is important now to focus on specialized management education for infrastructure projects such as airports, sea, public transport and roadways (Mohoney, 2007; Swaroop, 2005).

UAE nationals must play a significant role in the management of the infrastructure projects in the region. It is important to note that there are noticeable gaps between market demand and supply as it pertains to management. It is unreasonable to expect that UAE nationals are fully capable to fill the immediate demand needed to carry forward the tremendous developments in the infrastructure sector in the coming years. In addition to being few in number, many UAE nationals still lack adequate management education or field experience. Current practice depends on the continuous interaction with foreign management personnel, and enrollment in management development programs to reduce the managerial gaps is lacking. Proper in-depth systematic training programs are needed and enforced before any managerial post is given to nationals (Elewa, 2007). This will certainly have implications in terms of enhancing project quality, reducing the risks associated with infrastructure project development, and enhancing its success indicators measured by time and cost overruns as well as stakeholders' satisfaction.

2.6 Summary of Chapter 2

Chapter two has presented an insight into UAE political, social, and economic development that has taken place over the past three decades. The chapter reflected on how these developments affect infrastructure projects in the UAE, especially in the transportation-related infrastructure sector. The characteristics of UAE development in the various aspects of the community was also examined in order to direct the research work and determine areas in need of further development to serve and support the community in coping with the progressive developments still to come. This chapter further highlighted some of the cultural challenges and barriers that the UAE community will experience in future project management in the region and some solutions that need to be implemented to improve the success of infrastructure projects in the coming years.

The next chapter presents a comprehensive literature review on the state-of-the-art management practices adopted in different countries. This review is used to clearly identify the research direction and methodology.

CHAPTER 3

LITERATURE REVIEW

3.1 Introduction

The purpose of Chapter 3 is to provide a comprehensive literature review of previous project management research of relevance to mega Transportation Infrastructure Projects (TIPs). On planning for the research literature review, Cooper's (1988) Taxonomy of Literature Reviews was adopted to organize the review according to the research focus, goal, perspective, coverage, organization and audience (Randolph, 2009).

The study involved searches of published electronic literature as well as library searching of articles on topics of relevance to the subject matter. Scholastic papers were also collected from central university searches. A final list of related articles was compiled, and the articles were retrieved and reviewed. Topics included previous studies in Transportation Infrastructure Projects, previous studies in project management, methodological and theoretical issues, as well as other scholarly publications. While the focus of the research here was UAE specific, the literature reviewed was widely international to gain benefit from overseas knowledge and cultural influences. The process followed that suggested by both Randolph (2009) and Cooper (1988).

The review presented in this chapter includes seven sections. Section 3.1 starts with an overview on papers and reports on international project management research and "best practice". Section 3.2 presents key management issues with particular emphasis on project construction stages, stakeholder importance, and management processes, including the role of communication, coordination, decision-making, and knowledge-sharing. Section 3.3 presents theories and models related to stakeholders in their role of ensuring a successful project. Section 3.4 focuses on issues related to the technical management of a project and key construction stages such as project design and planning, scoping, scheduling, tendering, and construction. Section 3.5 reports on successful outcomes and measures for a Transportation Infrastructure Project (TIP). Section 3.6 presents material on cultural differences and verification. Section 3.7 summarizes the important characteristics of the review as they relate to this research program.

3.2 Project Management

The management of TIPs has changed significantly over the last four decades. Frederick Taylor, considered to be the father of scientific approaches in this area by Bista (2006), introduced a new method for understanding productivity through performance leveling in organizational management systems. Moreover, his associate Henry Gantt's development of the bar diagram as a process for planning and controlling projects was equally a significant breakthrough.

The expansion of businesses worldwide motivated the need for better project management processes. New and sophisticated methods of project management are available in various forms including web-based software. In his summary article, Meyer (2010) noted that project management software is probably the single most important tool a project manager will use in keeping a project on track and on time.

3.2.1 Project Management: Concept and Profession

Duncan (1996, p6) argued that project management is *the application of knowledge, skills, tools, and techniques to project activities in order to meet or exceed stockholders' need of expectations from the project*. Kerzner (2003) also noted that project management has evolved from a management philosophy restricted to a few functional areas *nice to have*, to an enterprise project management system involving every functional unit.

Project management involves people, technology, business, risk, and expectation management. It is a juggling act, focused on managing all these features successfully. Project management should be viewed as a process that helps organizations to accomplish designated projects effectively and efficiently (Azzopardi, 2010). Today, it is a highly structured process, involving initiating, planning, execution, monitoring, controlling and completing a project as required. It involves expertise in estimating costs, procurement of resources, organizing teams and workloads, directing and assigning roles, time management, status reporting, risk assessment, and communication at all levels (Meyer, 2010).

3.2.2 History and Evolution of Project Management

Project management has been practiced for thousands of years dating back to the Egyptians epoch, but it was not until the mid-1950's that formal project management tools and techniques

were applied to complex projects. Azzopardi (2010) noted that the 1950s marked the beginning of the modern project management era. Prior to then, projects were managed by ad-hoc procedures such as flow charts or informal techniques and tools.

Azzopardi (2010) pointed out that there were four periods in the development of modern project management. The first period pre-1958 was named “Craft System to Human Relations” where the evolution of technology, such as telecommunications, shortened the project schedule. The job description which later became the basis of developing the Work Breakdown Structure (WBS) was widely used.

The second phase of project management development occurred between 1958 and 1979 and was named by Azzopardi (2010) as the “Application of Management Science”. During this time, significant technology advancement took place, such as the first automated plain-paper copier by Xerox in 1959. In the late 1950’s, the “Program Evaluation and Review Technique” or (PERT) and the “Critical Path Method” or (CPM) were developed. This led to significant progress in project management systems (Bista, 2006). During the 1960s and 1970s, the PERT and CPM were popularly used within the private and public sector. Defense Departments of various countries, NASA, and other large engineering companies applied project management principles and tools to manage the large-budget, schedule constrained projects. The popularity in the use of these project management tools during this period coincided with the evolution of computers and the associated packages that specialized in project management.

The third period in the development of project management was between 1980 and 1994 and labeled the “Production Center Human Resources” period (Azzopardi, 2010). This was characterized by the revolutionary development in the information management sector from the introduction of the personal computer (PC) and related computer communications networking facilities. These developments resulted in having low cost multi-tasking PCs that enabled high efficiency in managing and controlling complex project schedules. Thus, project management techniques became more easily accessible enabling the development sectors to adopt and implement sophisticated project management practices.

The fourth phase for project management development was from 1995 to the present labeled by Azzopardi (2010) as the “Creating a New Environment” period. This is dominated by the

developments related to the Internet that changed business practices dramatically, by providing fast, interactive, and customized new medium that allows people purchasing products and services online, resulting in making firms more productive, more efficient, and more customer oriented. Furthermore, it allows automatic uploading of information so that anyone around the globe can input the most recent status of their assigned tasks, be informed of any delays or advanced in the schedule; and stay “in the loop” for their project role (Azzopardi, 2010).

Globalization increased the need for greater speed-to-market with products and services. As discussed by Haughey (2010), projects become larger, more complex and increasingly more difficult to manage with multiple teams spread across the world. Economic crises pushed work offshore to low cost countries, presenting some new challenges. The world is changing, and project management needs to change with it. No doubt new techniques and better practices will emerge along with the new challenges that arise.

3.2.3 Project Management Objectives

Azzopardi (2010) argued that while the 1980's were about the quality, the 1990's were all about globalization, and the 2000's are about pace to stay ahead of competitors. There is no doubt that today, organizations face more competition and they operate in a highly unstable business environment. This results in higher demand of more accountability for the private and public sectors, and a greater emphasis on the operational effectiveness and efficiency. In a project environment, managers must support the implementation of the project according to organizational goals (Azzopardi, 2010). They should also provide a greater commitment to stakeholders, through efficient and effective management of the resources. Given today's economy, the focus for many organizations is on doing more with less: as Abudi (2010) noted, shorter deadlines, tighter budget, and fewer human resources.

In a study of information system projects by Roberts and Furlonger in 2006 (cited in Azzopardi, 2010) they showed that a detailed project management methodology could increase productivity by 20 to 30 percent. Furthermore, the use of a formalized management system for projects can facilitate clarifying the project scope, following on objectives and goals, identifying needed resources, and ensuring of accountability for results and performance.

The development of project management capabilities mandated that operation teams work cooperatively to put plans aiming at synchronizing tasks, schedules, and resources allocation. Azzopardi (2010) stressed that at a macro level, organizations are motivated to apply project management techniques to ensure that their undertakings are delivered on time, within the budget and to the stipulated quality. At the micro level of project management with the support of appropriate information management plans, tasks include reducing project overhead costs, customizing the project workplace to support the operational style of the work teams, and tracking team members while proactively informing the executive management of the project status on a real-time and continuous basis. Azzopardi (2010) noted that this ensures that the project team members share accurate, meaningful and timely project documents and ensures that critical assignment deadlines are met.

Monacelli (2007) pointed out that project management IT is often an after-thought on a project life cycle. It can be perceived as “project control” or an administrative function that tracks issues and schedule dates based on best guesses, rather than a fundamental part of the management process. For effective project management, the organization needs to invest in technology early in the project life cycle. Accordingly, the program or the technology needs to be introduced and activated before negotiations begin capturing key upfront information. Before the technology is unwrapped or even selected, a program manager should know answers to key questions that allow him/her to set realistic expectations at all levels. Such information is to be collected and analyzed to enable managers developing accepted and necessary planning tools (work breakdown structures, control accounts, master schedules etc.) that will assist in controlling and analyzing the program (Monacelli, 2007).

It should be emphasized that the causes for failure to deliver on time, on budget and to the quality of performance expected could be addressed by the use of efficient and effective project management tools and processes. The failure to deliver on time, on budget and to the quality of performance expected, does not necessarily mean that the project outcome was itself a failure, but rather project management was not perfect (Azzopardi, 2010).

3.3 Project Management and Mega Project Complexities

Davies *et al.* (2009, p101) described a mega project as one requiring *an investment of \$1 Billion or more to build the physical infrastructures that enable people, resources, and information to move within buildings and between locations throughout the world.* Mega projects continue to have poor performance records. They noted that most are unsuccessful when measured against their original time, cost, quality and safety objectives, as well as their expected revenue predictions.

Li and Guo. (2011) further noted that complexities in managing Mega Construction Projects (MCP) arise from technical, social, and managerial aspects. The technical complexity of the mega construction project is determined by the technologies employed in the design and the construction process. Social aspects may arise from the inadvertent consequences of mega projects on the environment and social structure within their site of implementation. Managerial complexities are related to the operation and governance aspects of projects including financial planning, scheduling, and resource allocation and decision management. Managing MCPs requires knowledge of how to address the associated complexities during implementation.

Li and Guo suggested that cross-functional and cross-professional coordination is essential for the continuous improvement and successful implementation of the project. An integrated framework for management maturity for mega construction programs was suggested, consisting of two sub-models: Organizational management and Process management. A case study indicated that this model could improve the management capability of all involved parties; owners, designers and main contractors.

3.4 Key Management Processes

Literature on infrastructure project management indicated a number of processes that could be problematic in executing a plan. Among these were Communication, Coordination, Knowledge-Sharing, and Decision-Making. In addition, the satisfaction of the stakeholders is also essential when judging the success of a project. These management processes are discussed in more detail in the following subsections.

3.4.1 Communication Mechanisms and Effectiveness

Aspects of communication management include developing communication strategies, designing internal and external communication mechanisms, and managing the flow of information, including online services. Sambasivan and Soon (2007) claimed that new technologies profoundly assist managers in communications among the various stakeholders.

Effective organizational communication is a necessary precondition for effective management – without effective communication, management becomes difficult or impossible. Organizations with more than one level of control will suffer from communications problems that will interfere with almost all aspects of the organization, especially when undertaking corrective actions (Farmer, 2008).

The role of communications management is to ensure that all parties in a project have access to current and changing information, aimed at improving the organization of tasks, and working together in a more coordinated approach. In practice, the same incentives must apply to all parties otherwise, as noted by Farmer (2008), groups with differing incentives will generate different goals, negating the sense of shared and valuable information exchange. Farmer (2008) claimed that one of the simplest and most effective communications management methods is a straightforward, hierarchical, bidirectional communication strategy, with clear incentives. He noted that Printronix (NASDAQ PTNX), a \$100m manufacturing company with five levels of management, first applied the simple method of communication in 1990. Within a week, the perennial grumbles about “bad communication” ceased. By 1994, the agency had reduced product development time (for computer printers, a complex product) from three years to six months, and doubled product service life, greatly reducing the total cost of ownership of their product.

Construction management studies widely emphasized the role of communication in effective management. Project Management Institute (2004) argued that 74% of projects are unsuccessful. They claimed that of the many factors that contribute to the failure of these projects during initiation, execution and implementation, inadequate or poor communication rated highly.

Zwikaël *et al.* (2005) examined project management practices in Japan and Israel and concluded that different types of management styles, scope and time management have an impact on

improving technical performance of projects, while communication and cost control improve the overall success measures of projects. Soetanto and Proverbs (2002) suggested that the use of communication effectiveness models to predict satisfaction levels should be adopted by contractors and clients at the earliest possible stage in the project life-cycle.

To reduce impaired designs, and subsequent overrun of cost and schedules, Zou *et al.* (2002) reported that the design team needs to establish an effective communication strategy among the designers. A framework for enhancing communication and knowledge-sharing in large-scale projects was proposed by Jackson and Klobas (2007), while Stewart (2007) stressed that strategic implementation of advanced information and communication technologies are essential for the long-term survival of construction firms. The lack of communication among parties was reported among the ten most prominent causes of project delay by Sambasivan and Soon (2007). Chen and Partington (2006) indicated that a qualified project manager must possess the capability of effective communication with different people at different levels.

Kerzner (2003) reported that effective communication management includes the process required to ensure timely and appropriate generation, collection, storage, and ultimate disposition of project information, including (i) an exchange of information; (ii) a verbal or written communication; (iii) a method for expressing ideas effectively; and (iv), a means by which substance or ideas are exchanged between individuals through a common system of symbols. Kerzner (2003, p230) also defined the various components of communication as *the message, source, encoding, channel, decoding, receiver, feedback, noise, context and shared meaning*. This can take different forms such as orally (face to face), telephone, meetings, written and non-verbal. Precision can be achieved through regular communication via memos, letters, or notices via email. The author explained his own successful experience in using this technique to communicate with customers. Moreover, he emphasized that the project success depends on effective communication during every phase of the project's life cycle. Examples addressed the methods and communication tools required for effective communication, based on types of stockholders and different occasions.

Philip (2005) indicated that communication takes up to 90% of a project manager's time. He defines the term communication as transferring knowledge. Philip's research indicated that the larger the project, the greater opportunity for communication to break down.

A study published by Cornelius Associates (2001) addressed the challenges faced by cross-functional, inter-organizational project teams. These usually do not involve regular teams and sometimes do not even exist in the same geographic locations. They argue that delivery methods and communication devices should be utilized to overcome these challenges. Success depends upon fast and effective communications that reach all those affected. The study showed that project members in different locations reported that the result of better communication is a smoother running project. This study provides a plan for sufficient communication, which requires stakeholder analysis, followed by identifying the project communication needs. They divided the plan into six categories: communication device, vehicle, accountability, objectives, recipients or shareholders, and frequency (Philip, 2005).

Liapi *et al.* (2003) developed a computer-based system for dissemination of information regarding the construction schedule and traffic control that allowed contractors and consultants to make better decisions with respect to several issues in the management of a major construction project. The system utilized 3D and 4D CAD technology to enable consultants and contractors to communicate information during planning and construction phases. The system displays the progress of construction details on time and allows the project team to visualize the 3D geometry of complex activities during each construction stage (Liapi, Kawaja, and O'Conner, 2003).

3.4.2 Coordination Among Stakeholders

The lack of coordination among stakeholders is a key management issue discussed in the literature. Particular emphasis has been given recently to this in the UAE, especially coordination among various governmental agencies, due to the fact that poor coordination was the main reason behind several schedules overruns. The Executive Council of Abu Dhabi in its policy agenda for the year 2007 – 2008 emphasized the importance of coordination (Elewa, 2007).

In his article, Himanshu (2008) argued that coordination was the unification, integration, and synchronization of the efforts of group members to provide unity of action in the pursuit of

common goals. The coordination was represented as the hidden force that binds all the other functions of management.

Coordination is a core process of project management and is implicit and inherent in all functions. The critical functions needed for successful management of projects, as indicated by Nursing Management (2008), are (i) coordination through planning; (ii) coordination through organizing; (iii) coordination through staffing; (iv) coordination through directing; and (v) coordination through controlling. It is required in each and every function and at each and every stage of the project. Therefore, coordination is a key process to achieve harmony between individuals towards achievement of group goals.

The concept of coordination is somehow broader than that of cooperation, and both are needed for successful projects. As Zayyana and Akintoye (2008) noted, the basic management functions to achieve the organisational goals include planning, organising, staffing, directing, coordination, commanding, motivating and controlling of organisational resources. They also noted that coordination can be either internal or external. Internal coordination within an organization is involved in all the management functions, including the planning, organizing, directing, and controlling of activities. External coordination involves other stakeholders, such as the customer, the employees and the owners, whose conflicting needs and demands must be satisfied by the managers of any business.

3.4.2.1 Coordination in Transportation Infrastructure Projects

Coordination is a key management issue in transportation infrastructure projects. Timmermans and Beroggi (2000) stressed the importance of coordination between organizations with diverse objectives. The concept of international coordination for TIPs was also addressed by Short and Kopp (2005) when they argued that despite advances in the planning technologies, the European Union's ability to converge to "best practice" is questionable, due to a lack of international coordination and unified standards. Chen and Partington (2006) and Zou *et al.* (2002) identified the lack of coordination among project participants as a key risk factor in a number of TIP projects.

Coordination among different types of roadway construction and maintenance works by utilities, municipalities, and highway agencies is difficult and demanding. It involves, for example,

coordinating the activities of water, sewerage and storm water drainage systems, as well as the electricity, gas and communication utilities. Utilities, municipalities and highway agencies have had to rely on very time-consuming methods of project coordination to resolve conflicting issues, mostly through in-person meetings and telephone calls (Horsburgh, 2003, cited in Palowski et al., 2008). He also noted that advances in mapping technologies and other several areas have made it possible to develop smart automated solutions to coordinate the various infrastructure project activities.

3.4.2.2 Coordination in Work Teams

Jim Collins (2001) and the Harvard Business Review (2004) noted a number of important characteristics behind successful teams, such as commitment, positive motivation, company alignment, great leaders, to mention a few. Zoglio (2007) also pointed out that the key features to build effective work teams, stressing that individuals ought to commit to achieving benefit for the work team or company rather than their own personal needs. The valuable team members are those who understand how their work fits into corporate objectives, and align the team goals with the corporate mission and values. The work rules of the team should be set to consider both company and individual values, and when conflict arises, the team seeks acceptable solutions through alignment with purpose, values and goals.

Katzenbach and Garvin (2004) stressed the importance of commitment in successful teams. With commitment, the team becomes a unit of collective performance. Enhancing team commitment and coordination requires the team to develop its mission, vision and values statements in alignment with the corporation but reflect the individuality of each team. Having all team members on the same track at the beginning of a project will reduce the number of disruptions that may emerge at later stages (Katzenbach and Garvin, 2004).

Among the key elements of effective work teams are the leaders responsible for charting activities and the members with strong technical and interpersonal skills together with ability and willingness to learn. Zoglio (2007) indicated that the level of contribution is affected by the level of the individual's inclusion, confidence, and empowerment. Zoglio also stressed the importance of communication among team members: friendly, open and positive communication among the team members is likely to contribute to more team cohesiveness. Cooperation can be facilitated

to a great extent by highlighting the impact of individual members on the team productivity. Zoglio (2007) emphasized that an effective work team is one with the ability to develop connections with the larger work organization, among the team members, and to other external work teams. Katzenbach and Smith (2007) represented the six characteristics of a successful team shown in Figure 3.1.

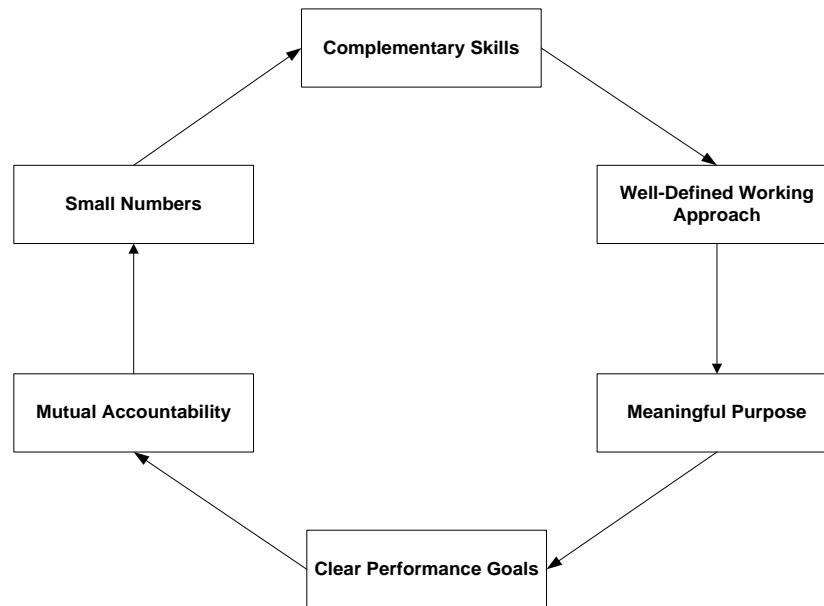


Figure 3.1: Characteristics of Successful Teams (Source: Katzenbach and Smith, 2007)

3.4.3 Knowledge-Sharing Among Stakeholders

Knowledge-sharing aims to increase the spread of knowledge within an organization by encouraging communication, offering opportunities to learn, and promoting the sharing of appropriate knowledge. Jackson and Klobas (2007) stressed the need to develop a knowledge-sharing process model for project managers. Data and knowledge interchange are needed for improving efficiency and standardize operations of complex distributed organizations. Workers need tools and guidance to manage the vast amounts of available data and information (Kovacs and Paganelli, 2003). Knowledge management (KM) is a process for continuous learning and effective knowledge-sharing, and is certainly beneficial to any work group. Jackson and Klobas (2007) define KM as all activities that can encourage learning and knowledge development. Among these activities is the creation of ‘Communities of Practice’ within an organization where

those who have similar interest can meet, learn from each other, and discuss topics of mutual interest.

When access to knowledge is certain, fast, and reliable, organizations benefit from fewer mistakes, quicker problem solving, less wasted time, less redundancy, improvements in process, increased participation from within and without, exposure to diverse viewpoints and better internal communication. Kovacs and Paganelli (2003) noted that organizations need to create a commitment to culture, to change, challenge, compete and cooperate. If, as is often the case, time pressure leads to poor knowledge-sharing, then there must be a commitment to allow time for it to happen. Jackson and Klobas (2007) further stressed the need to develop a knowledge-sharing process model for project managers. Data and knowledge interchange are urgently needed for improving efficiency and standardize operations of complex distributed organizations where commitment to knowledge-sharing must be demonstrated throughout the organization. Individuals of the organization should be committed to share their knowledge with others even if it is not formally part of their 'day job' (Jackson and Klobas, 2007).

A paper by Andreas Reige (cited in Shawn, 2006) titled: *Three-Dozen Knowledge Sharing Barriers*, lists sets of potential barriers to knowledge-sharing. These are listed in Table 3.1. The list is a useful reference for managers to consider when crafting a knowledge-sharing strategy. Improving internal communication and knowledge-sharing while aligning individual efforts with corporate direction can significantly boost the employee's satisfaction and motivation.

Table 3.1: Individual Barriers to Knowledge-Sharing (Source: Shawn, 2006)

- Integration of KM strategy & sharing initiatives into company's goals & strategies missing or unclear.
- Apprehension of fear that sharing may reduce or jeopardize people's job security.
- Low awareness and realization of the value and benefits of possessed knowledge to others.
- Dominance in sharing explicit over knowledge such as know-how and experience that requires hands-on learning, observation, dialogue, and interactive problem solving.
- Use of strong hierarchy, position-based status, and formal power (pull rank).
- Insufficient capture, evaluation, feedback, communication, and tolerance of past mistakes that would enhance individual and organizational learning effects.
- Differences in experience levels.
- Lack of contact time and interaction between knowledge source and recipients.
- Poor verbal/written communication and interpersonal skills.
- Age differences.
- Gender differences.
- Lack of social network
- Differences in education levels.
- Taking ownership of intellectual property for fear of non-recognition from managers & colleagues.
- Lack of trust in people because they misuse knowledge due to the source, and
- Differences in national culture or ethnic background, and values and benefits associated with it.

KM can be described in many ways, but the definition that seems best suited comes from The Federal Highway Administration (FHWA) in the USA (cited in Burk, 1999). It is the process of capturing and sharing a community's collective expertise is to fulfill its mission. KM takes advantage of an organization's most valuable asset – the collective expertise of its employees and partners.

Burk (1999) further noted that KM acts something like a library by providing a repository for written information on a given subject and makes it available to the organization as a whole. This knowledge can be the most valuable of all because it is put in context and it is frequently more

extensive and up-to-date and, therefore, more useful for decision-making. In short, KM helps ensure that the right information gets to the right people at the right time to make the right decisions.

KM has been used for the past several years by a variety of organizations in both the public and private sectors. Organizations such as international consulting firms value as a highly effective tool to ensure that external project teams communicate effectively and share essential information. Public agencies have found that KM helps capture the collective knowledge that ensures institutional continuity and the continued achievement of their strategic objectives (Robertson, 2004).

KM involves building a learning organization. By linking and sharing institutional knowledge, people can do their jobs better, assured that information will be available when and where it is needed. Shared knowledge helps learning to take place within an organization and fosters critical thinking to anticipate and adapt to change more rapidly and produce innovative solutions. KM learning by organizations in the Australian construction industry has led to continual improvement as they seek to adapt to their changing environments. Fiol and Lyles (1985) and Love and Edwards (2004) argued that a major factor driving the continuous improvement agenda in construction is the latent role played by organizational learning. In this context, organizational learning is defined as the process of improving actions through better knowledge and understanding (Love and Edwards, 2004).

Enhanced knowledge-sharing amongst people, reported by Walker (2008) is working in infrastructure-related agencies and a major aim of the Centre for Excellence and Innovation in Infrastructure Delivery (CEIID) in Western Australia. She claimed that closer links are sought with the private sector in the region to enable more cooperation, planning, and sharing of information with infrastructure projects. Knowledge-sharing will assist with the development of best practice and the adoption of a more consistent approach across works agencies. A monthly CEIID Knowledge Network Forum encourages the exchange of information through formal presentations, and informal networking to support this initiative. However, in spite of the fact that one of the goals of many KM projects is to 'support and/or increase knowledge-sharing', it is questionable whether this is both an effective, sensible and desirable goal, in practice.

3.4.4 Decision-Making Mechanism and Effectiveness Among Stakeholders

In her article on Critical Thinking and Decision-Making Techniques, Pop (2011) noted that critical thinking and decision-making are integral to proper self-development, success and happiness. Strong critical thinking skills enable accurate assessment of the benefits and drawbacks of various choices. Moreover, making wise decisions enhances personal autonomy and feelings of integrity and contentment.

Harris (2008) defined decision-making as the study of identifying and choosing alternatives based on values and preferences of the decision-maker. Shwenk (1984) views strategic decision-making as a special kind of decision-making under uncertainty. According to Shwenk, such decision-making involves the activities of goal formulation, problem identification, alternative generation, and evaluation/selection of the alternatives.

Decision-making is a fundamental element of the management process. In considering the types of decision-making, managers need to look at the five kinds of decisions: Irreversible, Reversible, Experimental, Trial and Error, and Conditional; as well as the four processes or styles employed in making the decision - Authoritative, Facilitative, Consultative, and Delegative (Slade, 2012). While in the authoritative style of decision-making the decision comes from the top in a decisive way, sometimes, a leader may use a delegative style of decision-making to pass off the responsibility for the decision to a subordinate or subordinates. This may be wise if the subordinate, or team of subordinates, has greater expertise, but managers normally reserve this type of decision for the lesser decisions involved with the everyday management of systems in a large organization. Facilitative and consultative decisions come in between where the facilitative process is a joint collaboration of the leader and his subordinates, while a consultative style involves the leader asking for advice from his subordinates or outside sources. In the end, though, he or she is the sole decision-maker (Slade, 2012).

Making a decision often involves alternative choices where the challenge is choosing the one that has the highest probability of success or effectiveness, and fits with goals, desires, lifestyle, values, etc. Decision-making is an important key management process in Transportation Infrastructure Projects in the UAE. Sudden changes in decisions and project requirements have a diverse effect on project cost and time schedules. Hence, decision-making is the process of sufficiently reducing uncertainty and doubt about alternatives to allow a reasonable choice to be

made from among them. This definition stresses the information-gathering function of decision-making and shows that uncertainty is reduced rather than eliminated (Harris, 2008).

Therefore, decisions that are based on a foundation of empirical knowledge and sound reasoning can lead the company into long-term prosperity. Conversely, decisions that are made on the basis of flawed logic, emotionalism, or incomplete information can quickly put a business out of commission (Gabor 1990). Vercellis (2009) explained the same point by stressing that the enterprises, which are capable of transforming data into information and knowledge, can use them to make quicker and more effective decisions and thus achieve a competitive advantage.

The quantity of information that can be processed by the human mind is limited. However, Harris (2008) argued that unless information is consciously selected, processing would be biased toward the first part of the information received. After that, the mind tires and begins to ignore subsequent information or forget earlier information. A common misconception about decision-making is that decisions are made in isolation from each other where information is gathered, alternatives explored, and a choice is made without regard to anything that has gone before. Harris maintained that decisions are usually made in a context of other decisions. A typical metaphor used to explain this is that of a stream, where decisions surrounding an earlier one have led to the follow up. Many other sub-standard decisions will follow from it. Previous decisions are activated or made operable and certain alternatives are deactivated or made inoperable (Harris, 2008).

In addition, Vercellis (2009) explained that business intelligence may be defined as a set of mathematical models and analysis methodologies that systematically exploit the available data to retrieve information and knowledge useful in supporting complex decisions-making processes. He added that business intelligence methodologies are interdisciplinary and broad, spanning several domains of application. For sure, they are concerned with the representation and organization of the decision-making process, and thus with the field of decision theory; with collecting and sorting the data intended to facilitate the decision-making process. To sum up, Vercellis (2009) argued that a business intelligence environment offers decision-makers information and knowledge derived from data processing, through the application of mathematical models and algorithms.

On the other hand, quantitative techniques use surveys, tests, experiments and other data-gathering methods to assemble information. The data gathered in this way can be used to help make business decisions. Both gathering and analyzing of information is crucial (Mundock, 2012). Few decisions are made with absolute certainty because complete knowledge about all the alternatives is seldom possible. Thus, every decision involves a certain amount of risk. Many decision-makers have a tendency to seek more information than is required to make a good decision. Harris (2009) argued that when too much information is sought and obtained, one or more of several problems could arise. Some of these are listed below:

1. *A delay in the decision occurs.* This delay could weaken the effectiveness of the decision or solution.
2. *Information overload will occur.* In this state, more information may actually decline the decision-making ability because extensive information may not be well-managed or assessed appropriately. When too much information is taken into memory in a short period of time, some of the information (often that received early on) is pushed out.
3. *Selective use of the information will occur.* The decision-maker will choose only those facts, which support a preconceived solution.
4. *Mental and decision fatigue can occur.* This results in slower work or poor quality work. Often the result is fast, careless decisions or even decision paralysis, where no decisions are made at all.

While decision-making is defined as the thought process of selecting a logical choice from the available options, decision-making models are defined as the process needed for concluding which decision need to be made and how to find alternatives for each decision (Business Dictionary, 2012). Decision-making models are introduced to enable making good judgments (Business Analysis Made Easy, 2012). Decision-making models can be classified into three types: Rational models, Intuitive models, and Recognition Primed models. The first step in the decision-making process is to identify the problem to be addressed (Klein, 2012).

The rational decision models are based around cognitive judgment of the pros and cons of various options. They aim at selecting the most logical alternative that will have the desired effect. Such models can be time consuming as they require a lot of information gathering.

Despite these limitations, many universities are still only teaching rational decision-making models and suggest that if these are not used, failure results. The Recognition Primed models describes that in any situation there are cues or hints that allow people to recognize patterns. Obviously, the more experienced the decision-maker is, the more patterns he/she will be able to recognize. Based on the recognized pattern, the decision-maker chooses a particular course of action. Past experience and learning plays a good role. There is no actual comparison of choices, but rather some iterative cycling of evaluation through the valid choices until an appropriate one is found (Klein, 2012).

Decision-making in five steps is an effective model for solving problems. The five steps of the decision-making model include (i) stating the problem, (ii) identifying alternatives, (iii) evaluating alternatives, (iv), making the decision, and finally (v), implementing the decision. All other decision-making models are specific for evaluating the alternatives (Business Analysis Made Easy, 2012).

Pop (2011) presented simple advise to apply critical thinking on the decision-making process. Decision-makers should delay judgment and take the time to thoroughly consider options and reach a well reasoned conclusion, seek disconfirmation to avoid the confirmation bias toward a pre-existing bias or decision, be creative in generating various options, and be consistent with his/her personal values in reaching a decision.

Armstrong (2001) explained that role-playing can be used to forecast decision. In role-playing, an administrator asks people to play roles and uses their “decisions” as forecast. Such an exercise can produce a realistic simulation of the interactions among conflicting groups. However, role playing is most effective for predictions when two conflicting parties respond to large changes and the method is claimed to be most successfully used in the military, law and business.

On the other hand, casual mapping is a tool that enables decision-makers to make sense of challenging situations so that they can get more out of them. A casual map is a word and arrow diagram in which ideas and actions are casually linked with one another through the use of arrows. It shows managers how to develop and use action oriented strategy maps and logic models in business decision-making (Bryson *et al.*, 2004).

Making the right decision can be critical in many situations, especially when it comes to business. The decision-making process is not always an easy one. However, there are a variety of

tools and techniques available to help make this process a little bit easier. This might include the Pros and Cons methods, weighted method, modeling, or cooperative solutions (Moudry, 2012). For a problem with only one solution, an analytical approach might be best (Klaus, 2011). However, for problems with multiple solutions, a scientist may need an approach that first figures out a few possible answers from many possibilities, then considers the strengths and weaknesses of each proposed solution. Sometimes, a team is needed to come to an acceptable answer.

Furthermore, Harris (2008) noted that there are often many solutions to a given problem, and the decision-maker's task is to choose one of them. The "choosing" task could be simple or complex as the importance of the decision warrants. The number and quality of alternatives can also be adjusted according to importance, time, resources, etc. Harris explained several strategies used for choosing a solution, such as (i) optimizing (choosing the best possible solution to the problem); (ii) satisfying (choosing the first satisfactory alternative); (iii) maxi-max (maximize the maximums); or (iv) maxi-min (maximize the minimums).

Andrew (2011) argued that using a decision tree helps in creating a contingency plan of action by identifying the problem, defining the most critical objectives, evaluating possible outcomes or circumstances to finally reach an reasoned plan of action and an optimal decision.

Olsen (2012) stressed the importance of certain decision-making techniques including: Pros and Cons, Brainstorming, PEST and SWOT analysis as the most popular techniques for business decision-making process. He also clarified many more decision-making techniques, clarifying that each can be more effective for a precise decision than the other. His additional techniques included:

- *Pareto analysis* (also known as the 80-20 rule): focuses on the most important changes required;
- *The step ladder technique*: allows for better group decisions;
- *Cost/Benefit analysis*: to determine the worthiness of the expenses;
- *Grid analysis*: to allow for a number of factors in to the decision-making process; and
- *Force Field analysis*: to analyze the pressures asserted for and against a change.

On the other hand, Kisner (2012) asserted that decision-making skills for the 21st century usually consist of fast-paced choices. Due to increase in technology and communication, people require immediate action. Therefore, gaining decision-making skills can come in handy. In addition, companies may like to see decision-making skills made on gut feelings, combined with strategically thought-out choices. However, one is typically better than the other. The key is to know when to go with the gut feeling over the intellect. Using risk analysis systems on computers is a strategic way by which companies determine what deal to make.

Finally, Bazerman (1994) argued that decision-makers follow a satisfying model rather than a rational decision model. Three systematic biases are: (i) availability: the degree to which instances are memorable, (ii) representativeness or the occurrence of previous similar situations, and (iii) anchoring and adjustment, starting from an initial point and making adjustment.

Decision Quality is a rating of whether a decision is good or bad. Harris (2008) noted that a good decision is a logical one based on the available information and reflecting the preferences of the decision-maker. An important concept to grasp here is that the quality of a decision is not related to its outcome: a good decision can have either a good or a bad outcome. Similarly, a bad decision (one not based on adequate information or not reflecting the decision-maker's preferences) can still have a good outcome. Kiani *et al.* (2009) further claimed that the degree of confidence in a decision provides a graded and probabilistic assessment of expected outcome.

In general, business and management systems should be set up to allow decision-making at the lowest possible level. The many decision-making models that exist nowadays mean that decision-makers have to choose which one to use. The following section will discuss relevant stakeholder models and theories reported in the literature.

3.5 Stakeholders in Infrastructure Management

In the context of transport policy, stakeholders are defined as those people who have a vested interest in a project by affecting it and/or being affected by it (Banville *et al.*, 1998). Stakeholders include organizations, such as clients, project managers, designers, subcontractors, suppliers, funding-bodies, users, owners, employees and local communities (Newcombe, 2003). Vinten (2000) noted that a crucial skill for managers of construction projects is to manage stakeholders' expectations. Cleland (1995) and Lim and Lee (2005) further claimed that failure

to address stakeholder expectations can result in project failures primarily because construction stakeholders tend to have the resources and capability to stop construction projects. However, it should be noted that the interests of stakeholders can vary over the life of a project (Friedman and Miles, 2002), and the reasons for these changes include learning, changing values, and specific experiences (Elias *et al.*, 2004). Zwikael *et al.* (2005) suggested that “on-time and on-budget”, technical performance, and stakeholder satisfaction, are the primary performance indicators of project success.

3.5.1 Stakeholder Theory

One of the earlier accounts of Stakeholder Theory was that provided by R. Edward Freeman in his book on *Strategic Management: A Stakeholder Approach* published in 1984. He described “Stakeholder Theory” as the understanding of stakeholders’ relationships, the processes for dealing with these stakeholders, and the transactions to achieve the project deliverables with satisfactory stakeholders. Stakeholder Theory involves ethics, morals and values in business. His theory involves the identification of stakeholder groups and who or what really counts in the management of successful projects (Elias *et al.*, 2000).

3.5.2 Stakeholder Dynamics

An interesting characteristic of the stakeholder concept is the dynamics of stakeholders (Freeman, 1984). The mix of stakeholders may change over time, by adding or dropping out stakeholder groups. The dynamics of stakeholders is implicitly incorporated in the work of Mitchell *et al.* (1997). The urgency attribute adds the dynamic component to the process. They used three attributes in measuring the importance of a stakeholder:

Legitimacy - the moral or legal claim a stakeholder has to influence a particular project;

Power - their capacity to influence the outcome of a given project; and

Urgency - the degree to which their claims are urgent or compelling.

The stakeholder topology is summarized in Figure 3.2. A stakeholder possessing all three attributes is categorized as highly important (definitive stakeholder), two factors as medium (dominant, dangerous or dependent stakeholder), and one factor as low (dormant, discretionary

or demanding). Any individual or organization possessing none of the above factors in a project is regarded as a non-stakeholder.

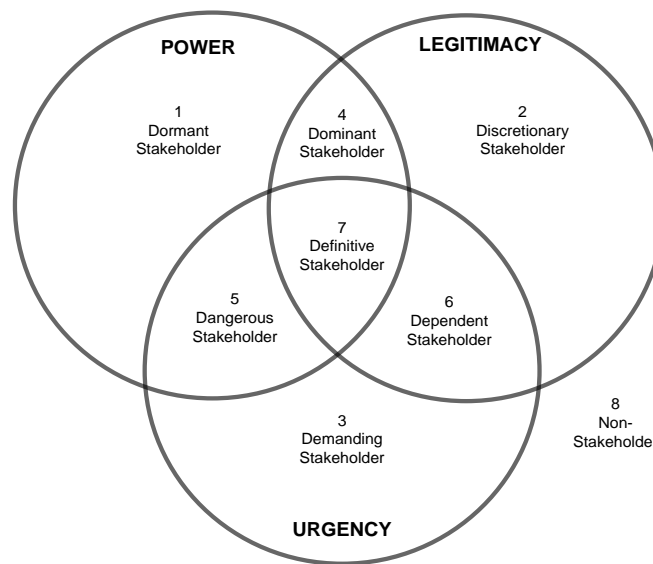


Figure 3.2: Stakeholders' Topology (Source: Mitchell et al., 1997)

Stakeholder management capability is tied to understanding the stakeholder topology of the project, the ability of one stakeholder to deal with other stakeholders, and the effectiveness of the decisions to achieve the project objectives. Less powerful stakeholders are subservient to their needs, while important, are generally less critical. This can potentially lead to conflict among stakeholders and it is important for the more powerful ones to employ strategies to address these potential conflicts to ensure a successful outcome (Fassin, 2007).

3.5.3 Stakeholder Power – Interest Grid

Among many stakeholder management researchers, Freeman (1984) identified the dimensions of power and interest as being significant, and suggested the use of a “Power-Interest Grid” to assist in balancing the need to take a broad definition of stakeholders whilst still yielding manageable numbers. Many researchers such as Ackermann and Eden (2011) have used the grid as a basis for understanding a company’s environment or for enabling managers to proactively manage their stakeholders.

The power - interest grid is presented in Figure 3.3. The four quadrants of the grid represent four categories of stakeholder importance to top management. Those in the top left-hand corner

(SUBJECTS) are very interested in the project (and have most at stake) but have little power to influence management strategies. Those in the bottom left-hand segment (CROWD) have little interest in the project and also little power to influence management decisions. Those in the bottom right-hand segment (CONTEXT SETTERS) have a high degree of power over the organization, especially in terms of influencing the future context within which strategies will need to operate, but they have little interest. The most important stakeholders to top management are those in the top right-hand segment (PLAYERS) as they are significant stakeholders with substantial power and interest. Top management needs to pay them significant attention, as they are able to exert strong influence on achieving management strategies.

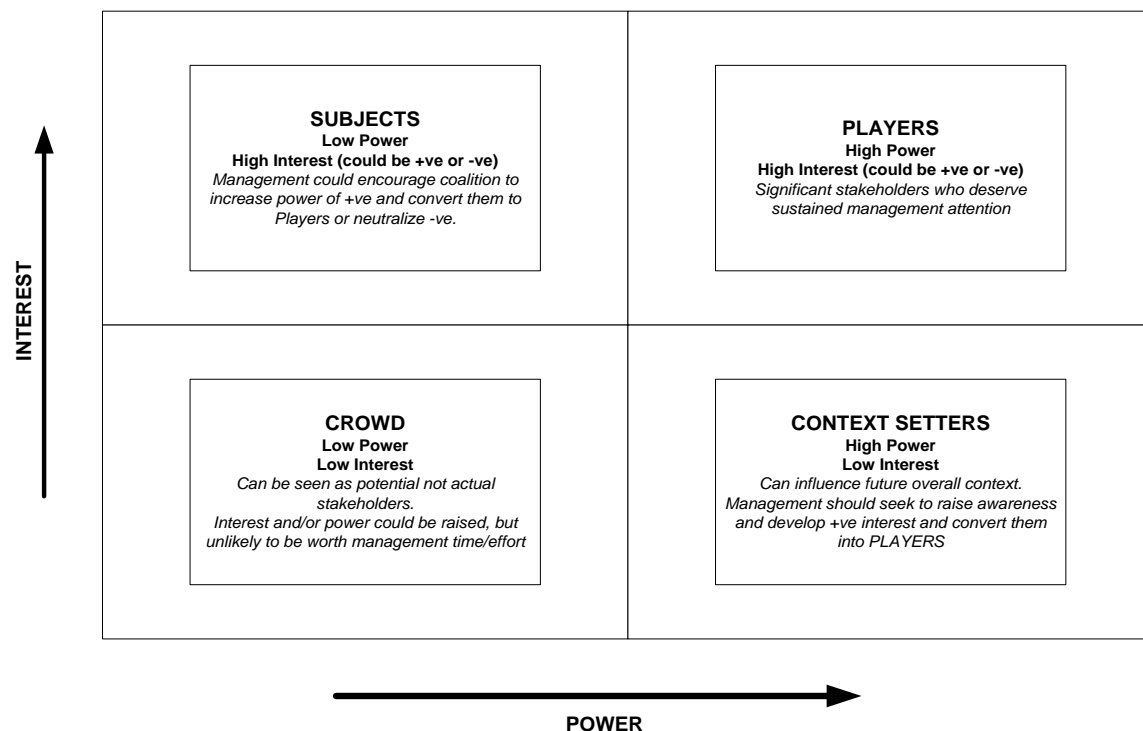


Figure 3.3: Outline Stakeholder Power – Interest Grid (Source: Ackermann, et al., 2011)

Ackermann *et al.* (2011) found that separating those groups with and without power and interest put the focus on stakeholders that need to be concentrated on for achieving a successful strategy outcome. They argued that one of the most important tasks during strategy-making is the management of the interface between many, often competing demands of an organization's different stakeholders in relation to its strategic goals. There is a well-established body of literature that discusses stakeholder management (see Polonsky and Ottman, 1998; Bunn *et al.*,

2002; Co *et al.*, 2009; Freeman, 1984; Elias *et al.*, 2000; Fassin, 2007; Philip, 2003; Rowley, 1997; Eisenhardt, 1989; Oliverio, 2007; Calhoun, 2002; and Jensen and Sandstrom, 2011). However, the concepts are not generally developed in ways that make them useful in practice. Ackermann and his colleagues (2011) pointed out that by anticipating and managing stakeholder responses to organizational strategies, actions could be put in place that either capitalizes on potential positive responses or reduce or eradicate negative responses.

3.5.4 Criticisms of Stakeholder Theory

The success of early accounts of stakeholder theory in current business management practice has been largely due to the inherent simplicity and clarity of the stakeholder model of Freeman (1984). However, over the years, critics have attacked the vagueness and ambiguity of the model. Fassin (2007) explained the shortcomings and imperfections in the stakeholder model's graphical representation to include the following:

- *Heterogeneity within stakeholders and pressure groups:* Members within a category are not all homogeneous, often quite the contrary, and so far stakeholder theory has largely ignored intra-stakeholder heterogeneity.
- *Multiple Inclusions (double appurtenance):* Most individuals are likely to belong to more than one stakeholder group at the same time. They may simultaneously occupy several roles.
- *Difference in Dependence among Stakeholders:* The stakeholder model typically assumes unidirectional relationships, yet all relationships are not equal, depending on power and sensitivity.
- *Salience and the impact of the various stakeholders:* The basic stakeholder model shows that all stakeholder relations are equal, however, the impacts of the various stakeholders are not equal, do not all carry the same weight, and the stakes and risks vary considerably.
- *The Firm's Center Place in the Model:* The firm lies at the hub of Freeman's stakeholder model and, as a consequence, the stakeholders appear to have relationships with the firm but, in reality, they deal with its representatives.

- *Multiple Linkages:* The original graphical scheme suggested that the stakeholders have no relations with one another. In reality, there are a series of multilateral contracts among the stakeholders.
- *A Network Model of Stakeholder Theory:* Every stakeholder has its own subset of stakeholders, with associated obligations and influences, and this can influence its relationship with the hub company.

Fassin (2007) recommended the development of a revised integrated model by superimposing the various graphical outlines to overcome the model drawbacks discussed above. However, the complexity of Fassin's (2007) recommendations would make it opaque and confusing, and the model will lose its pedagogical value. Indeed, the success of the stakeholder model has been claimed to be largely due to its visual simplicity and power.

In addition to Fassin's explanation of the shortcomings and imperfections in the stakeholder model's graphical representation, and despite its popularity, many scholars have problems with the stakeholder theory of the corporation. Key (1999) argued that stakeholder theory lacks complexity and specificity and thus cannot be operationalised in a way that allows scientific inspections. Fassin (2008) highlighted two major shortcomings of the stakeholder framework: the level of the firm's environment and the ambivalent position of groups and regulators. Rowley (1997) believes that the theory is incomplete in its model linkages. Donaldson and Preston (1995) believed that the theory gives arguments that are contradictory and diverse. Brenner and Cochran (1991) claimed that the theory promises much, but delivers little. Phillips (2010) argued that an amended principle of fair play – the principle of stakeholder fairness – provides a defensible source of moral obligations among stakeholders that has been missing in the literature on stakeholder theory. Jensen and Sandstrom (2011) reported that stakeholder theory loses its explanatory power and usefulness to managers in global organizations and advised developing a stakeholder theory that is more sensitive to globalization through highlighting the challenge to acknowledge new power relations (sub-political movements, new form of bureaucracy and hierarchy) and the challenge is to acknowledge new dimensions of political responsibility. Finally, King (2006) claimed that stakeholder theory offered no decision-making criteria that adequately guide corporate governance and that the real problem is that there are so many versions of stakeholder theory that it is difficult to know where to begin to offer criticisms.

Curiously, while the graphical representation of the stakeholder model has generally been adopted by most scholars and has contributed to the acceptance of the stakeholder concept by the business community, the graphical model has hardly been used in most of the extensive debates and critiques in the academic literature. The systematic, graphical analysis of the major criticisms leveled at the model leads to modest adaptations that provide new and insightful extensions to existing stakeholder literature (Fassin, 2008).

Drawing on the various criticisms and suggestions, a new refined stakeholder model was proposed by Fassin (2008). The “Stake Model” incorporates minor changes but respecting the logical line of evolution initiated by Freeman’s first conceptual stakeholder model and its subsequent adaptations. The ambition was to adopt Freeman’s framework, but with a little alteration as possible, so as to retain the visual power of its familiar scheme. The new concept of Stake Watchers, mainly pressure groups, and Stake Keepers, largely regulators, have been introduced. This view better reflects the distinct activities of stakeholders in one of three groups: the stakeholder who holds the stake, the Stake Watcher who watches the stake, and the Stake Keeper who keeps the stake. The refined stakeholder model (Fassin 2008) offers an improved conceptualization of the firm and its environment, its parts and the interrelation between the parts. This refined stake model will facilitate the strategic analysis needed to better manage stakeholders.

The stakeholder theory has been articulated in a number of ways, but in each of these ways, stakeholders collectively need to adopt corporate social responsibility. Milton Friedman’s famous 1912 pronouncement that the only social responsibility of corporations is to provide a profit for its owners (Friedman 1970), detracts from modern thinking. While accepting that in many ways Friedman was right, Hacker (2012) argued that corporations that only focus on profit may be harming their business. He claims that Friedman’s overly-simplified view of corporate activities leads to erroneous assumptions. Such a narrow focus can lead companies to short-term decisions that may make money now, but can ruin future profits and sustainability. He claims, therefore, that social responsibility in business should not be simply to make money, but to create long-term value for its owners.

In spite of the difficulties associated with stakeholder management and in spite of its implicit acceptance of simplification along the discussed explanatory elements, its success in

management literature as well as in current business practices cannot be ignored. Freeman's (1984) framework still stands as a good approximation to reality due to the simplicity of the stakeholder model and to the clarity of Freeman's powerful synthesized visual conceptualization.

On the other hand, the role of project managers is also a critical feature of the stakeholder framework. Ultimately, the benefits attained by particular stakeholders are determined by how managers prioritize competing claims. The resolution of specific stakeholder interests can be reached by mutually acceptable outcomes that impact on the institution strategies from global action on ecological and community development. In practice, it is a managerial activity that determines how others perceive corporate values; the way the organization addresses its stakeholders, and its economic corporate performance.

3.5.5 Agency Theory

Agency Theory is a contractual arrangement model that focuses on the relationship between managers and owners. It focuses on self-interest within people that can cause conflict of interests. Oliverio (2007) defined an agency relationship as a contract in which one or more persons (the principals) engage another person (the agent) to take actions on their behalf. An example of an agency relationship is the delegation of a decision-making authority from the shareholders of a firm (the principal) to a manager (the agent). The total cost of structuring, administering, and enforcing such contracts are called agency costs (Calhoun, 2002). Agency Theory assumes that the other party can act opportunistically. It ignores social issues and business environment and therefore it has so many extreme conditions and excessive reports that make it difficult to be applied to complex modern government agency operations (Eisenhardt, 1989). In addition, the agency literature is split into two camps (Jensen and Standstrom, 2011) leading to differences in interpretation. For example, Barney and Ouchi (1986) argued that Agency Theory emphasises how capital markets can affect the firm, whereas other authors (e.g.; Anderson, 1985) made no references to capital markets at all.

Two difficulties of Agency Theory were discussed by Chisholm (1982). First, there is the difficulty of accounting for the event, which is the agent's causing his understanding, and second, the difficulty of explaining how reasons influence our free acts. Chisholm further concluded that neither of the two difficulties has been fully solved. As such, the use of Agency Theory remains highly controversial among business ethicists. While some regard it as an

essential tool for analyzing and understanding the recent spate of corporate ethics scandals, others suggested that these scandals might not even have occurred had it not been for the wide spread teaching of Agency Theory in business schools.

Agency Theory also remains controversial in the literature on financial ethics. Since the publication of Jensen and Meckling's seminal work in 1976, Agency Theory has become an important part of modern financial economies (Proffitt, 2000). Its principles have been extended to provide explanations of merger activity and corporate restructuring, dividend policies, executive compensation, the composition of corporate boards and capital structure, among other issues. The world of business has competition at its very core. Competition exists not only among firms, but also within firms, as employees compete for recognition, promotions, and salary increases. Agency Theory acknowledges the ways of the world, but did not claim to have created it (Proffitt, 2000).

Although still controversial, Agency Theory is an important theory in business management. It offers unique insights into information systems, outcome uncertainty, incentives and risk. In addition, it is an empirically valid perspective, particularly when coupled with the complementary perspective. While Eisenhardt (1989) recommended incorporating an agency perspective in studies of many problems having a cooperative structure, Health (2009) argued that Agency Theory identifies the points at which both firms and markets are vulnerable to breakdown in the absence of moral constraint.

It is important, therefore, to examine further the various stages of project management which is the topic of the next section.

3.6 Project Management Stages

In today's competitive market, organizations must engage in project planning to survive and prosper. Strategic management is an approach to addressing the competitive challenges an organization faces. Strategic management has two distinct yet interdependent phases: strategy formulation and implementation. During strategy formulation, the planning group decides on a strategic direction from the company's mission and goals, its external opportunities and threats, and its internal strengths and weaknesses. Typically, a Harvard SWOT Analysis - **S**trengths, **W**eaknesses/**L**imitations, **O**pportunities, and **T**hreats - is used for this purpose (Simmons and

Pohl, 1994). At the implementation stage, the organization follows through on the chosen strategy. This consists of restructuring the organization and allocating resources.

Project management is fundamental in directing and coordinating human and material resources throughout the life of a project by using modern management techniques to achieve predetermined objectives. In 1987, the PMI (Project Management Institute) Standards Committee specified ideal project logic in terms of planning, controlling, and evaluating theories (Packendorff, 1995). In addressing the project management process, Blair (1996) developed a project management framework for a construction project using five dimensions, which he elaborated on in terms of a series of critical phases between starting and completing a project (see Table 3.2).

Table 3.2: Description of the Construction Process (*Source: Blair, 1996*)

	Process	Brief Elaboration of the Process
1	Starting the Project	Starting from idea realization through to the development of a business case and prioritization of the potential project investment.
2	Project Planning	This stage is critical to successful resourcing and execution of the project activities and it includes the development of the overall project structure.
3	Approving the Project	Important realization of treasury funding approval
4	Project Implementation	Against the project plan and project organization structure, the project activities are executed, tracked and measured.
5	Project close out & wrap up	Completion and close up stage

Blair emphasized the importance of planning the project as well as financial decision-making in the project's success. This stressed the importance of the evolution and growth in organizational and management research. Patel and Morris (1999) referred to this as the Life-Cycle of a project which they claimed uniquely distinguishes successful projects from non-successful ones.

Gabor (1990) also proposed six stages of infrastructure development; namely, planning, scoping, design, scheduling, tendering and construction, as well as a feedback loop for periodic adjustments as required. A feedback loop was introduced to incorporate the past knowledge experience in the process of new project management and development. Gabor's six stage framework is shown in Figure 3.4 and discussed further below.

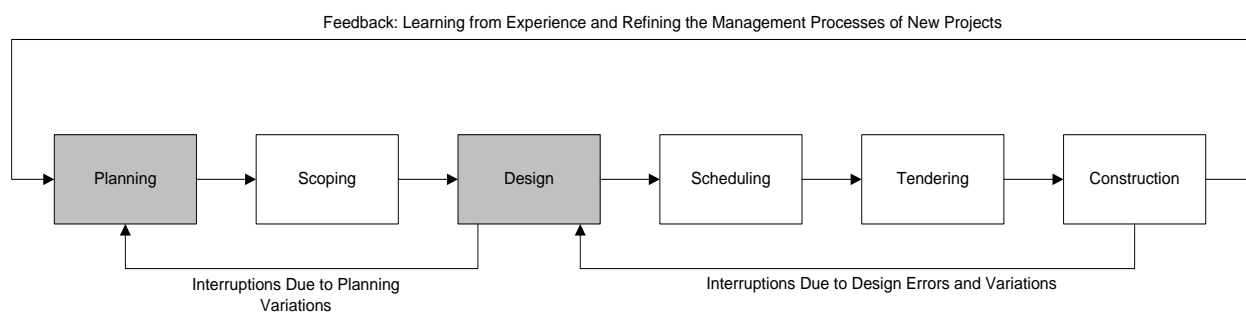


Figure 3.4: The six stages of project development (Source: Gabor, 1990)

3.6.1 Planning Stage

Traditionally, planning a new project is the first stage in developing a new TIP. Planning is the function of selecting the enterprise objectives and establishing the policies and programs necessary for achieving them. Weston and Copeland (1992) noted that the most important responsibility of a project manager is to plan, integrate and execute plans well. As most projects are of short duration, they require strict control of resources and a clear and formalized detailed plan. Cleland and King (1994) further suggested that the use of an effective plan is a prominent factor behind successful development and implementation of project.

Spinner (1997) identified four basic reasons for project planning: (i) eliminate or reduce uncertainty; (ii) improve the efficiency of operation; (iii) obtain a better understanding of objectives; and (iv), provide a basis for monitoring and controlling work. Kerzner (2003) further defined planning in a project environment as establishing a predetermined course of action within a forecasted environment. Horengren *et al.* (2007) noted the gloomy side of project planning where, apart from the cost and time involved in the process, a single planning mistake

can often spell disaster for the entire project management team. Kerzner (2003) elaborated typical reasons for failure as, (i) corporate goal-misconception and misunderstanding, (ii) quality of data issues, and (iii) personnel planning failures. He noted that project success or failure often depends upon management's ability to grasp the entire project planning dimensions.

3.6.1.1 Network Planning

Spinner (1997) pointed out that the most widely used project management principle is network planning, where a project comprising a group of interrelated jobs is directed towards a common goal. From surveys conducted from a number of industries, he reported that the network planning method is especially useful for projects that have well defined objectives and starting points and that project performance is usually successful when using this method. Pinson (2004) noted that the use of modern planning techniques has led to network planning being widely used these days in all types of operational programming. In network planning, he argued that the terms planning and scheduling are not synonymous. A plan is a proposed method of action or procedure while scheduling is the development of a timetable that estimates the plan tasks and indicates when activities are to be accomplished. The successful implementation of a project, Pinson argued, requires both detailed planning and implementation when developing a plan.

3.6.1.2 Strategic Planning

Gabor (1990) observed the positive relationship between quality improvement, success and strategic management as long as it identifies vision and mission of the organization precisely in a measurable form. Taken together, strategic planning and continuous quality improvement and success can dramatically improve the ability of the organization to meet the needs of its internal and external stakeholders. Based on a critical review of empirical and conceptual studies on project management in developed and developing countries, Gabor observed the need for an organization's vision, mission, and values as prerequisite factors for a successful management process framework. From large companies such as Ericsson in the USA, it was noted that time frames can be shortened by performing strategic planning tools and mechanism.

Formalized strategic planning, as a part of strategic management process, grew out of budget exercises in the 1950s and spread rapidly. Recently, Simmons and Pohl (1994) reported that following the use of SWOT analyses, Wisconsin University developed a comprehensive strategic

planning model, outlining mission, operating principles, strategic priorities and situational analysis. Strategic Planning, they argued, required a broad decision-making group of middle and operational levels of management in developing a strategic plan during times of changing leadership.

Weston and Copeland (1992) argued that while firms must always focus on long term strategic planning for performance efficiency, they also need to take care of performing well in a given yearly quarter. They added that this is especially true as market becomes increasingly international in scope and the economies of the world increasingly interlinked and subject to market fluctuations. Kerner *et al.* (2006) introduced a life-cycle-based model where adopting a Corporate Cultural Approach (CCA) breaks the project down into life-cycle phases. This has the advantage that the planning phase involves both planning and management control. They recommended the structuring of projects into phases based on the concepts of time value of money and the cost of frozen funds.

Continued strategic planning requires understanding the organization's competencies, values and resources as project management teams are not free from ambiguity and problems associated with forward planning. Understanding exogenous factors is essential in establishing and implementing successfully strategic plans regardless of size and resources on the influence of culture on project management (Zwikael, Shimizu and Globerson, 2005).

3.6.1.3 Accurate Project Finance Planning

As well as accurate project planning, Blair's (1996) five dimensional model discussed earlier stressed the importance of treasury funding approval for the success of a government – initiated onstruction project. Clearly, ensuring the project is adequately funded at the start is critical in ensuring a successful project. However, equally important is making sure there is sufficient allowance for cost escalations that will inevitably impact on the project's life-cycle.

Previous studies noted that the capital cost of most major transportation projects rises significantly and seemingly inevitably between the time that the project is originally planned and when it is actually built. The reasons why the actual cost of a commuter rail line in Massachusetts by the Massachusetts Bay Transportation Authority (MBTA) increased five times the estimated cost from the first feasibility study were examined by Faulkner and El-Sharafi

(2003). They found a 400% increase over the original projections which they attributed to project planners and engineers not producing accurate projected project cost estimates during the planning stage of the project.

It should be noted that increasing the project contingency by 100% initially might convey to financiers that a project is unfeasible and might result in cancellation of the project while it is still in its infant stage. Thus Faulkner and El-Sharafi (2003) stressed the need for careful statistical studies and discounted formulas, based on detailed projections, to reduce forecast errors from inflation for projects expected to take more than three year. The American Planning Association, an independent, not-for-profit educational organization with a membership of many thousands of project planners from around the world, recommended financial estimating procedures for large infrastructure projects. Its widespread use would surely produce more accurate estimates of large infrastructure projects such as “Toll Collect” and the “Channel Tunnel”, noted by Flyvbjerg *et al* (2009) as examples of projects that the vast majority of the public would not have accepted had they been properly budgeted at the outset.

3.6.1.4 Planning Environmentally Sensitive Transportation Projects

A major challenge on many current transportation projects is planning for environmentally sensitive projects. Hancher *et al.* (2003) reported that the Transportation Cabinet in Kentucky made an important commitment to a new approach in the planning and design of transportation projects to satisfy the human and natural environmental issues of transportation projects. Building on the principle of Context Sensitive Design (CSD), the new collaborative program is an interdisciplinary approach, involving all stakeholders, to ensure that these projects account for scenic preserves, aesthetic designs, and historic and environmental resources, while maintaining safety and mobility.

Context Sensitive Design (CSD) and Context Sensitive Construction (CSC) emphasize the importance of increased public and contractor involvement in the project development process. Currently, most contractors have little to no involvement in a project design prior to the start of construction, and have little or no interest in preserving the natural environment. They are more focused on meeting time schedules and budgets, and ensuring a satisfactory level of quality and safety (Jackson and Klobas, 2007). In their paper on planning transportation projects, they developed a social constructivist planning model describing the necessary and sufficient

activities for knowledge creation and transfer which may give the project managers a new perspective on how to enhance project performance in these environments.

3.6.2 Design Stage

Project design is the process of originating and developing a plan for a product, structure or component. Design plays a significant role in the infrastructure project's life cycle. It has internal and external impact on the project implementation and monitoring, and any discrepancies in the design stage can lead to accumulating errors in the subsequent processes of scheduling, scoping, bidding, and completion of a project. Thus, it is important to spend time and budget on the design stage to ensure minimum disruptions to deadlines, quality and budget in the life cycle of the project.

3.6.2.1 The Principle of Context Sensitive Design (CSD)

As noted earlier, Context Sensitive Design (CSD) is a collaborative, interdisciplinary approach that includes early involvement of key stakeholders to ensure that transportation projects are not only moving safely and efficiently, but are also in harmony with the natural, social, economic, and cultural environment (MDT 2010). The use of multi-disciplinary teams early on ensures coordination, and communication between governmental transportation department, environment groups, utilities and services, contractors and construction companies during the design stage. Hancher *et al.* (2003) and MDT (2010) noted that by insisting on early stakeholder and public involvement, CSD will avoid major readjustment and redesigns of the project at a later stage, thereby helping to reduce expensive and time-consuming rework later on and a more efficient project.

3.6.2.2 Design-Build (DB) vs. Design-Bid-Build (DBB) Projects

In a traditional Design-Bid-Build (DBB) or a Design-Award-Build (DAB) system, an owner develops contract documents (blueprints and a detailed specification) with an architect or engineer and then solicits Bids from suitable contractors. The project is usually awarded to the lowest responsive and responsible bidder. In a more recent Design-Build (DB) or Design-Construct system, the owner develops a conceptual plan for a project, then solicits bids from joint ventures of architects and/or engineers and builders for the design and construction of the project.

Apart from achieving significantly shorter project schedules, Ernzen, Williams, and Brisk (2004) reported that Design-Build systems to-date normally result in significant cost savings when compared to a pool of DBB projects.

3.6.2.3 Design and the issue of Constructability

Wideman (2000) reported that “constructability” can generally be described as the extent to which a design of a facility provides for ease of construction while meeting the overall requirements of that facility. It is an “attitude” that must prevail through conceptual planning, design and procurement, and field operation. If ease of construction is built into design, TIPs would be expected to be easier and less expensive. Hancher, Goodrum, and Thozhal (2004) claimed the following direct benefits for the management of these projects:

- Construction planning is made easier;
- Both design and construction costs can be reduced;
- Construction schedule may be shortened;
- Better quality can be required and expected;
- More realistic commitments can be made to subsequence trades; and
- Earlier owner-occupation.

In addition, they noted that there can also be indirect benefits such as:

- Building a collaborative team committed to project goals;
- Parties working for mutual benefit;
- Cross discipline training;
- Transfer of expertise from other projects;
- Constructor better understanding design intent, and vice versa;
- Increased innovation in both design and construction; and
- Shorter learning curves and competitive advantage.

These researchers conducted an evaluation of the feasibility and implementation needs to fully utilize constructability process on highway construction projects for Kentucky Transportation Cabinet, a US state agency charged with overseeing the highway, rail, and aviation infrastructure. They found that construction time, available manpower, experience, and contractor reluctance were four typical barriers to most construction programs among

transportation agencies. Traffic control, existing utilities, geotechnical, Right-Of-Way, bridge structures, and new utilities were the common construction issues encountered (Hancher, Goodrum, and Thozhal, 2004).

3.6.3 Scoping Stage

Project scoping is yet another important stage in a successful TIP which has high impact on the management processes. The scoping document describes current project tasks and boundaries and provides important information about procurement planning and a range of other cost and time-critical issues. Scoping is a key issue of concern at an early stage of the planning process and needs to be carried out early in the project's initial specification stages in order to aid site selection and identify any possible alternative.

The scoping process should involve all interested parties such as the designers, planners, government and environmental agencies, and members of the public. In May 2002, the US Transportation Commissioner directed the Virginia Transportation Research Council (VTRC) to develop an improved method to estimate project costs by the Virginia Department of Transportation - VDOT (Kyte *et al.* 2004). Their research team recognized early on that a very strong focus on project scoping was essential to provide an accurate methodology. The researchers relied on input from the project scoping committee that had been charged with exploring and developing recommendations for improving the scoping process. Testing of the tool was completed in summer 2003. Analysis of many completed VDOT construction projects showed that the estimation model yielded results that, on average, were different from actual final project costs by 22% (Kyte *et al.*, 2004).

3.6.3.1 Scoping, Value Engineering and Value Analysis

Value Engineering (VE) has traditionally been perceived as an effective means of reducing project costs. However, VE has typically only addressed one part of the value analysis equation, namely cost reduction, and can overlook its positive effect on project scope performance and value enhancement (Hunter and Stewart, 2003). Tritt (2008) noted that project scope performance measures are an integral part of the Californian Transport (CALTRANS) Value Analysis methodology and comprised:

- Identification of key project scope performance criteria;

- Establishing hierarchy of performance criteria and their impact on the project;
- Establishing performance criteria by evaluating its effectiveness on design concepts;
- Measuring the performance of alternatives; and
- Measuring the performance of the current Global Concept as overall value improvement.

Hunter and Stewart (2003) evaluated the development and integration of performance measurements into the value methodology employed on CALTRANS studies and concluded that the approach improved the effectiveness of these highway projects by providing a reliable, integrated means of measuring the effect of Value Engineering on performance. They noted that value analysis lead to an enhanced discussion of implementation alternatives, provided cheaper cost options, was more effective in the earlier stages of project development, captured input from participating projects and helped refine the project scope more effectively. Their major assumption was that the project functions (what the project delivers to its users and stakeholders) are always well established, which is not always the case in the UAE. In addition, the role of the work team should not be ignored in scoping performance targets, especially those more aware of the project details and work environment.

3.6.3.2 Scoping and Change Orders

Change order was defined by Hanna *et al.* (1990) as any event that results in a modification of the original scope. Change orders may occur on projects for a number of reasons such as design errors, design changes, additions to the scope or unknown condition, and may or may not have an impact on labor productivity. For each change, contractors are entitled to an equitable adjustment to the base contract price and schedule for all productivity impacts associated with the change. This phenomenon has become an everyday occurrence in construction, it is widely accepted by both owners and contractors that change orders do have an effect on labor efficiency, but this impact is secondary to quality and frequently leads to disputes. For example, in Taiwan, Wu, Hsieh, Cheng, and Lu (2005) noted that a total of 34 change order causes were found for construction projects in which Grey Relational Analysis was used (a Grey Relational Analysis is one in which part of information is known and part of information is unknown).

A statistical model was developed by Hanna *et al.* (1990) that estimated the actual amount of labor efficiency lost due to change orders. Data were collected from 61 mechanical construction

projects which showed that a late change order during a project had more impact on labor efficiency than an earlier one. While each project has unique characteristics, the model provides owners and contractors with baseline measures of lost labor efficiency for use in project scoping. Good and effective planning will always reduce the possibility and effect of design changes and hence reduce change order frequency. However, changes that might be introduced by the client during its progress is a major problems faced by the industry.

3.6.4 Scheduling Stage

A project schedule is a list of the essential elements and timing of a project from start to completion. Each element in a project schedule is a basic unit, commonly associated with resource requirements, duration, costs and who is the responsible agent. The schedule also lists start and end dates for both the project overall and for each task milestone. A construction schedule normally includes employees, materials procedures, information, regulation, courses, techniques, information, and so on, for any given day, week, or month in a work place. A schedule is necessary to avoid delays of material and equipment to a construction site that can delay the project completion date.

McCabe, 2003, cited in Lehmann, *et al*, 2009),) claimed that construction scheduling is important to reduce traffic delays, decrease construction time, and optimize the utilization of funding, people, and other resources. The accuracy of a construction schedule is crucial to the success of the project. For instance, McCabe reported that highway interchange projects are typically characterized by a high level of geometric complexity and thus are very hard to visualize and understand. Due to difficulties in understanding and visualizing the different phases of the construction schedule, unexpected delays or conflicts can occur that undermine the project success.

McCabe (2003) developed a probabilistic model using Monte Carlo simulations to assist in estimating lower and upper duration estimates and in the preparation of a risk analysis of the schedule. This model was tested in 14 projects with excellent results. The application of the model can provide valuable information to the owner and the contractor, unfortunately though, lack of common knowledge about the technique is a major barrier to its use.

3.6.4.1 Scheduling Accuracy and Variations

Evaluating the accuracy of construction scheduling indicates a wide variation in the accuracy of schedules submitted by contractors for many projects, which in turn can affect their usefulness. Liapi, Kwaja, and O'Conner (2003), for example, developed a computer-based system that facilitated the communication of information regarding construction schedule and traffic control measures to all interested parties and allowed consultants and contractors to make better decisions to a wide variety of issues. After developing the system, it was employed during the planning and construction phase of a section of the 635/75 interchange project in Dallas (USA) to display visually alternative schedules and traffic control strategies during the construction of the project with some success. While an excellent example of the use of computer-based system to facilitate communication, it would be useful to employ the system on more than one project to assure its validity and applicability to a variety of different transportation construction projects.

3.6.4.2 Scheduling and Procurement Delays

Delays in the delivery of materials and equipment to construction sites are often thought to be a contributory cause of cost overruns in construction projects in developing countries. Tachizawa and Thomsen (2007) claimed that firms generally need supply flexibility for a number of important reasons, such as manufacturing schedule fluctuations, Just-In-Time purchasing, manufacturer slack capacity, low level of parts commonality, demand volatility, demand seasonality and forecast accuracy. Companies can increase this type of flexibility by improved supplier responsiveness and flexible sourcing. The supply flexibility strategy selected depends on the mix, volume or delivery uncertainty.

Manavazhi and Adhikari (2002) set out to assess the impact of procurement delays on scheduling of 22 highway infrastructure projects in Nepal and their costs. They reported that the main causes of material and equipment procurement delays were organization weaknesses, supply of default products, government regulations, and transportation delays. However, the actual impact of these delays on project costs was found to be only minimal (around 0.5% on average of the total project cost). These authors warned, however, to take care in generalizing these results to other countries or other projects in highway design and construction, given the special circumstances that existed in Nepal.

Sambasivan and Soon (2007) investigated the causes and effects of delay facing the Malaysian Construction Industry and listed ten main causes of delay and their effects, as shown in Table 3.3. An important contribution for the study was the fact that they addressed the empirical relationship between the causes and effects of delays, which can help practitioners (clients, contractors, and consultants) and academics to better understand the dynamics of project management and make efforts to reduce the incidences of delay. Like the Nepalese study by Manavazhi and Adhikari (2002), these authors, too, noted that some causes and effects they saw may be unique to the region where the study was undertaken.

Table 3.3: Causes and Effects of Delays in Malaysian Construction Industry
(Source: Sambasivan and Soon, 2007)

Causes	Effects
<ul style="list-style-type: none"> • Contractor's improper planning • Contractor's poor site management • Inadequate contractor's experience • Inadequate client's finance and payments for complete work • Problems with subcontractors • Shortage in material • Labor supply • Equipment availability • Lack of communication between parties • Mistakes during the construction stage 	<ul style="list-style-type: none"> • Time Overrun • Cost Overrun • Disputes • Arbitration • Litigation • Total Abandonment

3.6.5 Tendering Stage

Bidding is the process of submitting a proposal (a tender) to undertake, or manage a construction project. It usually commences with a project BRIEF provided by the client or the project managing team outlining the full extent of what is required. The proposal submitted by the competing firms generally contains a bill of quantities, a bill of approximate quantities and other specifications which enables the tenders to attain higher levels of accuracy in estimating the

work required. The client or project managing team will usually seek a number of tenders from which they will select one, based on the price, reputation, references, and previous experience.

In any construction project, there is always an element of risk – risk in the design, risk in the construction company, the consultants, engineering challenges, etc. As Ashton (2004) noted, risk management is an important factor in bidding that needs to be addressed. The project manager must explore the right procurement policy as well as procurement planning when selecting a suitable sub-contractor. He reported that the Boston Consultancy Group developed a mechanism built around the learning curve concept to address this. More on this concept related to project planning can be found on the Boston Consultancy Group (BCG) website (www.bcg.com).

3.6.5.1 Competitively Bidding

The traditional system for selecting a construction firm is by competitive bidding, where tenders are obtained by advertising or by inviting a number of pre-selected suitable organizations to submit a proposal or tender and then selecting the successful one based on their price, reputation, references, previous experience, etc. Many factors can affect the completed cost of a project such as the quality and constructability of the design, management techniques required by the contractors, location of the project, staff salaries, and macroeconomic conditions. The low bid is prone to errors in assumptions made by the contractor, and many external events can affect costs during construction. In this chaotic environment it would be expected that the low bid amount could not be used to develop predictions of the completed project cost.

However, Williams (2003) found that there is a relationship between the low bid and final cost and that it often occurs in a repeatable manner across industries. He set out to examine the relationship between the lowest bid and the completed cost of competitively-bid highway projects across a range of agencies in highway construction. He found that as the magnitude of the low bid increased, the resulting completed project cost tended to increase absolutely and as a percentage of the original bid. He concluded that regression models can be useful for predicting budgeting outcomes. Dredging projects, however, appeared to follow different mechanisms of cost increase than the highway projects and were not predicted as well by regression modeling.

3.6.5.2 Incentive/Disincentive Bidding

An increasing number of highway agencies are using Incentive/Disincentive (I/D) bidding for highway construction. The I/D bidding concept is designed to shorten the total contract time by allowing the contractor to obtain incentives for early completion and pay disincentives for late completion of a project. Using this type of bidding, contractors face the problem of determining better strategies to develop their bid estimate, including cost, construction time, and I/D payment. Moreover, highway authorities face the problem of setting an appropriate incentive amount to minimize waste of public monies and still maintain an effective incentive.

Shr and Chen (2003) developed a quantifying model to determine an optimum low bid to submit for construction projects, using projects undertaken for the Florida Department of Transportation. A linear functional relationship was found between construction cost and time duration from these data from which it was possible to optimize the maximum incentive days and incentive amount. While these researchers planned on validating this relationship, no report was subsequently found on this outcome.

3.6.5.3 Bidding and Project Payment Terms

There are five standard forms of project contract payment terms: (i) Cost Plus, (ii) re-measurement based on schedule of rates, (iii) re-measurement based on bill of quantities, (iv) re-measurement based on bill of materials, and (v) Fixed Price. Conceptually, all five contract payment terms should deliver the same output costs. However, it is possible that opportunism by the contractor will lead them to inflate claims for quantities used in the earlier types, and will lead them to create bogus claims for variations in the latter types. Hence, it is important to place control mechanisms to stop opportunity for deceit and insure that all participants, clients and contractors are equally motivated to achieve common objective and align their goals.

Turner and Simister (2001), for instance, set out to examine what type of contract suited both partners in what situation, assuming that clients and contractors are equally motivated to achieve common objectives. They interviewed people involved in major infrastructure projects and drew on earlier research done by the Engineering Construction Institute. They found that it is not risk *per se* that determines the appropriate type of contract, but uncertainty of the eventual project. Where uncertainty of the project is low but uncertainty in the process of delivery is high, they

reported that Design-and-Build fixed price contracts were commonly used. When both are high, fixed price contracts were used and when both are low, Build-Only re-measurement contracts are chosen. They observed that if the purpose of a contract is to create a project organization, then the need for goal alignment is more significant. This requires that all contracted parties should be properly rewarded and that is achieved by adopting contract pricing terms suggested by the study results.

3.6.6 Construction and Project Implementation

The construction of a Transportation Infrastructure Project is the outcome of the preceding planning, designing, scoping, scheduling and tendering efforts and what eventually will enable their successes to be evaluated. Even with the most perfect design and management systems, the construction phase can still be problematic due to unforeseen construction difficulties, staffing problems and poor performance in any of the four key management processes of communication, coordination, decision-making and knowledge-sharing that were discussed earlier (Botten and Sims, 2006).

3.6.6.1 Construction Issues and Strategies

There are three important key issues identified from the literature review that relate to successful construction of Transportation Infrastructure Projects. These include day or night construction, effective construction methods, and construction and computing tools.

Day or night construction is usually adopted in highway design, based on minimal traffic flow delays and congestion. As costs are usually higher at night (penalty payments), they tend to be discouraged (Al-Kaisy and Nassar, 2003). However, increased night scheduling is also used to address critical time delays. For improved construction methods, Ernzen *et al.* (2004) claimed that the use of DB or DBB discussed earlier in TIP construction methods can result in significant cost savings for these mega projects. Computing tools such as Pavement Management Systems in TIP constructions have helped to address earlier problems where pavement and infrastructure management decisions were often based on incomplete evidence, engineering judgment and expert advice. The use of an asset management approach and new software packages offers great promise to support pavement management development (ASCE, 2011).

3.6.6.2 Project Implementation

The implementation phase of a project is the final activity of the project management process, taking into account outstanding critical issues such as, utility relocation, operating strategies, and last minute procurement needs. The project implementation stage not only signals the end of the planned activities but also permits the evaluation of its success against the original business case outlined. Botten and Sims (2006) define implementation as the combined resources of people and machines that are dedicated to building and delivering a product. Kerner (2006) outlined an operational framework for the project management process (see Table 3.4) highlighting implementation as the central part of project management.

Table 3.4: Operational Framework for Project Management Process
(Source: Kerzner, 2006)

	Process	Brief Elaboration of the Process
1	Review of the vision and strategy of the organization	Vision and strategy review is prerequisite process.
2	Definition and specification of measurable project objectives and project specification	Technical strategy as exemplified in technical risk assessment as well as market risk assessment will be considered in this process, along the way to develop measurable objectives (Kerzner's Model). Project specifications and terms of reference.
3	Project Planning	The planning process can best be described as the functions of selecting the objectives and establishing policies, procedures and programs necessary for achieving them. Thus, planning is around establishing a course of actions within a forecasted environment. Based on success face factor, planning will cover cost, time, & risk analysis.
4	Project Implementation	Implementation process represents the final part of project management. This process covers the completion of planned activities as well as evaluation of the success of the project. Identification of opportunities for improvement is an integral part of project implementation. Resource allocation, operating strategies, organizational design and evaluation as well as control are the main parameters of project implementation.

Kerzner (2006) further pointed out the empirical and conceptual frameworks for analyzing the relationship between decision-making systems and implementation of the project, taking into consideration the many facets of success. He noted that the uniqueness of the study's framework

is embodied in the project management process, from the definition of mission, goals, and objectives, to formulation of strategy and operational plans, ending up with successful implementation of project in the wider perspective. Although development of relationships between clients and contractors can be difficult, it is often assumed that more cooperation between the client and contractors will improve the performance of construction projects (Laan *et al.*, 2011).

By virtue, TIP management is continually seeking new and better techniques to cope with the complexities, size of investment, opportunity-cost of allocated funds, masses of data, and tight deadlines that are characteristics of highly competitive industries. Horngen, Suden and Stewart (2005) noted that planning and control mechanisms must help management in predicting satisfactory completion. Academics and practitioners see controlling the project through planning and scheduling techniques, as the most common methods, capable to achieving a designated objective (Spinner, 1997).

Effective management of a program requires a well-budgeted cost and control mechanism, so that immediate feedback can be obtained. “Variance Analysis” techniques are the most popular tools to control cost (Palmer 2012) but are not widely used currently in the UAE to establish a profile on successful implementation of a project. Hence, there is much scope for embracing a more empirical approach, exploring and adopting cost planning and cost control as ingredients behind implementation of public projects in the region.

Authors, such as Laan *et al.* (2011) have focused on the relationship between trust and control and showed that trust is related to inter-organizational relationship performance. The literature on trust dynamics suggests that strong coordination and communication in a project quickly sets the level of trust between the stakeholders and can lead to change in the level of control adopted. Good early conditions of an inter-organizational relationship can lead to risk-sharing and creating opportunities for mutual gains, and thus conducive for the development of trust between them. They note the importance of developing a virtual “cycle of trust development” between the client and contractors leading to better problem solving and hence ultimately, better project outcomes (Laan *et al.*, 2011).

3.6.6.3 Project Implementation and Utility Relocation

Recent studies, such as that by Dominguez *et al.* (2009) on the future of infrastructure sectors, showed that there is a consistently widening gap between the requirements for ensuring the delivery of utility services and the capacity of the public sector to meet those requirements. This capability gap is accentuated by emerging challenges such as increasing uncertainties in socio-technical context conditions, massively expanded investment needs, shifting objectives, market liberalization, and changing regulation. They noted that rapid urbanization and a general trend among public administrations to pay scant attention to infrastructure systems make this gap even more critical in many parts of the world.

Dominguez *et al.* (2009) reported that utility-related problems are a leading cause of delays on highway construction projects. When the design of a highway project does not take into consideration such things as underground utility requirements, major delays to highway contractors can occur. Every effort must be made to include these needs at the design stage and identify potential utility conflicts early in the development of highway projects. Enhanced Communication, Coordination, Decision-Making, and Knowledge-Sharing strategies are necessary between governmental transportation departments and utility companies. Best practices between governmental transportation departments and utility companies help to reduce delivery time and costs and improve quality in the utilities process.

Scott (2004) reported that the Subsurface Utility Engineering (SUE) process, involving civil engineering, surveying, geophysics, nondestructive excavation, and other professions, has become a routine requirement on many highway projects. Designers plan with thorough and comprehensive knowledge of the exact locations of underground utilities and avoid damaging underground assets, historical and archaeological sites, and other underground items. The American Society of Civil Engineers developed a national consensus standard titled ASCE C-1 38-02, standard guidelines for the collection and depiction of existing subsurface utility data (ASCE, 2002). This national consensus standard is held in high regard by the US justice system and courts and lawyers use these standards to assist in both defining a professional's standard of care and in adjudication of blame. This seems to be in conflict with claims made by Dominguez *et al.* (2009) who argued that at the moment, the literature does not support the widespread implementation of such guidelines. However, the ASCE noted that in real life, it is wonderful to

enjoy the luxury of these new approaches, but it is a difficult objective to achieve without a clear outline for such a system.

3.6.6.4 Principle Components Analysis in Project Implementation

A Principle Component Analysis (PCA) is a mathematical procedure to convert a set of observations of variables into a set of principle components. Like Factor Analysis, it aims to reveal a limited number of clusters or groups of principle components in a data set to best explain the variance. Soetanto and Proverbs (2002) listed five principle components important to contractor satisfaction when implementing new projects:

- support provided to contractors;
- client's understanding of their own needs;
- quality of client's brief;
- financial aspects of performance; and
- the nature of the project and contractor characteristics.

Applying these principles should enable clients to perform better which, they claim, is conducive towards satisfactory participant performance and overall project performance. They identified three key aspects of client performance to significantly influence contractors' satisfaction levels, namely (i) the capability of the client's representative; (ii) the client's past performance and project management experience; and (iii) the financial soundness and reputation of the client. Soetanto and Proverbs (2002) urged clients to use this approach to help improve their performance and the harmony and success of the construction project.

3.6.6.5 Project Implementation and Risk Management

Lam (1999) claimed that each sector of the economy has its own characteristics and operating environment. The power industry, for example, faces a different set of risks to the transport industry. Risk identification entails listing most, if not all, of potential areas where an undesired outcome may result at the early stage of a project. While highway construction is relatively less complex than building tunnels and bridges, they still pose similar risks to project sponsors since they belong to the same mode of transportation as far as toll collection and user pattern are concerned. Table 3.5 lists road construction risks identified by Lam (1999).

Table 3.5: Road Construction Risks (*Source: Lam, 1999*)

- Toll road sponsors face the daunting risk of inadequate traffic volume.
- The accuracy of traffic forecast is severely undermined if competing routes are made within easy reach of the motorists. Cash flow deficiency guarantees or minimum traffic level guarantees by government can provide investors and lenders with a certain level of comfort.
- Road projects usually do not involve very sophisticated technology but can require very large investment because of the size and scope of the project.
- Right-of-way disputes.
- Being politically sensitive, the level of toll is monitored closely by government in a bid to alleviate public complaints against the rising cost of living and the danger of monopoly.
- As the income streams of toll roads, tunnels and bridges are usually in the form of local currency (except where cross-border traffic is involved), project economics will be jeopardized if construction is financed predominantly by foreign funds.

The pattern of risk inherent in a project is largely influenced by the financial structure of the project. During times of interest rate fluctuations, the conventional projects funded by direct capital injection from the governments will be affected by cost increases in their important elements. For highly geared Build, Operate and Transfer (BOT) projects using the large proportions of offshore loans, the ability of their sponsors to service the loans will be severely constrained (Khan, Jamil and Sattar, 2008). On the other hand, government support can create a favorable environment for BOT projects in terms of attracting finance (Lam, 1999).

3.7 Project Success Indicators

The following section discusses in details the project success indicators found in the literature.

3.7.1 Success frameworks

Judging whether a project was successful or not is critical for understanding difficulties and problems encountered and to learn from these for future TIPs. This will potentially lead to greater effectiveness and efficiency in future and improve customer satisfaction. Kerzner (2006) developed a seven-dimension framework for defining project success as shown in Figure 3.5. The success model stresses that one successful project does not mean that the organization as a whole is successful in its project management endeavors.

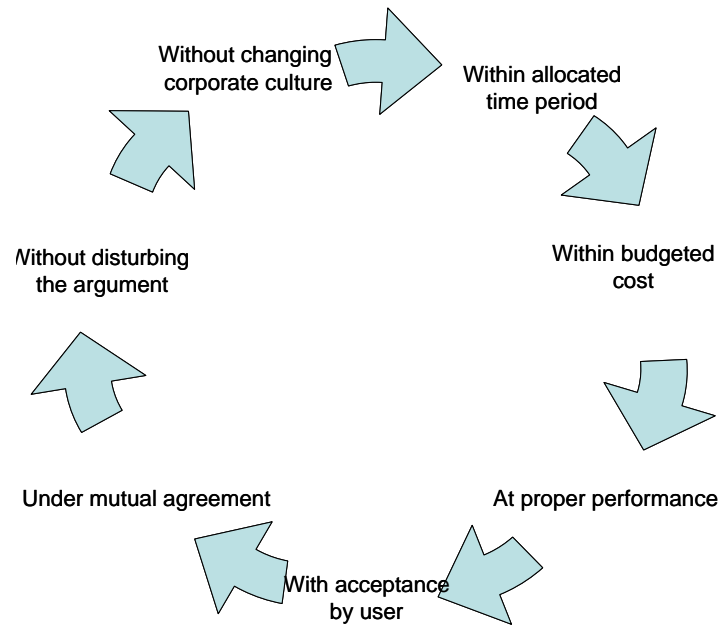


Figure 3.5: Seven Dimensions Framework for defining project success (Source: Kerzner, 2006)

Large infrastructure investments are a vital component of any public or private institution but unfortunately it appears that cost overruns, delays, and exaggerated benefits seem to be the norm rather than the exception for roads, bridges, stadiums, concert halls, and new plants (Flyvbjerg, 2009). As noted earlier, project success or failure often depends on management's ability to grasp the project planning dimensions, yet this proved to be less than adequate over the last 50 years or so. Atkinson (1999) argued that the definitions for successful project management continue to include a limited set of criteria, namely cost, time and quality as shown in his “Iron Triangle” in Figure 3.6.

In spite of the fact that there are other success criteria, such as stakeholders' benefits, methodologies, tools, knowledge and skills, to date the simple Iron Triangle's success criteria still seems to continue to be the preferred success criteria (Atkinson, 1999).

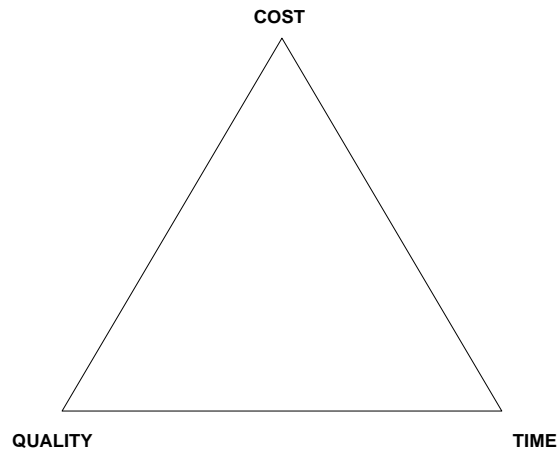


Figure 3.6: Defining Project Success: The Iron Triangle (Source: Atkinson, 1999)

Using the simple “Iron Triangle”, success criteria can cause project managers to be reluctant to include additional success indicators, thereby committing a Type II error that something has not been done as well as it could have been. Early attempts to describe successful project management, based on only the Iron Triangle criteria, may have resulted in a biased outcome of project management success in the past and created an unrealistic view of the success rates. In trying to prevent Type II error of project management, Atkinson (1999) further suggested that the Iron Triangle should be developed to become the Square Route of success criteria, providing a more realistic and balanced indication of success.

Applying the Square Route concept presented in Figure 3.7 shifts the focus of measurement of project management from the exclusive process driven criteria to one containing stakeholder satisfaction and knowledge-sharing.

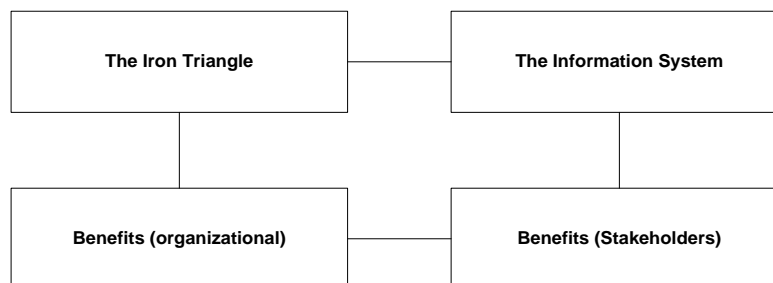


Figure 3.7: Defining Project Success: The Square Route concept (Source: Atkinson, 1999)

3.7.2 Cost Overrun

Apart from other challenges, Project managers are often faced with cost overruns in Transportation Infrastructure Projects. Cost overruns are defined as an excess of actual cost over budget, although they are also referred to as "cost escalations", "cost increases", or "budget overruns" (Jenpanitsub, 2011). In 2002, Flyvbjerg and his colleagues conducted a large major study of cost escalation in international transport infrastructure projects (Flyvbjerg, *et al.* 2002). Based on a sample of 258 TIPs, they reported that overruns of 50% to 100% were common and claimed statistical evidence of gross over-reporting of mega projects that could only be explained by false representations or lies. Some examples included the Suez Canal (1,900% overrun), the Boston's Big Dig tunnel (275% overrun) and the Channel tunnel linking UK and France. In the UAE, two major projects that grossly exceeded their budgets were the Big Mosque in Abu Dhabi and Burj Dubai in Dubai. It should be noted, though, that while many of these projects involved significant cost overrun during construction, it is expected that many will generate social, and probably economical, benefits for generations to come. Thus judging their success entirely in terms of an initial cost overrun may be a narrow definition of success.

Two main reasons that might result in projects' cost overruns are change order and design errors. As noted earlier, Hanna *et al.* (1990) define change order as any event that results in a modification of the original scope, execution time, or cost of work. Design error can also be considered as a change to the construction contract. Any such change can affect the constructor's method, manner, time or cost of performing the work. Design error correction may result in either direct or constructive changes. Hsieh *et al.* (2002) noted that changes can be divided into two categories, namely technical and administrative changes. Technical changes often arise from problems in planning during design stage. Accurate project planning is likely to reduce the possibility of design changes. Administration changes, according to Alarcón and Mardones (1998) and Andi and Minato (2003) are those that are normally introduced by the client during the project duration - often the result of a change in social, political and/or working environment.

3.7.3 Time Overrun

Infrastructure projects can lag behind anticipated work schedule, due to late supplies, client's variations, unclear definition of a project, bad designs, or what Bose (2009) described as a non-anticipated "Mother Nature's condition".

The Critical Path Method discussed earlier computes critical and non-critical tasks. A delay in a critical task almost always leads to a time overrun as there is no float on the critical path, while a non-critical may or may not, depending on its relevance and the delay period. Understanding the effect of any delay on critical and non-critical tasks allows the project managers to look for ways to compensate for these delays and ensure effective management of the project completion date (Vidalis and Najafi, 2002).

Project Management Blog (2006) published the article “Effective Project Management” where they noted that all project managers spend huge amounts of time and energy in preparing, updating and monitoring the status of their projects at any point of time. The Earned Value Management (EVM) technique, coupled with good planning and effective use of Microsoft Project Plan, they claimed, has helped project managers to report the actual schedule and cost parameters at any given point in time with ease. An example of an EVM template of a problem and solution template, enabling any project manager to apply the value management technique in managing projects is shown in Table 3.6.

Table 3.6: Problems and Solutions for Project Management
(Source: Project Management Blog, 2006)

Problems Faced in the Project	Solutions
<ul style="list-style-type: none"> • Applications were being reported as having Schedule Overrun and Effort Overrun after they have been delivered to the client. • Overall project Schedule Overrun / Effort Overrun was not known until the project was completed. • Schedule Overrun / Effort Overrun for the project was being calculated as the average of the Schedule Overrun of the applications which was giving a wrong impression. • At any given point in time there was no information available on the Schedule and Effort Parameters. • Scheduled Overruns calculations had no way of excluding the hold on applications in the calculations resulting in huge Schedule Overrun; which actually should not be attributed to the project. • Resources linkages using the Predecessors field was the most time consuming activity. • Project Plan updates taking almost half the Project Manager’s time. • Project Plan monitoring becoming a tedious job by using Filters in the MPP and having to deal with the Dates for any calculation. 	<ul style="list-style-type: none"> • Earned Value Management with Efforts being considered in place of cost. • Deliverable oriented WBS. • Using the Priority field of the Task for sequencing the tasks. • Automatic Resource Leveling in MPP based on Priority and Standard Leveling heuristics.

3.7.4 Strategies for Managing Cost and Time Overruns

Cost and time overruns are clearly correlated and any malfunction during the course of the project due to any contingent factor is likely to affect the time and cost of the project. Thus, as Ellis and Thomas (2003) noted, it is extremely important to take care not to overlook unforeseen charges such as for utility relocations and other similar tasks to avoid any financial losses, delay of the project hand over, and eventually, cost overruns.

There are also certain significant strategies that cannot be ignored in project management and can be applied to avoid any cost or time overrun on the project. Ellis and Thomas (2003) again stressed the value of carrying out a comprehensive investigation of cost and time overruns to determine and understand the root causes of these impediments. By identifying the causes of them, the project manager is in a better position to correctly tackle the problems and minimize any impact on the project's success.

Al-Kaisy and Nassar (2003) noted that by identifying the project objectives and studying their type and the scientific methodologies as well as the tools used, the project manager is in a better position to decide what strategy to use in the execution of the highway design project. For example, they argued that more night-time work may be a suitable strategy for correcting a particular cost or time overrun on some projects but may not be suitable on others. By identifying the source of the problem, the project manager can make the most appropriate decision and reduce the impact of the problem. They claimed that the selection of any of such strategies should positively affect the flow of traffic movement, reduce traffic jams and the number of accidents, and minimize the influence of the problem.

3.7.4.1 Mega Projects and Time & Cost Escalations

Li and Guo (2011) reported that mega projects in transportation and infrastructure have often failed to produce favorable results, due to budget and schedule overruns, as well as in general stakeholder dissatisfaction. Thus, one might speculate that larger projects should have larger percentage cost escalations than smaller projects, because, all things being equal, implementation phases would be longer for larger projects with resulting increases in cost escalation. The question then is whether because of their size and/or complexity, larger projects are more sluggish and therefore more prone to cost escalation?

Merewitz (1973), Ellis (1985) and Morris and Hough (1987) all argued that track records are poorer for larger projects than for smaller ones, and that cost escalations for large projects are particularly common and especially large. It has been difficult or near impossible to test such claims rigorously because data that would allow tests have been unavailable or wanting.

Project size matters to cost escalation for projects where increased size correlates with bigger cost escalations and larger risks of escalation, as found for rail. It should be pointed out that there may be good practical reasons to pay attention to, and use more resources for, preventing cost escalation in mega projects. Flyvbjerg *et al.* (2003) for instance, argued that a cost escalation of around 50% in a US\$5 billion project would typically cause more problems in terms of budgetary, fiscal, administrative and political dilemmas than would the same percentage escalation in a project costing much less. They noted that if a project manager and/or the owner wished to avoid such problems, attention should be paid to cost escalation for larger projects.

Flyvbjerg and his colleagues tested what caused construction cost escalation, focusing on three variables: (1) the length of the implementation phase; (2) the size of the projects; and (3) the type of ownership. They found that for the length of the implementation phase, decision-makers should be more concerned about long implementation than slow planning. They also reported that large roadwork constructions such as bridges and tunnels, tended to have larger percentage cost escalations than did smaller projects. They concluded that the risk of cost escalation is higher for larger projects but still significant for all project sizes and types. Their findings, however, failed to support the claim that public ownership is problematic *per se* and that private ownership results in more efficiency in curbing cost escalation. The main problem, they argued, may not be public or private ownership but rather a particular kind of public ownership (e.g., state-owned enterprises) that lack transparency and public control (Flyvbjerg *et al.*, 2003).

3.7.5 Technical (Quality) Performance

Hendrickson and Tung (2008) argued that quality control in the construction industry typically involves making sure that the project complies with minimum standards of material and workmanship to guarantee the required performance, according to what was designed. They noted that it is implicitly assumed that quality control practices adopt an acceptable quality level that allows for an acceptable proportion of defective items.

While Total Quality Control assumes that no defective products are acceptable, this can never be permanently obtained, although it is a worthy goal for all construction projects to aim for. Current certification standards for quality control are outlined by the International Organization for Standardization's ISO 9000 standard [ISO 9001; 2008] which describes quality goals and a series of cycles of planning, implementation and review (Hendrickson and Tung, 2008).

As pointed out by Philip (2005), when you expect a certain level of service or satisfaction and those expectations are met, then you naturally feel that your demand for quality has been met. Quality means meeting or exceeding the customer's expectations. Philip maintained it is the ability of the project to meet all of the project scope requirements and the implied needs of the project scope. It must be planned for and cannot be included after the fact. From a business perspective, Philip proposed that project quality can also be judged by the following criteria:

- Was the project completed on time?
- Was the project completed within the budget?
- Did the system meet the needs when it was delivered? and
- Is it stable?

Philip (2005) further noted that Quality Assurance is a management process that is focused on ensuring high quality from each project, its operations, and the organization as a whole.

3.7.5.1 Quality Plan

Mega Transportation Infrastructure Projects usually require a Quality Project Plan (QPP) to be compiled at the time of scoping the project. Visitask (2007) noted that a QPP should describe how the project team will manage the ultimate quality on a specific construction project. Clients may ask for QPP to ensure that acceptable standards are maintained and can be monitored throughout the life of the project. A quality plan might include such items as details of the management team and responsibilities; project specified standards; project-specific inspections and tests; project purchasing policies; project-specific, site-specific and contract-specific requirements; and compliance and monitoring procedures (Visitask, 2007).

3.7.5.2 Total Quality Management

The emergence of Total Quality Management (TQM) has been a major development in management practice. TQM has been credited with providing a competitive advantage for organizations that implement it properly (Adam *et al.*, 1990; Samson and Terziovski, 1999). TQM, however, is not only a set of tools, methods and practices, but more importantly, profound and valuable knowledge which can be tailored in a flexible manner to suit organizational specific needs, including quality and innovation (Sitkin *et al.* 1994).

TQM has been widely accepted as a management model that provides a competitive advantage for companies through greater quality. In an empirical case study of a large manufacturing firm, Prajogo and Sohal (2004) showed that TQM as a management philosophy and model provides a foundation on which companies can also build a competitive advantage through innovation.

3.7.6 Stakeholders' Satisfaction

Freeman (1984) described stakeholders are organizations or people that have influence on, or are affected by, a particular construction project. Newcombe (2003) listed stakeholders as clients, project managers, designers, subcontractors, suppliers, funding bodies, users, owners, employees and local communities. Typical TIP stakeholders in the UAE include financing agencies (the Abu Dhabi Government or the Dubai Executive Council), clients (the Ministry of Public Works, or Abu Dhabi Municipality), governmental agencies, such as the police and utility companies, project management firms, consultants, and contractors. The development of a TIP is a shared responsibility among these stakeholders, and the interest of each stakeholder varies in importance over the various stages of a project life cycle.

Camarota (2008) noted that stakeholder expectations include product outcomes, functionality, and private and public benefits. Thus, they expect to look forward to a successful outcome with some degree of certainty. Discrepancies between stakeholders' needs, specific requirements, expectations and actual results can be a significant source of dissatisfaction with the final project outcome. Hence, it is important to assure good stakeholder communication throughout the duration of the project (Friedman and Miles 2002). Lim and Lee (2005) argued that failure to address stakeholder expectations has resulted in countless project failures primarily because

stakeholders tend to have the resources and capability to stop projects. Successful completion of projects is therefore dependent on meeting the expectations of stakeholders (Cleland, 1995).

Friedman and Miles (2002) noted that in construction projects, the interests of stakeholders can vary over the life of a project and the reasons for these changes can include learning, changing values, and specific experiences (Elias *et al.*, 2004). Accordingly, Zwikael *et al.* (2005) suggested the use of cost overrun, schedule overrun, technical performance and stakeholder satisfaction as the primary performance indicators of projects. Time and costs are, at best, only estimates, calculated at a time when least is known about the project. Technical performance, or quality, is a phenomenon; it is an emergent property of peoples' different attitudes and beliefs, which often change over the development life-cycle of a project (Atkinson, 1999).

3.8 Cultural Differences: Implication for Project Management

Culture is the basis and structure of progress and welfare worldwide. It includes religion, language, customs and tradition and is the main axis and symbol of intercommunication and connection among different societies. It is the heritage acquired by generations. The impact of culture upon the life of individuals can vary from one person to another and from one environment to another.

Cultural influences can affect management processes. Project management in Japan, for instance, depends heavily on teamwork, while in Israel, project management is more likely to involve less teamwork and a more independent approach (Hofstede, 1980). This difference, it is claimed, became clear while formulating the strategies and administrative regulations. This does not mean that the two methods are either right or wrong, rather that this is strong evidence proving that project management in every society has its own methodology based on its cultural roots and procedures.

Cross-cultural teams, if formed properly, can provide various sources of experiences and skills to enhance the organization competency. However, cultural differences can interfere with successful completion of projects in today's multicultural global business community. Anbari *et al.* (2003) argued that to achieve project goals and avoid cultural misunderstandings, project managers need to be culturally sensitive and promote creativity through flexible leadership. Global project management can only succeed through culturally aware leadership, cross cultural

communication, and mutual respect. Hofstede (1980) proposed a set of cross-cultural management dimensions along which dominant value systems can be ordered involving (i) the relationships between people; (ii), motivational orientation of the society; and (iii) attitudes towards acceptable time durations.

As noted in the previous Chapter, the United Arab Emirates is a diverse and multicultural society, based around Islam religion and traditional Arab and Bedouin culture (UAE 2007). Today it is a highly cosmopolitan society with a diverse and vibrant culture, although there are differences in the Arabian business environment, especially the importance of personal relationships and mutual trust. While large firms can be international, many organizations can be a family affair, where the decision-maker is often the head of the family. There are many mega TIPs in process in the UAE and care must be taken to respect the cultural differences that apply in terms of the key stakeholders, project management procedures and expected outcomes.

3.9 Summary of the Literature Review

This review set out to examine previous research into what makes a successful mega Transportation Infrastructure Project (TIP) in terms of construction, stakeholder importance, project management and success indicators. In addition, the review focused on both theoretical and practical issues related to TIPs, as well as the implications of cultural influences and processes. There were a number of important key findings from the review of relevance to the research program for this thesis, and are summarized below.

3.9.1 Project Management Complexities and Processes

Mega Transportation Infrastructure Projects are highly complex endeavors that need to be tightly planned and monitored to ensure a successful outcome. TIPs are highly competitive with a focus on efficiency and modern technical practices. Effective and efficient project management is critical to achieve the goals and expectations of their sponsors or clients. Social and environmental implications are also important aspects.

Key management processes that emerged from the review included effective and efficient communication, coordination, decision-making and knowledge-sharing. These four were key critical dimensions in a successful TIP and warrant close attention throughout the design and implementation of the project. Management team structure, too, is important for success with

those involved having good experience, commitment and leadership. The review identified a number of important characteristics for a successful TIP team. While cultural setting can have some impact, the features of what constitute a successful team are international.

3.9.2 Stakeholders and Relevant Theories and Models

There are many stakeholders associated with a TIP from consumers, labour organizations, special interest groups and the community. However, the key important stakeholder groups include sponsors or clients, project managers, governments (national and local), consultants and contractors. Their individual roles in a TIP vary throughout the various stages from design to completion and need to keep a focus on efficient and effective management of the project.

A number of theoretical issues and processes related to efficient and effective stakeholders were also highlighted during the review. Stakeholder theory was first enunciated in the early 1960s and has grown to become an important feature of successful transportation infrastructure projects. It stresses strategic management and outlines the importance of satisfaction, ethics, morals and values. Stakeholder dynamics change over time and implicitly incorporate issues of legitimacy, power and urgency. Those who possess all three attributes also have maximum influence in the conduct of the project and are clearly key stakeholders. The trade-off between power and interest is important in addressing the strategic goals of the project and while stakeholder theory has its critics, its mounting successes in the literature and in business practices cannot be overlooked.

3.9.3 Construction Stages and Issues

The review showed that there are a number of important milestone phases in the construction of a TIP from start to finish. Those identified as important from this review, once the project is agreed to and funding is secured, include planning, scoping, design, scheduling, tendering and construction. The initial stages of design and planning were seen to be particularly important in ensuring a successful project outcome. The role of the stakeholders varies in terms of interest and importance across the various life-cycle phases. The importance of each phase as a precursor to the next cannot be over-stressed in ensuring the ultimate success of the project.

3.9.4 Success Indicators

The implementation phase of a project represents the ultimate project management activity and an opportunity to evaluate its success against the original business case. Success measures vary, depending on each of the stakeholders' views and expectations. At a practical level, cost and time overruns, technical and quality issues, and stakeholder expectations seem to be most paramount. Academically, effectiveness and efficiency throughout the various project stages from design to construction are also of relevance in judging its success.

3.9.5 Cultural Influences

Cultural influences can affect the management of a TIP. As noted earlier, cultural expectations vary across countries and regions and these need to be taken into account in designing, constructing and implementing a TIP. In the UAE, for instance, project management tends to be more hierarchical where the main decision-maker is often a government sponsor or client who relies heavily on personal relationships and the trust of other stakeholders. Project success, therefore, is likely to be affected more by the successful interactions between stakeholders in the UAE than in other regions.

3.9.6 Implications for the Research Program

The literature review clearly confirmed the need for an in-depth examination of mega TIPs in the United Arab Emirates. This examination should focus on understanding current practices of project management in general and infrastructure projects in particular in the UAE and identify how it could be improved to achieve greater success rates in the management of future TIPs in the region. The in-depth examination needs to focus on international best-practice and its application in the diverse multicultural Islamic environment.

Four key dimensions for this review need to involve stakeholder importance (low to high importance). Project management processes (especially coordination, communication, decision-making and knowledge-sharing), construction stages (from design through to construction and implementation) and success indicators (such as cost and time overruns, technical and quality indicators, and especially stakeholder satisfaction) applied in a UAE environment.

While the importance of practical frameworks for improving project success is paramount, the research should not overlook the theoretical lessons that can be learned from increased

knowledge in the management of these mega TIPs in the region, as well as more broadly relevant internationally. The research needs to incorporate a traditional qualitative research approach, evidence-based and scientifically robust.

The following chapters of this thesis outline the plans, methods and findings from the research conducted, along with the implications for successful project management.

CHAPTER 4

RESEARCH DESIGN AND METHODOLOGY

4.1 Introduction

This chapter provides an overview of the research design and methods. It provides an assessment of the stakeholders' network of mega Transportation Infrastructure Projects (TIPs) in the UAE, highlights various management processes with relevance to TIPs in the UAE, lists the research objectives and questions, proposes a conceptual model for the research, and finally outlines a detailed description of the research design stages and methodologies.

4.2 Research Design Overview

As discussed earlier in chapter one, the aim of this research is to provide an outline of what are successful management practices relevant for enhancing TIPs in the UAE. Given the lack of previous research in the UAE, it is expected that this will provide a contribution to successful management practices of mega TIPs in the region. The research involves a review of international best practice in the management of TIPs, examines experts' views of current practices and problems and includes a detailed in-depth analysis of a major TIP in the UAE. From these findings, this study provides an outline of what is required to enhance success rates, and finally develops a preliminary framework for use by practitioners in the field.

4.2.1 Research Objectives and Questions

As noted in Chapter 1 (section 1.3), three objectives were identified for this research. These are presented again below:

1. To develop a better understanding of Transportation Infrastructure Project (TIP) management practices and challenges in the UAE;
2. To understand how the various stakeholders and management processes impact on project success throughout the different stages of project execution; and
3. To summarise the findings and develop a preliminary framework for quantifying future project success of TIPs in the UAE.

The current practice of mega Transportation Infrastructure Project management in UAE raises many questions that form the scope of the thesis and directions of the research. The focus is very much directed at how current practice can be improved to achieve greater successful TIPs in future and what is required to assist management in their endeavors.

4.2.2 Research questions

Answers to a number of specific research questions will be sought from the research program undertaken here. The six research questions, previously presented in Chapter 1 (section 1.3), are:

1. What is the current state-of-the-art of UAE mega Transportation Infrastructure Project management?
2. What are alternative international theories for managing infrastructure projects that could be relevant for the UAE environment?
3. What are the key factors necessary to enhance UAE TIP management practice?
4. What are the key impediments to the successful completion of the projects in the UAE for each stakeholder and for the whole network in the UAE?
5. How can the success or failure of TIP projects in the UAE be judged and what measures best describe success or failure in the region?
6. What are the data and system needs to help ensure successful TIP management practices in the UAE?

An overview of the overall research program is outlined in section 4.5 which includes a flow chart showing each activity undertaken to address the research objectives.

4.3 What is Project Management?

Project management involves many skills such as planning, organizing, controlling and managing resources to achieve specific goals. It evolved from a management philosophy restricted to a few functional areas and regarded by Kerzner (2006) as something important for an efficient enterprise project management system affecting every functional unit. According to Gaber (1990), most of the practitioners utilize a typical six-stage project management model; which he denoted as the Project Management Maturity Model (PMMM).

4.3.1 Project Construction Stages

The project construction model in Figure 4.1 was derived from that outlined by Gaber (1990) in the previous Chapter. It comprises six stages of infrastructure development; namely, planning, scoping, design, scheduling, tendering and construction, as well as possibilities for resetting (for whatever reasons) to earlier stages. A feedback loop is introduced indicating the necessity to incorporate the past knowledge experience in the process of new project management and development.

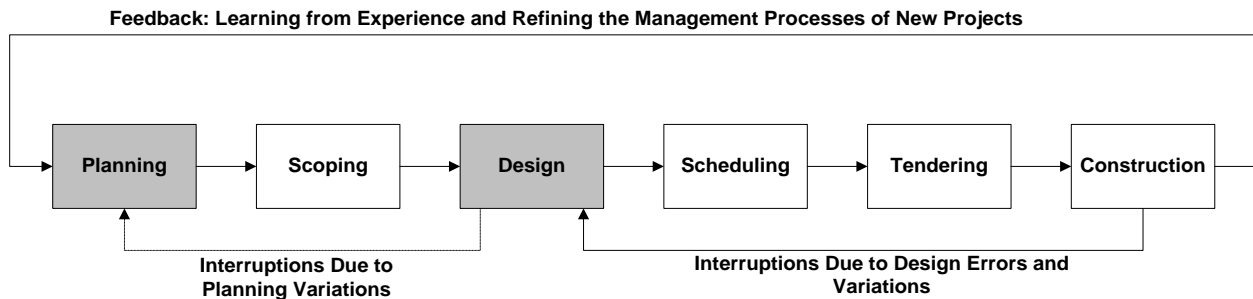


Figure 4.1: Infrastructure project management phases and feedback loops
(Source: Gaber, 1990)

4.3.2 Key Stakeholder Groups Network Topology

The task of constructing a mega Transportation Infrastructure Project usually involves many stakeholders in addition to the Key stakeholders listed above. Figure 4.2 illustrates the number of groups commonly associated with the construction of a TIP in UAE. The degree of influence on project decision-making is characterized by key dimensions of Legitimacy, Power and Urgency, outlined by Mitchell *et al.* (1997) in their pioneering stakeholder topology concept. Stakeholders such as sponsors or clients are acknowledged as having the highest level of influence, while those possessing less factors (for example, project management firms and consulting firms) are considered to have only medium influence on project success.

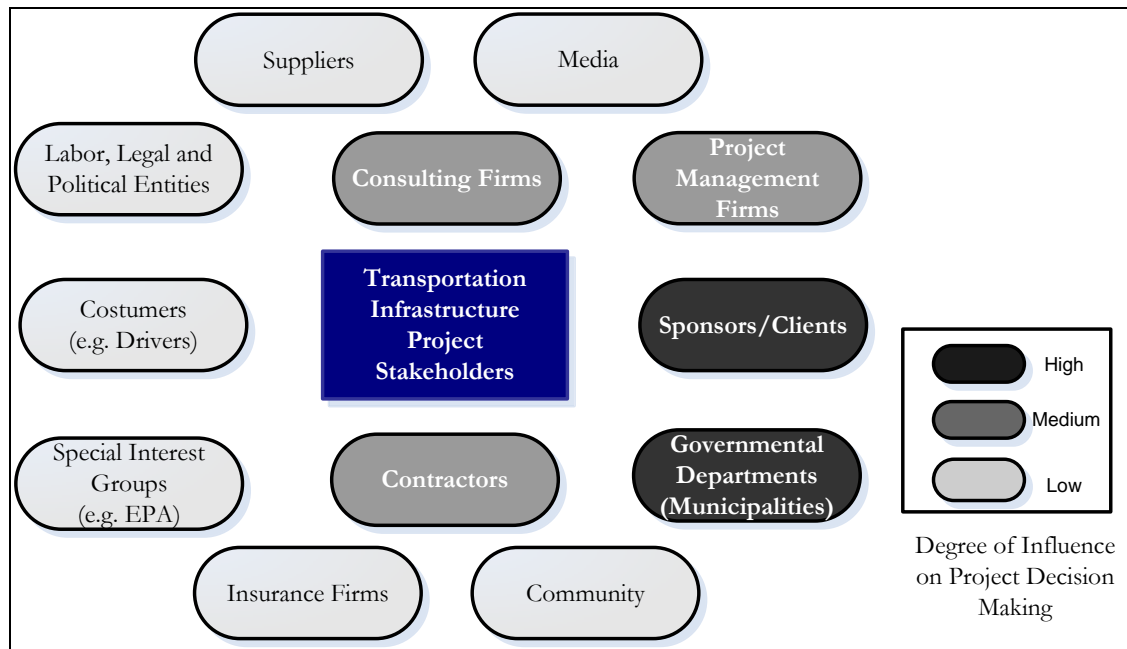


Figure 4.2: Stakeholder network topology of Transportation Infrastructure Projects in the UAE

The main stakeholder groups for TIPs in the UAE outlined in Figure 4.2 are considered to include the following:

1. **Sponsors/Clients:** Sponsors such as the Council of Ministries or the Executive Council of Abu Dhabi are responsible for the allocation of the federal funding, or for funding projects within the Emirate of Abu Dhabi. These entities possess the attributes of power, legitimacy and urgency and are regarded as a highly important and influential group of stakeholders. Clients include governmental agencies initiating and responsible for undertaking the project and can be federal, state or private entities. Examples include the federal Ministry of Public Works (MPW) and the state client Municipality of Abu Dhabi.
2. **Non-Client Governmental Departments:** These include Municipalities, Police, Utility companies, and so on. They may be involved during the various stages of the project, but mostly in the management and coordination activities undertaken by other stakeholders, for example, consultants during the design phase, and contractors during the construction phase.
3. **Management firms:** These are third-party contracted entities, responsible for coordinating and managing project activities on behalf of the client or sponsor. Their

responsibilities include reviewing all documents and design drawings by consultants, approving payments, working with the consultants and contractors on various day-to-day difficulties and overall supervision of the construction phase.

4. **Consulting firms:** Consultant responsibilities tend to be specific aspects such as the design, scheduling, tendering and supervision of all construction activities by the contractors. Some consulting firms might get involved in the earlier stages of project planning and scoping on behalf of the clients if the client organization has no internal planning department of its own.
5. **Contractors:** Contractors are those who carry out the necessary construction work. Their responsibilities include the scheduling of the activities of the construction phase, coordination and communication with the various consultant and management organizations employed on the project, and importantly, execution of all construction work. Some contractors might get involved in the earlier design stages of the project.

The above five groups are regarded as significant influential contributors to the success of a project (with varying levels of responsibility, power and interest) and have major influence during the execution of its various stages. Furthermore, the project execution progress can be markedly affected by the quality of managerial skills and other decision-making process by all of the stakeholder groups.

4.3.3 Key Management Processes

Along with knowledge-sharing and stakeholder importance, the key elements identified in the literature review as likely to be important are the four management processes of Communication, Coordination, Decision-Making and Knowledge-Sharing. These were discussed in detail in Chapter 3 and are briefly reviewed again below.

1. **Communication.** Communication management is the systematic planning, implementing, monitoring, and revision of all the channels of communications within an organization, and between organizations. Successful projects appear to be those that comprise ongoing, clear and effective communication practices between stakeholders, clients and the project management team in particular. This ensures that all major players are kept fully informed of any problems or difficulties and have procedures for decision-

making and managing these immediately when they occur and not allow them to disrupt the project.

The literature on construction management has widely emphasized the role of communication in effective management. Zwikael *et al.* (2005) examined project management practices and concluded that various types of management style, scope and time management can impact on improving technical performance of projects, while communication and cost management impact on improving overall success measures of projects. Other researchers have suggested the use of communication effectiveness models to predict satisfaction levels by contractors and clients at the earliest possible stage in the project life cycle (Soetanto and Proverbs, 2002). To minimize defective designs and subsequent overrun of cost and schedules, Zou *et al.* (2007) reported that the design team needs to establish an efficient communication scheme among the designers. Stewart (2007) stressed that strategic implementation of innovative information and communication technologies are essential for the long-term survival of construction firms. The lack of communication among parties was reported among the ten most important causes of project delay by Sambasivan and Soon (2007).

- 2. Coordination.** Strong and effective coordination effort between key stakeholders, clients and the management team is vital to keep everyone informed of progress and any associated issues as they arise. Effective coordination between the project managers, construction companies and sub-contractors is also critical to keep production schedules on-track and ensure that appropriate decisions are made when problems or difficulties arise (Timmermans and Beroggi, 2000).

Coordination is recognized as a key management process in transportation infrastructure projects. The implementation of such projects entails several stages, and the stakeholder network is more complex than that of any other infrastructure project. The coordination of the various stakeholders is among the key success factors of such projects. Timmermans and Beroggi (2000) stressed the importance of coordination between organizations with diverse objectives. The concept of international coordination for transportation infrastructure projects was addressed by Short and Kopp (2005). Chen and Partington (2006) emphasized the ability of project managers to coordinate activities on

site. Lack of coordination among project participants was identified as a key risk factor in Australian projects (Zou *et al.*, 2002).

In the UAE, particular emphasis has been given recently to this coordination issue, especially among various governmental agencies. The Executive Council of Abu Dhabi issued the “Policy Agenda for the year 2007 - 2008”, where coordination was emphasized many times throughout the report.

3. **Decision-Making.** Decision-making typically involves identifying and choosing among alternatives, based on the values and preferences of the decision-maker. The necessity of a feed-back loop to gain insights on decision-making in various projects was emphasized by Short and Kopp (2005), suggesting that to improve planning processes and decision-making, it would be helpful to look back at past decisions and extract lessons from them.

Decision-making is significantly tied to the communication media and effectiveness. Decentralized communication channels are known to facilitate better information flow and decision-making when problems arise. Clients who have decentralized communication channels ease communication and facilitate faster decision-making (Soetanto and Provebs, 2002). In assessing the project performance measures, the project managers need to understand what causes or factors result in time or cost overrun. Once these factors become clear, the managers can take proactive steps to avoid such situations. Sambasivan and Soon (2007) identified client slow decision-making as primary factor for time and cost overrun. Odeh and Battaineh (2002) identified 28 construction delay factors and categorized them in eight various groups. The client related factors include finance and payments of completed work, owner interference, slow decision-making and unrealistic contract duration imposed by owners.

4. **Knowledge-Sharing.** Knowledge-sharing or KM is a means of increasing useful knowledge within the organization. Ways to do that include encouraging communication, offering opportunities to learn, promoting and sharing of appropriate knowledge artifacts.

Knowledge-sharing implies that client project managers in specific or key stakeholders in general should apply methodologies or guidelines to benefit from past project experiences and help to avoid previous mistakes. Knowledge-sharing represents an important “feed-

back” loop, but is mostly missing in the construction management literature and uncommon in construction projects in the UAE. In some developed countries, the sharing of knowledge is a mandatory condition, imposed by different Directorates, to assure successful and effective project management. Jackson and Klobas (2007) stressed the need to develop a knowledge-sharing process model for project managers. Kovacs and Paganelli (2003) further noted that data and knowledge interchange is critical for improving efficiency and standardize operations of complex distributed organizations.

In the light of the above discussion, the research methodology adopted here specifically focuses on issues related to effective communication, coordination, decision-making and knowledge-sharing practices among transportation projects in the United Arab Emirates to achieve more efficient and effective projects in the future through the development and exercise of a framework and guidelines for adopting best practice in the region.

4.4 The Conceptual Model

Figure 4.2 (p.87) identifies the key stakeholders and their relative importance. Figure 4.1 (p.86) shows the six construction stages identified by Gaber (1990) and discussed in detail in Chapter 3. Section 4.3.3 highlights the key management processes that are considered important for project success. These have all been assembled into a conceptual model (see Figure 4.3) driving the research program.

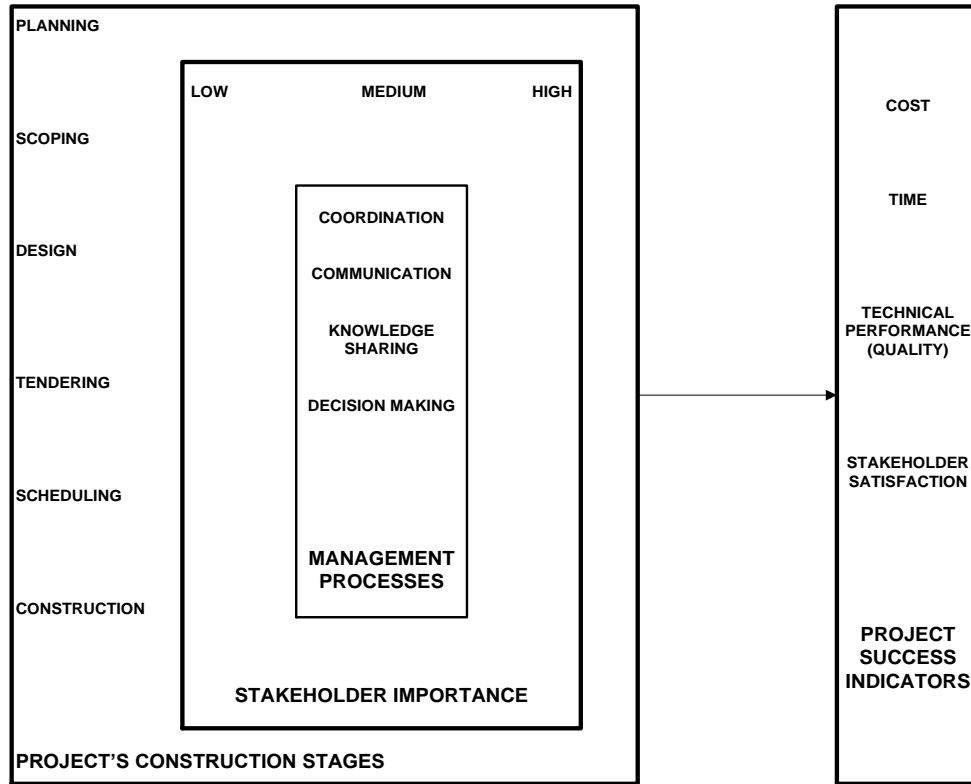


Figure 4.3: Conceptual Model for TIP Research

The left-hand side of the model combines all the independent variables identified from the literature that are likely to have an effect on the dependent variable, namely **Level 1: the Project's Construction Stages**; **Level 2: Stakeholder Importance**; and **Level 3: Management Processes**. These independent variables cover the principle issues identified in the literature that are likely to be the critical input factors in determining the success of a mega TIPs.

On the right-hand side are the dependent variables or outcome measures as project success indicators including cost, time, technical performance/quality of the project outcome, and satisfaction level of the various stakeholders.

The model identifies the mutual relationships and interactions among all these variables. For instance, communication deficiency within the important stakeholders during the planning stage may be the cause of some cost overruns and poor technical performance. Initially, it is important in this research effort to confirm what the important input factors are such as the various stakeholder roles and responsibilities and how they interact at the various construction phases to influence the outcome measures in achieving a successful project outcome (or not).

The conceptual model can be envisaged to be a three-level input hierarchical model and used to stipulate the most critical stages of a project life-cycle. The model forms a basis for the structure of the research program through its various phases (discussed further on) and will ultimately be evaluated and further developed to help the UAE achieve a higher number of successful Transportation Infrastructure Projects. This is expected to be the major contribution of this research program.

4.5 Program Phases and Outcomes

4.5.1 Overview

A diagram showing the various phases and tasks associated with the research program is shown in Figure 4.4.

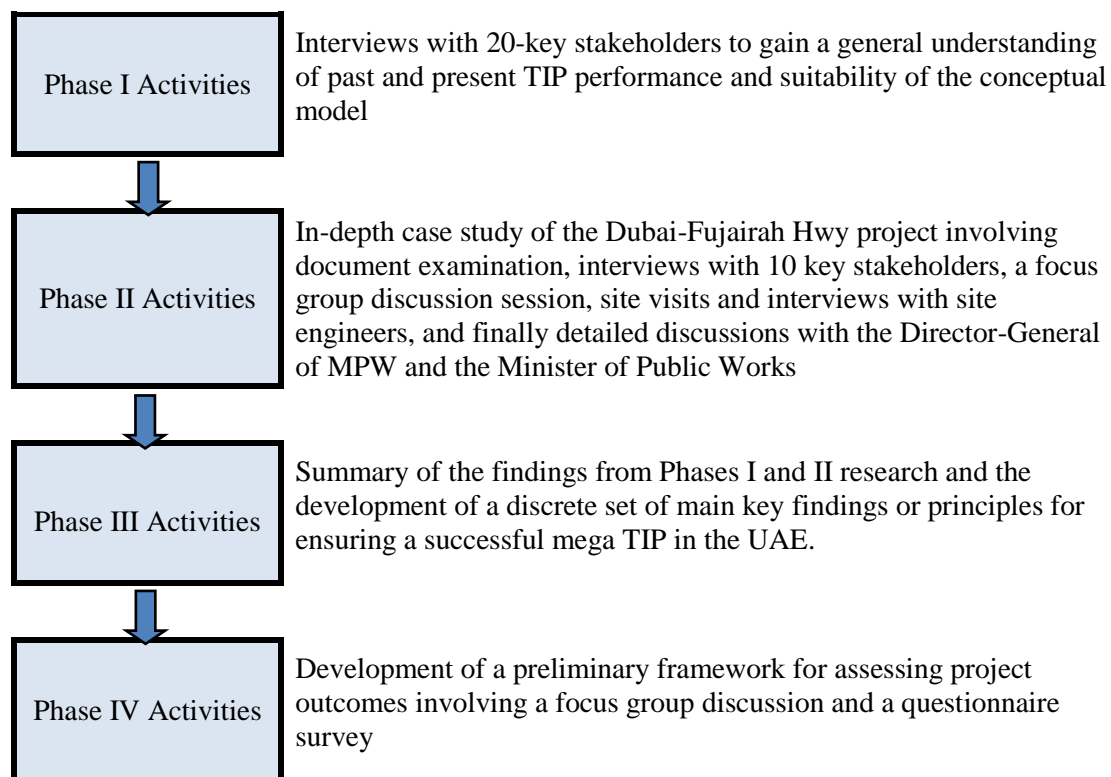


Figure 4.4: Flow diagram of activities planned for the research program

4.5.2 Multi-Phase Approach to Research

A phased approach was adopted for this research program as it provides a stepwise means of collecting appropriate data for analysis using qualitative methods (the reasons for this are discussed in more detail in section 4.6 below).

Phase I of the research program set out to gain a general understanding of the management of Transport Infrastructure Projects in the UAE through face-to-face interviews with 20 senior stakeholders. Findings from Phase I research are presented in Chapter 5.

Phase II sought to build upon the initial findings from Phase I interviews by conducting a detailed examination of a mega transportation project in the form of an in-depth case study. The Dubai-Fujairah Highway (DFH) project was selected for this task, given the problems and difficulties experienced during its 10 year history. Interviews were conducted with senior stakeholders involved in the project, historical documentation was examined to understand some of the changes that had occurred, a focus group discussion was conducted with key stakeholders, site visits were arranged to see first-hand some of the issues associated with the project and discussions with consultants and contractors on-site, and finally, discussions were held with the Director-General of the Ministry of Public Works and the Minister of Public Works to incorporate their views in the final analysis. Findings from Phase II are presented in Chapter 6.

Phase III first involved summarizing the findings of Phases I and II and identifying a number of important principles of relevance to the theoretical model and process outlined earlier. Phase III then set about validating these findings in two ways: (i) by conducting a second focus group discussion with eighteen key stakeholder participants; and (ii) a supplementary survey of 25 stakeholders focusing on their views on the importance of the four management processes (communication, coordination, decision-making and knowledge-sharing) in this project and their opinions of how important each stakeholder was during the planning and design stages of the project. Finally, Phase III outlined a number of key factors for success for a TIP in the UAE. The results of Phase III are presented in Chapter 7.

Phase IV develops a preliminary framework for helping practitioners in future TIPs in the UAE to maximize achieving a successful outcome. The results from Phase IV are also presented in Chapter 7.

The final chapter (Chapter 8) outlines the academic and practical contributions from this research program and describes the findings in regard to the initial objectives and research questions that had been set for this research effort. In addition, the strengths and limitations of the research are outlined along with recommendations for further research in this area.

4.6 Research Methodology

4.6.1 The Qualitative Approach

In adopting the research methodology, it was important to adopt scientific and proven research methodologies. Given the nature of the research tasks, a qualitative approach was selected for these investigations.

Qualitative research is an inductive method of inquiry used in many different academic and applied disciplines. Researchers using qualitative methods gather an in-depth understanding of natural and human behavior and the reasons that govern such phenomena. Techniques commonly used include interviews (structured or unstructured), focus group discussions, literature and material reviews and observation techniques (Myers, 1997). Qualitative research methods have been used for many years in the natural sciences to study natural phenomenon (Kaplan and Maxwell 1994), but more recently have been applied to survey methods, retrospective approaches (e.g. econometrics), action research, case study analysis, impression and reactions, and ethnography (to learn and understand cultural phenomena). As discussed by Myers (1997), qualitative data sources include observation and participant observation (fieldwork), interviews and questionnaires, documents and texts, and the researcher's impressions and reactions. Manson (2003) particularly noted that qualitative is typically exploratory by nature, is flexible and importantly, data-driven. It is commonly used in the fields of education, social work, women's studies, medicine and nursing, injury and disability, marketing and information, business management, political science, psychology, and many other fields.

4.6.2 Data Collection

It is important in any scientific research program to collect relevant and available data. This could include information from relevant textbooks, journal and proceeding articles for *primary data* on management issues and *secondary data* from exploratory research. Qualitative

exploratory research is clearly needed in order to understand management practice in UAE and the decision-making process in various stages of project implementation. Qualitative data collection methods applied in this research program involved the following techniques:

- Face-to-face interviews, involving both structured and unstructured formats, conducted in offices and on-site locations. These were used in the first two Phases of the research with the Ministries' General Directors and key stakeholders in the UAE. The details relating to these interviews conducted in Phases I and II are reported in Chapters 5 and 6 of this thesis.
- Focus Group discussions with selected key stakeholders can be particularly useful in providing opportunities for individuals to express their own perceptions and discuss these in front of other relevant colleagues. Often these discussions lead to a more appreciative and detailed understanding that face-to-face interviews cannot provide. Details of the focus Group discussions conducted in Phases II and III are provided in Chapters 6 and 7.
- A review of project documents to establish the history of progress, problems and difficulties encountered, and reasons for delays and modifications in the in-depth case study (the Dubai-Fujairah Highway project) selected in Phase II can be found in Chapter 6.
- On-site visits were included for a better understanding of issues associated with the Dubai-Fujairah Highway project and to obtain additional details from the workers on-site that are not always available from senior staff. The results of these visits conducted as part of Phase II are presented in Chapter 6.
- Surveys covering a broad range of participants were used to gain sufficient supplementary data when required and were used in Phase III research when validating the findings from the first two phases. The survey findings are included in Chapter 7 of the thesis.

The main methods employed in this qualitative research program are interviews, observations, documentary analysis, and focus group discussions. These methods are discussed in more details below.

4.6.2.1 Face-to- Face Interviews

Interview sessions were conducted during Phases I and II. These interviews were conducted for key stakeholders representing sponsors/clients, government departments, project management

firms, consultants and contractors. Yin (1994) considered interviews to be more a “guided conversation” rather than a structured inquiry while Bewley (2002) recommended that interviews with the goal of theory generation need to be less structured as the information can describe unexpected reasons for specific phenomena. This particularly inspired the use of unstructured forms in the interview procedure.

The principal limitations of interviews, noted by Yin (2003), are that they are extremely time consuming and expensive, difficult to access persons of power and set interview appointments, influence of the researcher’s and the interviewees’ mood, and the interviewee trying to provide the answers that the researcher desires. However, care was taken to avoid the influence of these features in setting up the interview.

All interviews were held at senior management levels and conducted in their place of employment and a digital recorder was used for recording all interviews. The interview was structured into a number of relevant sections, dictated by the purpose of the task. Full details of the first and second interview procedure can be found in Chapters 5 and 6 respectively and in the interview protocols.

4.6.2.2 Observations

Observation is a useful method of gathering data by watching behavior, events, or noting physical characteristics in their natural setting, as discussed by Zucker (2004). Observations can be overt – everyone knows they are being observed – or covert – no one knows they are being observed and the observer is concealed. The benefit of covert observation is that people are more likely to behave naturally if they don’t know they are being observed. However, ethical considerations tend to ensure that most observations involving humans are overt (Department of Health and Human Services, 2008). In overt observations, people know that you are watching them and hence may alter their behavior as they are *reacting* to the researcher’s presence. In this case, issues of validity must be considered and numerous observations of a representative sample are needed.

In this research program, most observations were confined to the on-site visit where it was possible and ethical to use observations from around the site and from site offices. Site managers

were agreeable and encouraging with this approach. In planning for these observations, a few specific areas of focus were set out for the data collection. These involved:

- *Recording Sheets and checklists:* This is the most standardized way of collecting observation data and it includes both present questions and responses (Department of Health and Human Services, 2008).
- *Observation Guides:* These guides list the interactions, processes, or behaviors to be observed with space to record open-ended narrative data (Department of Health and Human Services, 2008).
- *Field Notes:* This is the least standardized way of collecting observation data and do not include present questions or responses. Field notes are open-ended narrative data that can be written or dictated onto a digital recorder.

Full details of the observation procedure adopted here are provided in Chapter 6.

4.6.2.3 Document analyses

Documents are a useful source of data in qualitative research, but they have to be treated with care. The most widely used are official documents, personal documents and previous questionnaire findings (Zucker, 2004). Official Documents obtained in this research comprised registers, timetables, minutes of meetings, planning papers, lesson plans and notes, confidential documents, newspaper reports and journals, records, files and statistics, notice boards, exhibitions, official letters, and so on. While many of these gave useful and interesting information, they do not all necessarily provide objective truth; they have to be contextualized within the circumstances of their construction. The task of the researcher is not to take such documents at face value, but to find out how they were constructed, and how they are used and interpreted. Wood (2006) noted that they can be a useful and practical alternative means to observation and interview if conducted appropriately.

In this research program, the documents essentially focused on reconstructing the background behind the Dubai-Fujairah Highway (DFH) project and to understand differences between the initial and more recent contracts. In addition, documents were analysed to compare figures between different contracts and to understand modifications that had taken place in the project.

Some of the official documents reviewed and analyzed for the DFH project included Project Decrees and Correspondences files from inception in 1999 to 2010. A number of other initial project documents and reports were also examined. A summary of the documentation can be found in Chapter 6.

4.6.2.4 Focus Groups

Focus group discussions are a powerful tool for exploring the dynamic of management. Focus group tells us about the emotions, motivations, rational, and beliefs that influence decision-makers (Stermann, 1989). Zikmund (2000) noted that a focus group interview is an unstructured, free-flowing interview with a small group of people, not a rigid question-and-answer session, but a flexible format that encourages discussion of a topic. More importantly, focus groups are distinguished from the broader category of group interviews by the explicit use of group interaction to generate data. Instead of asking questions of each person in turn, focus group participants are encouraged to talk to one another, ask questions, exchange anecdotes, and comment on each other's experiences and points of view (Kitzinger and Barbour, 1999).

Usually participants of a focus group meet at a central location at a designated time. The group usually consists of an interviewer, a moderator; and six to ten participants who discuss a single topic. At the beginning of the interview, the moderator introduces the topic and encourages the members to discuss the subject among themselves. Zikmund (2000) stresses that focus groups need to allow people to reveal their true feelings, anxieties, and frustration, and to express the depth of their convictions in their own words. Ideally, the discussion proceeds at the group's initiative.

The ideal size of a focus group is six to ten individuals (Zikmund, 2000). If the group is too small, one or two members may intimidate the others. On the other hand, adequate participations by each group member may not be permitted in large groups as the amount of input from each individual can be limited and the flow of ideas can be restricted.

Advantages of Focus Groups: The primary advantages of focus group interviews, as noted by Zikmund (2000), are that they are relatively brief, easy to execute, quickly analyzed, and inexpensive. However, it must be highlighted that a small discussion group will rarely be representative of the sample, no matter how carefully it is recruited. Hence, focus group

interviews cannot take the place of quantitative studies. As compared to the rigid format of a survey, the flexibility of a focus group interview is also an advantage, as numerous related topics can be discussed and many insights can be gained. Furthermore, responses unlikely to emerge in a survey often surface more readily in a group interview.

Zikmund (2000) claimed that the combined effort of a group normally produces a wider range of information insights, and ideas than the accumulation of separately secured responses of a number of individuals. In addition, there is also the opportunity for the group to develop any idea to its full significance, as a comment by one member often triggers a chain of responses from the other members of the group. Within a well-structured group, an individual can usually feel more at ease as his or her feelings are similar to those of others in the group, therefore, each member can expose an idea without being obliged to defend it or to follow through and elaborate on it. Since no individual is required to answer any given question in a group interview, the individual's responses can be more spontaneous and less conventional. In this respect, a spontaneous answer is more likely to provide a more accurate account of the person's perception on issues than a global instrument.

Consequently, a focus group interview permits closer scrutiny as the session can be recorded or videotaped. Hence, several people can review the recording and this offers some checks on the consistency of the interpretation. Later, detailed examinations of the recorded session can offer additional insights and help clear up disagreements about what happened. Finally, the group interview allows for more structure and control than the individual interview with regards to the topics covered and the depth in which they are being discussed. Usually, the moderator has the chance to reopen topics that received insufficient discussion when initially presented.

Disadvantages of Focus Groups: One specific shortcoming of a focus group discussion can be the inexperience of the moderator. Without strict control, for instance, a single, self-appointed participant may dominate the session, and sessions that include a dominant member may be somewhat abnormal (Zikmund, 2000). Furthermore, participants may react negatively towards the dominant member, causing a "halo" effect on attitudes towards the topic of discussion, hence, projecting a negative impression to the discussion topic.

Other disadvantages of focus groups are similar to those of most qualitative exploratory research techniques. First, interpretations of qualitative findings are typically judgmental and subjected to interpreter bias. As a result of such problems in interpretation, exploratory findings should be considered preliminary. Second, focus groups utilize small sample sizes which may not be representative of the population as they have not been selected on a probability basis. Therefore, as Kitzinger and Barbour (1999) argued, in order to increase the generality of the findings of focus groups, these responses should be combined with quantitative methods such as numerical questionnaires surveys. At the outset of such research, focus groups can be used in the latter stage of quantitative projects as they can help tease out the reasons for surprising findings and to explain the occurrence of any “outliers” identified, but not explained by quantitative approaches.

These advantages and disadvantages were paramount in the design of the focus group discussions conducted in this research program. Full details are provided in Chapters 6 and 7.

4.6.3 Data Analysis

Analyzing qualitative data first requires the user to code these data. This requires the analyst to input data in a database and demarcate segments within it. Strauss and Corbin, (1988) describe a code as an abstract representation of an “objector phenomenon”, or as Ryan and Bernard (2000) noted, an “alternative mnemonic device used to identify themes in text”. Codes range from purely descriptive to more interpretive or analytical concepts. Each segment is labeled with a “code”. When coding is complete, the analyst prepares reports via a mix of summarizing the prevalence of codes, discussing similarities and differences in related codes across distinct original sources/context, or comparing the relationship between one or more codes.

Modern methods of analyzing qualitative data inevitably involve software programs such as NVivo¹ software; a proprietary desktop software package for the organization and analysis of complex non-numerical unstructured qualitative data. It is primarily used by qualitative researchers working with very rich text-based and multimedia information; where deep levels of analysis on small or large volumes of data are required (QSR 10 (2012)). The software allows users to classify, sort and arrange thousands of pieces of information; examine complex

¹ NVivo is Copyright © 2011 of QSR International Pty Ltd. ABN 47 006 357 213. All rights reserved. NVivo and QSR words and logos are trademarks or registered trademarks of QSR International Pty Ltd.

relationships in these data; and combine subtle analysis with linking, shaping, searching and modeling. NVivo accommodates a wide range of research methods, including network and organizational analysis, action or evidence-based research, discourse analysis, grounded theory, conversation analysis, ethnography, literature reviews, phenomenology and mixed methods research (Richards and Morse, 2007; Richards, 2005; Coffey and Atkinson, 1996).

Coding in NVivo is stored in nodes, which denotes the terminal point or the connection in a network. In a fully developed NVivo coding system, nodes become points at which concepts potentially branch out into a network of sub-concepts or dimensions. In a tree node, the parent node is the concept, and the child nodes are the sub-concepts. In brief, the coding in NVivo in this research program was carried out by introducing cases, attributes for the cases, tree nodes (parent and child), and finally queries were used to develop coding matrices (Richards and Morse, 2007; Richards, 2005; Coffey *et al.* Atkinson, 1996).

4.6.4 Summarizing the Key Findings

Research programs such as this one provide considerable volumes of data and summarizing these is critical to establish key factors for success. To aide this, a discrete list of the key factors emanating from the research effort will be established to provide insights into what makes a successful mega TIP in the UAE.

Lincoln and Guba (1985) noted that for credibility and dependability in qualitative research, the findings must be valid and limited. Horsburgh (2003) noted that this is a key issue for identifying a researcher's, credibility and his or her ability to ensure that their own thoughts and actions don't invariably impact upon the interpretation of their research. Thus, a rigorous process needs to be conducted to uncover what are the main factors of relevance and then prune these down to a useful set of workable principles.

It is important to ensure that the results obtained in this study are truly representative for adapting to a successful TIP in the UAE. If so, then the lessons learned here could be translated into a framework or a set of guidelines that could be potentially useful for future UAE projects.

4.6.5 Framework Development

The final phase of the research program (Phase IV) will involve the development of a preliminary framework that could be used by project teams in the future to ensure greater

successes in mega Transportation Infrastructure Projects in the UAE. This was considered to be a desirable and practical outcome for the UAE from the research program and something that could be further developed more generally for wider international benefit. While the research program will be confined to qualitative research methods, the development of a framework or set of guidelines is potentially a very useful, theoretical and practical contribution from this research program. While this is somewhat outside the scope of the research planned, nevertheless, the development of a preliminary framework, based on the findings from Phases I and II will illustrate what can be achieved, subject to more additional detailed research effort.

To assist in developing the preliminary framework, a second focus group session using many of the same participants as in Phases II and a supplementary survey involving key senior stakeholders will be conducted to identify and weight the relative importance of the key factors and processes. From these additional data, the framework should be able to further discriminate what needs fundamental attention for the ultimate successful completion of a mega TIP in the region.

4.7 Ethical Considerations

It is important in studies involving human volunteers that the study aims, objectives and methodologies be approved by a registered Human Ethics Committee. Monash University's Human Research Ethics Committee on ethical review of research and research governance approved this study on 23 April 2008 (Human Ethics Certificate of Approval 2008000540).

4.8 Summary of Chapter Four

This chapter provided an overview of the research program planned to examine current practice in the management of mega Transportation Infrastructure Projects (TIP) in the UAE and ways in which they can be improved to achieve greater future successes. It outlined an overview of the research plan including objectives and research questions; developed a conceptual model behind the research involving project construction, stakeholders and management processes; described the research methodology including research program phases and outcomes expected; and discussed methodological issues related to the research undertaken.

This Chapter has formed the road map for the research to be reported in detail in subsequent chapters. **Phase I:** the exploratory interview phase is reported in Chapter 5; **Phase II:** the in-

depth case study is reported in Chapter 6; **Phase III:** a summary of the findings and principle factors from Phases I and II and discussion of factors that impact on management processes and hence TIP outcomes are reported in Chapter 7; and **Phase IV:** the development of a preliminary framework for assessing outcome probability is also included in Chapter 7.

The final chapter of the thesis (Chapter 8) includes a general discussion of the research findings, how the objectives and research questions have been addressed, the academic and practical contribution of the work, strengths and limitations of the research, and finally recommendations for future research in this area.

CHAPTER 5

PHASE I STUDY RESULTS

5.1 Introduction

This chapter presents the findings from Phase I of the project. This phase involved face-to-face interviews with 20 key stakeholders who had been involved in a variety of transportation infrastructure projects (TIPs) in the UAE. The aim of this phase of the project was to establish the status of TIP management in the UAE. This chapter adopts the following structure: Section 5.2 provides brief details of the interview procedure and detailed profile for the key stakeholders and their role in TIPs. Section 5.3 presents the overall results based on the 20 interviews conducted with respect to TIPs completed in the UAE. Section 5.4 presents the results relating to each stakeholder group and finally, Section 5.5, presents a summary of the overall findings.

5.2 Interview Procedure and Interviewee Profile

The objective of the first phase interviews was to obtain some preliminary insights into the research questions of this study, particularly those in relation to important construction stages, stakeholders' relationships and importance, management concerns, and organizational definitions and interpretations for the project success and failure indicators. Twenty interviews were conducted with key stakeholders in the area of transportation project in the UAE. A snowballing approach was adopted in this research to ensure the randomness of the process to recruit participants to the interviews.

Interviews were conducted for up to 90 minutes or until saturation point was reached and no fresh themes were emerging. Typically, interviews lasted between 60 to 90 minutes which was sufficient to achieve the targeted depth to each of the detailed research questions. This is consistent with expert opinions on interviews highlighting the fact that interviews longer than 90 minutes do not reveal much depth as the respondent gets tired (Hermanowicz, 2002). In the instance where the interviewee was impatient due to his/her tight schedule, some interview questions were combined and/or skipped whilst assuring that the key informant was completed.

Most of the interviews were conducted at the participant's premise and a digital recorder was used for recording all interviews. Each interview commenced with some introductory statements addressing the purpose of interview, and assurance of confidentiality. The interview itself comprised of ten sections with a total of 58 detailed questions, which were intended to explore the interviewee's opinion on the key research questions. Refer to Appendix A for the interview protocol. Below is a brief summary of each interview section:

Section 1: General information (e.g. interviewee name, age, qualification, position, date of interview, location)

Section 2: Understanding the network of stakeholders in the area of infrastructure projects in general and TIPs in particular; and how organizations are structured

Section 3: Understanding the most critical stages of construction projects (Key stages were: planning, scoping, scheduling, design, contracting, and construction)

Section 4: Methods employed to insure projects avoided cost and time overruns.

Section 5: The level of importance of each stakeholder such as financing, agencies, clients, consults, contractors and governmental departments.

Section 6: Different stakeholders views and definition of success and failure of TIP projects.

Section 7: Understanding how agencies/departments define unsuccessful projects.

Section 8: Key management processes of Communication, Coordination, Decision-Making and Knowledge-sharing.

Section 9: Summing up and summarizing interviewees' opinions on key management processes and project success indicators.

Section 10: Confirmation of information confidentiality and willingness to contribute to research at later stages.

Names of interviewees and affiliations to organizations or companies have been disguised to ensure confidentiality. Some elementary details on the interviews are presented in Table 5.1.

Table 5.1: Phase I Interview Details

Interviewee number	Stakeholder Category	Interviewee's Title
1	Sponsors/ Clients	Executive Manager for Urban Planning & Housing
2		General Manager
3		Director of Road Department
4		Senior High Way Design Eng.
5		Technical advisor & SCDIA Committee member
6	Other Governmental Departments	Head of Project Execution Department
7		Director of Strategy & Policy Division
8		Director of Internal Roads & Infrastructure
9	Project Management Firms	Senior Project Manager
10		Project Manager
11	Consultants	Senior Liaison Engineer
12		Head of Contracting Department: Consulting firm
13		Project Manager (Transport Planning Section) and Director
14		Vice President of the compnay
15		Senior Architect and Chief Supervision
16	Contractors	Chief Operating Officer
17		Project Director of the company
18		Chief Engineer (Roads)
19		Contracting Manager
20		Construction Manager

The interviews were conducted from June to September 2008. Due to the close role in projects of both sponsors and clients and the limited number of interviewees' responses to draw meaningful conclusions, these two groups were merged into one stakeholder category (sponsors/clients) only

for the purpose of analyzing the interviews responses. The detailed response for each research question was coded for each participant. The data were analysed using the NVivo data coding and analysis software as discussed in the previous chapter.

All interviewees held senior positions within their organization and played a significant role in TIPs. As Table 5.1 shows, those interviewed included general managers, directors, vice presidents, chief engineers, senior architects, and other senior executives. The majority had been in their current position for between one and five years. Almost two-thirds had spent 20 or more years in their perspective industries with a broad range of experiences covering planning, scoping, design, scheduling, tendering, and construction. It is important to mention here that the majority of those interviewed were males with just two females involved who held key senior management positions. All interviewees generously volunteered their time and willingly shared their experiences in their respective fields of specialization. Most of the interviewees were involved in several “Mega, Fast-Track” TIPs in the UAE. The majority, if not all, national projects are considered mega and are described with the term “fast-track” to reflect the eager desire of the government to accomplish such projects in the shortest time-frame possible.

The projects discussed in the interviews were considered the most important national infrastructure projects in general and transportation in particular. Such focus on transportation projects results from the desire to support the other ongoing infrastructure developments in UAE and the growing population of the country. Examples of mega, fast-track projects include the following:

- The Dubai – Al Fujairah Highway connecting the East and the West coasts of the country;
- Abu Dhabi airport expansion project to accommodate a substantial increase in passenger travel;
- Various Road Traffic Authority highway developments within the Emirate of Dubai to support new residential developments such as Al Nakhla and Burj Khalifa;
- New road development in the Emirate of Abu Dhabi connecting Al Sadeyat and Al Reem Islands to the main land and to facilitate the flow of transportation within the island of Abu Dhabi;

- Zayed Donation Residence Project in Northern Emirates to support settlement of nationals.

The above-mentioned projects range from five to eight years in duration and vary in terms of their complexity and status.

5.3 Overall Findings

This section provides an overview of the overall findings based on the 20 interviews conducted.

5.3.1 Critical Stages of Project

As shown in Figure 5.1, almost all of the interviewees identified ‘Planning’ as the most critical stage of TIPs. Close to one-half of the interviewees identified ‘Design’ as the most critical stage. It is interesting to note that only one interviewee (a contractor) identified ‘Tendering’ as the most critical stage. ‘Scoping’, ‘Construction’ and ‘Scheduling’ were considered critical stages by only a few of the interviewees.

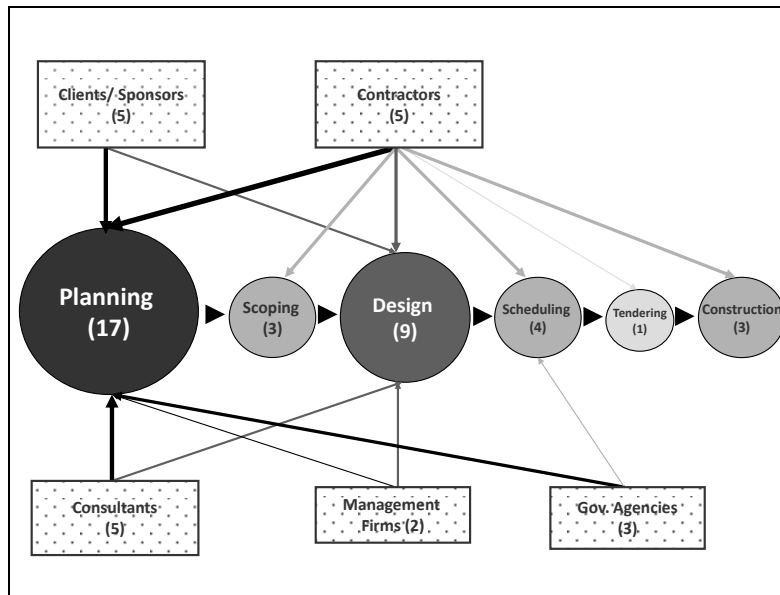


Figure 5.1: Critical Stages of TIPs in the UAE as Identified by the 20 Interviewees

5.3.2 Key Stakeholders and Their Influence on TIPs

Interviewees were asked to indicate whom they considered as the key stakeholders and what influence they had on TIPs in the UAE. Figure 5.2 shows the overall results. Around one-half of

the interviewees identified government agencies and clients as two of the key stakeholders affecting the success of TIPs. Six out of the 20 interviewees also identified state government departments and financial institutes as key stakeholders. Private developers and ministries/cabinets were judged as the least important stakeholders affecting the project success.

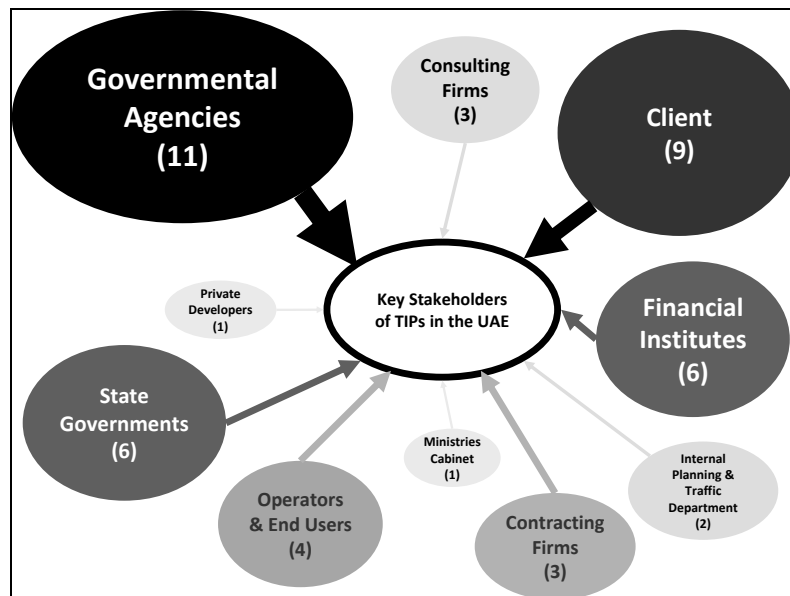


Figure 5.2: Key Stakeholders of TIPs in the UAE

There was little agreement amongst the 20 interviewees on how much influence the key stakeholders had on projects (see Figure 5.3). The highest response overall (seven interviewees in total) was the ‘ability to affect project execution and flow of activities’. The ‘ability to affect budget’, the ‘ability to conduct and influence planning and design’, the ‘level of involvement in a project’ and the ‘role a stakeholder plays in a given project’ was each mentioned by four out of the total 20 interviewees.

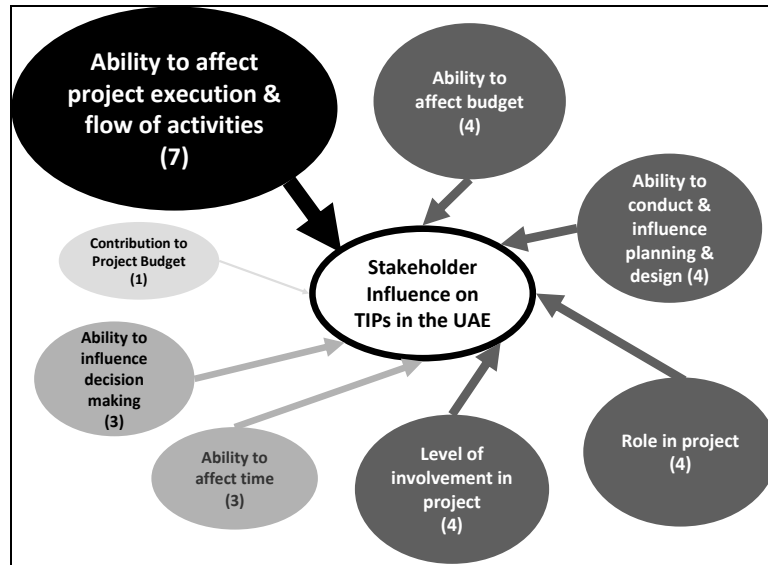


Figure 5.3: Stakeholder Influence on TIPs in the UAE

5.3.3 Stakeholders Involved In the Critical Stage of Projects

Overall, clients and local government were identified as the most important stakeholders involved in the critical stages of TIPs, identified by half of the total interviewees. This was followed in importance by governmental agencies, then consulting firms. Only one interviewee identified contracting firms and management firms as important.

5.3.4 Defining Project Success and Proportion of Projects Completed Successfully

Interviewees used a number of different indicators to define project success with some interviewees defining project success in more than one way (see Figure 5.4). Overall, ‘Minimum Time Overrun’ was mentioned by 13 interviewees and ‘Minimum Cost Overrun’ was mentioned by 10 interviewees. ‘Achieving project objectives’, ‘Achieving stakeholder expectations’ and ‘Excellent quality’ was also mentioned a number of times (by eight, five and five interviewees, respectively).

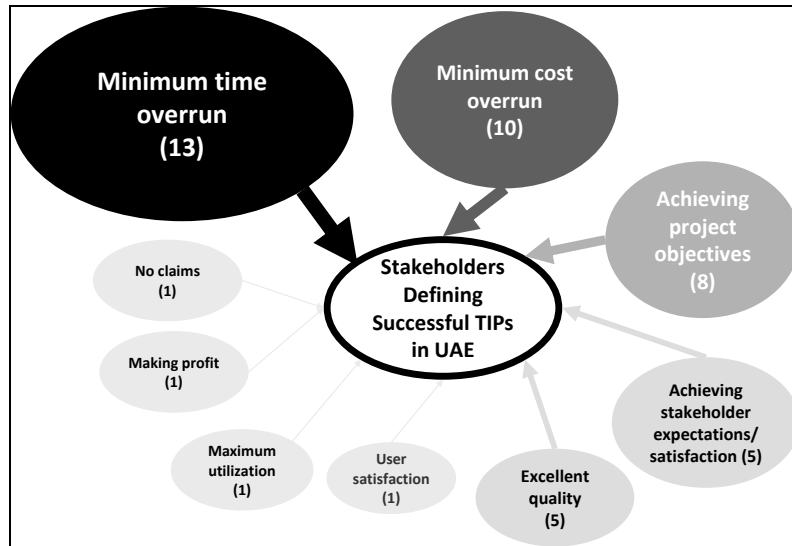


Figure 5.4 Stakeholders Defining Successful TIPs in UAE

Interviewees were also asked to indicate what proportion of projects they believed had been completed successfully in the UAE. The responses are summarized in Table 5.2 below. Note that only one of the five interviewees from the contractors group answered this question. Overall, the majority of the interviewees (12 interviewees out of the 16 who answered this question) agreed that over 70% of the projects had been completed successfully.

Table 5.2: Percent of TIPs Completed Successfully

	Sponsor / Client (n=5)	Governmental Agency (n=3)	Management Firm (n=2)	Consultants (n=5)	Contractors (n=5)	Total (n=20)
30% or Less	0	0	1	0	1	2
30-50 %	0	0	0	0	0	0
50-70%	1	2	0	0	0	3
70-90%	3	1	1	3	0	8
All	1	0	1	2	0	4
No clear answer	0	0	0	0	1	1

5.3.5 Measuring Project Success

Three specific questions focused on measuring project success: (i) how Departments or Organizations the interviewees worked for measured project success, (ii) what interviewees considered as the most important measures of success and (iii) the reason for selecting this measure. Note that a number of interviewees provided multiple responses.

Department/Organization Project Success Measures - Interviewees indicated that their Department/Organization made use of a range of different project success measures (see Figure 5.5). Overall, they identified ‘Excellent Quality’ and ‘Minimum Time Overrun’ as the most common project success measures – each identified by eleven out of the 20 interviewees. Minimum Cost Overrun (identified by eight interviewees) and ‘Achieving Stakeholders Expectations’ (six interviewees) were also identified as common project success measures. Measures relating to ‘Adequate Financial Liquidity’, ‘Excellent Management’, ‘Experienced Staff’, ‘Having No Project Claims’ and ‘Safety’ were only identified once by the interviewees.

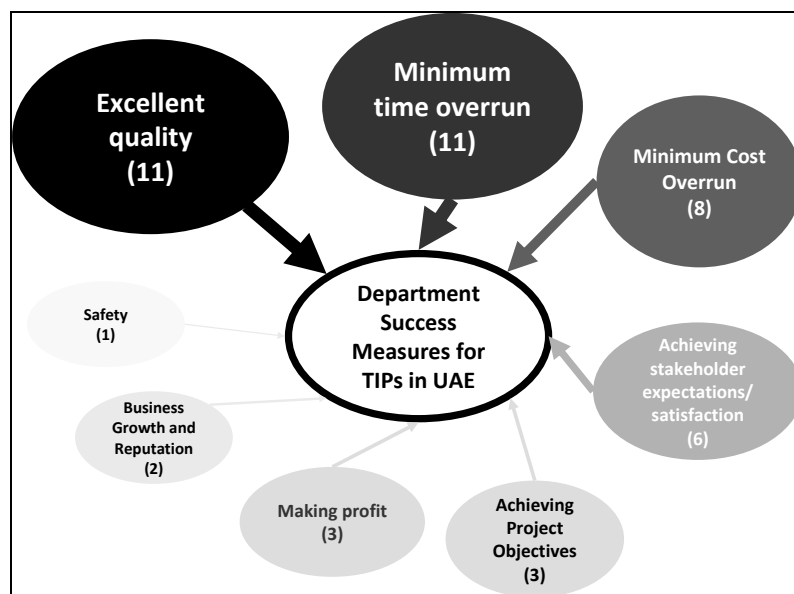


Figure 5.5 Department Success Measures for TIPs in UAE

Most Important Measure of Project Success - Overall, ‘Excellent Quality’ was identified by twelve out of the 20 interviewees as the most important measure, followed by ‘Minimum Time Overrun’ and ‘Achieving Stakeholders Expectations’ (each identified by eight interviewees).

‘Availability of Finance’ and ‘Environmentally Safe Projects’ were identified by only one interviewee as the most important project success measures.

Reasons for Selecting the Most Important Measure of Project Success - Overall, the most important reason identified relates to stakeholder satisfaction (‘Increase Stakeholders Level of Satisfaction’ – identified by eleven out of the 20 interviewed.) followed by reasons relating to time and budget overruns – identified by six interviewees. Few interviewees identified reasons relating to ‘Quality’ and ‘Project Uniqueness’.

5.3.6 Defining and Measuring Unsuccessful Projects

Two specific questions addressed issues relating to unsuccessful projects: (i) how the specific Department/Organization defined unsuccessful projects, and (ii) how failed projects were measured by the Department/Organization. Generally, the majority of the interviewees indicated that they ‘fully agreed’ with the project failure measures used by their organization, with only a few indicating that they ‘agreed to some extent’.

Department/Organization Definition of Unsuccessful (Failed) Project – Unsuccessful or failed projects were defined in a number of different ways. Overall, interviewees identified ‘Cost Overrun’ (identified by eight interviewees), ‘Time Overrun’ (seven interviewees) and ‘Poor Quality’ (six interviewees) as the most common definitions used for unsuccessful projects. Only one interviewee identified ‘Not Achieving Stakeholders Expectations’ and ‘Commuters Dissatisfaction’ as definitions for unsuccessful projects.

Project Failure Measures Used by Departments/Organizations - The responses show a variety of measures used to describe failed projects. Overall, interviewees identified ‘Poor Quality’ (seven interviewees), ‘Cost Overrun’ (six interviewees) and ‘Time overrun’ (six interviewees) as the most common measures used. Referring to the earlier discussion on measures of project success, both success and failure are measured primarily in terms of quality, time and cost.

5.3.7 Factors Causing Unsuccessful Completion of Projects

Interviewees provided a variety of responses with regard to the factors that caused unsuccessful completion of projects (see Figure 5.6). The most common responses relate to the involvement of unqualified stakeholders involved. ‘Unqualified-Bad Contractors’, ‘Unqualified Consultants’ and

‘Unqualified Engineers’ were mentioned seven times as the major factors causing unsuccessful completion of projects. Another set of responses relate to lack of coordination mentioned six times and included responses such as ‘Lack of Coordination with Local Governments’, ‘Governmental Process’ and ‘Poor Coordination with Utility Firms’. Other common responses relate to ‘Availability of Resources’ and/or ‘Materials Procurements’ (mentioned six times), ‘Bad Design’ (mentioned four times) and ‘Price Increments’ (mentioned four times).

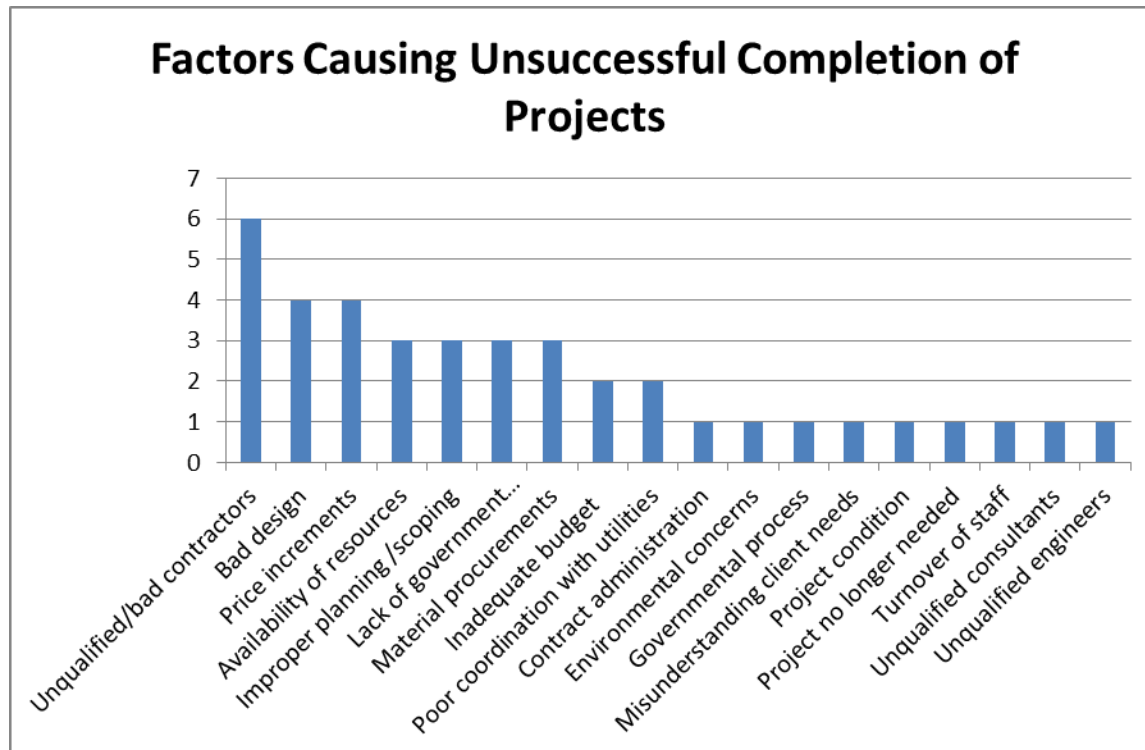


Figure 5.6: Factors Causing Unsuccessful Completion of Projects in the UAE (Number of Responses)

5.3.8 Major Reasons for Project Time and Cost Overrun

In examining more closely the reasons for project time overrun and cost overrun, interviewees gave a wide range of responses. The responses given for time overrun clustered around five major reasons, namely:

- Variation in or un-reviewed design and schedules (mentioned 10 times);
- Improper planning, scoping or cost estimates (mentioned seven time);

- Human resources issues (mentioned seven times). Specific responses included ‘availability and reliability of human resources’, such as differences in workers’ skills, experience and cultural background, and insufficient staff;
- Availability of materials (mentioned six times);
- Availability of qualified contractors and consultants (mentioned five times).

With respect to project cost overrun, the most common response (mentioned 16 times) related to material cost increases or inflation. The next most common responses were project variations and rework (mentioned six times), un-reviewed design/schedule (mentioned four times) and changes in stakeholder requirements (mentioned four times).

5.3.9 Management Concerns in the Implementation of Infrastructure Projects

The interviewees were asked to identify management concerns (deficiencies) in the implementation of infrastructure projects in the UAE. Again, a range of responses was provided and these cluster around four major concerns:

- Human resource issues (mentioned nine times). Specific responses included ‘lack of qualified contractors’, ‘shortage in qualified engineers’, ‘right people at right place’ and ‘lack of human resource experience’;
- Poor decision-making or interference in decision-making (mentioned six times);
- Lack of a master plan or unrealistic planning (mentioned three times);
- Lack of coordination at local and federal government levels (mentioned three times).

In addition, just over one-half of the interviewees agreed that these management concerns are valid in all phases of a project’s life cycle.

5.3.10 Management Practice in the UAE

Two questions were asked with respect to management practice in the UAE. The first question asked interviewees to rank management practice as ‘Excellent’, ‘Very Good’, ‘Good’, or ‘Fair’. The second question asked for a reason for the response given to the first question.

As shown in Figure 5.7, one-half of the interviewees regard management practice in the UAE as ‘Good’ whilst one-quarter indicated this was ‘Excellent’ (mentioned by three interviewees) or

‘Very Good’ (mentioned by two interviewees). Three interviewees identified management practice as ‘Fair’ and two of them did not provide a clear answer to this question.

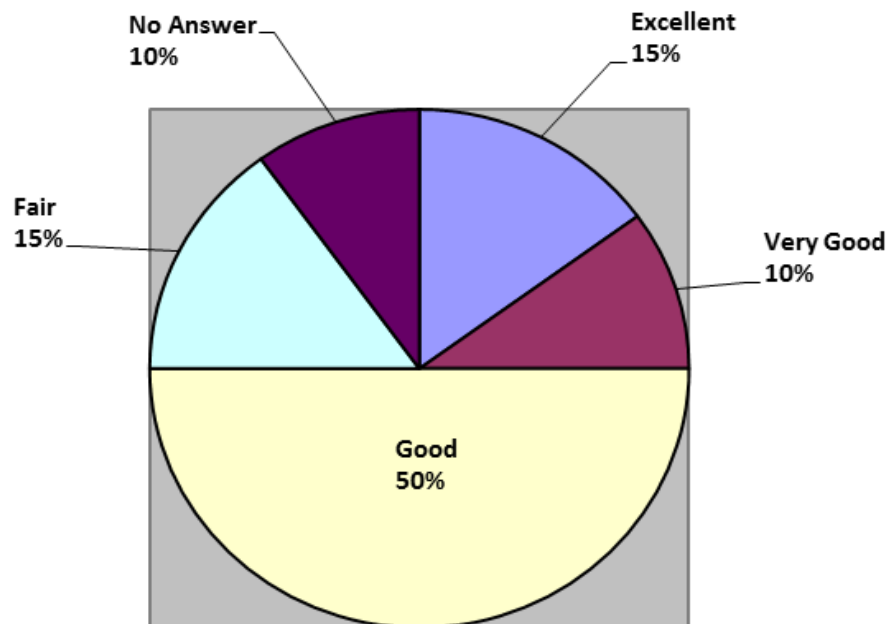


Figure 5.7: Management Practice in the UAE

A range of reasons was given for the above responses to the ranking of management practice. These cluster around the following three major reasons:

- Poor human resources (mentioned five times). Specific responses included ‘unqualified managers’, ‘engaging appropriately qualified staff’, ‘workforce variations’ and ‘availability of resources’;
- Lack of use of international design and quality standards (mentioned four times);
- Lack of a continuous improvement culture (mentioned three times).

Two interviewees noted that the number of fast track mega projects currently being undertaken in the UAE is overloading all entities and this may negatively affecting the ranking of management practices in the UAE.

5.3.11 Communication in Project Management

A series of questions focused on communication, namely how critical communication is to the success of projects, the commons methods used for communication, effectiveness of

communication within the organization and across the stakeholders, and how communication can be improved. The responses are summarized below.

Importance of Communication – Most the other interviewees indicated that communication is ‘Very critical’ (five interviewees) or ‘Critical’ (13 interviewees) to the success of the project. One interviewee provided no clear answer and another claimed that communication is ‘Critical to some extent’.

Communication Methods Used and Reasons for Their Use: Interviewees indicated that they used multiple methods for communication within their organization/department. The most commonly used methods are ‘meetings with minutes’ (mentioned 13 times) and ‘written documents’ (also mentioned 13 times). Although ‘e-mail’ was used reasonably frequently (mentioned 9 times), the use of ‘e-meetings’ was only mentioned once. Communication by ‘telephone’ was mentioned six times whilst ‘site visits’ was mentioned only once.

Five major reasons identified from the range of responses given for using such communication methods are:

- The method is fast and efficient (mentioned six times),
- The decision made is documented (mentioned five times),
- It is the officially accepted method (mentioned five times),
- The method used assures reaching a contractor/consultant (mentioned four times),
- It allows personal interaction and flow of ideas (mentioned three times).

Interestingly, ‘confidentiality’ was mentioned only once as the reason for using the method of communication.

Effectiveness of Communication - Generally, there was agreement amongst the 20 interviewees that communication within their organization/department is ‘effective’ (14 out of 20 responses). Two of the interviewees indicated that it was ‘effective to some extent’, one saying that it was ‘not effective’, and three provided no clear answer. There was less agreement amongst the interviewees on the effectiveness of communication across the different stakeholders involved: seven indicating it was ‘effective’, six indicating it was ‘effective to some extent’, and four saying that it was ‘not effective’.

Suggestions for Improving Communication - Interviewees made a number of suggestions as to how to improve communication in their organization. Responses related to establishing communication committees (mentioned three times), having regular meetings (mentioned twice) and having a committee chair to avoid wasting time (mentioned once). ‘Making electronic communication official’ and ‘Creating a manual or system procedure for communication’ were both mentioned twice as suggestions for improving communication. An interesting recommendation by one interviewee was to have a stronger commitment to involve other stakeholders in stages of the project, and give more authority for those involved in communication.

5.3.12 Coordination amongst Stakeholders

Two questions focused on coordination issues, namely the effectiveness of coordination amongst stakeholders and methods to improve coordination:

Effectiveness of Coordination amongst Stakeholders – Overall, one-half of the interviewees indicated that coordination amongst the stakeholders was ‘effective’ whilst another seven interviewees indicated that it was ‘effective to some extent’. The remaining three interviewees indicated that coordination amongst the stakeholders was ‘not effective’.

Methods to Improve Coordination amongst Stakeholders – Interviewees provided many suggestions with respects to improving coordination amongst stakeholders. The majority of responses fall into the following areas:

- Introduction of coordination regulations/model (mentioned six times);
- The introduction of new technology (mentioned four times). Specific responses included ‘Develop a GIS-based master plan with federal and local governments involved’, ‘Introduce e-government in all aspects’, ‘Introduce electronic communication’, and ‘Merge the stakeholder network via software technology’);
- Early involvement of stakeholders (mentioned four times). Specific responses included ‘Clarify project requirements from beginning’, ‘Encourage local authorities to share plans at early stages of project’, ‘Involve all stakeholders in early stages’, and ‘Briefing meetings with the right people’;

- Introduction and legalization of coordination committees/introduction of documented procedures (mentioned three times).

Other suggestions included ‘information exchange amongst agencies’, ‘increasing the level of trust and professional capabilities’, ‘enhancing problem understanding’, ‘enhancing decision-making and authority of others’.

5.3.13 Decision-Making in Project Management

Interviewees were asked for their opinion on the quality and speed of decision-making in project management and ways to improve this decision-making:

Quality and Speed of Decision-Making – There was general agreement (15 out of the 20 interviewees) that decision-making was of ‘good quality’. Only two of the interviewees indicated that decision-making was of ‘poor quality’ and the remaining three did not provide a clear answer. With respect to the speed of decision-making, there was almost equal split in the responses given; with nine interviewees saying ‘high speed’ and eight saying ‘poor speed’.

Methods to Improve Decision-Making - Interviewees made a number of suggestions to improve decision-making. One-half of the interviewees referred to ‘Increasing authority to lower level of the organization’. Seven responses referred to having competent staff - responses included ‘Competent Staff and training’, ‘Having the right people in the right places’, and ‘Upgrade Staff technically’. Other suggestions included ‘Having right information’ (mentioned three times), ‘introducing of a manual’ (mentioned three times) and ‘introducing a system for document control’ (mentioned once).

5.3.14 Knowledge-Sharing in Project Management

Three of the interviewees did not provide an answer to this question. Of the 17 who answered, the majority indicated ‘full agreement’ on the importance of knowledge-sharing amongst the stakeholders. Interviewees were also asked to indicate whether appropriate mechanisms existed within their organization/department for sharing knowledge internally. Twelve said ‘Yes’, four said ‘To some extent’ and three said ‘No’. A number of suggestions were offered for improving knowledge-sharing. These included:

- Through presentations, continuous meetings and continuous talking (mentioned 12 times);

- Development of a system (mentioned eight times). Specific response included ‘Electronic knowledge-sharing system’, ‘System for knowledge-sharing and database’, ‘Mechanism for knowledge-sharing’, and ‘Introduce a federal system to be imposed on local governments’;
- Establishing of a club or a knowledge centre (mentioned twice).

5.3.15 Improving Project Success Indicators

Finally, interviewees were asked to make suggestions as to how the various project success indicators (project quality, time overrun, cost overrun, and increasing stakeholders’ satisfaction levels) could be improved.

Improving Quality of Projects - From the responses given, the following four ways of improving quality of projects are identified:

- Using competent staff/stakeholders (mentioned seven times). Specific responses included ‘More qualified staff’, ‘Qualified Contractors’, ‘Better Consultants and Contractors’, and ‘Training staff’;
- Adoption of standards (mentioned four times). Specific responses included ‘Adopt international standards’ and ‘Adopt optimal standards to suit environment’;
- Improved coordination (mentioned three times). Specific responses included ‘Better coordination amongst stakeholders’ and ‘Good coordination in planning stage’;
- Improved design (mentioned twice).

Reducing Project Time Overrun - Five major suggestions identified from the range of responses given by the interviewees are:

- Proper planning and monitoring, and proper design (mentioned eight time);
- Qualified staff/stakeholders (mentioned five times). Specific responses included ‘More qualified staff’, ‘staff training’, and ‘Qualified contractors’;
- Increase coordination and cooperation (mentioned four times);
- Correct outsourcing/timely procurement (mentioned four times);
- Increase financial and human resources (mentioned four times).

Reducing Project Cost Overrun – From the responses given, the following four ways of reducing project cost overrun are identified:

- Qualified staff/equipment (mentioned seven times). Specific responses included ‘Proper equipment and staff’, ‘More qualified staff’, and ‘Staff training’;
- Improved project management (mentioned five times). Specific responses included ‘Meeting time schedule’, ‘Minimize interruptions’, and ‘Proper project management’;
- Control over materials (mentioned four times). Specific responses included ‘Control material cost’, ‘Looking for different material options and designs’, and ‘Secure materials ahead of time’;
- Enhance design (mentioned four times);
- Coordination with and meeting stakeholder expectations (mentioned four times).

Interestingly, use of Value Engineering and New Construction Technologies was each mentioned only once. ‘Slowing down activities’ was also mentioned once as a measure for reducing project cost overrun.

Increasing Stakeholder Satisfaction – A large number of suggestions were made by the interviewees. From these responses, three major ways for increasing stakeholder satisfaction are identified:

- Improved communication, coordination, support and involvement of stakeholders (mentioned six times). Specific responses included ‘Having better communication & coordination’, ‘Better stakeholder involvement in planning and scoping’, ‘Getting Governments to talk more’, ‘More support from higher levels (the Cabinet) and ‘Better coordination between clients and municipality’;
- Meeting project objectives for budget, quality and time (mentioned four times);
- Good design (mentioned three times).

Interestingly, addressing safety and environmental issues, and minimizing claims was each mentioned only once by the interviewees.

5.4 Individual Stakeholder Group Results

This section presents a tabulated summary of the results for each of the five stakeholder groups from the Phase I interviews including selected quotes taken from the interview transcripts.

5.4.1 Sponsors/Clients Stakeholder Group

Combined, the five sponsors/clients had over 80 years of industry experience. The individuals were selected on the basis of the important role they played in the management of TIPs in the UAE. Two of the five had a mix of expertise whilst another two were specialists in engineering management. The fifth member of this group had expertise in general construction. Their current job responsibilities included the management of planning, design, road testing and technical assessment. Table 5.3 presents a summary of the key findings for the sponsors/clients stakeholder group.

Table 5.3: Individual Stakeholder Group Result: Sponsors/Clients Group

Questions/Issue	<p>Response from the Sponsors/Clients Stakeholder Group - five individuals interviewed.</p> <p>NOTE: The number in the bracket below in this column is the number of individuals providing the response indicated.</p>
<i>Most critical stage of project</i>	Planning (3), design (1) and planning & design (1).
<i>Key stakeholders affecting overall project success</i>	Government agencies (3), state governments (2), government ministries (1), financial institutes (1), operators & end users (1) and private developers (1).
<i>How key stakeholders affecting overall project success?</i>	‘Ability to affect project execution & flow of activities’ (1); ‘ability to conduct & influence planning & design’ (1); ‘ability to influence decision-making’ (1); ‘contribution to budget & potential losses’ (1); and ‘involvement level and role in project’ (1).
<i>Most important stakeholder in the critical (planning and design) stages of project</i>	Local government (4), government agencies (2) and federal government (1).
<i>Proportion of TIPs completed successfully</i>	Over 90% (1), between 71-90% (3) and between 51-70% (1).
<i>Individual definition of project success</i>	‘Achieving project objectives’ (4), ‘minimum time overrun’ (2), ‘achieving stakeholder expectations’ (1), ‘excellent quality’ (1), ‘maximum utilization’ (1), ‘minimum cost overrun’ (1), and ‘no claims’ (1).
<i>Departments/organisations’ definition of project success</i>	‘Minimum time overrun’ (4) and ‘minimum cost overrun’ (2).
<i>Individuals’ opinion as to the most important success measures to use</i>	‘Achieving stakeholder expectations’ (3).
<i>Department/organisation’s definition of unsuccessful projects</i>	‘Cost overrun’ (2), ‘time overrun’ (2), ‘poor quality’ (2), ‘Consultant and Contractor claims’ (1), ‘not achieving project objectives’ (1) ‘commuter dissatisfaction’ (1), ‘not achieving stakeholder expectations’ (1) and ‘technical problems’ (1).
<i>Factors causing unsuccessful completion of projects</i>	‘Lack of coordination with local governments’ (2) ‘unqualified contractors’ (2), ‘improper planning and scoping’ (1), ‘inadequate budget assigned’ (1), ‘poor coordination with utility firms’ (1), and ‘project no longer needed’ (1).
<i>Reasons for project time overrun</i>	‘Improper planning/scoping’ (3), ‘availability of materials’ (2), lack of qualified staff/labour (1), and ‘lack of coordination with local authorities’ (1).
<i>Reasons for project cost overrun</i>	Increasing material prices (5), ‘changes in stakeholder requirements’ (1), ‘claims’ (1), ‘high profit margins by contractors’ (1), ‘project variations’ (1), and ‘utility relocation factors’ (1).

<i>Overall management concerns in implementing TIPs</i>	Decision-making (2), 'high number of running projects' (1), 'inadequate coordination between local and federal authorities' (1), 'having the right people at the right place' (1) and 'use of a variety of standards' (1).
<i>Assessment of management practice in the UAE</i>	'Excellent' (2) and 'good' (3).
<i>Importance of communication in project success</i>	'Very critical' (2) and 'critical' (3).
<i>Common methods of communication</i>	Meetings with minutes (4) and writing (3).
<i>Effectiveness of communication within departments/organisations</i>	'Effective' (4) and 'effective to some extent' (1).
<i>Effectiveness of communication amongst stakeholders</i>	'Effective' (2), 'effective to some extent' (2) and 'not effective' (1).
<i>Suggestions for improving communication</i>	'Establishing communication committees' (2) and 'establishing communication lines at lower levels' (1).
<i>Effectiveness of coordination amongst stakeholders</i>	'Effective' (2), 'effective to some extent' (2) and 'not effective' (1).
<i>Suggestions for improving coordination</i>	'Introducing and legalizing coordination committees' (2), 'encouraging local authorities to share plans at early stages of project' (1), 'information exchange among agencies' (1), 'introducing a coordination model' (1), and 'introduction of coordination regulation' (1).
<i>Effectiveness of decision-making</i>	'Good quality but of low speed' (5).
<i>Suggestions for improving decision-making</i>	'Increase authority to lower levels of the organization' (3), 'having the right information' (1), and 'stream lining – one opinion, one decision' (1).
<i>Knowledge-sharing</i>	'Fully agree' that it is important (4).
<i>Existence of knowledge-sharing within their department/org.</i>	'Yes' (4) and 'to some extent' (1).
<i>Suggestions for improving knowledge-sharing</i>	Introduction of electronic knowledge-sharing system or mechanism (3).
<i>Suggestions for improving quality of projects</i>	'Better coordination among stakeholders' (2), 'good coordination in the planning stage' (1), 'proper planning and scoping' (1) and 'more budget' (1).
<i>Suggestions for reducing time overrun</i>	'Good communication' (1), 'increasing financial and human resources' (1), 'increasing coordination and cooperation' (1), 'minimizing changes and interference after scoping' (1), and having

	'more qualified staff' (1).
<i>Suggestions for reducing cost overrun</i>	'Controlling material cost' (1), 'minimizing interference' (1), 'more authority for better decision-making' (1), 'more qualified staff/proper equipment and staff' (1), and 'proper project management' (1).
<i>Suggestions for improving stakeholder satisfaction</i>	'Achieving stakeholder goals and needs' (1), 'execute strategic projects (GCC rail)' (1), 'good roads, quality and services' (1), 'having a high standard system (Emirates project code) (1), 'having better communication and coordination' (1), 'more support from higher levels (the ministerial cabinet) (1), and 'quality, budget, time' (1).

5.4.2 Governmental Agencies Stakeholder Group

The three male interviewees in this stakeholder group held senior positions in their government organization. Their field of specialization was construction project management, business development & tourism and general construction. Of the five stakeholder groups, this group had the least experience, both in terms of the total number of years of experience and years of experience in their current job. Table 5.4 presents a summary of the key findings for this stakeholder group.

Table 5.4: Individual Stakeholder Group Result: Government Agencies Group

Questions/Issue	Response from the Government Agencies Stakeholder Group - <u>three</u> individuals interviewed. NOTE: The number in the bracket below in this column is the number of individuals providing the response indicated.
<i>Most critical stage of project</i>	Planning (2) and scheduling (1).
<i>Key stakeholders affecting overall project success</i>	Clients (2), financial institutes (2), government agencies (2), consulting firms (1), contracting firms (1), internal planning & traffic departments (1) and state governments (1).
<i>How key stakeholders affecting overall project success?</i>	'Ability to affect project execution & flow of activities' (2); 'level of involvement/role in the project (2), 'ability to conduct & influence planning & design' (1), 'ability to affect time (1) and 'ability to affect budget' (1).
<i>Most important stakeholder in the critical (planning and design) stages of project</i>	Clients (2), local government (2), government agencies (2), consulting firms (1) and financial institutes (1).
<i>Proportion of TIPs completed successfully</i>	Between 71-90% (1) and between 51-70% (2).
<i>Individuals' definition of project success</i>	'Achieving project objectives' (2), 'minimum time overrun' (2), 'achieving stakeholder expectations' (1), 'end user satisfaction' (1), 'good public transport' (1) and 'minimum cost overrun' (1).
<i>Departments/organisations' definition</i>	'Excellent quality' (2), 'achieving project objectives' (1),

<i>of project success</i>	‘minimum time overrun’ (1), ‘minimum cost overrun’ (1), ‘meeting performance indicators and efficiency measures’ (1) and ‘safety’ (1).
<i>Individuals’ opinion as to the most important success measures to use</i>	‘Minimum time overrun’ (3), ‘achieving project objectives’ (2), ‘achieving stakeholders satisfaction’ (2), ‘excellent quality’ (2) and ‘minimum cost overrun’ (1).
<i>Department/organisation’s definition of unsuccessful projects</i>	‘Cost overrun’ (2), ‘time overrun’ (2), ‘poor quality’ (2), ‘infrastructure not well integrated’ (1), ‘not achieving project objectives’ (1) and ‘poor design’ (1).
<i>Factors causing unsuccessful completion of projects</i>	‘Unqualified contractors’ (2), ‘unqualified consultants’ (1), ‘unqualified engineers’ (1), ‘government process’ (1), ‘improper planning and scoping’ (1), ‘price increments’ (1) and ‘project condition’ (1).
<i>Reasons for project time overrun</i>	‘Availability of materials’ (2), ‘availability of qualified contractors and consultants’ (2), ‘availability and reliability of human resources’ (1), ‘insufficient resources -labour, staff’ (1), ‘availability of finance’ (1), ‘conflicting objectives’ (1), ‘delay in decision-making by government agencies’ (1), ‘improper planning’ (1), ‘sequence of events’ (1), ‘un-reviewed design/schedule’ (1) and ‘variations and redesigns’ (1).
<i>Reasons for project cost overrun</i>	As above for time overrun. Plus ‘increasing material prices’ (2).
<i>Overall management concerns in implementing TIPs</i>	Decision-making (1), ‘lack of qualified contractors’ (1) ‘cultural issues affecting working times’ (1), ‘knowledge-sharing’ (1) and ‘timeline of response’ (1).
<i>Assessment of management practice in the UAE</i>	‘Good’ (3).
<i>Importance of communication in project success</i>	‘Critical’ (3).
<i>Common methods of communication</i>	‘e-mails and writing’ (3), ‘telephone’ (2) and ‘meetings with minutes’ (1).
<i>Effectiveness of communication within departments/organisations</i>	‘Effective’ (2) and ‘not effective’ (1).
<i>Effectiveness of communication amongst stakeholders</i>	‘Effective’ (1), ‘effective to some extent’ (1) and ‘not effective’ (1).
<i>Suggestions for improving communication</i>	‘Government’s involvement with other stakeholders’ (1).
<i>Effectiveness of coordination amongst stakeholders</i>	‘Effective’ (2) and ‘effective to some extent’ (1).
<i>Suggestions for improving coordination</i>	‘Introducing a coordination regulations’ (1), ‘introducing a formal regulatory mechanism’ (1), ‘introducing a documented procedure’ (1) and ‘merging the stakeholder network by using software technology’ (1).
<i>Effectiveness of decision-making</i>	‘High quality’ (3), ‘high speed’ (2) and ‘slow speed’ (1).
<i>Suggestions for improving decision-making</i>	‘Increase authority to lower levels of the organization’ (2), ‘having the right information’ (1), and ‘enhancing stakeholder consultation’ (1).
<i>Knowledge-sharing</i>	‘Fully agree’ that it is important (3).

<i>Existence of knowledge-sharing within their department/org.</i>	'To some extent' (3).
<i>Suggestions for improving knowledge-sharing</i>	'Electronic knowledge-sharing system' (1), 'establishing a club for knowledge-sharing' (1), 'establishing a knowledge centre' (1), 'increasing organizational commitment to address the cultural issues' (1), and 'through presentations' (1).
<i>Suggestions for improving quality of projects</i>	'More qualified staff' (1), 'adopting optimal standards to suit the environment' (1) 'knowledge-sharing between contractors' (1).
<i>Suggestions for reducing time overrun</i>	'Having the right sources' (1), 'proper planning and monitoring' (1), and 'staff training' (1).
<i>Suggestions for reducing cost overrun</i>	'Meeting time schedule' (2), 'adding more resources' (1), 'good design survey' (1), and 'understanding and scoping key stakeholder expectations' (1).
<i>Suggestions for improving stakeholder satisfaction</i>	'Addressing safety and environment issues' (1), ensuring 'better stakeholder involvement in planning and scoping' (1), 'meeting project objectives with budget, time and quality' (1), 'minimum claims' (1), and 'having more authority' (1).

5.4.3 Management Firms Stakeholder Group

The two male interviewees in this group included a senior project manager and a project manager, each with around 20 years of experience in the construction industry. Their current job responsibility was road project management and construction engineering project management, respectively. Table 5.5 presents a summary of the key findings for this group.

Table 5.5: Individual Stakeholder Group Result: Management Firms Group

Questions/Issue	Response from the Management Firms Stakeholder Group - <u>two</u> individuals interviewed. NOTE: The number in the bracket below in this column is the number of individuals providing the response indicated.
<i>Most critical stage of project</i>	Planning (2) and design (1).
<i>Key stakeholders affecting overall project success</i>	Clients (1), financial institutes (1), government agencies (1) and state governments (2).
<i>How key stakeholders affecting overall project success?</i>	'Ability to affect project budget' (1) and 'level of involvement in project' (1).
<i>Most important stakeholder in the critical (planning and design) stages of project</i>	Federal government (2), local government (2) and financial institutes (1)
<i>Proportion of TIPs completed successfully</i>	Less than 30% (1) and 100% (1).
<i>Individual definition of project success</i>	'Minimum time overrun' (2), 'minimum cost overrun' (2),

	‘achieving stakeholder expectations’ (1), ‘achieving project objectives’ (1) and ‘excellent quality’ (1).
<i>Departments/organisations’ definition of project success</i>	‘Excellent quality’ (2), ‘achieving project objectives’ (1), ‘minimum cost and time overrun’ (1), and ‘having no claims’ (1).
<i>Individuals’ opinion as to the most important success measures to use</i>	NO RESPONSE.
<i>Department/organisation’s definition of unsuccessful projects</i>	Poor design (1).
<i>Factors causing unsuccessful completion of projects</i>	‘Bad design’ (1), ‘lack of coordination with the local governments’ (1), ‘bad contractors’ (1), and ‘environmental concerns’ (1).
<i>Reasons for project time overrun</i>	‘Availability of qualified contractors and consultants’ (1), ‘change in stakeholders’ decisions during construction’ (1), ‘the land acquisition process’ (1), ‘service relocation procedures’ (1), and ‘un-reviewed designs’ (1).
<i>Reasons for project cost overrun</i>	‘Change in stakeholders’ requirements’ (2), ‘increasing material prices/price increases due to inflation’ (1), ‘project variations’ (1) and ‘un-reviewed design’ (1).
<i>Overall management concerns in implementing TIPs</i>	Budgeting and decision-making (1).
<i>Assessment of management practice in the UAE</i>	‘Very good’ (1) and ‘fair’ (1).
<i>Importance of communication in project success</i>	‘Critical’ (2).
<i>Common methods of communication</i>	Meetings with minutes (2), writing (2) and site visit (1).
<i>Effectiveness of communication within departments/organisations</i>	‘Effective’ (2)
<i>Effectiveness of communication amongst stakeholders</i>	‘Effective to some extent’ (1) and ‘not effective’ (1).
<i>Suggestions for improving communication</i>	‘Electronic methods’ (1) and ‘having a key person responsible for communication at lower levels of the organization for each project’ (1).
<i>Effectiveness of coordination amongst stakeholders</i>	‘Effective’ (1) and ‘effective to some extent’ (1).
<i>Suggestions for improving coordination</i>	‘Introducing electronic communication’ (1).
<i>Effectiveness of decision-making</i>	‘Good quality’ (2), ‘high speed’ (1) and ‘low speed’ (1).
<i>Suggestions for improving decision-making</i>	‘Having the right people’ (2).
<i>Knowledge-sharing</i>	‘Fully agree’ that it is important (2).
<i>Existence of knowledge-sharing within their department/org.</i>	‘Yes’ (1) and ‘no’ (1).
<i>Suggestions for improving knowledge-sharing</i>	‘Continuous meeting’ (1), ‘through presentations’ (1), and ‘using the websites’ (1).
<i>Suggestions for improving quality of projects</i>	‘Having better consultants and contractor’ (1) and ‘more time for projects’ (1).

<i>Suggestions for reducing time overrun</i>	‘Early land acquisition’ (1), ‘enhancing decision-making’ (1), ‘increasing financial and human resources’ (1), ‘proper planning’ (1) and ‘having qualified contractors’ (1).
<i>Suggestions for reducing cost overrun</i>	‘Enhancing project design and faster decision-making’ (2).
<i>Suggestions for improving stakeholder satisfaction</i>	‘Having more authority (1) and meeting the project quality, budget and time’ (1).

5.4.4 Consultants Stakeholder Group

The consultant stakeholder group included five male representatives holding a variety of positions (see Table 5.1). Between them, they had over 80 years of industry experience. They specialized in and had current responsibilities covering all aspects of managing construction projects. Table 5.6 presents a summary of the key findings for this group.

Table 5.6: Individual Stakeholder Group Result: Consultants Group

Questions/Issue	Response from the Consultants Stakeholder Group - <u>five</u> individuals interviewed.
	NOTE: The number in the bracket below in this column is the number of individuals providing the response indicated.
<i>Most critical stage of project</i>	Planning (4) and design (2).
<i>Key stakeholders affecting overall project success</i>	Clients (5), government agencies (3), consulting firms (2) contracting firms (2), state governments (2), operators & end users (2) and financial institutes (1).
<i>How key stakeholders affecting overall project success?</i>	‘Ability to affect project time’ (2), ‘ability to conduct & influence planning & design’ (2), ability to affect budget’ (1), ‘ability to affect project execution & flow of activities’ (1) ability to influence decision-making’ (1); and ‘role in the project’ (1).
<i>Most important stakeholder in the critical (planning and design) stages of project</i>	Clients (4), government agencies (4), consulting firms (2), local government (2), federal government (1) and end users (1).
<i>Proportion of TIPs completed successfully</i>	Over 90% (2) and between 71-90% (3).
<i>Individual definition of project success</i>	‘Minimum time overrun’ (4), ‘minimum cost overrun’ (3), ‘achieving project objectives’ (1), ‘achieving stakeholder expectations’ (1), ‘excellent quality’ (1), ‘adequate design’ (1).
<i>Departments/organisations’ definition of project success</i>	‘Excellent quality’ (4), ‘minimum cost overrun’ (3), ‘minimum time overrun’ (3), ‘achieving stakeholder expectations’ (2), and ‘business growth and reputation’ (1).
<i>Individuals’ opinion as to the most important success measures to use</i>	‘Excellent quality’ (4), ‘achieving stakeholder satisfaction’ (1) and ‘environmentally safe projects’ (1).
<i>Department/organisation’s definition of unsuccessful projects</i>	‘Cost overrun’ (2), ‘time overrun’ (2), ‘poor quality’ (2), ‘Consultant and Contractor claims’ (1), ‘not achieving project

	objectives' (1) 'commuter dissatisfaction' (1), 'not achieving stakeholder expectations' (1) and 'technical problems' (1).
<i>Factors causing unsuccessful completion of projects</i>	'Bad design' (2), 'improper planning and scoping' (1), 'misunderstanding client needs' (1), 'turnover of staff' (1), and 'unqualified contractors' (1).
<i>Reasons for project time overrun</i>	'Inappropriate project cost estimates' (2), local government (2), 'availability/reliability of human resources' (1), 'availability of qualified contractors and consultants' (1), 'changes in stakeholders' decisions during construction' (1), 'delays in decision-making by government agencies' (1), 'high demand of transportation' (1), 'service relocation' (1), and 'variations and redesigns' (1).
<i>Reasons for project cost overrun</i>	'Changes in stakeholders requirements' (1), 'inadequate cost estimate' (1), 'inadequate planning' (1), 'increasing material prices/price increases due to inflation' (1).
<i>Overall management concerns in implementing TIPs</i>	'Shortage of qualified engineers' (2), 'unclear and unorganized permitting process used by local governments' (2), 'lack of human resources experience' (1) and 'no plans for development' (1).
<i>Assessment of management practice in the UAE</i>	'Excellent' (1) and 'good' (2).
<i>Importance of communication in project success</i>	'Very critical' (2) and 'critical' (2).
<i>Common methods of communication</i>	Meetings with minutes (3), writing (2) and e-mails (1).
<i>Effectiveness of communication within departments/organisations</i>	'Effective' (3) and 'effective to some extent' (1).
<i>Effectiveness of communication amongst stakeholders</i>	'Effective' (2) and 'effective to some extent' (1).
<i>Suggestions for improving communication</i>	'Creating a manual/procedure' (2) and 'establishing communication committees' (1).
<i>Effectiveness of coordination amongst stakeholders</i>	'Effective' (2), 'effective to some extent' (1) and 'not effective' (1).
<i>Suggestions for improving coordination</i>	'Briefing meetings with the right people' (1), 'developing a GIS-based (Geographic Information System) master plan with the federal and local government involved' (1), 'higher management agreement on coordination issues' (1), and the 'introduction of some coordination regulations'. (1).
<i>Effectiveness of decision-making</i>	'Good quality' (2), 'poor quality' (2), 'high speed' (4).
<i>Suggestions for improving decision-making</i>	'Increase authority to lower levels of the organization' (3), 'introduction of a manual for procedures and relationships' (2), 'right people in the right place' (1) and 'introducing a system for development - based on cost benefit' (1).
<i>Knowledge-sharing</i>	'Fully agree' that it is important (5).
<i>Existence of knowledge-sharing within their department/org.</i>	'Yes' (2) and 'no' (1).
<i>Suggestions for improving knowledge-sharing</i>	'Continuous meetings/talking' (1), 'introducing a federal system to be imposed on local governments' (1), 'establishment of a system for knowledge-sharing and database' (1), and 'through

	presentations' (1).
<i>Suggestions for improving quality of projects</i>	'More qualified staff' (2), 'adequate design' (1), 'integrating land use plans with public transportation' (1), 'having qualified contractors' (1), and 'adopting international standards' (1).
<i>Suggestions for reducing time overrun</i>	'Proper planning and monitoring' (2), 'enhance decision-making' (1), 'increase financial and human resources' (1), 'increase coordination and cooperation' (1), and having proper 'project design' (1).
<i>Suggestions for reducing cost overrun</i>	'Looking for different material options and designs' (1), 'slowing down of activities' (1), 'tight coordination with stakeholders' (1), 'understanding and scoping key stakeholder expectations' (1), and 'using value engineering during design' (1).
<i>Suggestions for improving stakeholder satisfaction</i>	'Adequate contractors' (1), 'better coordination between clients and municipality' (1), 'getting governments to talk more' (1), 'matching project goals with standards' (1), and 'project completion' (1).

5.4.5 Contractors Stakeholder Group

Finally, the contractors stakeholder group consisted of five males, with three of them holding top management positions and the other two holding middle management positions (see Table 5.1). Each one of them had over 20 years' experience in the industry. Their current job responsibilities included construction management, business development, quality assurance and contracting. Table 5.7 presents a summary of the key findings for the contractors.

Table 5.7: Individual Stakeholder Group Result: Contractors Group

Questions/Issue	Response from the Contractors Stakeholder Group - <u>five</u> individuals interviewed.
	NOTE: The number in the bracket below in this column is the number of individuals providing the response indicated.
<i>Most critical stage of project</i>	Planning (5), scoping (3), design (3), scheduling (3), construction (3) and tendering (1).
<i>Key stakeholders affecting overall project success</i>	All stakeholders (2), government agencies (2), clients (1), financial institutes (1) and operators & end Users (1).
<i>How key stakeholders affecting overall project success?</i>	'Ability to affect the project execution and flow of activities' (3), 'ability to affect budget' (1) and 'influence decision-making' (1).
<i>Most important stakeholder in the critical (planning and design) stages of project</i>	Clients (3), consulting Firms (3), contracting Firms (1), end users (1) and management firms (1).
<i>Proportion of TIPs completed successfully</i>	Less than 30% (1).

<i>Individual definition of project success</i>	‘Minimum cost overrun’ (3), ‘minimum time overrun’ (3), ‘achieving stakeholder’s satisfaction’ (2), ‘excellent quality’ (2), ‘making profit’ (1) and ‘being a preferred contractor’ (1).
<i>Departments/organisations’ definition of project success</i>	‘Achieving stakeholders’ expectations’ (3), ‘making profit for the company’ (3), ‘minimum time overrun’ (2), ‘excellent quality’ (2), ‘enough financial liquidity’ (1), ‘excellent management’ (1) and ‘experienced staff’ (1). (1).
<i>Individuals’ opinion as to the most important success measures to use</i>	‘Minimum time overrun’ (4), ‘excellent quality’ (3), ‘minimum cost overrun’(3), ‘achieving stakeholder expectation’(2), ‘availability of finance’,(1) and ‘minimum design variations’. (1).
<i>Department/organisation’s definition of unsuccessful projects</i>	‘Cost overrun’ (2), ‘inadequate client-contractor relationship’ (2), ‘time overrun’ (1)and ‘Consultants and contractors claims’ (1).
<i>Factors causing unsuccessful completion of projects</i>	‘Availability of resources’ (3), ‘materials procurement’ (3), ‘price increments’ (3), ‘bad design’ (1), ‘inadequate budget assigned’ (1), ‘poor coordination with utility firms’ (1), and ‘contract administration’ (1).
<i>Reasons for project time overrun</i>	‘Variations and redesign’ (4), ‘availability of materials’ (2) and ‘insufficient resources - Labour and staff’ (2), ‘availability of finance’ (1), ‘service relocation’ (1) and ‘un-reviewed design’ (1).
<i>Reasons for project cost overrun</i>	‘Increasing material prices’ (3), ‘price increase due to inflation’ (2), ‘project variations’ (2), ‘inadequate cost estimates’ (1), ‘inadequate planning’ (1), and ‘un-reviewed design’ (1).
<i>Overall management concerns in implementing TIPs</i>	‘Lack of qualified contractors’ (2), ‘interference in decision-making’ (2), ‘lack of human resources’ (1), ‘shortage of qualified engineers’ (1), , ‘unrealistic planning’,(1) and ‘dealing with unforeseen conditions resulting from not studying the project in detail’ (1).
<i>Assessment of management practice in the UAE</i>	‘Very good (1), ‘good’ (2) and ‘fair’ (1).
<i>Importance of communication in project success</i>	‘Very critical’ (1), ‘critical’ (3) and ‘critical to some extent’ (1).
<i>Common methods of communication</i>	E-mails (4), meetings with minutes (3), writing (3) and telephone (3).
<i>Effectiveness of communication within departments/organisations</i>	‘Effective’ (3) and ‘effective to some extent’ (1).
<i>Effectiveness of communication amongst stakeholders</i>	‘Effective’ (2), ‘effective to some extent’ (1) and ‘not effective’ (1).
<i>Suggestions for improving communication</i>	‘Regular meetings’ (2), ‘making electronic communication official’ (1), ‘more authority for those involved in communication’ (1), and ‘having a chair for meetings to avoid wasting time’ (1).
<i>Effectiveness of coordination amongst stakeholders</i>	‘Effective (3) and ‘effective to some extent’ (2).
<i>Suggestions for improving coordination</i>	‘Clarifying the project requirements from the beginning’ (1), ‘enhancing problem understanding’ (1), ‘enhancing decision-making and giving authority’ (1), ‘increasing level of trust and professional

	capabilities' (1), 'introduction of coordination regulation' (1), 'involving all stakeholders in early stages' (1), 'better organization' (1) and 'regular meetings'. (1).
<i>Effectiveness of decision-making</i>	'Good quality' (3), 'high speed' (2) and 'low speed' (1).
<i>Suggestions for improving decision-making</i>	'Increasing authority of decision-making to lower level of the organization' (2), 'competent staff and training' (2), 'upgrading staff technically', 'having the right people at the right places' (1) and 'introducing a manual for procedures and relationships' (1).
<i>Knowledge-sharing</i>	'Fully agree' that it is important (5).
<i>Existence of knowledge-sharing within their department/org.</i>	'Yes' (2), 'to some extent' (2) and 'no' (1).
<i>Suggestions for improving knowledge-sharing</i>	'Through presentations' (3), 'regular meetings' (2), 'auditing' (2), 'introducing a system for knowledge-sharing' (2), and 'applying best practice with adaptation to fit local needs' (1).
<i>Suggestions for improving quality of projects</i>	'Adopting international standards' (2), 'improve design quality criteria' (1), 'introduce a quality culture' (1), 'more qualified staff' (1), and 'training of staff' (1).
<i>Suggestions for reducing time overrun</i>	'Proper planning and monitoring' (2), 'proper and timely procurement' (2), 'having the right resource' (1), 'increase financial and human resources' (1), 'increasing coordination and cooperation' (1), 'more qualified staff' (1), 'proper design' (1), 'staff training' (1), 'reduce paperwork' (1), and 'obtaining approval from utility companies ahead of construction' (1).
<i>Suggestions for reducing cost overrun</i>	'Proper equipment and staff' (3), 'control material costs' (1), 'enhance design' (1), 'meet time schedule' (1), 'more qualified staff' (1), 'tight coordination with stakeholders' (1), 'staff training' (1), 'investigate and implement new construction technologies' (1) and 'secure materials ahead of time' (1).
<i>Suggestions for improving stakeholder satisfaction</i>	'Good design' (2), 'allowing for price escalation and variations' (1), 'better staff benefits - two-day weekend' (1), 'good contract administration' (1), 'making good investments' (1), 'proper planning' (1), 'making the right decisions' (1), 'quality-budget-time' (1), 'good roads, quality and services' (1), and 'having better communication and coordination' (1).

5.5 Summary of Phase I Results

This chapter presented in detail the findings from interviews conducted with 20 stakeholders representing the five major groups: sponsors/clients, government agencies, management firms, consultants and contractors.

There is considerable agreement amongst the five stakeholder groups with respect to the key stakeholders in TIPs in UAE, the critical stages of TIPs, the major influence that the key

stakeholders have on project success, how success is defined, how effective key management processes are and how these can be improved. The importance of Communication, Coordination, Decision-making, and Knowledge-sharing as key management processes is emphasized again and again in the responses to various questions during the interviews. It is clear that project success can be enhanced by improving these management processes. The results also show the influence various stakeholders have on project success in the UAE. It would be useful to examine in more detail whether stakeholders' influence in terms of their power, urgency and legitimacy impacts on overall project success as well. This is the focus of the investigation in Phase II which presents an in-depth case study of a mega TIP (see Chapter 6).

The other key findings from Phase I of the study are summarized below. These findings guided the investigation carried out in Phase II.

- Planning and Design are the most critical stages in a project life cycle and overall, government agencies and clients were identified as the most important stakeholders influencing projects in terms of their ability to affect budget as well as their ability to influence planning, and design. In addition, clients and local government were identified as the important stakeholders involved in the critical stages of TIPs for the same reasons.
- 'Minimum Time Overrun' and 'Minimum Cost Overrun' were mentioned by the majority of interviewees as a definition of project success. At the department/organization level a range of different project success measures were being used, with 'Excellent Quality' and 'Minimum Time Overrun' identified as the most common ones. Nevertheless, the most important reason identified for measuring project success by the interviewees was the need to satisfy stakeholders. 'Cost Overrun', 'Time Overrun', and 'Poor Quality' were used by departments/organizations to measure unsuccessful projects.
- Although over 70% of TIPs projects in UAE were considered to have been completed successfully and management practices were considered to be generally good, a variety of responses were given by interviewees as the causes for unsuccessful completion of projects. These primarily relate to ineffective management processes, namely lack of coordination amongst stakeholders, poor communication, unrealistic or poor decision-making as well as interference in decision-making by some influential stakeholders, lack

of a master plan, lack of use of international design and quality standards, lack of a continuous improvement culture and unqualified staff working for various stakeholders.

- Communication was considered to be ‘very critical’ or ‘critical’ to the success of TIPs and interviewees indicated that it was generally effective within their organization/department but there was less agreement amongst the interviewees on effective communication methods. Meetings with minutes and written documents are the main method of communication used. Suggestions for improving communication were establishing communication committees, using electronic communication mechanisms and establishing manuals/procedures for communication. Reference was also made to having a stronger stakeholder commitment, especially at the earlier stages of a project, and giving more authority to those involved in communication.
- There was roughly an equal split amongst the 20 interviewees on how effective coordination was amongst the stakeholders, with half indicating it was ‘effective’ and the other half indicating it was ‘effective to some extent’ or ‘not effective’. Suggestions for enhancing coordination amongst stakeholders again relate to improving management processes as well using new technologies and improving trust and capabilities.
- Although decision-making was generally considered to be of ‘good quality’, almost one-half of those interviewed indicated that it was at a ‘low speed’ and suggested that increasing authority at lower level of organization would improve this aspect of management. A range of other suggestions made relate to improving other aspect of management processes.
- The results indicate that few organizations/departments have appropriate mechanisms for sharing knowledge internally and with other stakeholders. Suggestions made for improving knowledge-sharing again relate to enhancing the key management processes.
- Finally, a range of suggestions were made by the interviewees to improve project outcomes (improve project quality, reduce project time/cost overrun and increase stakeholder satisfaction). The main suggestions centered around the need for employing highly skilled/experienced staff who have competence in the various management

processes and are familiar with the relevant international standard (especially quality standards) and are able to act accordingly at time of crisis (e.g. the global financial crisis).

Phase II of the study builds upon the insights gained from Phase I. Phase II results presented in the following chapter presents a detailed, in-depth case study of a mega TIP.

CHAPTER 6

PHASE II STUDY - THE DUBAI FUJAIRAH HIGHWAY PROJECT: AN IN-DEPTH CASE STUDY

6.1 Introduction

This chapter presents the detailed results from Phase II of the study; the in-depth case study of the Dubai Fujairah Highway (DFH) Project. The in-depth study tools include review of relevant documents, conducting a site visit, interviews with ten key stakeholders involved in the DFH Project, a focus group discussion session involving six DFH Project stakeholders, an interview with the Director General of the Ministry of Public Works (MPW), and an interview with the Minister of Public Works.

This chapter is divided into the following major sections:

- *Section 6.2:* presents an introduction entailing the importance and objectives of the in-depth case study stage of the research project.
- *Section 6.3:* presents an overview of the case study project and a detailed project description extracted from an examination of various documents relating to the DFH Project. Thirteen milestones were identified.
- *Section 6.4:* presents the results of the ten in-depth interviews conducted with key stakeholders involved in the DFH Project.
- *Section 6.5:* presents the findings from the site visit and discussion with four site engineers.
- *Section 6.6:* presents the findings of the focus group conducted on the MPW premises with six key stakeholders involved in the DFH Project.
- *Section 6.7:* presents the results from an interview conducted with the Director-General of MPW.
- *Section 6.8:* presents the results of an interview conducted with the Minister of Public Works.

- *Section 6.9:* presents the shortcomings and lessons learnt from the DFH Project.
- *Section 6.10:* presents a discussion on stakeholder influence on the DFH Project milestones.
- *Section 6.11:* discusses the state of the DFH Project in 2010.
- *Section 6.12:* concludes the chapter with a short summary.

6.2 Objectives of the In Depth Case Study

Case study research aims to provide a detailed understanding of a complex issue or object and can extend experience or add strength to what is already known through previous research (Myers, 1997). Case studies emphasize detailed contextual analysis of a limited number of events or conditions and their inter-relationships. Researchers have used the case study research method for many years across a variety of disciplines. Social scientists, in particular, have made wide use of this qualitative research method to examine contemporary real-life situations and provide the basis for the application of ideas and extension of methods. Phase I of this study intended to address the ‘what’ and ‘who’ questions (see chapter 5). It focuses on questions such as “what are the stages of the project”, “who are the most important stakeholders”, “what are the major reasons for project delay”, etc. Phase II of the study, the in-depth case study stage reported in this chapter, addresses the “how” questions and provides deeper understanding of how project success outcomes have been or are being affected by the management process pertaining to the communication, coordination, knowledge-sharing, and decision-making. In brief, it is intended to reinforce and provide a more thorough understanding of the real situation or circumstances.

The process of developing an in-depth case study approach is defined by the objectives of the research project. The primary objective of Phase II is to understand how key stakeholders (in terms of power, legitimacy and urgency) affect communication, coordination, knowledge-sharing and decision-making; which will eventually impact on the project success.

The detailed procedure relating to the conduct of the interviews, site visit and the focus group are presented in the relevant sections below.

6.3 Overview of the In-depth Case Study

Construction of the DFH commenced in 1999 and the highway was eventually opened to the public in 2012. The project has a very checkered history and was therefore selected as a suitable case for in-depth examination in this research project.

Many files, containing reports and correspondence relating to the DFH Project from its inception to the time when the in-depth case study was conducted were identified. Four major files were considered important in this study and were examined in details. These files are:

1. File A: Project Decrees and Correspondences file from inception up to 2003.
2. File B: Project Decrees and Correspondences file from 2004 to 2006.
3. File C: Project Decrees and Correspondences file from 2007 to 2010.
4. File D: Initial project studies and reports.

The content of the files reflect all the circumstances of the project, the procedures adopted and the difficulties faced at its various stages. Table 6.1 below represents some of the correspondences selected for analyses from project files A, B and C. Each of the files was examined to identify problems and obstacles faced during the various stages of the DFH Project, especially during the planning and design stages; identified as the critical stages in Phase I of this study. Issues relating to communication, coordination, knowledge-sharing (exchange of information and experience among the stakeholders, be they local or federal departments) and decision-making were studied to identify their impacts on project outcomes.

The following sub-sections provide an overview of the DFH Project including its history. Thirteen specific milestones are identified from the documents examined, as listed in Table 6.1.

Table 6.1. Selected Documents from the Dubai Fujairah Highway Project Files

	Ref. File	Date	Document Type	From	To	Subject
1	A	24/2/2003	Decree 67/2003	Ministry of Transportation	-----	Approval for Additional topography design charges and extending time
2	A	19/3/ 2003	Correspondence	MPW	Ministry of Finance	Expected Budget for the proposal of each of 2, 3 or 4 lanes proposals
3	A	12/10/2003	Decree 29/2003	Ministry of Transportation	-----	Approving to increase number of contractors from 2 to 4 and modifying consultant contract and payment schedules.
4	A	18/11/2003	Correspondence	MPW	Ministry of Planning	Attaching the approval of President for 4 lanes extendable to 6.
5	B	4/3/2004	Decree 23/2004	Ministry of Transportation	-----	Approving of additional consultancy fees
6	B	23/3/2005	Memorandum	MPW	Project Committee	Change Order number 6 for consultancy contract
7	B	4/6/2006	Correspondence	MPW	Design Consultants	Change order number 9
8	B	24/6/2006	Decree 64/2006	MPW	-----	Approving change order number 8 regarding consultancy fees
9	C	30/3/2007	Correspondence	MPW	Supervision Consultants	Approving speed limit of 120 km/hr with 3 lanes – Detailed Design request not interfering with current construction works of the contractor
10	C	9/4/2007	Correspondence	MPW	Design Consultants	Notes on construction designs for contracts 1 & 2
11	C	20/6/2007	Correspondence	MPW	Supervision Consultants	Postponing work progress in contract 1 until further notice
12	C	28/6/2007	Correspondence	MPW	Supervision Consultants	Study obligations and redesigns requirements
13	C	29/8/2007	Correspondence	MPW	Design Consultants	Approving design standards changes request and redesign
14	C	18/10/2007	Correspondence	MPW	Design Consultants	Requesting redesign work schedule and related cost estimates
15	C	9/11/2007	Correspondence	MPW	Design Consultants	Redesigns and cost comparison requests
16	C	21/12/2007	Correspondence	MPW	Design Consultants	Change order number 10
17	C	27/1/2008	Correspondence	MPW	Supervision Consultants	Change order for contracts 1 & 2
18	C	10/2/2008	Correspondence	MPW	Design Consultants	Change order number 10 for contracts 1 & 2 – Redesign Work
19	C	28/2/2008	Correspondence	MPW	Design Consultants	Change order number 10 for contracts 1 & 2 – Responsibilities & Contract obligations for Redesign Work
20	C	28/2/2008	Correspondence	MPW	Design Consultants	Change order number 10 for contracts 1 & 2 – Approving redesign work

6.3.1 DFH Project Description

Mega projects are huge undertakings that can cost \$1 billion or more, require resources that run into millions of man hours, numerous stakeholder, an extraordinary amount of interlinks, completion time of five years or more. They usually generate high public attention (Li and Guo, 2011).

Hence, the DFH Project can be considered a unique mega project with an estimated budget of AED 1.43 billion in July 2009. At the start of the project the estimated budget was AED 350 million. The DFH Project involved constructing a new route in accordance with the highest international standards to link the Emirates of Dubai and Sharjah with the Eastern Coast areas of the UAE. This was expected to overcome the serious traffic congestion on the existing Sharjah – Fujairah Road, as well as reduce the travel time between the destinations and minimize the number of road accidents.

Table 6.2 presents a brief comparison between the Meleiha Road statistics and what was initially expected for the DFH. The table shows that the time saved in travel was expected to be almost 30 minutes. Furthermore, significant benefits with respect to safety and environmental issues were also expected from the DFH Project (File D). The aim was to reduce right-angle and rear-end crashes by 80%-100% reduction and to control speeds by Speed Rader Detectors and Early Warning Systems as well as increasing the width of the safety shoulders along the highway. In addition, the DFH Project would benefit residents in many cities by reducing sound, air and heat pollution as it bypasses high density residential areas. Moreover, the DFH Project takes into consideration other environmental issues such as the wild life and the destruction of valleys and mountains. These issues were not considered in the construction of the existing road. (File D).

The DFH design consists of three interchanges and six underpasses to facilitate free movement of traffic through a very tough mountainous area and complicated geological strata. The tough natural terrain necessitated high rock cuts (over 100 meters in some locations), and construction of bridges to avoid existing utilities and high pressure water and gas lines. Accordingly, the DFH Project is deemed to be a very complicated project, but also one of very strategic importance to the nation.

Table 6.2: Comparison between Meleiha Road & the DFH Project (Source: File D)

	Current Meleiha Road	New Dubai- Fujairah Highway
Total Distance	96 Km	84 Km
Speed Limit	80 Km/h	120 Km/h
Trip Time	72 minutes	42 minutes
Car crash reduction	Specific Figures Not Available	Estimated 80% – 100%
Traffic Capacity	3,600 vehicle/h in each direction	6,000 vehicle/h in each direction

After the completion of the design, the DFH Project was divided into two tenders – Contract 1 covering 17.35 Km and Contract 2 covering 22.65 Km of the DFH. The project was tendered at the end of 2003, and both contracts awarded to the one construction contractor in July 2006.

Initially, the DFH was designed for 120 Km/h speed limits, but since the tenders were higher than the initial estimated budget (AED 350 Million), the designer was asked to perform value engineering to reduce the total cost. Among the value engineering attempts was to reduce the design speed to 100 Km/h, however, the estimated cost of this alternative was still higher than the initial budget. Accordingly, the initial budget of AED 350 million was increased. Approximately six months into the construction of the DFH, the Ministry of Public Works (MPW) made the decision to increase the design speed again to 120 Km/h and to construct an additional lane to make it three lanes in each direction. This decision delayed the completion of DFH Project significantly and the total time scheduled for completion of the highway increased by almost four times. This also increased the project cost. In order to reduce the time for completion of the construction processes, the MPW, in early 2009, decided to delete some parts of contracts 1 and 2 and float it in tender 3. Construction included the building of five utility bridges and two high cut areas with a construction cost of AED 423 million. This increased the DFH Project budget from the initial estimate of AED 350 million to AED 1.43 billion.

6.3.2 Project History

During the 1990s, the UAE witnessed a significant increase in activities relating to economic development, tourism, and construction. The MPW identified a substantial increase in traffic movement on the road linking the Eastern Coast with the Western Coast, which passes through many residential, commercial and industrial areas (Etihad, 2010).

The MPW developed a number of plans to facilitate traffic movement as well as to generate economic and agricultural development and open new horizons for business opportunities for the population living in the area. By the end of 1999, the MPW had decided to build a new highway linking the Eastern Coast with the Western Coast of the country. The DFH was intended to serve a number of cities in the Emirates of Dubai and Fujairah including Mileha, Shouka, Aukhdeirah, Kadrah, Asfany, Al Firfar, Al Hayl (see Figure 6.1)

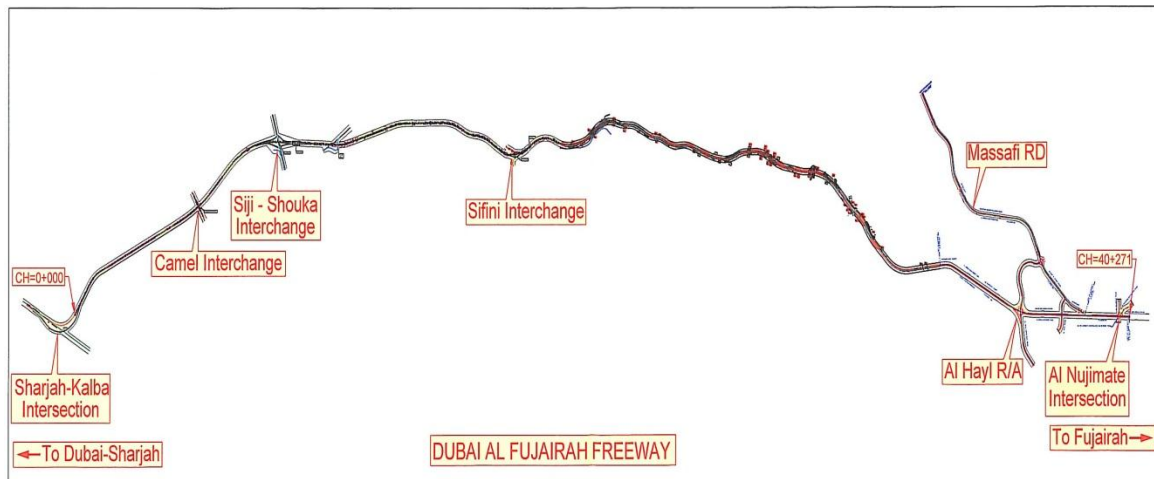


Figure 6.1: Site map showing cities served by Dubai-Fujairah Highway
(Source: File D)

6.3.3 DFH Milestones

Since the inception of the DFH Project, a number of major events have taken place that have impacted on its progress. These include hiring of new consultants, design variations, and re-tendering of contracts. Thirteen different milestones have been identified and these are briefly discussed in the remaining part of this section. Figure 6.2 presents a summary of these milestones.

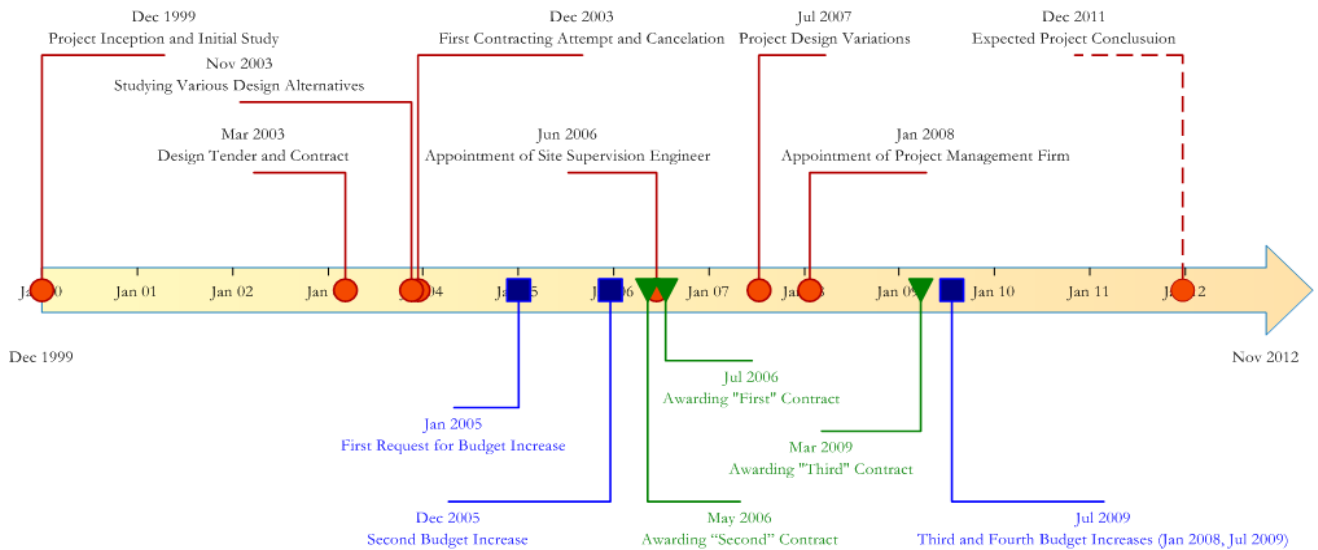


Figure 6.2: Summary of DFH Project Milestones

1. DFH Project Inception and Initial Study: 1999 – 2001

- MPW contracted an initial consultant to provide a feasibility study for the construction of the DFH for an initial cost estimated at AED 350 Million.
- End of 1999: MPW submitted applications for the DFH projects to be included in the federal public budget.
- May 2001: Budget approved by the Ministry of Finance.

2. Design Tender and Contract: 2001-2002

- Tender documents were prepared and the project was floated to a selected group of consultants. Initial assessment indicated that the contract for the design of the

- project be awarded to the design consultant who submitted the lowest bid for two other major projects at the same time. It was subsequently found that they were unable to meet the terms of the DFH contract.
- b. The Permanent Projects Committee (PPC) of the MPW therefore cancelled the existing contract and re-issued a new tender. The project was then awarded to a new design consultant in March 2002 for completion of the design stage.
 - c. Following the award of the project, the Government of Fujairah requested substantial variations to the project, which included the addition of a third traffic lane in both directions.

3. Studying Various Design Alternatives: 2003

- a. March 2003: A meeting was held with the Director of the Office of H.H., President of the UAE, to discuss re-tendering of the project for either two, three or four lanes in each direction.
- b. The scope of the work and estimated cost increased due to:
 - Addition of a ring road around Fujairah city.
 - Construction of a separate interchange at the entrance to Fujairah city.
 - The change of the route of the existing road at Fujairah entrance according to Fujairah government planning.
- c. Due to 2a and 3b above, the MPW decided to divide the DFH project into four new tenders. In June 2003, the MPW sent a memo to this effect to the PPC with approval granted in July 2003.
- d. MPW floated the revised project designs to several consultants and bids were received in October 2003. Recommendations were forwarded to the Office of H.H., the President of the UAE.
- e. November 2003: The Office of H.H., President of the UAE, approved the MPW recommendation and the DFH project design proceeded with two lanes in both directions with scope for future expansion to three lanes in each direction.

4. First Contracting Attempt and Cancellation: 2003

- a. December 2003: The PPC agreed to MPW recommendation to cancel subsequent tenders due to the excessively high bids, compared to the consultant's estimates. The PPC also issued a new tender after studying other economic alternatives and obtaining approval from the Ministry of Finance to increase project cost.
- b. December 2003: MPW requested approval for an increase in project cost and for the successful bidder from the Ministry Cabinet which was subsequently obtained.
- c. December 2003: The successful bidder then informed the MPW that their costs would increase after the legal closing date of December 29, 2003.
- d. December 2003: MPW informed the PPC of this matter, but no response was received from the Ministry, and the bidding company subsequently withdrew their bid.

5. First Request for Budget Increase: 2004 – 2005

- a. Another attempt was initiated by MPW in 2004 to re-design the DFH project to reduce total cost. The suggestion was made to only have two construction contracts instead of 4. This involved cancelling the upgrade of the existing roads, the reduction of the speed limit to 90 km/h, instead of 120 km/h, and various other matters. The project cost after redesign was still higher than the allocated funds available.
- b. January 2005: The PPC sent a letter to the Ministry of Finance seeking an increase in project cost from AED 350 million to AED 500 million, stating the actions taken by the MPW to reduce the project cost.

6. Second Request for Budget Increase: 2005 – 2006

- a. June 2005: MPW again floated the revised construction tenders.
- b. September 2005: The successful bidder was chosen.

- c. December 2005: MPW informed the PPC of the award of the tender and requested an increase in project cost from AED 350 million to AED 872.6 million, according to the lowest bid submitted.
- d. January 2006: The Ministry Cabinet and the Ministry of Finance agreed to the increased budget.

7. Awarding “Second” Contract: 2006

- a. May 2006: The successful bidder was awarded the contract and the site handed over to the nominated construction company.
- b. However, because the Sharjah Government requested new variations to sections located in the Emirate of Sharjah, the tender was again cancelled.

8. Appointment of Site Supervision Engineer: 2006

- a. March 2006: The engineering consultant requested a review of fees for supervisory staff, arguing that since many years had passed since awarding the initial contract and local costs had increased substantially.
- b. The MPW refused to review the fees, and in May 2006 it was agreed with the engineering consultant to float the supervisory work of the project in a new tender. Subsequently, a new supervisory consultant was appointed.

9. Awarding “First” Construction Contract in 2006

- a. April 2006: Tender No. 1 was again issued and awarded to the successful construction firm. The site was handed over to the construction contractor in July 2006.
- b. During the supervision of the project works, the engineering consultant raised many issues related to the project design. The acute horizontal and vertical curbs with a design speed of 90 km/h, was highlighted as potential safety and security hazards for road users.

10. Project Design Variations: 2006-2007

- a. November 2006: MPW senior management decided to yet again re-design the DFH Project. These changes included new design requirements, project financial measures, and time constraints. Parts of the project that were already completed or currently under construction continued without change to avoid any further delays, and minimizing potential variations where possible.
- b. MPW recognized that the time required for redesign would likely jeopardize the entire project. Many options were considered in the selection of a supervisory consultant, having full knowledge of the necessary project works in order to minimize time.
- c. July 2007: Project design was then reassigned to the final construction consultant.

11. Appointment of Project Management Firm: 2008

In January 2008, the MPW finally agreed to appoint a project management firm to oversee the entire project execution. Several concerns were raised by the construction contractor and engineering consultant on the role of the management firm (issues surrounding these comments are discussed further in the site visit and observation in Section 6.4.5).

12. Third and Fourth Budget Increases: 2008-2009

Due to the many variations to the DFH project design and some additional works, especially the increase of the number of the road lanes, a request was submitted to increase the budget from AED 872.6 Million to AED 1.226 Billion. This request was approved by the Cabinet Ministry and the Ministry of Finance in January 2008. The cost was again increased to AED 1.43 Billion in July 2009.

13. Awarding of “Third” Contract: 2009

Due to the repetition of the project re-design works accompanied by delays, modifications and substantial variations in the requirements of the Utilities or Services Departments, the MPW decided to take action to reduce the impact of the claims, delays and variation. Major variations, including new utility bridges, were

combined into a new construction tender and floated in March 2009. The contract was awarded to the lowest bidder.

These thirteen milestones outlined above will be referred to again in this chapter when stakeholder influence is discussed (see Section 6.10). The next section presents the findings from the interviews conducted with key stakeholders in the DFH project.

6.4 Interviews Conducted with DFH Project Stakeholders

6.4.1 Procedure

With the assistance of the Roads Department of the MPW, a second questionnaire was developed and interviews were conducted with ten key stakeholders who had played a substantial role in project work execution or in executive decision-making for the DFH Project especially during the planning and design stages.

At the beginning of the interview, the researcher explained the purpose of the interview, the objectives, and the importance of this study and its advantages to the UAE community. In addition, the researcher confirmed the confidentiality and the privacy of the interviewees' opinions on the various issues raised during the interviews. The researcher was particularly keen not to put pressure on the interviewees during the interviews with full freedom to express themselves. Written consent was obtained from all interviewees. The interviews were digitally recorded, and subsequently analysed using the NVivo software program.

6.4.2 Interviewee Identification and Profile

The interviewees were selected from stakeholders who were considered to possess the three attributes of legitimacy, power and urgency in different combinations and to varying degree. For example, interviewees representing government agencies and MPW (client) possess power, legitimacy and urgency, while those representing management firms possess urgency and legitimacy. On the other hand, interviewees representing contractors and consultants possess urgency and legitimacy. Since all interviewee groups

possess two or three attributes, based on the stakeholder theory, they are therefore considered important stakeholders.

The DFH Project commenced in December 1999. Some of the staff involved in the very early stages of the project were unfortunately not able to be interviewed as there had been many changes to the structures of the organizations involved in the DFH Project. Several organizational changes were introduced at the federal level (MPW) and the local levels (municipalities). Furthermore, the modifications to the design of the project and the tendering at the various stages resulted in difficulties in identifying suitable staff for interviews. Table 6.3 lists those stakeholders finally selected. They represent sponsors/clients, government departments, project management firms, consultants and contractors.

Table 6.3: Key DFH Project Stakeholders Interviewed

Participant	Stakeholder Category	Title
1	Sponsors / Client	Director of Road Department
2		Head of Project Planning Department
3		Executive Director of Work Affairs
4	Management Firms	Head of Road Department
5		Senior Planning Engineer
6		Liaison Engineer
7	Consultant	Director: Transport Division
8	Contractor	Project Management
9	Governmental Agencies	Executive Director of Electricity
10		Director

All ten interviewees held senior management level positions and continued to play a key role and influence the flow of work relating to the DFH Project. All but two of the ten interviewees were males, with one female project manager and a female utility executive.

Overall, eight of the ten interviewees were directly involved in the management of activities of the DFH project. More specifically, two of the interviewees were involved in

the construction activities, two involved in the design activities, and two in the planning activities. The role of the interviewees within their department (sorted from most to least common) varied between the management of construction, design review, management of design, detailed design, planning studies, and tender document review.

The interviewees exhibited good understanding of the research work, and were cooperative, willing, and happy to share their own experience and knowledge of the project. Names of individual interviewees have been withheld to ensure their confidentiality.

It is worth mentioning here that in responding to the questions asked, some of the interviewees provided more than one response. The interview questions are presented in Appendix B.

The following sub-sections present the findings from the stakeholder interviews conducted. A number of quotes are used in presenting these findings. The reference number given at the end of each quote relates to the specific interviewee. This is done for reasons of confidentiality.

6.4.3 Planning and Design of the DFH Project

All ten interviews fully agreed on the importance of planning and design stages on the success of the DFH Project with one staying: *“If you have the proper planning and design, I don’t think you face problem in future”* (Ref: WS310019)

Two major reasons stated identified planning and design as important. These included: ‘to avoid problems during construction’ (mentioned by five interviewees) and ‘better view [of the project] and estimations [of cost] (mentioned by two interviewees). Other reasons mentioned related to ‘reduction of risk and costs’: *“To minimize risk; it will affect the execution, so the contractor will not be stopped”* (Ref: 171220091) *“The construction cost would be much reduced having all details in front of him in tender documents”* (Ref: WS310012).

Three interviewees indicated that design and planning ‘affected project completion duration’ while another three indicated that design and planning can have ‘negative effect with respect to time and budget’. Specific responses in this respect included: “... *You have to design it correctly otherwise you will face so many problems during construction of any project.*” (Ref: WS310016) “*It is too hard to change once you have a contractor working on the site, if we have proper design from the beginning and proper planning, we will have bigger view and better estimation*” (Ref: WS310002).

With regard to how design and planning of the DFH Project might have affected the project budget, three interviewees indicated that ‘the budget was multiplied’ and two interviewees referred to ‘inaccurate budgeting’. “*If we have done this project 3 years ago I think it will less than half or the government would have paid less than half*” (Ref: WS 310024). “*It will be [AED] one billion and 800 or 600 thousand. Of course negative effects*” (Ref: WS310019).

On how design and planning of the DFH Project might have affected the duration of the project, two of the interviewees stated that ‘appropriate design defines cost and budget’ while two interviewees referred to ‘time being longer’. Other responses relate to ‘negative effect’, ‘no planning’, and ‘unnecessary project halts’. A specific response included: “*The project went into hold for around couple years... another dilemma started to happen due to the long hold... the construction prices went up... it was very high inflation... pretending using less criteria*” (Ref: WS310022).

With regard to how design and planning of the DFP might have affected project quality, two of the interviewees referred to ‘lowering specifications to cut the cost’. However, another two interviewees thought that ‘quality is better as design speed is higher’. Other opinions related to ‘appropriate design defining quality levels’, ‘quality not particularly being affected’, and ‘there being no adequate planning’. Specific responses from interviewees included: “*They want to construct something within the available budget that’s why they go with lower criteria*” (Ref: WS310002). “*They reduce criteria and the speed because of the budget limitation. If we did not put the budget constraint on the*

design, we would go for a good design. ... I think even the quality would be better.” (Ref: WS310002) *“Reduce scope of work/ criteria and higher cost”* (Ref: WS310022).

6.4.4 Importance of Stakeholders

The Interviewees stated that the important stakeholders involved in the design and planning stages of DFH Project are: ‘the local authorities’ as indicated by nine interviewees, ‘the MPW’ as indicated by eight interviewees, and the ‘utility service firm’ as indicated by six interviewees. Contractors, consultants, community users and financial institutes were ranked lower (by five interviewees or less). *“Local government would be the main stakeholder”* (Ref: WS310019) *“It is the local government. Utilities authorities also affect our project.”* (Ref: WS310002) *“Fujairah people and Fujairah Municipality are the important stakeholders”* (Ref: WS 310024) *“Fujairah government... probably the contractors... Ministry of Public Works, they are the technical authority... financial ministers”* (Ref: WS310012).

When asked to indicate how they measured stakeholder importance in the DFH Project, there was some agreement amongst the interviewees with three issues: ‘stakeholder’s ability to accept or reject’, ‘ability to affect financial decisions’, and ‘ability to affect project execution’. Other responses related to ‘stakeholders’ amount of contribution to the project’, ‘decision-making’ and finally the ‘influence on the project’. Specific comments in this respect included: *“They have to decide and give an approval for the certain things in all stages, either they will accept certain things or they will reject certain things.”* (Ref: WS310019) *“Because they can take the decision”* (Ref: WS310023) *“They affect the decision-making by the end of the day, affects the completion”* (Ref: WS310022).

6.4.5 Success Level of the DFH Project

Five of the interviewees indicated that the project would be successful after completion. Others indicated that it is a ‘strategic project’ (four interviewees) and that it ‘enhances transportation mobility’ (three interviewees) Specific comments included: *“There is no failure of this project, it’s only a success. You cannot say financial or economical or*

social, it is all these together” (Ref: WS 310024). “I hope it will be success as it will shorten (the time) to reach Dubai and I think it’s avoiding traffic in Sharjah. As strategic idea, it’s success.” (Ref: 171220091). “It is a successful project... creates a shortcut to Fujairah... it will help people to reduce the distance” (Ref: WS310002).

However, three interviewees indicated that the project in its current status was not successful. One of them commented: *“It would be unsuccessful, if I consider the delay, and exceeding the budget. But I think it would work”* (Ref: WS 310024). Other negative comments relate to budget and time being exceeded (two interviewees), and planning and design not being up to the standards (two interviewees).

6.4.6 Department/Organization and Interviewee Success Measures

In response to the question on what were the success measures of the organization or the department used in the DFH Project, seven interviewees referred to both ‘meeting budget’ and ‘meeting time schedule’ while six also referred to ‘good quality’. Other success measures used included ‘good coordination and communication within the Ministry’, ‘stakeholders satisfaction’, ‘competent and experienced client and consultant staff’, ‘proper planning and scheduling’, and ‘proper construction management’. These were each selected by three of the interviewees. All interviewees fully agreed with the organization success measures used in DFH Project. One interviewee commented on the importance of financial measures: *“Financial reason was very important... if we don’t do enough profit that reasons to say project successful or failed.”* (Ref: WS310022).

The interviewees’ opinions on the most appropriate measures of success included: ‘stakeholders’ satisfaction’ (six interviewees) and ‘quality’ (five interviewees). ‘Cost and Budget’ (three interviewees) and ‘meeting time schedule’ (two interviewees) were less regarded. One interviewee stressed that the success measure should include ‘importance to the end user’.

6.4.7 DFH Project Time Overrun

Several interviewees were apparently unaware of the project time schedule as this is clear in their response to the question on the difference between the scheduled and the actual

DFH Project duration. While, five of the interviewees thought that the project time had ‘almost doubled’, four interviewees did not provide a clear answer to the question.

The reasons for delay as indicated by the five interviewees referred to ‘design changes’ (five interviewees), ‘mixed client instructions’ and ‘technical issues’ (three interviewees). ‘Improper design and coordination’ was referred to by two of the interviewees. Also, two of the interviewees referred to the DFH Project being intentionally slowed down by the stakeholders to ‘upgrade and achieve better benefits’. Specific comments from the interviewees included: *“They need to slow down on the process of something to upgrade it to have more benefit from it.”* (Ref: WS310018) *“Delay is working against nature on the mountain. Also the order from H.H. Sheikh Khalifa to make 3x3 than initial work was 2x2”* (Ref: WS 310024) *“Changes in design and the requirements of the local authorities”* (Ref: WS310012).

Other responses from the interviewees for time overrun relate to ‘slow approval from service authorities’, ‘unavailability of budget’, ‘inexperienced personnel of consultant and contractor’ and ‘added items or variations (e.g. utility bridges)’. In this respect, one of the interviewees commented: *“Unavailability of the budget, technical issues behind it, and changes in instructions”* (Ref: WS310002). Suggestions for reducing time overrun related to ‘hiring an additional contractor’ (three interviewees), and ‘accelerating work’ (three interviewees). One interviewee’s comment was: *“Split the work between two different contractors to accelerate the construction completion that they have already done [and] re-tender of the work for completion”* (Ref: WS310002).

6.4.8 DFH Project Cost Overrun

In response to the question on how large the difference was between the actual and the expected project cost (budget), three interviewees thought that it had ‘doubled’ while another two thought correctly that it had increased by ‘a factor of four’. One interviewee thought that the difference was very ‘big’, with one providing no clear answer. Specific figures mentioned were: *“Doubled, it was 500 million, now it’s 1 billion. So it is doubled”* (Ref: WS310002); *“I think they started 350 to 800 [now] to 1.12 to 1.43 [billion]”* (Ref: WS310012). Responses to the cost overrun question were quite

astonishing in terms of how they thought the cost had varied. Given that these interviewees have a managerial role and a thorough knowledge of the project, it was expected to get a clear response on this question.

Reasons identified for exceeding the project budget included: ‘changes in design and requirements’ (six interviewees), ‘changes in federal government requirements’ (three interviewees), ‘inadequate planning study’ (two interviewees) and ‘inflation’ (two interviewees). ‘Lack of experts’, ‘conflict with utility services’, ‘material cost increases’, and ‘under-estimate of needed resources for project in a difficult mountainous area’, were also highlighted. Some of the specific comments made included: *“Two things as stated before: lack of coordination, experts and gaining more benefit for stakeholders”* (Ref: WS310018), *“Redesign and cost of more cuts in mountains”* (Ref: WS310003), *“From additional requirements; design was two lanes..... Recognized it should be three lanes”* (Ref: WS310023), and *“There was like couple of years stop in the project life...The inflation... the budget from the beginning... wasn’t correct”* (Ref: WS310022).

Three interviewees indicated that cost overrun could not be reduced. One of them commenting: *“I am afraid, this is the best cost we have”* (Ref: WS310002). However, two of the interviewees indicated that cost overrun could have been reduced by proper attention to the first stage of the project. Another suggested that cost overrun could have been reduced by minimizing conflicts with service utilities, while another suggested that the use of new construction technologies could have contributed to reducing cost overrun.

6.4.9 DFH Project Quality Level

Five interviewees suggested that the DFH Project exhibited a ‘good’ quality level while another indicated that the project was of ‘medium’ quality level. The remaining four could not comment on the quality level as they felt that they were not directly related to site activities.

Suggestions made by the interviewees to improve the quality level of the DFH Project included: ‘quick decision-making by the client’ (two interviewees), ‘better specifications’, ‘better safety consideration’, ‘proper management and supervision of

staff”, ‘introducing risk management analysis’, ‘better accessibility (through tunnels)’, and ‘accountability issues’.

6.4.10 Stakeholders Satisfaction with DFH Project

Consultants and the client were identified by two of those interviewed as the ‘stakeholders contributing most to the cost and time overrun’ of the DFH Project. Local authority was also mentioned by one of the interviewees: “*Unclear local authority requirements, Lack of consultants experience*” (Ref: WS310002).

There were mixed responses to the question relating to the level of stakeholder satisfaction. Two of the interviewees indicated ‘satisfied’, three noted ‘satisfied to some extent’, and two claimed ‘unsatisfied stakeholders’. Reasons given for the satisfaction level identified included: ‘time and budget overrun’ (two interviewees); the ‘strategic nature of the project’, ‘variation in schedule and extra claims by the contractors’, and ‘the relationship between the client and the higher authority’ as reasons that affected project delays’.

6.4.11 Management Concerns in DFH Project

Interviewees indicated several management concerns or deficiencies in the implementation of the DFH Project including ‘budget variation’, ‘coordination’, ‘communication’, ‘decision-making’, and ‘knowledge-sharing’. Others included: ‘deficiencies in early project stages’, ‘lack of experts’, ‘technical abilities of client staff’, and ‘poor safety’. Specific responses in this respect are: “*You have to choose correct person to manage the project. So, choosing the correct consultant and choosing the project managers*” (Ref: WS310018) “*Lack of coordination and expert*” (Ref: WS310018). “*The technical background of the client.....*” (Ref: WS310022). Interestingly, three of them indicated no concerns at all.

Seven of the ten interviewed thought that these concerns are also valid through the planning and the design stages of the DFH Project. One commented: “*Yes, not only through planning and design stages but to the completion of the project*” (Ref: WS310018).

6.4.12 Communication in the DFH Project

Meetings, written correspondences, and telephones were considered the most common communication methods used in the DFH Project. Six of the Interviewees confirmed that communication was ‘effective’, and another thought it was ‘not effective’ commenting: *“You can see it from the project how many years passed and how much is the progress”* (Ref: WS310018). The remaining three interviewees did not respond to this question.

Suggestions to improve communication of the DFH Project included ‘weekly meetings and site visits’, ‘allowing emails’, ‘communication with high level authorities’, ‘a committee of all stakeholders’, ‘public hearing’, and the ‘stakeholders’ commitment to communication policies’. A specific comment in this respect is: *“You can involve the stakeholder that you feel it will affect the completion and performance of the project about your milestones that we would share because for me to achieve the completion we should communicate”* (Ref: 171220091).

6.4.13 Coordination in the DFH Project

The level of coordination among important stakeholders in the DFH Project was expressed equally as ‘satisfactory’, ‘good’, and ‘very good’ by the interviewees. Only one interviewee indicated ‘poor’ level of coordination, commenting: *“Coordination comes when there is a matter which benefits the stakeholders”* (Ref: WS310018), meaning that many of the stakeholders had not benefited due to poor or no coordination. Two interviewees further suggested that ‘inappropriate coordination amongst stakeholders had caused major delays’.

Suggestions to improve coordination related to ‘establishing a committee’, ‘documenting project-related approvals’, ‘early definition of requirements’, ‘establishing MOU’s for data exchange’, ‘introducing a non-confrontational alliance contracting system’ and ‘resolving communication problems between federal and local authorities’. A specific comment was: *“Something like alliance contracting ... where both the contractor and the client ... and the consultant share one office and they work together”* (Ref: WS310001).

6.4.14 Decision-Making in the DFP

Most of the interviewees agreed that the ability to make quality decisions was crucial for the success of the DFH Project. One thought this to be ‘very crucial’, three indicating it is ‘crucial’, and another three indicating it is ‘crucial to some extent’. Specific comments received were: *“I think they make it [decision-making] as soon as they think it is a decision. They do hesitate to make the right decision in the right time”* (Ref: WS310024). Also, *“The decision is being made very quickly on most things, things that require the upper authority – like budgeting”* (Ref: WS310012).

Suggestions to improve decision-making of the DFH Project included ‘commitment and follow-up’, ‘proper planning’, ‘decision-makers visiting the site’, ‘delegation of authority and power’, ‘competent, professional and experienced staff’, ‘building a solid management team’, and ‘consideration of alternative designs’. Comments to this effect included: *“Professional and experienced staff on both the consultant and client [side]”* (Ref: WS310012), *“Establish closed committee to the project and having meetings at site, and proper planning”* (Ref: WS310019).

6.4.15 Knowledge-sharing in the DFH Project

On the extent of knowledge-sharing among stakeholders, five interviewees indicated that it was ‘good’, three indicated it to be ‘satisfactory’, and two indicated ‘poor’. Documents and reports, meetings, and Q&A sessions were considered to be the most common knowledge-sharing methods among the stakeholders involved in the DFH Project. *“We try to give them whatever we can”* (Ref: WS310024).

Suggestions to improve knowledge-sharing included ‘creating a database’, ‘productive meetings with targets and goals set’, ‘weekly meetings’, ‘involving media throughout various project stages’, ‘sharing project management tools’, ‘changing contracting arrangement (from confrontational to alliance)’, and ‘forming committees involving the MPW and concerned local authorities’. Specific comments in this respect were: *“I ask the Ministry to make like small committee between two parties on regular basis”* (Ref:

WS310024), and “*To organize meetings you can share knowledge... where there is a productive schedule there is a goal achieved*” (Ref: WS310018).

6.5 On-Site Visit and Discussion

After digesting the results from the interviews of the ten senior executives and the historical documentation, it was apparent that there would be considerable benefit from conducting a site visit and observing first-hand some of the issues raised to date. This section deals with the observations collected from the discussions at the site with senior construction staff as well as discrete observations made by the research staff.

6.5.1 Introduction

As noted earlier, Zuker (2004) claimed that observation techniques have been used successfully in a variety of disciplines for collecting data about people, processes and cultures in qualitative research. Observations coupled with interviews have been widely utilized to evaluate many physical aspects of various environments. In this research phase, site observation was included as one method of collecting information on the case study project, given that it is considered a significantly accurate and subjective data collection tool (Kawulich, 2005).

Observation typically involves data gathering from watching behavior, events, and/or noting physical characteristics in their natural setting. Observation can be overt where everyone knows they are being observed, or covert where no one knows they are being observed and the observer is concealed (Myers 1997). One major benefit of covert observation is that people are more likely to behave more naturally when they are unaware they are being observed. In this research, to satisfy the research ethical considerations, however, only overt observations were considered.

Observations can also be either direct or indirect. Direct observation is when one watches interactions, processes, or behaviors as they occur, while indirect observations are when one watches the *results* of interactions, processes, or behaviors (Myers 1997). In this research, both direct and indirect observations were used.

6.5.2 Site-Visit Procedures

In setting up the study, the researcher discussed the arrangements for a site visit with the MPW. The purpose was explained in detail and their approval was obtained. The objective of the visit was to understand how the execution of the project is affected by the decisions made by the key stakeholders as well as the day-to-day decisions made on-site.

The researcher also explained the rules outlined by Monash University for site visits in that they should not disrupt any work without the agreement of the organizer or the person in-charge at the site. Not to breach construction activity and people's privacy, the researcher limited when and for how long the workers were required for discussion and no names were kept. The site visit involved the student and one of the supervisors, and was conducted on June 27, 2010. It lasted approximately two hours. The site visited was part of contract No. 2 activity.

Photographs were taken of the project progress to date for record keeping. An example of these photos is presented in Figure 6.3.

In addition to the site observation activities, the use of machinery, and other labor movements, the visit also included a 60 minute open discussion forum with four site engineers. Three of the four site engineers were Resident Engineers (RE) of the project, while the fourth was a Deputy Resident Engineer. The visit also included a walking tour of the construction site, and a short meeting with the contractual engineer.

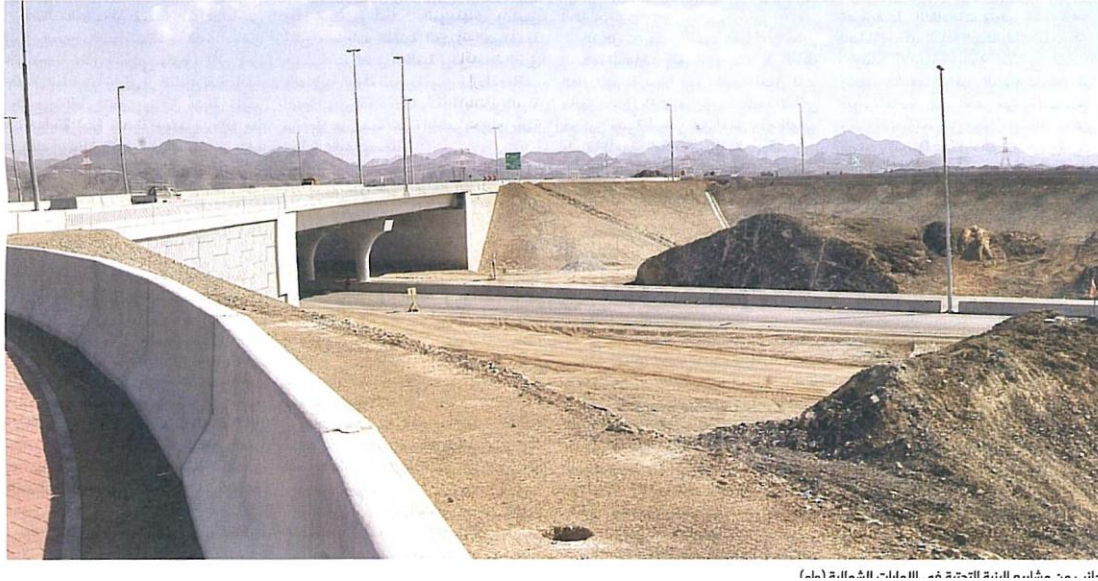


Figure 6.3: Photograph of Typical DFH Project Site

6.5.3 Site Visit Discussions

The open forum discussion started with a brief introduction of the study objectives in general and the requirements of the Ph.D. program at Monash University. Assurance of the confidentiality of the information to be collected was raised, along with a brief statement on the purpose of the site visit, and the questions for discussion. These included:

1. When you are faced with an issue, how long do you have to wait for an answer, specifically when a response is required from the client/consultant/project manager?
2. Can you make any decisions yourself? If yes, give examples of the decisions made and implemented.
3. What decisions can you not make yourself? Give an example.
4. How do you share information with others on the site? How often is this done? How effective has this been?
5. What changes would you like to make to improve site operations? Why are you not able to make these changes now?

6.5.4 General Comments

The open discussion forum proved to be very interesting and informative. Several insights are gained from the discussions and the site observations. Among the most important responses, there was a general impression that the project was experiencing unnecessary delays due to the project management firm organizing the project:

- *Communication with the client involved more time due to the management firm's intermediate role;*
- *The project progress would be much faster without the management firm; and.*
- *No particular system is used for knowledge transfer on site.*

Following is the detailed qualitative analysis of the open discussion forum.

6.5.5 Decision-Making of the Client and Project Management Firm

On the question relating to how fast and effective is the decision-making from the client, the responses were mostly negative, particularly relating to the appointed project management firm. Decision-making takes more time with no direct interaction with the site engineers. This was particularly attributed to the unjustified role of the project management firm in the DFH Project. This is further illustrated in the quotes presented below:

“Before, there was no project manager [firm], our communication was directly with Ministry [client], we were getting decisions faster than now. The liaison engineer [of the client], we were discussing directly with the liaison engineer, two or three days we were getting confirmation to go ahead. Now, it is a little more difficult, we are going to communicate with the project manager, who in turn will communicate with the client. Since the appointment of the project management engineer, we did not get direct decision-making from them [the project management], their engineer says I have to check with the Ministry.”

“It [the project management firm] might be considered as an additional project management. If you compare, if you have a decision-maker [on site], like a senior liaison

engineer from Ministry on site, you can explain to him the issue, whether it is a variation, and he can decide, like what we were doing in Dubai for example with RTA [Road Traffic Authority], you can send a letter, confirm based on the verbal discussions, one, two, three, done. This the fastest way”.

‘We [the consultant] are not the designers; the design is done by WSP. We cannot contact the designer directly; we have to go all around. We seek permission from the liaison engineer, we explain, he [the liaison engineer] can call directly; he can call the designer to come for a meeting, or to solve it with him. It was very easy before. Now, we have to go to the manager, to the employer, then to the designer, and we are waiting for the designer [to respond]’

The above quote clearly indicates deficiencies in the communication among the various stakeholders in DFH Project.

“There is another point; the contractors have risen, officially. They have reservations against the role of the management firm. Who is this [management firm]? It is not defined in the contract. We [the contractors] know the employer, we know the engineer representative [the consultant], who is party in the middle; we will not take any instructions from him [the management firm], we will not listen to him, he is just an advisor to the client”.

This quote indicates the level of stakeholders’ satisfaction. Clearly there were some concerns on the role of the project management firm. Some issues were also raised on the “contractual” aspects arising from the fact that the project management firm was brought to the project at a very late stage. Typically, the project management firm is most valued at the early stages and in the contracting stage of the project. In the DFH Project, the project management firm was brought in after all parties were in place. This created some contractual issues with the pre-appointed consultants, site engineers, and contractor as indicated by the above response.

On a question regarding the client’s (MPW) justification of adding the project management firm, responses highlighted project difficulties, design variations, and

inadequate client's staff. One response highlights this: *"I think because of the difficulties in the project, and they found many changes in the design, the discussion times, the variations, they [the ministry] said, "may be" the staff [Ministry staff] is not sufficient, we will bring a project manager who will manage"*

One of the site engineers indicated denial of such justification indicating that the role of project management firm can be fully handled by the existing parties. *"This can be done by the engineer [the consultant]" "Also, it is a link. The decision is not fast, the commercial, even the technical, they are not making decisions"*

6.5.6 Client Interaction with Site Engineers

It was claimed that the client's commitment to the project can be particularly captured by the frequency of the site visits, and the direct interactions with the work progress activities. A question was raised on the frequency of the client (MPW) engineers visiting to the site. The responses indicated few site visit activities by the client engineers since the appointment of the project management firm in early 2008. This is again illustrated in the two quotes below:

"Just to explain, actually at the beginning there was a committee from the Ministry that included many engineers. At that time, there were many engineers from the Ministry, coming and meeting. Now, the committee stopped working, starting with the new management firm, which is involved and responsible for everything, and to be the [management firm is the] link with the employer [the Ministry]. Now we have only one engineer from the Ministry, in connection with the management [firm] most of the time, not with us. Sometimes he attends the meetings"

"We feel that the system of RTA is the best, because the client/employer has his own engineers [on site] and directly deal with engineers. So everything can be finalized within a telephone call, which can be confirmed within an official letter within five minutes"

6.5.7 Decision-Making on Site

The Site engineers were asked about what decisions can be made on site and whether consultants can make such decisions or whether they have to wait for approvals from the client or project management firm. The responses indicated limited authority given to the site engineers:

“From our side, as a consultant here, we approve the contractors work, and some simple “things” that are not affecting the cost, the final cost and the time. Any decisions that might impact cost or time should come from employer”

On another question regarding interfering with the decisions made, the responses highlighted that there was no interference (within the given authority of decision-making) *“Since it is within the specifications, within the contract, [there is] no interference”*

Final approvals or decisions regarding variations or aspects of re-design are taken by the client (MPW). This indicates no authority and implies project delays as explicitly stated by one of the site engineers: *“It should be studied and proposed by the engineer, and to be approved or disapproved by the client. Even if the engineer gives the approval, the final approval should come from the client. Like now, in contract 1 or 2, the engineer gave the approval that the contractor is eligible for extension of time. Till now, we did not get the final approval from the employer. The employer is studying also.”*

6.5.8 Communication with other Stakeholders

As indicated earlier in the project history section, the DFH Project has two consultants; one for design (Consultant 1) and one for site supervision (Consultant 2). This necessitated intensive and effective communication mechanisms to be in place so that frequent queries on design issues, drawings etc. could be handled. Responses to the question on how easy it is to communicate between the site supervisors and the design consultant, indicate that direct communication is difficult:

“Actually we created in contract 3, I was there earlier, I created a short cut, I called and sent emails [with the designer], but it is not allowed. This is for specific cases that were very urgent, and I had to inform the project management that I called.”

Further responses indicate that the client was not in favor of communication among the two consultants. Issues of design liabilities need to be strictly observed by the client. Apparently there have been several serious issues and concerns with the existing design. Responses also indicated that the initial design and the accompanied studies were not totally accurate. This was illustrated in the following quotes:

“And even now we have a case from the project management. They say forget about the designer. I think there is a dispute between the Ministry and the designer, so they said forget about the designer. We have to find solutions by Consultant 2. And, they is saying this has liability issues. We cannot come and make modifications to the design of somebody else. Then, where is the liability issue!”

“A second issue I would like to highlight here. I think the main problem in this contract is that the design in the previous stages was not given the appropriate time and importance. What happens; it is all like this. Consultant 1 gave the initial design, and then the Ministry started the work, then they [the Ministry] found (at the site) that this is not the appropriate design, not the most optimum, so they started the revisions, which make all these delays, variations, all these consequences, differences in our jurisdictions, resolving claims from our contractor.”

“This is I think the main issue, plus the designer did not study the nature of the mountains, the geological strata, the nature of the rocks, so when the contractor started cutting, failure and collapse of slope rocks happened, this mean the template or the slope that he [the designer] proposed to cut the site was not studied properly; it is just random template was given. So this resulted in requiring re-profiling; another cut which is a variation, more quantities, more time.”

“I could not find for example any boreholes, any study for geological strata of the mountains that the freeways are going through. Nothing. So this indicates a lack of proper and comprehensive study.”

6.5.9 Suggestions to Improve Decision-Making and Communication

To overcome the communication and decision-making problems, suggestions included having a client liaison engineer on site (instead of the project management firm). *“As from our experience before, this project and other projects, if you have only liaison engineer, it is much easier.” “I will say one word. Straight line is the best. It is the shortest. [Implying the issues of the project management’s additional communication efforts]”*

Other suggestions included the education and training of the client’s managerial staff, especially those responsible for contracting and purchasing. Also, having a contract manager and a quantity surveyor associated with the consultant was considered useful. *“If the client upgrades his staff in management, in contracting and purchase departments, plus the engineer [consultant] should upgrade his staff to have a contract manager or senior QS [Quantity Surveyor] who can review the claims and variations,, which I believe is the most perfect one. This team of the engineer [consulting] with the team of the client can discuss, agree, with the minimum type and proper setup.”*

The only justified role of the project management firm was the presence and role of the senior quality supervisor. As such, hiring the QS with the consultant may result in resolving many communication issues and facilitate decision-making. This is reflected in the following quotes: *“May be the presence of the senior QS to filter the claims before the client is the only positive thing about the project management” “... [the QS] can be added to the engineer [consultant], even the same person who is now in the same firm [project management]. If the same person can be assigned here within the engineer [consultant], he will do the same job. Then, he will discuss with the client or counterpart of the client side”.*

6.5.10 Knowledge-sharing in DFH Project

On knowledge-sharing mechanisms within the same stakeholder group or among the various stakeholder entities, the site supervisors' responses indicated that such systems did not exist:

“As sharing with our selves, no sharing like that. But as experience from projects, it is up to them the Ministry. As I know, they get some experience from this project and they reflected to other projects when they tender the new ones, when they start, how to deal with designer, like in the future, Ministry now is going to make the designer and the engineer [consulting for site supervision] as one, not two parties, to avoid this difficulty that we face now.”

6.5.11 Work Resources Availability

Throughout the site visit, the researcher noticed several construction activities on site at different locations. To the researcher's knowledge, the resources available on site (labour and machinery) were adequate to progress the construction activities. This was confirmed by the site supervisor [consultant] who was asked about issues [if any] they have with contractors' resources. The responses indicated no issues or concerns with any of the contractors' resources: *“Actually everything is good”. “Manpower and machinery are more than the required.”*

6.5.12 Project Execution Delays and Reasons

According to the site supervisor consultant, the work progress experienced delays with respect to the schedule stated in the project's three contracts. *“In contract 1 and 2, there is extension of time, and it will be approved or I think it will be approved. In contract 3, one year ago it started, and it got some delays in one of the bridges because of the redesign [the issue of the utility line], because of the conflicts we had at site with the water pipe, and gas line, so we had to shift the piers [of the bridge] and it takes some time for redesign. This is the only issue.”*

The main reasons for these “execution” delays as explicitly stated were the inaccurate design resulting in the need for price variations: *“.....the main reason, even for future projects, to pay more attention and care to the design stage. That was the main reason for these extensions of times, and claims and delays”*

As illustrated in the following quote, good design will help in avoiding major changes: *“When it comes to implementations, 100% you will see variations, but minor changes, minor variations. But not major as here. These lessons need to be learnt in order to be taken into future projects.”*

The interviews with the ten key stakeholders of the DFH Project provided useful insights. Some of the issues identified from these interviews were further explored in the focus group session conducted, the results of which are presented in the following section.

6.6 DFH Project Focus Group Discussion

6.6.1 Introduction

Zikmund (2000) noted that the focus group is a form of qualitative research in which a group of people are asked about their perceptions, opinions, beliefs and attitudes towards a product, service, concept, advertisement, idea, or packaging. Questions are asked in an interactive group setting where participants are free to talk with other group members.

Using the same criterion as for selecting the ten interviewees, participants for the focus group discussion session were selected based on having two or all three stakeholder attributes: Legitimacy, Power and Urgency (Mitchell *et al*, 1997).

A focus group was arranged as a data collection method for the in-depth case study phase of research. It was intended to produce data and insights that would be less accessible without interaction found in a group setting – listening to others’ verbalized experiences stimulates memories, ideas, and experiences in participants.

The following paragraphs briefly present the steps taken to plan and administer the focus group discussion for the in-depth case study project.

The primary objective of the focus group discussion session was to add to the findings obtained from examination of various documents, site observations and the face-to-face interviews conducted (see sections 6.3 to 6.5). The intention was to obtain deeper insights into management processes, specifically as they relate to communication, coordination, decision-making and knowledge-sharing; and how these affected the project's success measures in terms of cost, time, quality, and stakeholder satisfaction.

Some questions were developed to capture the participants' opinions on the management concerns and project success measures. The focus group was conducted on May 29th 2010 at the MPW premises in Dubai and lasted for approximately two hours. Initially, ten stakeholders were contacted in writing through the MPW and were the same individuals who had earlier taken part in the face-to-face interviews. Only six of the ten invited were able to join the focus group discussion with the other four sending their apology due to other commitments. The six participants were perceived as a small enough number to give everyone opportunity to express an opinion and large enough to provide diversity of opinions.

It is important to note here that participants were viewed as possessing important knowledge about the DFH Project, and they had experience, needs, and perspectives that the researcher hoped to learn more about. The confirmed participants were called a day before the focus group discussion to further reinforce their commitment to attend the session. The participants included representatives of the consultants (design and site supervisor), the contractors, the project management firm and the MPW.

In addition to the six participants, the focus group involved a moderator, a note taker, an assistant moderator, and a transcriptionist. Table 6.4 provides details on the participants involved in the focus group discussion session. Names of participants have been disguised to ensure confidentiality.

Table 6.4: DFH Project Focus Group Discussion Participants

Participants	Stakeholder Category	Interviewee's Title
1	Sponsors / Client	Liaison Engineer
2		Senior Planning Engineer
3	Management Firms	Project Manager
4	Contractor	Project Manager
5	Consultant	Head of Road Department
6	Government Agencies	Municipality Director

The focus group meeting started by the moderator thanking the participants for attending the meeting to examine the history of the DFH Project and stressed its importance for the research project underway. Each of the participants then introduced themselves and outlined their role in the design and construction of the highway and that of the organization they represented. The purpose and scope of the meeting was then explained and any questions were answered. The findings from the focus group are presented in the following sub-sections. The specific questions aimed at promoting discussion are presented in Appendix C.

6.6.2 DFH Project Success Measures

The meeting commenced with the moderator asking the MPW for an outline of where the highway construction was at that stage and when completion is expected. There was no clear definitive response on the expected completion date: *“I don’t really know because we have 3 contracts. Contract 1 will be completed this November 2010, next year the far of the road will be completed and it will be open for the public and it will be used partially. Partially the project is successfully completed. In the mean time, we have tried to solve some of the problems and to accelerate completion and achieve the revised completion date. We got [management firm] involved and they are doing well with the program. We have some problems here and there but still we are in the program.....”*

The focus group moderator commented on the history of the project that the numerous delays had occurred. One objective of the focus group was to develop a better understanding of the decision-making processes, and whether the DFH Project is

considered successful. In response to this, the following comment was made by a representative of MPW: *“The design stage actually started in 2002. You know in any project it starts with an idea of the project and then the concept design, the feasibility design, and then the actual design started 2002”*. In *“2006, the construction started”*.

A question was raised on whether it is a typical practice to have a four year delay in starting a mega project. Responses confirmed that projects usually do not take such a long time. The long delays were attributed to the design changes, interruptions, and the delayed decision-making by the MPW. *“...I think no. It shouldn’t take this much time. The decision-making was the most important thing. Somebody should choose the route. The designer usually would give 5-6 alternatives, so taking a decision to choose which alternative is the most suitable within the budget, should be taken by the Ministry. This decision has delayed a little bit due to all these changes and interruptions”*.

6.6.3 Project Budget and Delays

Discussion confirmed there was not an accurate study plan nor a detailed budget prepared for the DFH Project at the beginning. This led to tremendous cost overrun, from AED 350 million, expected to reach AED 2 billion by the end of the project: *“....we will not start any project unless we can be sure that the allocated budget is there and the feasibility study Unlike what we did in Fujairah, we started with 350 million Dirham and then we discovered that it was not enough and it became 800 million and now it is 1.4 billion and with the protection work it might be extended up to AED 2 billion”*

A question was raised on the reasons for such budget growth and whether the project has grown in extent, changed in its focus or that it has become a large project. Responses indicated that some of the criteria such as the design speed had changed. Variations included redesign. A comment was raised on some contractual mistakes; the initial design project contract did not include site supervision: *“The original designer designed the project, gave alternatives and we chose some of his alternatives and he finished the design. One of these mistakes actually, there was no supervision..... supervision engineer....”*. *“One of their tasks was to review the original design as a professional consultant.... This is substandard in some areas and they propose some revision to the*

design Redesigned the project based on 3 lanes with different design speed limits.....the scope has changed, the route has changed, everything changed, curves have changed, everything has changed.”

6.6.4 Coordination and Communication Amongst Key Stakeholders

The DFH Project extends across three Emirates: Sharjah, Ras Al Khaimah and Fujairah. A question was raised on whether this complicated the project and whether there was enough coordination and cooperation from the local authorities. Responses indicated that there was coordination but also some delays were encountered. Some concerns were raised over complicated processes (e.g. obtaining Non Objection Certificates – NOC’s) and various Emirates standards. These concerns are reflected in the following quote: *“Coordination; sure it is affecting the Emirates. They are cooperating because it is for their benefit. But there is some impact. Al Ahmadiyah has to get a NOC from 15 or 16 authorities. So, this [causes] delays in certain areas. This should be taken into consideration. But we are involved, even in the traffic signs. Sharjah for instance have their own typical things and typical names, but we go to the federal signs.”*

With respect to the coordination and communication among the various departments, the responses indicated that the MPW was acting as the key link for communication and coordination among the relevant departments: *“We [MPW] are the link between this. They seldom meet and coordinate usually through us”. “., police department, municipalities, those are completely separate entities, so each Emirate has its own agencies and there is no major federal agency that organize the communication.”*

Reference was made to the establishment of a Coordination Committee during the design stages of the project. The role of this committee was to coordinate the services issues between all the relevant agencies across the Emirates. The committee had regular monthly meetings and had helped in obtaining NOC’s: *“..... At the first design stage of it, there was a higher committee created by the ministry officials headed by the under-secretary. Part of its role was to arrange and coordinate the services issues between all the relevant agencies across the Emirates. So this was one of the positive points. It really helped lot”*

The Higher Coordination Committee (HCC), which is the highest authority at the MPW and chaired by the Minister himself, focuses on higher level decisions. The HCC has representatives of the municipalities from the various Emirates. The decisions made by the HCC were communicated to the other stakeholders by the appropriate representatives on the committee: *“..... For example, we were talking about one of the agencies. They have branches, so the representative of FEWA would convey messages and agreements to their local offices in ... or in Fujairah and so on.” “..... With a representative of each municipality and they will explain whatever decision that committee makes, they will [convey] that decision to their people, they would send the letter to that committee.....”*

The committee was disbanded unfortunately after the conclusion of the design stage and opinions by the respondents were against discontinuing this central committee. There was a strong belief that such a committee could have helped in the construction phases. Explicit statements were made that the progress of the project was negatively affected by discontinuing the HCC: *“By creating this committee it was a central communication. I say that one of the issues that negatively affected the progress of the project was that this committee didn’t carry on to the end of it. In my opinion if we have this committee till the end to the construction that would facilitate even the construction.” “When we initiated this project in 2003 that was end of the design stage when the committee, we didn’t need it anymore” “To the tender for construction and that was the end of the design stage and the end of the committee.....”*

Responses indicated that the central role of the HCC was dealing with other agencies. Decision-making when it comes to design issues, and redesign were made explicitly by the MPW: *“The decisions about the design changes, design standards, high decisions on the project that’s done from the ministry, not the committee. The committee was to facilitate NOC’s of the relevant agencies.”*

Discussions on design issues during the construction activities were brought up. Such discussions made reference to the bi-weekly progress meetings. These meetings were seen as particularly valuable in resolving the project design problems: *“.....For example, we had a number of design issues that arose out of the construction of bridges in*

particular. These were raised at our normal progress meetings but they were only referred to in those progress meetings in a manner to highlight that there was a problem. The solution of a particular problem was through correspondence with subsequent design meetings. So we had specific design meetings to resolve those. And in the end these design meetings were fairly successful and all, (interviewee hesitated) most of the design issues were resolved.” “For our contract we had progress meetings initially every 2 weeks. It’s a normal procedure here in the Emirates, you have meeting every 2 weeks and then once the project is underway and proceeds systematically it stretches out to every 4 weeks.”

Such progress meetings were attended by the project manager, the consultant and the contractor: *“In those progress meetings there is usually the project manager which is the consultant who is assigned the powers of the client, the engineer which is [consultant], and the contractor. The client representative attended as well. But when the client rep is unavailable, the role is taken by the project manager. Generally the client rep. attended, but on occasion didn’t.”*

6.6.5 Power and Control of Stakeholders

Discussions indicated that client involvement had been minimal, with more power given to the project management firm. They took responsibility for most of the decisions made, unless the issue was outside their jurisdiction. In such cases, the client got involved: *“Yes. This is the latest now, 3 months ago we minimized the involvement of the ministry, the client, and we gave role to the project managers. That’s why recently few meetings we are attending”. “....the project manager is reporting and he is doing the management part which the client should do. [in case of] authorities which are not given to the project manager, he has to go back to us in case of any problem or anything which is a common thing. “*

Such progress meetings appear to have been quite successful in minimizing communication efforts through letters and correspondences: *“We have such meetings here in the ministry in order to bring all the parties (together) and to overcome all the issues and (trying to) avoiding all the correspondence, we had to exchange a lot of*

letters, and finally we decided to have these meeting to solve problems, we give targets, finish.”

Such meetings were also meant to resolve disputes or problems: *“Mostly in case of disputes, problems or expected delays. If there is a flag that is raised by the contractor or the consultant or any of these stakeholders”*

The frequency of these meetings was determined based on the nature of the issues for discussion: *“It depends, could be one week, if necessary, until the problem is solved. So for example, the contractor raises the flag and says I’ll be facing some delay that is affecting my program and I have to get this information within this time. So, we try to solve this problem. Some of them are minor problems and some of them would affect progress, because it is a critical activity which they should do now.”*

6.6.6 Contractor’s Perspectives on Communication and Coordination

Whether such process of communication and coordination was satisfactory to the contractor was not clear. Responses were quite positive, yet indicated that improvement was needed. This was further explained in the following quote: *“Under the way contracts are administrated here, yes it was successful. But it was dependent on us being persistent. Our correspondence at time was fairly detailed and we would lay out in some cases alternative designs or ways of doing the work and the consequences of those alternatives and we always referred back to our baseline programs, saying if we follow this path we expect this would be the delay.”*

Suggestions on how to improve the current work environment included using partnering contracts (the Australian practice). Comments were made on how the contractor should be persistent in following up (which was not seen as the contractor’s role) to move project forward: *“You see I come from an Australia environment and the last contract I was working on was a partnering contract, which is a different concept and the way contracts are set up here in the UAE, such contracts wouldn’t work here. And again, I was involved with an alliance contract and again it’s a totally different attitude. But from my perspective and what I know in the UAE, I think what happened here so far has been*

quite successful. But the contractor has to be persistent and has to put everything on the table and keep pushing it. A lot of contractors will sit back and would say I am going to end up getting a big claim out of this. Now that's a misconception and that's not the way we work."

Reference was made to the fact that contractors had to "act" as designers sometimes in the DFH Project: *".....following up, It's a matter of following up. It is not our role to.... Obviously, we can indicate what we think is the best solution either cost-wise or time-wise. At the end of the day the client has to decide whether it's time or cost that is important to him. We can only lay these down on the table..... We take the line that we are not designers, we are the contractors, we can only suggest things and at the end of the day the decisions are made by the client, we can't force our opinion on the client."*

Decision-making filtered up the chain to the MPW (the client). The chain of decision-making was to the consultant, then the project management firm, and up to the client: *"Yes, but what we are trying to do is to give enough information, if we are asked for information, to the client, so they have all the details and understand all the consequences of what is occurring."* *"It goes to the consultant who studies it and raises the recommendation. Then it will come filtered to us to make a decision we will have options and information in front of you."*

6.6.7 Coordination with Utility Services

There was considerable discussion relating to the utility bridges, part of Contract 3, which accounted for about AED 60 million of the total initial contract value (AED 300 million). Statements were made that indicated these bridges were not part of the original design. Delays in project execution resulted in creating conflicts with some utility services, which mandated such utility bridges. That was a major cost that could have been avoided if the project delays had been avoided. From the following statement it can be concluded that even though NOC's were obtained for the road alignment, these NOC's were not respected by the granting agencies themselves. *"As we mentioned the project was started the first phase in 2002, the design in 2003. At that time there was no decision-making [agreed to by Ministry of Finance]. There was an on-hold stage for*

about 1½ years until we went back to redesign in 2005. From 2003 or 2002, while we studied the alignments, the first task is to study the different alternatives, and once the client chooses a certain alternative we will start the design. The alignment was chosen 2002. By that time the alignment was running in empty spaces, most of the areas that it passes through are empty of the utilities, of the major utilities. “While we were studying the alignment we had already collected information from the services authorities like [water company], [the phone company], and [the electricity company], the gas company, so everyone knows that we are studying these alternatives. Of course as part of our rule we had to share the alignment with those authorities. “The NOCs were obtained in 2005 without bridges”. “There are utilities there but they did not require bridges, only filling (culverts)”. “In the beginning if you got NOC from the service authorities and they come later and lay some services, they supposed to come to you to get NOC (which has not been done).”

The utility company provided specifications to the NOC at an earlier stage. Later, these specifications were requested to be upgraded by the utility firm. This affected the design at the time of project contracting, and resulted in halting contract 3. It was evident that even though communication and coordination were probably done adequately during the earlier stages when the earlier NOC's were obtained; such communication/coordination proved less effective later when the project was halted. It was clear that there was some miscommunication of utility activities and constructs within the project: *“They got the NOC for doing culvert for protection. Later [utility company] said no they cannot do this, they need this much clearance, horizontal clearance, vertical clearance, so the best and cheapest way to do this is to build a bridge.”*

Justification was made within the MPW on the issue of the utility bridges. Utility bridges probably minimize the risk of conflicts with utility maintenance requirements. *“.....We went back to them and said, OK we have the NOC with you and we will not construct the bridges. But we asked the contractor how much we are going to save, a few million only and it will not be up to their standards. Now we constructed these bridges (considering) future maintenance. Our road will be protected in any accident to their lines, the road will not be closed, and they can walk underneath without any disturbance*

to our road. In the previous methodology in case of anything the road should be closed so the risk in the future would be more. I think the decision was good.”

6.6.8 Suggestions for making Improvements by Site Supervision Consultant

A number of suggestions were made during these discussions relating to how improvements could have been made, including the following:

- i. ***Need for a better contract:*** responses from the contractor indicated the need for a better contract: *“The contract wasn’t written properly, there were a lot of missing design practice on the contract and we had long disputes and argument with MPW whether these items should be designed, should be under our scope of work or not.”* This issue had been identified to be unique to this project and contributed to considerable delays: *“I am talking specifically about this project. No it’s not normal and it really contributed to the delay of the project, As I told you, we had disputes with the ministry which delayed the progress of the job because we need to know if this part of the work is part of scope for the designer or not.”*
- ii. ***Decision-making:*** decision-making was explicitly stated as the primary reason for time delays and cost overruns: *“The project was designed in 2003 based on 100 design speed and 110 design speed in the mountains and it allows trucks run on it, and the design scenarios were 4, 6, 8 lanes and the same scenarios were issued to the contractors. The construction value of the 6-lane scenario came to be AED 611 million. And now we are designing the road with the same criteria, for 120 design speed, in the mountains and the terrain, almost the same road and criteria, same number of lanes, and now the value is AED 1.4 billion, which is more than double of the price in 2003. If the decision was taken in 2003 to award the project that would have saved us a lot of hassles. One of these hassles is the utility bridges, because at the time the major utilities were not laid as yet. Then we would not have had to get into utility bridges scenario”.*

- iii. ***Integrity of the design:*** Suggestions included checking the integrity of the design early, during the planning and the design stage. Consultants should have been hired specifically to check on the validity and correctness of the design. This particular practice may resulted in considerable savings in both costs and time, as well as reduced variations at the contracting stage: *“If you are going to repeat such a project, some major path be considered like time of change and the influence of stakeholders in the project. In the planning and design [stages] the influence is high of the stakeholder and the cost of change is less. But once you come to a contract you have a third party, you have the contractor in, then any change will cost you a lot. So if it do the same project again, after doing the design, I have to make him ready of the design change. I will send it to 1 or 2 consultants for checking the integrity of the design, please make sure that we are complying with all requirements. It will take 2 or 3 months for some cost an amount. No problem, I can accept. Before going to tender I have to be sure that the scope is well defined, I have achieved the requirements of the design.....”*
- iv. ***Minimizing design changes after tender:*** Suggestions included minimizing any design changes after the tender is granted to the contractor as this entails higher cost of change: *“..... I refer to the curve here about the influence of the stake holder and the cost of change. [A curve was drawn by the respondent; the curve illustrates two non-linear S shape curves; one increasing (cost of change vs. time) and one decreasing (influence of stakeholders vs. time)]. This point here [points to cross-over point of the two lines] is the tender point, once you have the contract you have to consider that the change will cost a lot. This is the main one.”*

Suggestions were made that the federal government had to have authority over local governments and utility companies to avoid conflicting circumstances (e.g. the utility issues of the DFH Project): *“.....after finishing the tender they have cancelled this one. I think that was a big mistake” “.... After designing and tendering the project, some instructions were given to change the design.” “They have taken design NOCs of all parties, but the federal government have control*

all local governments and all local authorities. As soon as they got design NOCs and start other projects, they have to put rules”

Suggestions made were that it was better to cancel the project and retender to avoid contractor’s claims: “After that, as soon as the project is tendered and awarded to a contractor and decisions are made to change the design, then I think we have to suspend the project. Cancel the project with the main contractor, pay him certain amount, but it will be less than the claims he is going to ask later on. So, redesign the project and award it again. I think it would be better.”

6.6.9 Lessons Learned from the DFH Project

Discussions among members of the focus group identified a number of important lessons learnt from this project. These are discussed below.

The experience gained from Contracts 1 and 2 was used to prepare Contract 3 to avoid delays: *“..... most of the lessons learned from the mistakes of contract 1 and 2 we avoided and didn’t repeat. We revised the design, we revised the templates, but still some other issues which have been left because we were in a hurry not to start and award this project”*

There was a need to avoid some of the technical difficulties experienced during excavation in mountainous areas, remedy inaccurate designs, insure enough and adequate investigation, and to complete contracting documents: *“..... To summarize for the bulk things: The template for the excavation, this is one of the major things; the templates were revised to suit the nature of the rocks which are located in these areas. The second is, we got enough time to redesign the bridges which were not there at the early stageThe contract documents have been revised. All the missing items which were missed in the previous contract have been added.”. “For example, the blasting procedures; the procedures and specifications for blasting have also been added”*

Better recording project history, events and feedback during progress meetings was important to improve communication and coordination. Reference was made to some ongoing communication problems with the “designer”, but some assurance of these

communication concerns being resolved: *“Contract 3 has been prepared by the original designer. We didn’t give this to somebody else in order to avoid liabilities or different disabilities. So it has been given to them. Again, we had something like communication and we talked about it and we have overcome all of these problems we had....”*

Discussions indicated that the management of the project (and the level of coordination, communication, decision-making and knowledge-sharing) was much better now, compared to earlier experiences. They defined good management in terms of knowledge, performance and personalities. Better coordination, communication and decision-making was particularly attributed to the technical competency of the staff: *“And again, when we started this project in 2006, if I compare the management level then with the management level now, the management now is very, very good compared with the initial level of management. Now we can communicate, we have many people with good knowledge and performance, personalities, the three characteristics of good project management. .. Nobody wants to share this, nobody will recognize it, but now, once we have the technical people, we have..... it is easy now to communicate and exchange and make a decision. This is in my view important.”*

Responses confirmed that the weaknesses at the start were due to inadequate cooperation and collaboration with management at that time: *“Yes, at that time the management was May be over loaded or lack of resources, I don’t know, but at the end of the day you have to (hesitates), compared with the management level now, a big difference.”*

Project managers indicated that they had difficulties dealing with the contractor without involving the supervision consultant at the beginning. *“When we started we [were not] taking the decision, because originally we started with a contractor. If the supervision consultant or the checking consultant had been appointed 3 or 4 months before the tender, it would have made a big difference. The input can be incorporated without considerable cost.”*

Commenting on cultural lessons, it was noted that the UAE is different to similar projects outside the UAE. The contractor raised the issue and concerns of the different contracting philosophy in the UAE, suggesting the need for using more partnering or alliance

contracts: *“I guess there is the whole philosophy of how contracting is done here, and again I am speaking from the point of view of what partnering or alliance contracts can achieve. This is a cultural thing and in some parts of the world is not recognized or regarded as a reasonable mode of contracting or a reasonable mode of protecting the client’s interest. Even in the UK, partnering is not widely recognized or practiced.”*
“Partnering as I see it is where all of the stakeholders come together, including the client, and you thrash out the problems at a project level and so the senior stakeholders in my experience have been, almost up to ministerial level in Australia, involved and have come to understand what the problems are, so they can facilitate decisions at that level. The process is more formal. It relies basically on the “dare” I say it, the British system of contract administration.”

Comments were also made on how important and difficult this mega project had been. Lack of experienced staff was stated as a major drawback. The error of designing the DFH Project as a normal road was again pointed out. Lack of experience in design, in decision-making, and design variations during construction were highlighted as major mistakes: *“This project is one of the mega projects and is the most complicated project, probably, in the UAE, probably in the GCC, because it is in mountainous regions. And you look at the mountains and see the different configurations of the mountains. To do this, you need an experienced designer, an experienced reviewer..... And you need an experienced contractor to achieve it. I think there was a lack of experience. I think this road was designed as a normal road, and it is not a normal road. And the lack of experience in this area from all parts contributed too much. Lack of experience in design, and aside from.., lack of experience in making decisions, changes in the middle of construction, a big mistake, big changes in the middle of construction, everything stopped, and the costs....”.*

Comments were made on the quality of the DFH Project initially conducted in 2002. Comments indicated that this study was very good but was not implemented due to budget restraints: *“When they did the study in 2002 they did a very good study but it was not implemented. The study is one [thing] and the design is another [thing]”* *“They did a*

preliminary design which was better than the final design. But it was not accepted. I don't know [why], there were feelings at the time, because of the budget, we have to...

The selection of an appropriate design company was highlighted and the company engaged for a preliminary design for the feasibility study was mentioned positively: *"No, there was the consultant before [the current one]..... [he was] one of the world's leading engineering and development consultancies".* The preliminary design was not carried forward however because of the delay in "decision-making" and in the design. *"The initial design was done on maps. That was just a concept design, aerial maps, contour lines etc. They drew a line, estimated the quantities. At that stage, in 1999, based on the prices in 1999, they estimated that it could be 300 – 350 million Dirham. And actually, the road was not only from the points we are talking about now, but a comprehensive solution from the City of Sharjah to Fujairah, And this was within the 350 million Dirham. And later, Sharjah was waiting and waiting and the design was not completed, so they designed their own road, which is the Sharjah Road. So our road starts from the intersection in That task was also given to the designer [name]. They gave all these alternatives to the ministry to make a decision."* There was some agreement among all those present that the current design was not totally adequate.

There were no clear answers for the reasons behind the initial project delays (following the initial study). In response to a question on why decision-making was slow, following the initial design stage, participants speculated that it was due to budgeting issues. They alleged that allocated funds were under-utilized at the very early stages and, as such, were redistributed to other projects by the Ministry of Finance. Also, the budget was not enough: *"Why they were waiting, I don't know. A lot of questions have been asked, I didn't find..... budget – we allocated this budget and we didn't get this much and we distributed it to other running projects. Usually the government, the Ministry of Finance, will give according to the needs of the project. We have to ask them for this much and they allocate a certain budget for the ministry in general. So they are certain reasons because of the running projects at the time, they needed some money and they will get it. They will take some money from this item, in the Finance Department they have items, to give to other projects etc. OK? The reason was that the budget was not enough. They*

instructed the consultant, the designer, to reduce the number of lanes and designing criteria. It's like going to a tailor and asking him to make a suit with this cloth..... “.

Issues of multiple consultants was raised as a matter of concern and attributed to bad decision-making from the client (MPW). Impacts of such decision required the site supervisor to communicate with the designer on all aspects of design: *“We didn't terminate the designer, they have not been terminated. Actually, again, decision-making from both sides. Usually, and it is better, even though the designer is here and the supervising engineer is here also, if you ask the engineer who is supervising the project right now, and this is good for them, they have a job, but if you were to ask them professionally, they will tell you: We shouldn't be here, the original designer should be here for the supervision. I don't know, not certain. They [consultant] didn't accept to supervise the project [did not agree with the MPW on the fees for the site supervision]. The ministry to save some money, they didn't take the correct decision, they float the tender and they got [name of site consultant] on board to supervise. Now this communication and everything which is related to the designthey have to go back to the original designer.....because of that lump sum contract, now the designer involved is not getting paid because they will tell: this is your design and you have to rectify it, in case there is anything related to the design. “*

The knowledge and the experience of the client and their staff was noted as an important factor in ensuring a successful outcome: *“Knowledge and experience of the client; this is very important because at the end of the day they make the decisions. Sometimes the decision-makers, the higher-ups, are not engineers, for example the minister, they need the feedback from their people and they are filtering the information coming from the designer, the people who are under them. It depends on them. If they are well experienced and they don't accept supervising”*

More elaboration took place on client staff experience and its relationship to decision-making: *“Since these people are not here to defend themselves, what you take away is this: I can look at a building and say this is well designed, but I don't know if it will last for a month. It looks nice to me. So what we have inherited is bad project, bad*

management, bad design, which means the people were not well qualified. If I am a professional engineer, I will not accept compromises. I go to the Minister or the Director General and tell him: This is the situation. Take it or leave it. If you force me to do that, I will quit. As a professional engineer I will not accept that decision. You want to make that decision, OK you'll make it but I won't participate in it. And this is what we are actually doing right now."

Sufficient authority for decision-making was not given by the client to other stakeholders (contractor or consultant) at the earlier stages which proved troublesome. This was rectified in the recent MPW practice: *"...we are having this professional way of dealing.... You can ask anybody in the project, we have healthy relations, the contractor is allowed to propose. Before, they were not allowed to propose or give anything – you are the contractor, you are here to do this work.... The consultant, again, we are the consultant we are doing A, B, C, D. They were not given authority to practice..... in certain durations the client was acting as the consultant. The consultant was there but the power of the client was more"*

Reference was also made to the fact that more recently, the Minister and the Director-General were now actually participating in the decision-making. They had not been involved in the project from the beginning. *"Now we have the H.E., the Sheikh who is making the decisionsAnd he has the power to defend his ideas and visions (or decisions?) And if it comes to, let's say, to money for the project, he has the power and the access to convince the Prime Minister what's happening here."* *"Same thing with the Director General; he has the knowledge and is personally involved in the project. the Director General is involved in a project, visiting the project and attending some of the meetings so he makes decisions directly. Our [the previous] Director-General was not involved from the start. If he had been there, this would not have happened. Actually at a certain stage he mentioned that he was planning to stop the project completely, rearrange everything and start clean again. This idea of Contract 3 came almost from ... [Name of the current Director General]. He said, we have to find a solution, we should not be moving blindly like this without an end to the project and the time. We were not expecting when this project would be completed and what it would cost. But now we have*

a clear idea, we have a target that we are completing finish the project in this date, with this amount.....”

There was general recognition of the importance in knowledge-sharing between the different contractors in achieving the final outcomes for this large project. In fact, responses indicated there were several confrontations over knowledge among contractors: *“There is communication, but.... With the contractor mentality! No, certainly not. This is something, if he was to answer frankly, this is something else. These are contractors and the other contractors are not here to defend. If you are bringing two contractors working in the same area together, this will not be a healthy thing. We were expecting this and we tried to clear up all these things...Knowledge-sharing in what way? The two contractors don’t like each other; they don’t share ideas from each other. To be quite honest, there is no need for knowledge-sharing with the work we are doing. We are both doing the same work. There is no need. The main problem arises through interfaces. We had some confrontations but they have been resolved. This always happens in this type of contracts. There was one and OK they had some things to do and they did them and we could proceed. At the time, OK, emotions were running high but now it’s solved and our discussions with the contractor are fairly amicable.”*

Better documentation and contract preparation flows from knowledge-sharing and knowledge gained from the feedback collected from the ongoing contracts: *“Sharing knowledge is already done by collecting all the feedback from Contract 1 and 2. So, now he is getting much better documentation, much better design specifications, descriptions – so already done during the tender and the preparation of the contract documents.”*

Reference was made to several projects that were executed successfully. They noted management attitude was more congenial today than in the past. In recent times, the attitude with the DFH had changed from ‘making problems’ to ‘solving problems’: *“The last 2 or 3 years we did some big projects and they have been completely successful, without claims or any problems, because they have been studied properly, designed properly and then supervised and managed properly. We also did some roads”* *“Yes, the terrain is different, it’s not mountainous terrain, but it’s a project.”* *“The positive attitude*

from the ministry is very important. And top management. I want to solve problems – not make problems.”

Some concluding remarks suggested that despite the changes introduced in the DFH Project criteria and specifications to reduce delays and project cost, there was a feeling that it had been worth delaying the project further to correct the design issues and to increase the usability of the project: *“What would have happened if we closed our eyes and continued with the same design and to end up with a final product which is not acceptable or doesn’t meet the expectations of the client. Then the costs would be double of this cost. But now, even though the decisions or the changes have been done at a later stage, it is not ideal, but we have to imagine, if we had kept silent, continued with the project, complete the project with the same ...And we’ll end up with something that cannot be used, the cost of the change will be much more.”*

The discussions above pointed to four major issues: (i) inexperienced management staff, perhaps because this was a novel, large project; (ii) poor decision-making and poor alternative choices; (iii) budget constraints and poor budgeting; and (iv) poor knowledge and experience early on by the client’s staff.

In order to provide further insights relating to the many issues discussed above, interviews were conducted with the Director-General of MPW and the Minister of Public Works. Results of the interviews are presented in the next two sections.

6.7 Results of Interview Conducted with the Director-General, MPW

A 90-minute interview was conducted with the Director-General at the Ministry of Public Works, directly after the focus group discussion. The interview started by providing the Director-General a brief overview on the research project, its objectives and the benefits to be gained within the infrastructure sector in general and roads in particular. The student outlined all the phases of the study and the methods adopted in collecting the information and explained that there was certain information collected that needed verification at this interview.

The remaining part of this section summarizes the findings of the discussions with the MPW Director-General regarding the DFH Project.

6.7.1 Reasons for Delays and Cost Overrun of the Project

The following reasons for delay and cost overruns of the DFH Project were identified during these discussions as noted below:

1. Project complexity: *“Most complex in nature and process”*.
2. Did not recognize the suitable skills needed for the project in the early stages.
3. Skills were not enough to make it successful.
4. Poor project planning: *“It was executed in 1999, but wasn’t planned properly.”*
5. Poor site investigation: *“The site investigation was not done properly that was one of the disasters.”*
6. No proper integration among project phases: *“When the study and design was done and phase 2 built it without going back and looking into the project again”*.
7. Inaccurate design: *“Later on [the consultant] assumed the design was OK and didn’t do any independent design”*.
8. Poor management skills early on: *“There was not enough management skills at that time, the new team joined the Ministry in 2005”*.
9. Improper communication. *“Phase 1 to Phase 2 [was] a total failure due to improper communication”*.
10. Inappropriate transfer of duties and people who did the design without proper hand-over. *“The Ministry shouldn’t release people who did the design without [proper] handing over”*.
11. Decision-making was not adequate because of inexperience with mega projects.
12. Design problems and associated variations and claims: *“We had problems at the design stages and the only thing to do was to go into execution – many variation and claims were expected”*.

13. Difficulties in decision-making. Hesitation to make decisions by management team because of a complex nature and history of the project. *“Most issues were handed to the head of the committee to make a decision”*.

6.7.2 New Procedures and Techniques adopted by the MPW

The interview provided insights into the procedures and techniques adopted by the MPW to remedy the problems in executing the DFH Project. The following is a summary of these insights:

1. Different management strategy; *“the top level management decided to manage this mega project differently than other projects”*.
2. Paying particular attention to the initial study: *“Re-study again the project by new team”*.
3. Involving the use of an external consulting firm at the early stages.
4. Establishing a management committee at the early stages.
5. Organize good communication among management committee and all stakeholders: *“Today, the management group communicates with consultant and contractor meeting on a weekly basis and comes up with the results to the higher management for decision-making.”*
6. Delegation of responsibilities *“Everyone realizing that the project is over and everything is being new and everything being clear to use and we have responsible team in place”*.
7. Communication improvements initiated in recent times:
 - *Bi-weekly meetings instead of six weeks meeting.*
 - *Project managers meet weekly.*
 - *Director/Manager meets bi-weekly with the committee.*
 - *Director/Manager meets monthly with all stakeholders.*
8. Changes to allow the consultant to make technical decisions on site.

9. Established database system to be shared among all MPW's departments. *"There is a common database; it is a system that we have developed for us based on our targets and ideas"*
10. Ministry of Finance and MPW contribute to establishing a decision-strategy (based on what they experienced in the project).
11. More collaboration with the stakeholders and better management skills in the project.
12. More understanding of other stakeholders (e.g. contractors): *"We understand the contractor better, we collaborate with stakeholder better"*.

The Director-General thought that there is still room for improvement through greater use of technical skills. A remark was made that the project could have been executed with more effective management: *"It could have been better - cooperation, collaboration, communication, decision-making is the best for money saving based on efficiency"*.

The Director-General made explicit statements on the following actions that had been undertaken by the ministry:

1. *Establishing a database system.*
2. *Building a highly skilled team.*
3. *Careful detailed project study and design*
4. *Enough project time to enable discussion with stakeholders.*
5. *Introducing a system for human resources department. The system aims at training people, developing a motivation system, and increasing the professionalism of staff.*
6. *Particular emphasis on the study in the planning and design stages to avoid variations, problems and claims during later stages.*
7. *Better collaboration with stakeholders.*
8. *More expert and professional staff.*

Finally, the Director-General made reference to the establishment of a new department within the MPW. This was the: *“establishment of a ‘saving’ department [value engineering] to study the status of the project cost, duration and completion, to fit the project with cost, and if possible to cut the expenses.”*

6.8 Results of Interview Conducted with the Minister of Public Works

An interview was also arranged with the Minister of Public Works to discuss questions relating to the DFH Project. The questions were identified to capture his opinion and perceptions of the management deficiencies, communications, coordination, knowledge-sharing and decision-making, in general and of relevance to the case study project in particular.

The Minister asserted that there were many problems to be faced. The majority of these were related to administrative and technical errors leading to an increase in the cost and the time frame of the project. All these were attributed to the continuous changes in the project specifications such as making the road from 2 to 3 lanes, and change of the speed from 90 km/h to 120 km/h. This was in addition to other variations in the curves, turns, and degrees of uphill and downhill, leading to changing the consultant more than once and causing time overrun and cost overrun. It was clear that there was no clear objective for the project initially as the road specifications regarding the lanes and speed and whether this road is for saloon cars, trucks or others were not outlined and consistent.

On the other hand, the Minister asserted that the project currently is “on schedule” and expected to complete the first phase of the project during November 2010. He added that this first phase included 16 km and when complete, will serve remote cities such as Shawqua, Kadrah, and Siji.

The Minister added that the DFH Project was initiated and executed at the direction of HH the President of UAE to improve the living standard in the Northern Emirates and help the nation through upgrading the infrastructure system in general, facilitating transportation by reducing traffic congestions, and improving road safety in particular.

In addition, the Minister added that he was comfortable with the current progress of the DFH Project and was looking forward for a more developed and safer transportation environment for the people of UAE. He emphasized the importance of providing better communication and advance technology in the decision-making process. He claimed that this will improve the standard of performance, work progress and meetings, and address issues of current cost and time, and stakeholder's satisfaction. The Minister claimed that at this time, the vision is clear, objectives are identified and coordination between the project parties is stable and effective.

The Minister further noted that many new procedures have been established to improve the standards of communications, cooperation and decision-making. Among these procedures, a project manager has been appointed who is fully dedicated to the project and in direct contact with the Director-General at the Ministry. The Minister confirmed that there is now continuous communication between all parties, and when it is necessary to hold a meeting between the Ministry and the local authorities, a quick response always follows.

The Minister also confirmed that during any planning changes, there has been continuous and permanent contact with the stakeholders in this project. Therefore, a better vision was established and the roles of each party involved in the project were clearly identified.

The appointment of the project manager facilitated the contact between all the parties and all the requirements are now clear. This has enhanced the stakeholders' satisfaction thus leading to minimizing the number of claims and progress.

The Minister said he was satisfied with the communication between the Ministry and local authorities. He felt that all stakeholders are now participating effectively and the results show the effective standard of communication between the Ministry and the stakeholders.

The Minister explained his role in the communication process. He said he had established contacts between the Ministry, the head of the local government, and the Crown Prince, in order to provide them with an overview of the project and the work progress. He also

had facilitated contacts with the heads of the federal governments in respect of progress and pays regular visits to the site and holds regular meetings with the Prime Minister to provide progress reports.

The Minister confirmed that the Ministry is now adopting more advance technology to make use of improved communication within the local environment. He stressed that making use of such modern technology is critical and would positively reflect on the DFH Project as well as other projects. He indicated that the new changes and procedures recently adopted provide a clear vision of each project. This had happened following a rigorous review of the project at its early stages, along with an exhaustive study of the planning and design upon which the substantial plans of the project were set-up.

The stakeholders play an effective role at such stages by expressing their opinions and requirements in a clear and transparent manner. Once a fully agreed plan is established, no stakeholder shall have the right to request any variations because this will create more problems as to the cost and time due to the re-design, which in turn will lead to many variations. The Minister claimed the decision-making process within the Ministry is a joint system between the management parties, with some delegation of authority. Some examples in this respect are:

1. Delegation of the authority of taking the decisions to the project manager according to the interests of the project.
2. If the project involves a number of geographical areas, each area shall have its respective manager and each manager shall have the decision-making authority suitable to his area to ensure the smooth and uninterrupted progress of work.
3. Strategic decisions are taken through the Executive Office at the Ministry.
4. Strategic decisions are communicated by senior management to all entities concerned via efficient and formal methods of communication. The decisions are made in writing and assured to be communicated, received and understood by all concerned entities.

The Minister confirmed that many lessons had been learnt from the DFH Project. For example, the appointment of a project manager for each project positively reflected on the projects, leading to minimizing the problems and obstacles caused by the increase in cost and delay. When asked about whether these initiatives had been introduced at the start of the project, he confirmed that the situation would have been completely different and more successful if they had been. He indicated that he would not guarantee that there would be no problems or obstacles in future, but they will be minimal.

6.9 Shortcomings and Lesson Learnt from the DFH Project

This section briefly highlights the shortcomings of the DFH project and the lessons learned by the MPW staff in conducting similar projects. Four pivotal issues are discussed: (i) contractual issues, (ii) technical issues, (iii) site supervision, and (iv) project management issues.

6.9.1 Contractual Issues

Among the lessons learnt from this project was that the standard contract form should follow international best practice for all national projects as is now the case in Abu Dhabi. Sub-contracts, too, should follow international standards as outlined below:

1. Bills of quantities need to be prepared in accordance with international best practice. This can prevent disputes and reduce costs on site.
2. All required construction works need to be fully specified.
3. Specification clauses need to be unambiguous
4. Time taken to process and approve Variation Orders (VO's) and the use of standard MPW VO forms, including justification form needs improving.
5. Mediation/arbitration process should be included in contracts to avoid unnecessary and expensive litigation.

6.9.2 Technical Issues

With respect to technical issues, the following suggestions were made by the MPW staff:

1. Full site investigation should be carried out and results made available to the project designer at the early stages to ensure a complete and robust design. Bidders should also be given a copy so as to minimize claims for unforeseen ground conditions.
2. Provisional allowances should be included in the Bill of Quantity (BOQ) to cater for uncertainty with any aspect of the design and also cover for contingencies.
3. The Ministry should consider adopting their own specifications together with their own standards, outlining details for the construction of highways.

6.9.3 Site Supervision Issues

Due to various reasons, the initial project design necessitated some variations:

1. Problems arose when the design consultant was not the site supervisor of the project. The site supervisor could then foresee difficulties with the design. There were many design changes which has necessitated getting the design consultant involved retrospectively leading to unnecessary delays in resolving design issues.
2. It is imperative that the design and site supervision teams are led by experienced engineers with sound technical and contractual knowledge in order to safeguard the client's interests and ensure that the project is completed in accordance with the contract documents and to time and budget. Weaknesses were indentified and actions taken to ensure that the supervision teams were strengthened.

6.9.4 Project Management Issues

A strong project management team is essential for the successful completion of any project and should include the necessary expertise to achieve this.

In the early stages of the DFH project it was considered that a project manager together with a document controller could fulfill this role. However, certain weaknesses were found with commercial issues and it was necessary to reinforce the project management team with a claims assessor, senior quantity surveyor and planner. This resulted in the creation of a more robust team which now has full control of the contracts.

6.10 Stakeholder Influence on the DFH Project Milestones

Section 6.3.3 discussed the major milestones of the DFH Project. The in-depth case study findings presented in this chapter and Mitchell *et al.*'s (1997) stakeholder theory lead to a better understanding of the influence stakeholder's power, urgency and legitimacy had on the DFH Project milestones. This is discussed in relation to each of the 13 milestones.

1. DFH Project Inception and Initial Study: 1999-2001

The major stakeholders involved at inception of the DFH Project were the Ministry of Public Works, local governments and the Ministry of Finance. Each had differing levels of power, urgency and legitimacy. The Ministry of Finance, as the funding entity, for instance, possessed much more “power” than the other two stakeholders, whereas the MPW had the highest level of “urgency”. Also, the consultant involved at the stage had high legitimacy and power in carrying out the initial study. The outcomes of this stage were the inception study and the approval of the project funding. To some extent this phase can be considered successful even with the long duration it incurred.

2. Design Tender and Contract: 2001-2002

At this next stage, the Permanent Project Committee emerged as a highly significant stakeholder, having legitimacy, urgency, and power due to its role in the “technical” decision-making process and the selection of the consultants. Later in this stage, the Government of Fujairah emerged with more legitimacy and power, than that of the PPC, as they overruled the approved initial design of the project. However, this led to unnecessary delays in preparation and distribution of the tender.

3. Studying Various Design Alternatives: 2003

The Director of UAE Presidential Office emerged as a key player during this third stage as he held the upper hand in the technical and financial decision-making process and demonstrated the highest level of power. Even though the MPW and the PPC were also involved during this stage, their role was limited to the execution of the study of various alternatives and providing technical recommendations. The final

decision-making was made exclusively by the “Director of U.A.E. Presidential Office”. An outcome of this stage is the agreement on the design of the DFH Project.

4. First Contracting Attempt and Cancellation: 2003

During the contracting stage, the Ministry Cabinet and the PPC had a substantial role in decision-making and approval of contracts; the former having more importance with respect to all three attributes of urgency, legitimacy, and power. Two other stakeholders involved in this stage were the MPW and the least bidding contractor. The decision relating to the request for budget increase in this stage was substantially delayed and is largely attributed to the Ministry Cabinet’s power. Insufficient information or poor justification for the budget increase made by the PPC was also another possible reason for the delay. Hence, the expected outcome from this phase was not actually achieved.

5. First Request for Budget Increase: 2004-2005

The role played by MPW, the PPC and Ministry of Finance during the difficult budgeting decisions in 2004 and 2005, proved that each had significant influences. The role of the MPW was limited to the technical evaluation of more alternatives and providing recommendations on budget increase. It is not clear why no decision was made on the budget increase, but may have included insufficient evidence to justify, or delay in decision-making by the Ministry of Finance.

6. Second Request for Budget Increase: 2005-2006

During this stage, the MPW, the PPC, the Ministry Cabinet” and the Ministry of Finance all had a high level of legitimacy, power and urgency. Fortunately, it did not interfere with the resultant decision to increase the project budget.

7. Awarding “Second” Contract: 2006

Two additional stakeholders became involved during this stage, namely the Government of Sharjah and the contractor. Both had legitimacy and urgency, although the Government of Sharjah had a degree of power over the contractor due to their different roles. The decision to award contract No. 1 was over-ruled by the

client due to the variation requests of the Government of Sharjah, although only partial success was achieved in this stage.

8. Appointment of Site Supervision Engineer: 2006

During this stage, the legitimacy and the “technical power” of the consultant impacted on the work progress. However, their request (justified or not) for a fee increase was ultimately denied by the MPW (possessing the three attributes of power, legitimacy and urgency). The MPW decision to hire another site engineer, while resulting in a delay of about three months, showed the overriding power they possessed, in spite of the technical power of the consultant.

9. Awarding “First” Construction Contract: 2006

The new engineering consultant, as a new stakeholder in the project, had both legitimacy and technical power at this stage. The legitimate safety concerns raised by them had a significant effect on the work progress of the project. Other stakeholders involved in this stage were the MPW, the contractor, and the design consultant. Issues of inaccurate project design were brought up by the site engineer. Delays encountered in this stage can be particularly attributed to the project designer who had little power in the process and was unable to affect the outcome.

10. Project Design Variations: 2006-2007

The MPW, the design consultant, and the engineering consultant were largely the most involved stakeholders during this stage. The MPW had legitimacy, urgency and “financial” power, while the two other stakeholders mostly having legitimacy and “technical” power. The decision to re-float contract No. 1 led to delays of around seven months, which could have been avoided with better technical design by the design consultant. Nonetheless, the decisions were mostly influenced by the MPW who possessed all three attributes. The delay in finalizing the decisions during this stage can be partially attributed to poor decisions made by the MPW.

11. Appointment of Project Management Firm: 2008

The project management firm appointed by the MPW during this stage held legitimacy, urgency and the highest level of “technical” power over the design consultant, the site engineer, and the contractor. Arguments have been made about the legitimacy of the new stakeholder, as it was not previously identified in the consulting and contracting contracts. Had the project manager been introduced earlier, they would possibly have had a higher level of legitimacy by the already existing stakeholders. While this stage did not incur delays, it did lead to additional cost to the project.

12. Third and Fourth Budget Increases: 2008-2009

During this stage, the financial power, urgency and legitimacy reverted back to the major stakeholders (the MPW, the Ministry Cabinet and the Ministry of Finance. They played a substantial role in the decision to approve the budget increases that were justified as a result of the design variations requested. Both the Ministry Cabinet and the Ministry of Finance had more power than the MPW, although the MPW had more urgency.

13. Awarding of “Third” Contract: 2009

While the decision to award the contract was made by the MPW (as they had the overall project power), the new contractor emerged as having legitimacy and “technical power”. The MPW decision involved several factors including design variations, and insufficient communication and coordination with utility firms, which resulted in considerable delay in completing the project.

6.11 Status of the DFH Project in 2010

The MPW (client), local governments, the project management firm, the design consultant, the site supervising consultant, and the project contractors continue to be the key stakeholders involved in the DFH Project. The MPW dominate the critical decision-making having legitimacy, urgency and power. The roles of the Permanent Project Committee, Ministry Cabinet and Ministry of Finance have been integrated into the role

of the MPW recently. Based on the DFH Project milestones outlined above and the related discussion on the influence of stakeholders, the following insights can be drawn:

- i. There is a clear deficiency on how decision-making was carried out, evident from the lack of the clear decision-making since inception of the project specification. It can be seen that years after the project inception, there was still no definitive decision on the number of lanes and the design speed of the road.
- ii. There were clear deficiencies in communication, coordination and knowledge-sharing among the involved authorities including the MPW, the Fujairah Government, Sharjah Government, and the services authorities. This was evident from the various changes, leading to redesign and repeated progress interruptions to project progress.
- iii. The number of stakeholders in this project is difficult to justify, in particular, the two consultants (one for design and one for site supervision). Also, the need for the project management firm in this project is questionable.
- iv. The slow procedure for decision-making in the early stages of the project significantly affected the work progress and resulted in considerable time overrun. Specifically, the assignment of one consultant in the early stages, then the assignment of another, followed by a third, as well as the multiple re-tendering of the project and changes in assignment of a contracting company, were clearly excessive and beyond normal requirements, even for a mega TIP.
- v. It is also apparent that estimation of the project budget was poorly executed initially and at various milestones along the way. The need to review costs several times and to approve increases from AED 350 million initially, then to AED 500 million, with a further increase a few months later to more than AED 872.6 million and finally exceeding AED 1.4 billion is very inefficient.
- vi. There is clear evidence that the initial design lacked accuracy. This resulted in many subsequent variations and redesigns during the course of the project.

6.12 Summary of Chapter 6

This Chapter presented a detailed investigation of a mega TIP project in the UAE, namely the Dubai Fujairah Highway (DFH) project. It was initiated in 1999 and was completed in 2012. The analysis identified thirteen major milestones relating to the evolution of this project that was clearly not successful by most definitions. Data gathering involved examination of relevant documents, more interviews with key DFH stakeholders, a site visit and interviews, focus group sessions, and interviews with the Director-General and Minister of the Ministry of Public Works. There were a number of major findings from this analysis which are outlined in detail throughout the Chapter.

It is clear from the analysis presented in this chapter that different stakeholders influenced the DFH Project differently, and the need for more efficient and advanced improvements in how management processes are carried out. Importantly the factors that impact on the management processes and ultimately project success were identified and specifically involved the need for improvements in communication, coordination, decision-making and knowledge-sharing. The analysis further identified that the planning and design stages of a mega TIP are very important stages and providing they adopt modern, efficient and effective management processes, can go a long way towards ensuring ultimate project success.

While the DFH project was considered to be unsuccessful by most definitions, the lessons learned from this case study were valuable for understanding the interactions between the project's construction stages, management processes and stakeholders importance in ensuring a successful project.

CHAPTER 7

PHASE III: SUMMARY OF FINDINGS, DISCUSSION, AND A PRELIMINARY FRAMEWORK

7.1 Introduction

The previous two chapters presented the detailed results from Phase I and Phase II of the research program. Phase I was an exploratory study in which interviews were conducted with 20 key representatives of the five major stakeholders (Sponsors/Clients, Government Agencies, Management Firms, Consultants and Contractors) who had been involved in a variety of transport construction projects in the UAE (see Chapter 5). Phase II in Chapter 6 involved an in-depth case study of a mega TIP (the Dubai Fujairah Highway) which included document examination, site observations (including interviews with four site engineers), interviews with 10 key stakeholders involved in the case study project, a focus group discussion session and finally interviews with the Director-General and the Minister for Public Works.

The overall purpose of this chapter is to summarise the key findings from the research, outline the critical (principle) factors involved in a successful mega TIP, and develop a preliminary framework for practitioners in the field to use when establishing a new TIP to maximise project success.

7.2 Key Findings from Phases I and II Fieldwork

This section provides a summary of the findings from the fieldwork conducted in Phases I and II. This leads to an overall discussion of the findings from the two phases presented in Section 7.3.

7.2.1 Phase I: Interviews with 20 Stakeholders

Detailed findings from Phase I of the study were presented in Chapter 5 where the major stakeholders of TIPs in the UAE, the most critical stages of TIPs, and managerial deficiencies that impact on project outcomes, were identified. The analysis of the

interview data among other things identified the significant importance of communication, coordination, decision-making, and knowledge-sharing, as well as project success indicators and time and cost overrun factors. Below is an overview of the key findings from Phase I of the study:

- The most critical stages of a project identified were planning and design. During the whole project life cycle, the most important stakeholders were government agencies and clients. They have the ability to affect project budget and timing throughout the project, especially during the planning and design stages.
- Project success was primarily defined by the stakeholders as minimum time overrun and minimum cost overrun, although the departments and organizations they represented also included excellent quality, too, as another measure of success. The most important reason given for using these measures related to stakeholder satisfaction. Conversely, cost overrun, time over run, and poor quality were identified as measures of unsuccessful projects.
- Interviewees indicated that 30% of the TIPs in UAE had been unsuccessful. Reasons related to unqualified stakeholders involved, specifically, unqualified contractors, consultants, and engineers. Coordination amongst the stakeholders was highlighted as a significant management issue for success.
- Management practice in the UAE was generally regarded as good although availability of adequate human resources, lack of use of international design and quality standards, and lack of a continuous improvement culture were highlighted as major challenges. With respect to TIP management, communication was identified as very critical to the success of the project, and coordination amongst the stakeholders was also noted as generally effective.
- Although decision-making was generally considered to be of good quality, there were mixed responses with regards to the speed of decision-making. There was considerable agreement on the importance of knowledge-sharing amongst stakeholders, although

interviewees noted that appropriate mechanisms did not generally exist internally within their organization or department for knowledge-sharing.

- Interviewees made many suggestions to improve quality, and minimize time/cost overruns. These suggestions primarily related to improving communication, coordination, decision-making and knowledge-sharing. Using highly skilled labor and international design standards were also mentioned a number of times to help improve the success of these mega projects.

7.2.2 Phase II: The DFH Project

The Dubai Fujairah Highway (DFH) project was chosen as a case study because it is one of the mega TIPs projects currently under construction in the UAE. This complex project consists of three major interchanges and six underpasses to facilitate free movement of traffic passing through very tough mountainous terrain with complicated geological strata. The stakeholders engaged in this project possess the three attributes of legitimacy, power and urgency and included local authorities, the Ministry of Public Works, utility services firms, contractors, consultants, management firms and financial institutions. Follows are the key findings from the DFH case study:

7.2.2.1 Examination of DFH Project Documents

Detailed findings from the examination of various DFH Project documents were presented in Chapter 6, Section 6.3. The key findings included:

- A clear deficiency on how decision-making was carried out, especially in the earlier stages of the DFH Project. This was evident by the various changes and ineffectiveness since inception in establishing the project specifications including the number of lanes and design speed. Even after the project design stage was finally completed, there were still no definitive decisions on these characteristics leading to further changes later on.
- There were also deficiencies identified in communication and coordination among federal and local government authorities leading to several variations, redesign and repeated progress interruptions.

- The slowness of decision-making in the early stages of the project significantly affected the work progress and resulted in considerable time overrun. This was evident from the assignment of one design consultant at the early stages and then the re-assignment to another further on. Also, the assignment of the initial construction contractor, then re-tendering the contract and assigning it to another, lead to significant difficulties and delays. Finally, the assignment of a consultant for the re-design and then another later for the same task smacks of inefficiencies and unnecessary waste.
- Inaccurate and continuing poor estimations of the project budget with the subsequent ongoing need for additional funding also led to considerable delays and major cost inflations. For instance, in 2005, the budget was initially increased from AED350 million to AED500 million, then again only a few months later when the project was retendered to more than AED872.6 million. Throughout the project execution, the anticipated budget grew to exceed AED1.4 billion (a four-fold increase in budgeting over six years) and is now expected to finally cost around AED 2 billion.
- There was clear evidence that the initial design was not well developed or scoped, largely due to the inexperience of many individuals involved initially in the DFH project. This resulted in many variations and redesigns during subsequent stages of the project.

7.2.2.2 Interviews with Key stakeholders of the DFH Project

The detailed findings from the interviews conducted with 10 key stakeholders involved in the DFH Project were presented in Chapter 6, Section 6.4. The key findings are listed below.

- As in Phase I, planning and design were again confirmed to be the most important stages in the construction of the DFH project.
- The important stakeholders involved in the design and planning stages of DFH project were the local authorities, the MPW, and the utility service firms.

Contractors, consultants, community users, and financial institutes were ranked lower in importance during the early project stages.

- There was disagreement amongst the 10 stakeholders interviewed over whether the DFH Project was successful or not. Three of the 10 interviewees clearly indicated that the project was not successful in terms of meeting budget, time schedules, and achieving quality standards, while others were less committal.
- Other success measures reported to be lacking included, good coordination and communication within the Ministry, stakeholder satisfaction, competent and experienced clients and consultant staff, and proper construction management. The main reasons for project delays were design changes, mixed client instructions, technical issues, and improper design and coordination.
- The reasons given for cost overrun included poor design and lack of communication, coordination, and knowledge-sharing amongst the stakeholders. Changes in design and requirements, changes in requirements by federal government, inadequate planning study, and cost inflation were also highlighted.
- The overall quality of the DFH project was considered to be good generally by those interviewed, although they did express suggestions for further improving the quality. These included faster decision-making by the client, better specifications, better safety considerations, proper management and supervision of staff, the introduction of standard risk management procedures, better accessibility through the tunnels, and issues of improved accountability.
- Interviewees indicated a number of management concerns or deficiencies in the implementation of the DFH Project. These included budget variations; insufficient coordination, communication, decision-making and knowledge-sharing, especially in the early project stages. Others also included a lack of management expertise; poor technical abilities of client staff; and lack of concern for safety. The majority of the interviewees thought that these concerns were valid throughout both the planning and design stages of the DFH projects.

- A number of suggestions were made of how communication in the DFH Project could have been improved, namely better communication with high level authorities, forming a committee of all stakeholders to provide input into the project, and importantly, greater commitment by the stakeholders to improved communication policies.
- There was agreement that coordination of the project was somewhat lacking initially. The main suggestions to improve coordination among stakeholders in the DFH project included establishing committees, improving documentation and establishing alliances. There was consensus that coordination had improved markedly during the project life-cycle.
- Decision-making was largely considered to be “Top-Down” and suggestions for improvement included a stronger commitment to wider decision-making processes and follow-up; more decision-maker visits to the construction site; wider delegation of authority and power; more competent, professional and experienced staff; the need to build a solid management team; and greater trust.
- The extent of knowledge-sharing among stakeholders was generally considered OK, although variable throughout the life-cycle. Suggestions for improvement included creating appropriate databases and dissemination, holding regular committee meetings with targets and goals, regular media involvement to disseminate to the whole community, sharing project management tools, and changing contracting arrangement from confrontational to alliance.

7.2.2.3 Site Visit – Dubai Fujairah Highway

The DFH project site visit included an assessment of work progress captured mainly by site examination, observing work activities, and open discussions with four site engineers. The site visit was especially beneficial in providing an overview of many of the issues raised during earlier interviews and discussions, and from a clearer understanding the DFH project process generally. The detailed findings from this were presented in Chapter 6, Section 6.5. The key findings are listed below.

- The considerable delays in decision-making and the time taken to communicate between the client and the site engineers was considered by those at the site to be primarily caused by the unnecessary presence of the project management firm. It was highlighted that this led to little or no interaction between the site engineer and the construction team and was not justified;
- There was limited authority in decision-making given to the site engineers;
- There was no particular system in place for knowledge-sharing on-site;
- There was a view that the project experienced unnecessary delays due to the project management firm and that progress would have been much faster without their presence; and
- Communication and coordination among all the stakeholders with the construction team was somewhat lacking.

Not surprisingly, there was, however, no mention of any delays caused by the contractors themselves.

7.2.2.4 Results Obtained from the Focus Group Discussion

The detailed results from the focus group discussion session held at the premises of the MPW were presented in Chapter 6, Section 6.6. The key findings from this were:

- No accurate scoping of the study was conducted at the initiation stage of the project and a lack of experienced staff which led to poor decision-making early on. Final decisions were generally always taken by the client (the MPW).
- Inadequate specifications in the initial design, primarily in the number of lanes and design speed. Design parameters continued to change even throughout the construction stage.
- Disbanding the project committee during the construction stage was not considered to be good. They thought that it would have been better if this committee continued until the completion of the DFH Project.

- Meetings with stakeholders should be held more frequently and as deemed necessary.
- Stakeholder satisfaction was negatively affected by the inadequate and unclear project scope and the frequent design changes.
- There were multiple consultants involved in the project and no specific authority was given to them and the contractors.
- Unclear knowledge-sharing systems were in place.

In summary, the above points to (i) inexperience on the part of the early management staff, perhaps because the DFH Project was a novel, large project; (ii) poor decision-making and poor alternative choices; (iii) changes in design and budget constraints; (iv) limited knowledge-sharing, and (v), the lack of experienced of the staff by the Client during the early stage of the project.

7.2.2.5 Interviews with the Director-General and the Minister of Public Works

The results from the interviews conducted with the Director-General of the MPW and the Minister of Public Works are presented in Chapter 6, Sections 6.7 and 6.8 respectively. These two interviews confirmed much of what was reported from examining the documentation, the site visit, stakeholder interviews and the focus group discussion session. A number of important findings emanated from these discussions.

- Reasons for delay and cost overruns of the project were identified as a result of the complex nature of the DFH Project and inadequate decision-making due to the considerable ambiguity of the project;
- Unsuitable and inadequate managerial skills at the early stages of the project had led to improper planning, improper integration during the various project phases, inaccurate design, poor communication, inappropriate transfer of duties, and design problems associated to variations and claims;

- The Minister emphasized the importance and later improvements in coordination, communication, decision-making, and knowledge-sharing in the DFH Project that enhanced performance, reducing time, and meeting the final budget allocated;
- Technical administrative problems that existed at the early stages of the project were acknowledged. The Minister emphasized that there were no clear project objectives and proper specifications developed early on; and
- Frequent variations and redesigns to satisfy a changing project specification in number of lanes and speed limit requirements led to excessive budget increases and delays.

The Director-General and the Minister provided details on the modified strategies, procedures and techniques now adopted by the MPW for these mega projects, including:

- the adoption of a different management strategy where the MPW now pays greater attention to the project;
- external consulting firms are now involved during the early stages of the project and a management committee is always established;
- improved communication and collaboration within the management committee and all stakeholders. There is a serious attempt to develop a better understanding of capabilities of the other stakeholders and contractors involved in the project;
- there is now considerable delegation of responsibilities to other stakeholders and the project management skills have improved; and
- a knowledge database has been established and appropriate information is shared widely among all MPW departments, and others.

7.3 Discussion of Results from Phases I and II

Overall, the results from both phases of the study confirmed that planning and design phases are the most important in executing a mega TIP successfully, and that they can significantly affect project completion and success. Local authorities, federal government and the client (the MPW) are the most important stakeholders, especially during the

planning and design phases. Blair (1996) discussed this as a critical step in the evolution and growth of management research. Moreover, Weston and Copeland (1992) and Cleland and King (1994) also argued that detailed planning is fundamental behind successful development and implementation of large-scale projects such as TIPs.

The Dubai Fujairah Highway (DFH) Project case study involved many important stakeholders during its duration. The importance of these stakeholders was seen to be based on their possession of the attributes of Legitimacy, Power and Urgency mentioned by Mitchell *et al.* (1997) in the Stakeholders Theory. While this theory has been subjected to modern criticisms by Key (1999) and Fassin (2007), others such as Oliverio (2007), Ackermann *et al* (2010), and Jensen and Sandstrom (2012) still claim it has considerable merit in clarifying dynamic processes in project management today.

The stakeholder's level of legitimacy, power and urgency however, was shown to vary across the different stages of the DFH Project. The stakeholders emphasized aspects of key management process (communication, coordination, decision-making and knowledge-sharing), impacting in different ways over the various stages of a project life cycle, as noted by Mitchell *et al* (1997). Importantly, though, as originally reported by Freeman (1984), stakeholder theory's main strength is its simplicity and clarity in explaining stakeholder interactions in these projects, and shown to be evident in the findings of the DFH project.

Project success can be defined in many different ways as illustrated by the results here. The simplest form of success came down to the project being on time and on budget, although stakeholder satisfaction was also noted as important. Atkinson (1999) also claimed that project success primarily involved cost, time, and quality, consistent with the views of many who were interviewed in this research program. However, other views by the participants here such as stakeholder satisfaction and acceptance, and long-term benefits to the travelers were also identified. As noted earlier, Kerzner's (2006) outlined a seven dimension framework of success factors, namely within time, within budget, proper performance, acceptance by the user, mutual agreement, without disturbance, project quality, and adopting corporate culture. Clearly, there are many ways of defining the success or otherwise of mega TIPs such as the DFH and one must be careful not to

use simple criteria when judging success. Importantly, the benefits of the DFH project will provide easier access to many communities across the remote areas of the UAE which should not be overlooked.

Although management practices in TIPs in the UAE were considered to be generally good, there was agreement that further improvements were needed in coordination, communication, decision-making and knowledge-sharing between all the stakeholders. Azzopardi (2010) argued of the need for construction organizations today to focus on globalization and pace to stay ahead of its competitors. This clearly demands a strong focus on the four key management processes in the research model identified above. The lack of knowledge-sharing and poor decision-making, along with a lack of qualified contractors with appropriate technical capability and shortage of skilled engineering and other staff, were key factors in the DFH project's lack of success. Ultimately, the inability to constrain costs and time overruns go against today's needs for successful TIPs in the UAE.

Delegating authority for decision-making to other stakeholders seems important to improve the quality of outcome and the speed of decision-making. Developing detailed procedures and regulations too is important. Among the key elements identified by Katzenbach and Smith (2007) for successful work teams is relying on members with strong technical and interpersonal skills and an ability and willingness to learn. As such, the need for them to be more involved and trusted in making project decisions is fundamental for the success of the whole team. Collins (2001) and the Harvard Business Review (2004) stressed the importance of having the right staff and leadership for the long-term success of an organization, a lesson to be learned here also.

7.4. Principle Factors Critical to TIP Success

Mega Transportation Infrastructure Projects aimed at contributing to the economic and commercial development of the UAE can reduce the rate of accidents and traffic congestion and facilitate a decent life for its citizens. However, they need to be properly planned and executed in a highly professional and efficient manner to return maximum benefits for minimal cost. These projects require strong project management teams and

highly experienced supervisors. A number of other critical factors can also significantly impact on project performance.

This section discusses the critical factors found in this research program that can impact on successful management and ultimately lead to TIP success in terms of cost, time, quality, and stakeholder satisfaction. These factors have been identified from the discussion of the key findings from Phases I and II of the study presented in earlier sections of this Chapter. Figure 7.1 outlines the key factors identified and how they can impact on project outcome.

7.4.1 Leadership

All projects require strong and effective leadership and transportation infrastructure projects are no different in this respect. In order to successfully initiate and manage mega TIPs (as is the case in the UAE), leadership needs to come from the very top. Leadership need to be provided from the ministerial level and from the Director-General of the MPW. The lack of leadership in the early stages of the DFH Project examined in Phase II of the study was shown to lead to significant delays and poor decision-making. From these results, leadership clearly changed in later phases with more active involvement in the decision-making processes by the Minister and the Director-General. A number of procedural changes in the ministry also led to significant improvements.

Effective leadership needs to be provided throughout the project life-cycle. The leader's primary role should be to ensure that project goals are understood and accepted by all stakeholders and appropriate knowledge is shared amongst them in a timely manner.

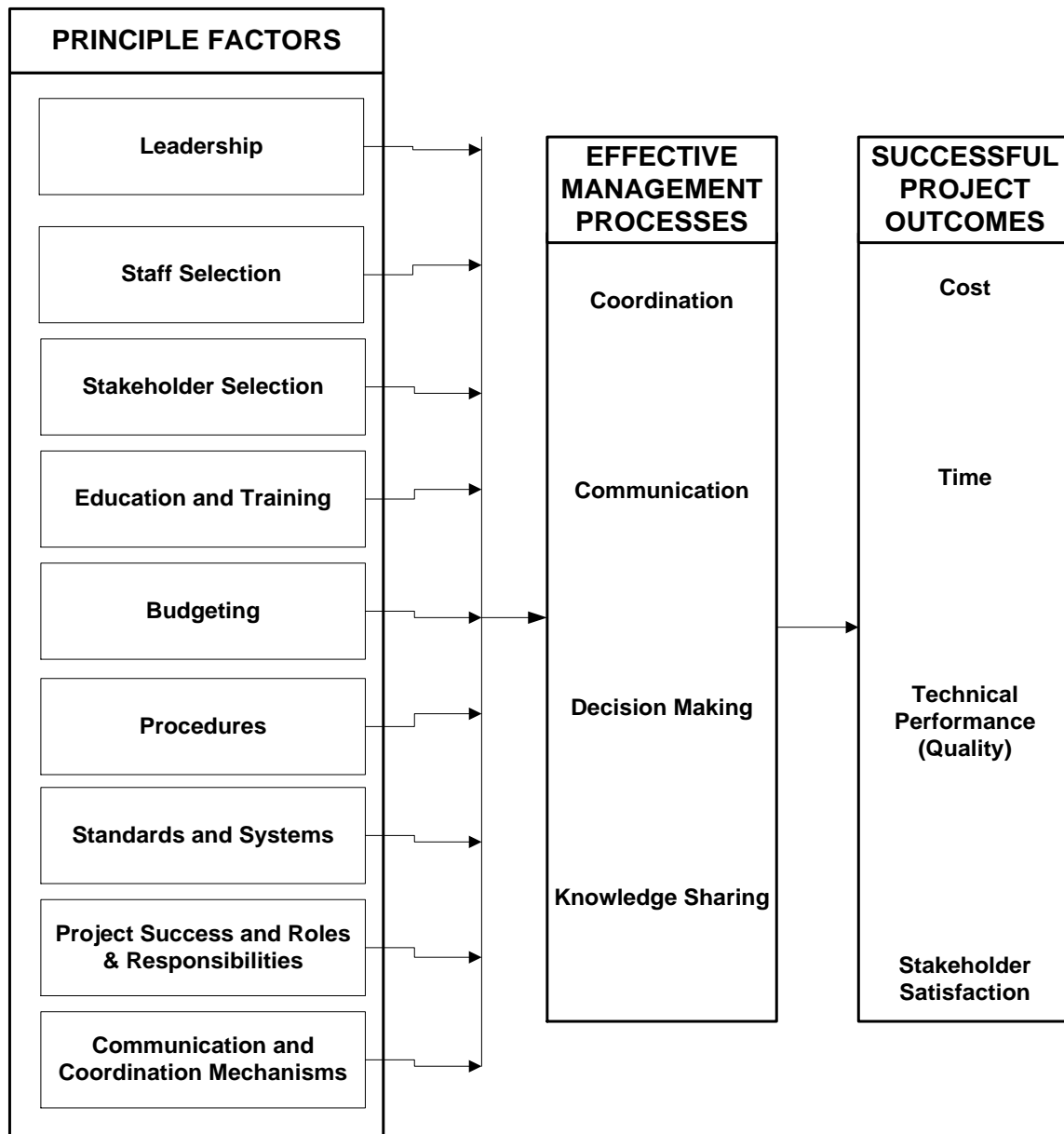


Figure 7.1: Framework for Effective TIP Management

Any conflict arising among the stakeholders needs to be resolved positively and quickly. Trust and respect also needs to be developed so that stakeholders can work together in a supportive, rewarding, and effective environment. Essentially, all stakeholders involved must work together as a team otherwise problems will emerge that will impact negatively on the project outcome. Hence, selection of staff within each organisation and the

selection of the particular organisations (stakeholders) engaged in the project is an important task. This is further discussed below.

There was general agreement that decision-making could be improved by increasing authority to lower levels of the organizations involved in the DFH Project. Assigning accountability and responsibility to lower management can enhance their motivation and commitment (Harris, 2008). Moreover, increasing lower level authority in an organisation (particularly relating to technical aspects) can help reduce the pressure on top management. This can only happen though when competent staff are employed by the various stakeholders involved with ongoing education and training for them. Some of these factors are further discussed below.

7.4.2 Staff Selection

This research highlighted major deficiencies resulting from the deployment of unqualified staff. During the Phase I interviews, participants suggested that 30% of previous TIPs had been unsuccessful and the reasons given for this related to unqualified contractors, consultants and engineers. Similarly, in examining the problems related to the DFH Project, reference was often made to the competence and experience of the individuals involved. Hence, selection of professional staff must become a key activity for all stakeholders involved in the project.

The results showed that local and federal governments need to develop their Human Resource departments further, ensuring that they are capable of carrying out the necessary tasks relating to staff recruitment, training and deployment. Having the right staff that possess the necessary qualifications and experience, and understand the local culture and environment are those that will meet the future challenges expected in fast track mega TIPs in the UAE. Human Resource departments must employ best practice in recruiting new expertise as well as training existing employees. Survival in the current tough economic climate is difficult and making employment-related decisions is even more difficult. Relying on traditional (cultural) methods of recruitment that focus mainly on trust need to be reviewed and replaced with a more professional approach taking into account relevant education and expertise.

In addition, the research highlighted the need to adopt modern managerial processes and techniques, where quality management, project management, risk management and communication and coordination between them improve. In this respect, governments must provide the support necessary to educational and training institutes so that specialized programs can be developed and delivered to meet the needs of the country.

7.4.3 Stakeholder Selection

The DFH Project experienced considerable delays as a result of poor selection of key stakeholders. For example, the consultants and contractors assigned in the early stages of the project were then replaced by others when the project was retendered causing confusion and significant cost and time overruns. The Ministry of Public Works has already implemented a number of changes resulting in significant improvements to the management of TIPs. These changes include the appointment of a project manager for each major project undertaken who reports directly to the Director-General. The selection of well qualified organisations as key stakeholders and the on-going communication and coordination with them has become a major role for the project managers.

7.4.4 Education and Training

To cope with rapid infrastructure development in the UAE, management education and training need to be developed to meet specific local market requirements. This research highlighted the urgent need for appropriate education and training, in particular, that adopted by the ministries and government agencies as well as the engineers and managers employed by contractors, consultants and management firms.

Workers must possess the necessary skills and experience for the organizational roles needed to undertake the responsibilities of the managerial positions in general and those that relate to the infrastructure development in particular (Mohoney, 2007; Swaroop, 2005). In spite of all efforts carried by the federal and regional governments to enhance management education in the UAE, it is important to recognize that much still needs to be done, particularly in developing specialized curricula to fit market needs. Importing such curricula from international schools might not offer the best solution, as it may not meet or fit the UAE special code of practice and needs. Instead of focusing on general

administrative management education, or general management education, it now needs to focus on specialized management education, such as management education for infrastructure projects for airports, roadways, maritime, etc. This will help bridge the noticeable gaps between the market demand and what is provided currently.

7.4.5 Budgeting

Kerzner (2006) and Wideman (2000) both argued that inadequate time and budget allocated in the early stages of planning and designing a project can seriously impact on all subsequent stages of that project. Planning and design stages have been identified as the most important stages of a project, and poor execution of these two stages can result in many TIPs ending in time and cost overruns and ultimately dissatisfied stakeholders. Hence, there is a pressing need to allocate sufficient funding to carry out detailed and accurate planning and design work prior to commencing the subsequent stages of the project. This will reduce the many variations and redesigns demanded during the construction stage, as was the case in the DFH Project.

7.4.6 Procedures

Each Emirate in the UAE has its own procedures, standards, and rules in administering its daily governmental work. This makes it difficult to implement projects extending across more than one Emirate. The development and implementation of consistent, systematic administrative procedures that enable effective decision-making and facilitate improved communication and coordination is absolutely necessary. The DFH Project case study highlighted many times where the lack of adequate procedures contributed negatively to project success. The government of each Emirate must work collaboratively with the federal government in undertaking strategic decisions. The implications of such unification are many. A coordinated effort to create a national standardized set of procedures, requirements, conditions and standards will reflect positively on the smooth flow of construction while meeting deadlines and assigning budgets for infrastructure projects.

It is also necessary to implement procedures related to obtaining site access, especially when unique archeological sites, tombs, queries, or valleys are involved. Once the nature

of the project has been determined, it is usual that a complete topographical, geophysical and geotechnical survey be conducted to determine ahead of time any unexpected challenges that might appear during the implementation stage (Hancher, Pigman, Hartman, Goodum and Mettillie, 2003). The DFH Project highlighted the need for such procedures in the UAE. Obtaining work permits from the utility authorities and other related authorities ahead of time is critical for the smooth and timely progress of the project during the implementation stage.

Finally, adequate procures also need to be implemented for project hand-over when required. Proper briefings and documentation as well as proper knowledge-sharing must take place when there is a need for changes in key stakeholders, such as replacing one consultant firm with another, as seen in the DFH Project. The new organisation taking over the project work should not take full responsibility without first obtaining detailed knowledge and understanding the implications of earlier decisions that have been made.

7.4.7 Standards and Systems

The lack and use of appropriate systems, such as international quality systems, was highlighted during this study as a major factor impacting on project progress and success. These systems enable the various tasks to be undertaken in an effective manner using international best practice in managing mega TIPs. In addition, the DFH case study showed the need for appropriate databases to be installed which can then be used as reference points in decision-making. Knowledge-sharing systems and mechanisms, either in electronic or manual format, are essential to help avoid repeating the same mistakes (Burk, 2009).

It is suggested that a body of knowledge appropriate for the UAE with respect to mega TIPs is quickly established. This knowledge should be shared across concerned stakeholder and research entities, through an official regulatory body, ensuring easy access. This can lead to the establishment of a flexible, robust and efficient system that can be adapted for various project sizes, characteristics and constraints (Robertson, 2004).

7.4.8 Project Success Measures and Roles & Responsibilities

Another important requirement is the establishment of a common set of performance measures to be used to assess project success. This research highlighted the need to establish policies for the unification of such performance measures urgently among the various governmental agencies and project execution entities involved in TIPs. Both the federal and local governments must act to establish benchmarks in this respect.

A comprehensive study of potential future problems should be undertaken to illustrate what needs to change to avoid unnecessary delays in the future. Detailed project success scoping documents and management plans are essential in mitigating unexpected project delays or overruns (Gabor 1990; Kyte *et al.* 2004). A successful management plan should include Problem Identification, Success Index Estimation, Responses to Delays, and Planning and Execution scenarios. As Lam (1999) pointed out, it is critical to implement and complete a successful management plan during the project planning stage to successfully perform other project stages.

Developing a detailed understanding of the nature of the project work involved, especially for government departments and authorities and the various ministries, is crucial in determining specific roles and responsibilities and the resources required. For example, working in a dangerous mountainous area, as was the case for the DFH Project, requires a unique set of skills and technologies. Hence, understanding these requirements ahead of the planning stage, can greatly assist in overcoming unwanted delays and cost over runs and achieving project outcomes.

This research program highlighted the important role played by management firms in the success of TIPs in the UAE. From this research, it is obvious that project management firms need to deliver clear and concise messages between stakeholders to clarify issues and problems as they arise and come up with effective solutions and recommendations.

7.4.9 Communication and Coordination Mechanisms

Finally, the need for a project management committee to oversee all mega TIPs throughout the project life-cycle was highlighted in this research. This committee should

act as a communication body representing clients and/or project sponsors and have the primary role of providing effective communication and coordination with all stakeholders, especially contractors and consultants. The committee should address the needs of the clients, and help establish the project's objectives and specifications to maximize stakeholder satisfaction and a more effective decision-making process.

The importance of establishing decentralized communication channels for direct daily communication with all concerned entities was apparent from the research program results. These decentralized channels can accelerate communication of problems and challenges in daily work assignments and understanding the nature of these challenges. Such quick assessment can improve response from decision-makers in solving problems effectively and efficiently, avoiding unnecessary and expensive project delays (Farmer, 2008).

Due to the importance of infrastructure development and management in the UAE and its critical role in the development of the political, social, economic, investment and industrial sectors, the importance of adopting coordination regulations, models and coordination committees was emphasized. Federal and local governments through their involvement in these committees need to assure early engagement of other key stakeholders and enhance the level of trust and capabilities that are absolutely necessary for effective project management.

7.5 Developing a Preliminary Framework for a mega TIP

In outlining what are the most critical stages and management processes for TIPs in the UAE, it is prudent to evaluate the findings obtained in this research program with others who are experienced and engaged in active mega projects in the region. This section describes the process carried out with respect to the importance of management processes and stakeholder influence identified from the research conducted in Phases I and II. While it would have been useful to undertake a full validation of the results obtained from this program, this was not strictly possible given the qualitative nature of the research. Nevertheless, in developing the preliminary framework with relative judgments

of importance, it was necessary to adopt more of a quantitative approach and hence a pseudo-validation process was conducted, as outlined below.

7.5.1 Second Focus Group

A second focus group was conducted at the MPW offices in Dubai to rate the relative importance of the management processes and the stakeholder influence. After consultation with the MPW, 18 participants were selected to be involved in these discussions. Contact details of these individuals were provided by the MPW and subsequently invitations were sent inviting them to participate in this focus group. Nine of the 18 participants represented Sponsors/Clients, two represented Project Management Firms, six represented Consultants, and one represented Contractors. The focus group session was facilitated by the research program supervisors, it lasted a total of 120 minutes, and the discussions were recorded.

The focus group discussion commenced with an overview of the findings from Phases I and II of the study. This led to some interesting dialog during which a number of further insights were gained. The focus group participants were then asked to provide their assessment on the importance of each of the management processes (communication, coordination, knowledge-sharing, and decision-making) in completing each stage of a TIP and the importance of the six construction stages, planning, scoping, design, scheduling, tendering, and construction. They were asked to make these judgments independently using a scale of 1 to 9 where 1= not important and 9= very important.

Specific forms were generated to capture these data (see Appendix D for an example of these forms). Focus group participants were also requested to assess the importance of each of the stakeholders in the project. They were given 30 minutes to complete these forms. The data obtained was tabulated and analyzed which showed that there were many missing responses as well as clear biases and group responses identified in the data.

7.5.1.1 Focus Group Results

Variations in the ratings were clearly identified in these data. Given that planning and design were identified as the most critical stages in a TIP, it was decided that only the

findings related to the planning and design stages of the project would be focused on. These results are shown in Tables 7.1 and 7.2. In keeping with the qualitative nature of the project, the participants' 1-9 scale judgments were subsequently converted to ordinal figures of Low, Medium and High relevance.

Table 7.1: Importance judgments of key stakeholders generally in mega TIP

Project Stage	Key Stakeholders			
	Sponsors/Clients (9)	Management Firms (2)	Consultants (6)	Contractors (1)
Planning	Med	Med	Low	Med
Design	Med	Med	Low	Low

Table 7.2: Importance of key stakeholders for each management process

Management Process/Project Stage	Key Stakeholders			
	Sponsors/Clients (9)	Management Firms (2)	Consultants (6)	Contractors (1)
Communication				
Planning	Med	Med	Low	Med
Design	Med	Med	Low	Low
Coordination				
Planning	Med	Med	Low	Med
Design	Med	Med	Low	Low
Decision-Making				
Planning	Med	Med	Low	Med
Design	Med	Med	Low	Low
Knowledge-Sharing				
Planning	Med	Med	Low	Med
Design	Med	Med	Low	Low

The results showed that sponsors/clients and project management firms had medium importance in the planning and design stages generally and more than consultants and contractors. However, it should be noted that there were wide discrepancies in the number of participants across the five key stakeholders, and indeed clients and government members were essentially the same participants.

7.5.1.2 Discussion of Focus Group Results

These results were quite disappointing in that they failed to show any real differences in the judgments of the focus group participants for the planning and design stages of the project. Moreover, subsequent discussion with the focus group participants confirmed that many of them had not clearly understood what was required when completing the assessment forms and had in fact randomly guessed the response or copied from another respondent. Because of these problems, data collected in this focus group was not considered suitable for further use in developing the framework.

Thus, a short follow-up questionnaire survey was subsequently conducted to collect additional unbiased data validating the results of Phases I and II. This is discussed further in the next section.

7.5.2 Follow-up Survey

Assessment for developing the framework again focused only on planning and design project stages of a TIP. A new questionnaire was developed comprising two parts (see Appendix E). The first part focused on stakeholder's assessment of the critical importance of the four management processes of communication, coordination, decision-making and knowledge-sharing. Respondents were asked to rank these on a 4-point scale where 4 = Very High importance and 1 = Very Low importance. To overcome the earlier problem of large differences between the stakeholder groups, five representatives of each of the major stakeholder groups were recruited.

The second part of the form captured the respondents' opinion with respect to how important each stakeholder is during the planning and design stages of a TIP. The five stakeholders were asked to assign rank '1' to the most important stakeholder and rank '5' to the least stakeholder.

The survey form was mailed and respondents asked to complete and return it to the researcher within two weeks. A total of 23 completed forms were received (a success rate of almost 90 percent). Unfortunately, only three of the five participants from the

Governmental Agency group responded. These data were analyzed and the results listed below.

7.5.2.1 Results of Follow-Up Survey

Results relating to the importance of management processes and the importance of stakeholders are discussed below for these two project construction stages.

7.5.2.2 Importance of Management Processes

Table 7.3 shows the overall importance for each management process during the planning stage as subjectively assessed by the researcher (row 1). This is based on the findings from Phase I and Phase II of this study. Very high importance is placed on decision-making while both communication and coordination are assessed to be of high importance. This will naturally reflect on project outcomes. If decision-making is poor then project outcomes will be low.

Table 7.3: Importance of Management Processes in the Planning Stage

	<i>Importance Level</i>			
	Communication	Coordination	Decision-Making	Knowledge-sharing
<i>Research team</i>	High	High	Very High	Medium
<i>Stakeholders</i>	Medium	Very High	High	Low
	<i>Suggested Weighting</i>			
<i>Research team</i>	High (3)	High (3)	Very High (4)	Medium (2)
<i>Stakeholders</i>	Medium (2)	Very High (4)	High (3)	Low (1)

In addition to the judgments by the survey respondents, the research team also conducted the survey, based on their understanding of the importance of both the stakeholders and the management processes. This was to provide some comparative indications based on their interpretations of the data collected and for interest sake in developing the preliminary framework.

The second row in Table 7.3 shows the importance placed on each management process as assessed by the stakeholders through the survey discussed above. In the third and fourth rows, the following weights are assigned: very high importance = 4, high importance = 3, medium importance = 2 and low importance = 1. As can be seen, the

weights assigned by the researcher and the stakeholders in the survey were quite close for all four management processes, with a maximum weight difference of one. In assessing overall project outcomes with respect to the planning stage (see the following section), the weights calculated from the survey (row four in Figure 7.3) were used.

In a similar manner, the importance of management processes during the design stage was assessed. The results are presented in Table 7.4. The research team assessment indicates very high importance of coordination during the design stage with high importance placed on decision-making (first row of Table 7.4). If the coordination is poor, project outcomes will be low. The level of importance assessed through the survey is shown in the second row of Table 7.4. As can be seen from the weights assigned (rows three and four of Table 7.4), the research teams assessment is closely aligned with that of the stakeholders with only a maximum weight difference of one for communication. The weighting calculated from the survey (row four in Figure 7.4) is used in assessing overall project outcomes with respect to the design stage.

Table 7.4: Importance of Management Processes in the Design Stage

<i>Importance Level</i>				
	Communication	Coordination	Decision Making	Knowledge-sharing
<i>Research team</i>	Medium	Very High	High	Medium
<i>Stakeholders</i>	Low	Very High	High	Medium
<i>Suggested Weighting</i>				
<i>Research team</i>	Medium (2)	Very High (4)	High (3)	Medium (2)
<i>Stakeholder</i>	Low (1)	Very High (4)	High (3)	Medium (2)

7.5.2.3 Importance of Stakeholders

Table 7.5 shows stakeholders and the research team's importance ranks of the various stakeholders for the planning and design stages calculated from the follow-up survey. Of particular importance, it can be seen that the two rankings match exactly. This shows that both the research team and the study participants agreed on the importance of stakeholders, using the stakeholder theory criteria specified by Mitchell *et al.* (1997).

Table 7.5: Importance ranking of the stakeholders from the follow-up survey

Project Stage	Client or Sponsor	Government Agency	Project Management	Consultants	Contractors
Planning					
<i>Research Team</i>	1	2	3	4	5
<i>Stakeholders</i>	1	2	3	4	5
Design					
<i>Research Team</i>	2	3	4	1	5
<i>Stakeholders</i>	2	3	4	1	5

7.5.2.4 Importance of Stakeholders' Power, Legitimacy & Urgency

The final analysis addressed the roles of the stakeholders' power, legitimacy and urgency during the planning and design stages of a mega TIP. This dimension was important for developing the preliminary framework but was not an issue included in the focus group discussion or the follow-up survey. Given the perfect agreement between the research team and the stakeholders' judgments in Figure 7.5 it was deemed suitable for the research team alone to make these assessments. Naturally, in finalizing the preliminary framework, it will be necessary to validate these judgments ultimately.

Table 7.6: Estimation of Stakeholders' Importance and Rank by the Research team

Project Stage	Client or Sponsor	Governmental Agency	Project Management	Consultants	Contractors
Planning					
Power	High (3)	Medium (2)	Low (1)	Nil (0)	Nil (0)
Legitimacy	High (3)	Medium (2)	Medium (2)	Medium (2)	Nil (0)
Urgency	High (3)	Medium (2)	Medium (2)	Medium (2)	Nil (0)
Overall Importance	9	6	5	4	0
Rank*	1	2	3	4	5
Design					
Power	Medium (2)	Medium (2)	Medium (2)	High (3)	Low (1)
Legitimacy	High (3)	Medium (2)	Low (1)	High (3)	Low (1)
Urgency	High (3)	Medium (2)	Medium (2)	High (3)	Low (1)
Overall Importance	8	6	5	9	3
Rank*	2	3	4	1	5

*1=most important stakeholder and 5=the least important

Table 7.6 summarizes the researcher's subjective assessment of the importance of stakeholders in terms of their power, legitimacy and urgency during the planning and design stages. The overall importance level as a value ranging 0-9 was used in estimating project outcomes associated with the various stakeholder groups and is the sum of the weights assigned to power, legitimacy and urgency. Based on the overall importance level, the ranks are assigned from 1 to 5.

All the results from the follow-up survey and Table 7.6 were subsequently used for developing the preliminary framework for assessing project outcomes as discussed in the following section.

7.6 Preliminary Framework for Assessing TIP Outcomes

This section describes the development and use of a preliminary framework for assessing the outcomes from a mega Transport Infrastructure Project (TIP). A quantitative approach was undertaken here and the results obtained from the follow-up survey were used. The development of the framework is potentially a valuable contribution for project management practitioners in the UAE. The preliminary framework developed is outlined in Tables 7.7 to 7.10 and is shown diagrammatically for a sample of outcomes in Figures 7.2 to 7.5.

7.6.1 The TIP Preliminary Framework

The framework uses the independent variables of stakeholder importance from the previous section, with the various levels of power, legitimacy and urgency, and the importance and effectiveness of key management processes. The dependent variable is the level of successful project outcomes relating to cost and time overrun, technical performance and stakeholder satisfaction, as illustrated in the conceptual model presented in Figure 4.3 in Chapter 4.

The development of the framework is illustrated for the planning and design stages only. A similar approach can be undertaken to extend this work to include other stages of a construction project. This will require additional data collection which was not possible in this research program. The four dimensions of the framework are described below.

7.6.1.1 Importance of Each Management Process

The first dimension addresses the importance of the key management processes of communication, coordination, decision-making and knowledge-sharing during each stage of a TIP. For example, one may regard decision-making skills of a particular stakeholder group to be highly important during the earlier stages of the project, but of lower importance during other stages. The importance of each management process may vary from one construction stage to another, and hence, weighted accordingly for each stage. The following weightings were used: Extremely Important (4), Very Important (3), Important (2), and Slightly Important (1).

7.6.1.2 Effectiveness of Each Management Process

The second dimension assesses how effective each management process is during each stage of the project (the quality of communication, coordination, decision-making and knowledge-sharing). The effectiveness of key management processes can be actually measured by outputs such as the technologies used in communication, the delegation of authorities within the organization, and the existence of dedicated personnel for such management process. It has been categorized as Very Effective (3), Effective (2) and Not Effective (1).

7.6.1.3 Stakeholder Importance

The third dimension assesses the importance of each stakeholder in terms of their level of power, urgency and legitimacy. The importance of the stakeholder may also change from one construction stage to another. That is, an important stakeholder during a specific stage may have a higher influence on the project, compared to a stakeholder with lower importance, with differential impact on overall project success. The level of power, urgency and legitimacy was assessed to have either: High (3), Medium (2), or Low (1) importance.

7.6.1.4 Stage of the Project

The fourth dimension captures the project stage specifics and is included to study the interaction among the first three dimensions at the planning and design stages. It is important to emphasize here that it is not planning or design itself that will impact on the

project success, but how the first three dimensions (importance of management processes, effectiveness of the management processes and the importance of the stakeholders) interact together throughout these stages.

7.6.2 Using the Preliminary Framework to Assess Project Outcomes

The weightings and ranking developed above for the importance and effectiveness of the management processes and for stakeholder importance have been applied in the framework to estimate overall project (TIPs) outcomes. This was done at each specific stage of the project. In the examples presented here, however, only the planning and design stages are illustrated.

Tables 7.7 and 7.8 illustrate the use of the framework to assess project outcomes at the planning and design stages. It aggregates levels of effectiveness and importance of the four management processes (communication, coordination, decision-making and knowledge-sharing) with the stakeholder importance with respect to power, legitimacy and urgency. Column one in these tables accounts for the level of effectiveness of the management processes and column two accounts for the importance of the management processes. The following columns take into account each stakeholder's importance in terms of their levels of power (P), legitimacy (L) and urgency (U). The levels of P, L and U are then multiplied by the effectiveness and importance levels to arrive at an estimate of the overall rating of importance (as previously shown in Table 7.5).

Tables 7.7 and 7.8 present what we have called the 'quantitative project outcome index' (QPOI) that is associated with a particular management process and its effectiveness across each stakeholder importance value. The project outcome index is defined as the product of:

1. The weight allocated to the effectiveness level of the management process - a weight of three (3), two (2) and one (1) for Very Effective, Effective and Not Effective is assigned respectively.
2. The weight allocated to the importance level of the management process. The weight was initially assigned subjectively and then verified through the survey results, as discussed earlier and highlighted in Tables 7.3 and 7.4.

3. The weight allocated to the importance level of stakeholder. The weight (a value ranging from 0 to 9) was initially set subjectively (as the sum of the P, L, and U levels), and then verified through the survey results, as discussed earlier and highlighted in Tables 7.5 and 7.6.

The QPOI associated with ‘not effective decision-making by the client/sponsor stakeholder’ during the planning stage is calculated as the product of the “weight of very effective decision-making” [3], the “weighted decision-making importance” [3], and the overall importance level of the client/sponsor” [9]. The resulting product of these three quantities results in the project outcome index of 81. It should be noted that this index is a quantitative measure of the project outcomes. The higher is the number, the higher the likely project outcome. As such, cost and time overruns are likely to be reduced and technical performance and stakeholder satisfaction will be improved.

Further classification can then be carried out to categorize these indices into descriptive terms (very high outcomes, high outcomes, medium outcomes, or low outcomes). Project outcomes therefore can be described using category indices such as:

- Very high outcomes (for quantitative indices 70+)
- High outcomes (for quantitative indices in the range 50-70)
- Medium outcomes (for quantitative indices in the range 25-49); and
- Low outcomes (for quantitative indices in the range 1-24)

Tables 7.9 and 7.10 illustrate the alternative descriptive approach, based on the above classification.

7.6.3 Application of the TIP Framework in a Diagrammatical Form

Figures 7.2 through 7.5 illustrate some examples of applying the framework in a diagrammatical form that may be more suitable for practitioner use. For example, Figure 7.2 shows the outcomes associated with having very effective coordination during the planning stage. As can be seen, a very high level of outcomes for both the client/sponsor and the governmental agency groups is illustrated. A high level outcome for the project management group and a medium level outcome for the consultants group are illustrated.

The contractors group has no outcomes as their importance is not recognized during the planning stage, but rather later in the construction process.

Similarly, Figure 7.3 illustrates the outcomes associated with very effective decision-making during the planning stage. Figure 7.4 illustrates the outcome associated with very effective coordination during the design stages. Finally, Figure 7.5 shows the outcome associated with very effective decision-making during the design stage.

Table 7.7: Framework for Assessing TIP Outcomes (Planning Stage)

Project Success Index						
Management Issue		Stakeholder Group				
		[levels of power, urgency and legitimacy][high= 3, medium=2, low=1, N/A at the project stage=0] (overall stakeholder importance= sum of power, urgency and legitimacy levels)				
<i>Effectiveness Level</i> [Not Effective (NE)=3, Effective (E)= 2, Very Effective (VE)=1]	<i>Importance Level</i> [Extremely Important =4 Very Important=3 Important=2 Slightly Important =1]	<i>Client/Sponsor</i> [P=3, U=3, L=3] (Overall = 9)	<i>Governmental Agencies</i> [P=2, U=2, L=2] (Overall = 6)	<i>Project Management</i> [P=1, U=2, L=2] (Overall = 5)	<i>Consultant</i> [P=0, U=2, L=2] (Overall = 4)	<i>Contractor</i> [P=0, U=0, L=0] (Overall = 0)
VE [3]	<i>Communication</i> {2}	54	36	30	24	0
E [2]		36	24	20	16	0
NE [1]		18	12	10	8	0
VE [3]	<i>Coordination</i> {4}	108	72	60	48	0
E [2]		72	48	40	32	0
NE [1]		36	24	20	16	0
VE [3]	<i>Decision Making</i> {3}	81	54	45	36	0
E [2]		54	36	30	24	0
NE [1]		27	18	15	12	0
VE [3]	<i>Knowledge-sharing</i> {1}	27	18	15	12	0
E [2]		18	12	10	8	0
NE [1]		9	6	5	4	0

Table 7.8: Framework for Assessing TIP Outcomes (Design Stage)

Project Success Index						
Management Issue		Stakeholder Group [levels of power, urgency and legitimacy][high= 3, medium=2, low=1, N/A at the project stage=0] (overall stakeholder importance= sum of power, urgency and legitimacy levels)				
<i>Effectiveness Level</i> [Not Effective (NE)=3, Effective (E)= 2, Very Effective (VE)=1]	<i>Importance Level</i> Extremely Important =4 Very Important=3 Important=2 Slightly Important =1]	<i>Client/Sponsor</i> [P=2, U=3, L=3] (Overall = 8)	<i>Governmental Agencies</i> [P=2, U=2, L=2] (Overall = 6)	<i>Project Management</i> [P=2, U=1, L=2] (Overall = 5)	<i>Consultant</i> [P=3, U=3, L=3] (Overall = 9)	<i>Contractor</i> [P=1, U=1, L=1] (Overall = 3)
VE [3]	<i>Communication</i> {1}	24	18	15	27	9
E [2]		16	12	10	18	6
NE [1]		8	6	5	9	3
VE [3]	<i>Coordination</i> {4}	96	72	60	108	36
E [2]		64	48	40	72	24
NE [1]		32	24	20	36	12
VE [3]	<i>Decision Making</i> {3}	72	54	45	81	27
E [2]		48	36	30	54	18
NE [1]		24	18	15	27	9
VE [3]	<i>Knowledge-sharing</i> {2}	48	36	30	54	18
E [2]		32	24	20	36	12
NE [1]		16	12	10	18	6

Table 7.9: Descriptive Framework for Assessing TIP Outcomes (Planning Stage)

Project Success Index* (Planning Stage)						
Management Issue		Stakeholder Group				
		[levels of power, urgency and legitimacy][high= 3, medium=2, low=1, N/A at stage=0] (overall stakeholder importance= sum of power, urgency and legitimacy levels)				
<i>Effectiveness Level</i> [Very Effective (VE)=3, Effective (E)= 2, Not Effective (NE)=1]	<i>Importance Level</i> [Extremely Important =4 Very Important=3 Important=2 Slightly Important =1]	<i>Client/Sponsor</i> [P=3, U=3, L=3] (9)	<i>Governmental Agencies</i> [P=2, U=2, L=2] (6)	<i>Project Management</i> [P=1, U=2, L=2] (5)	<i>Consultant</i> [P=0, U=2, L=2] (4)	<i>Contractor</i> [P=0, U=0, L=0] (0)
VE [3]	<i>Communication</i> {2}	H	M	M	L	N
E [2]		M	L	L	L	N
NE [1]		L	L	L	L	N
VE [3]	<i>Coordination</i> {4}	VH	VH	H	M	N
E [2]		VH	M	M	M	N
NE [1]		M	L	L	L	N
VE [3]	<i>Decision Making</i> {3}	VH	H	M	M	N
E [2]		H	M	M	L	N
NE [1]		M	L	L	L	N
VE [3]	<i>Knowledge-sharing</i> {1}	M	L	L	L	N
E [2]		L	L	L	L	N
NE [1]		L	L	L	L	N

- VH: “Very high” outcome (for quantitative indices [70+])
- H: “High” outcome (for quantitative indices in the range [50-70])
- M: “Medium” outcome (for quantitative indices in the range [25-49]); and
- L: “Low” outcome (for quantitative indices in the range [1-24])N: No impact on outcome

Table 7.10: Descriptive Framework for Assessing TIP Outcomes (Design Stage)

Project Success Index*						
Management Issue		Stakeholder Group				
		[levels of power, urgency and legitimacy][high= 3, medium=2, low=1, N/A at stage=0] (overall stakeholder importance= sum of power, urgency and legitimacy levels)				
<i>Effectiveness Level</i> [Very Effective (VE)=3, Effective (E)= 2, Not Effective (NE)=1]	<i>Importance Level</i> [Extremely Important =4 Very Important=3 Important=2 Slightly Important =1]	<i>Client/Sponsor</i> [P=2, U=3, L=3] (8)	<i>Governmental Agencies</i> [P=2, U=2, L=2] (6)	<i>Project Management</i> [P=2, U=1, L=2] (5)	<i>Consultant</i> [P=3, U=3, L=3] (9)	<i>Contractor</i> [P=1, U=1, L=1] (3)
VE [3]	<i>Communication</i> {1}	L	L	L	M	L
E [2]		L	L	L	L	L
NE [1]		L	L	L	L	L
VE [3]	<i>Coordination</i> {4}	VH	VH	H	VH	M
E [2]		H	M	M	VH	L
NE [1]		M	L	L	M	L
VE [3]	<i>Decision Making</i> {3}	VH	H	M	VH	M
E [2]		M	M	M	H	L
NE [1]		L	L	L	M	L
VE [3]	<i>Knowledge-sharing</i> {2}	M	M	M	H	L
E [2]		M	L	L	M	L
NE [1]		L	L	L	L	L

- VH: “Very high” outcome (for quantitative indices [70+])
- H: “High” outcome (for quantitative indices in the range [50-70])
- M: “Medium” outcome (for quantitative indices in the range [25-49]);
- L: “Low” outcome (for quantitative indices in the range [1-24]), and
- N: No impact on outcome

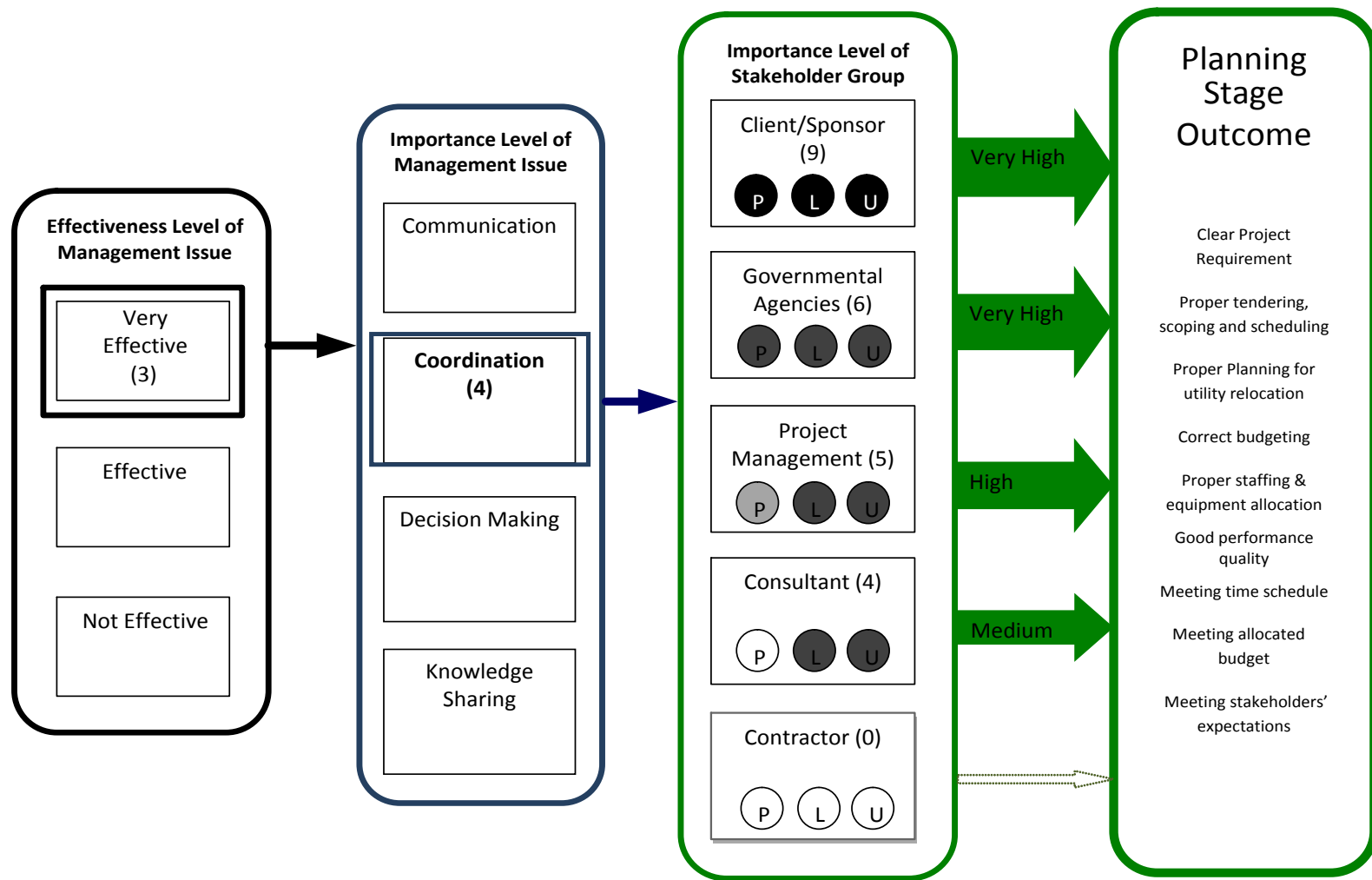


Figure 7.2: Project Outcomes when coordination during planning is very effective by various stakeholder groups

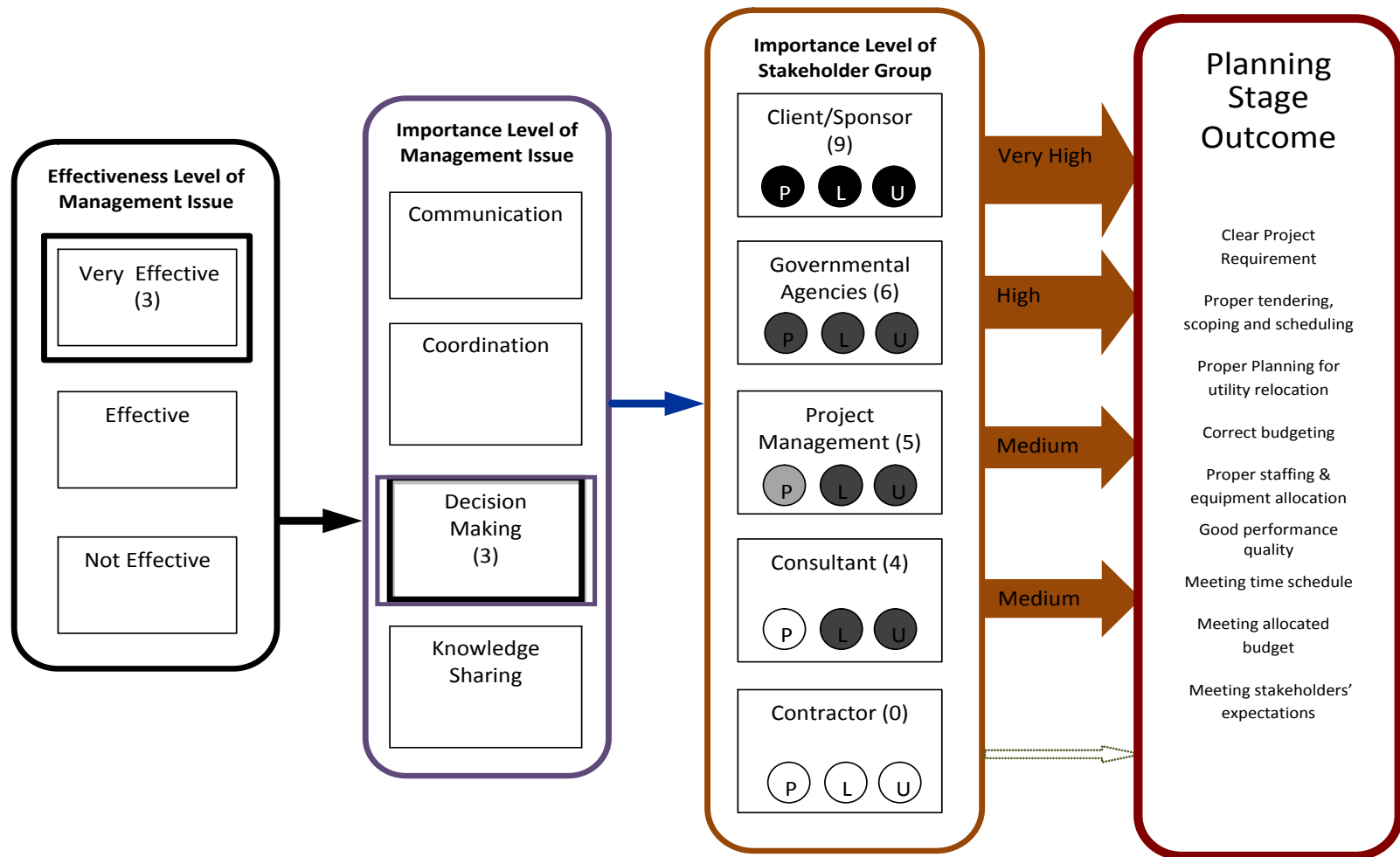


Figure 7.3: Project Outcomes when decision-making during planning is very effective by various stakeholder groups

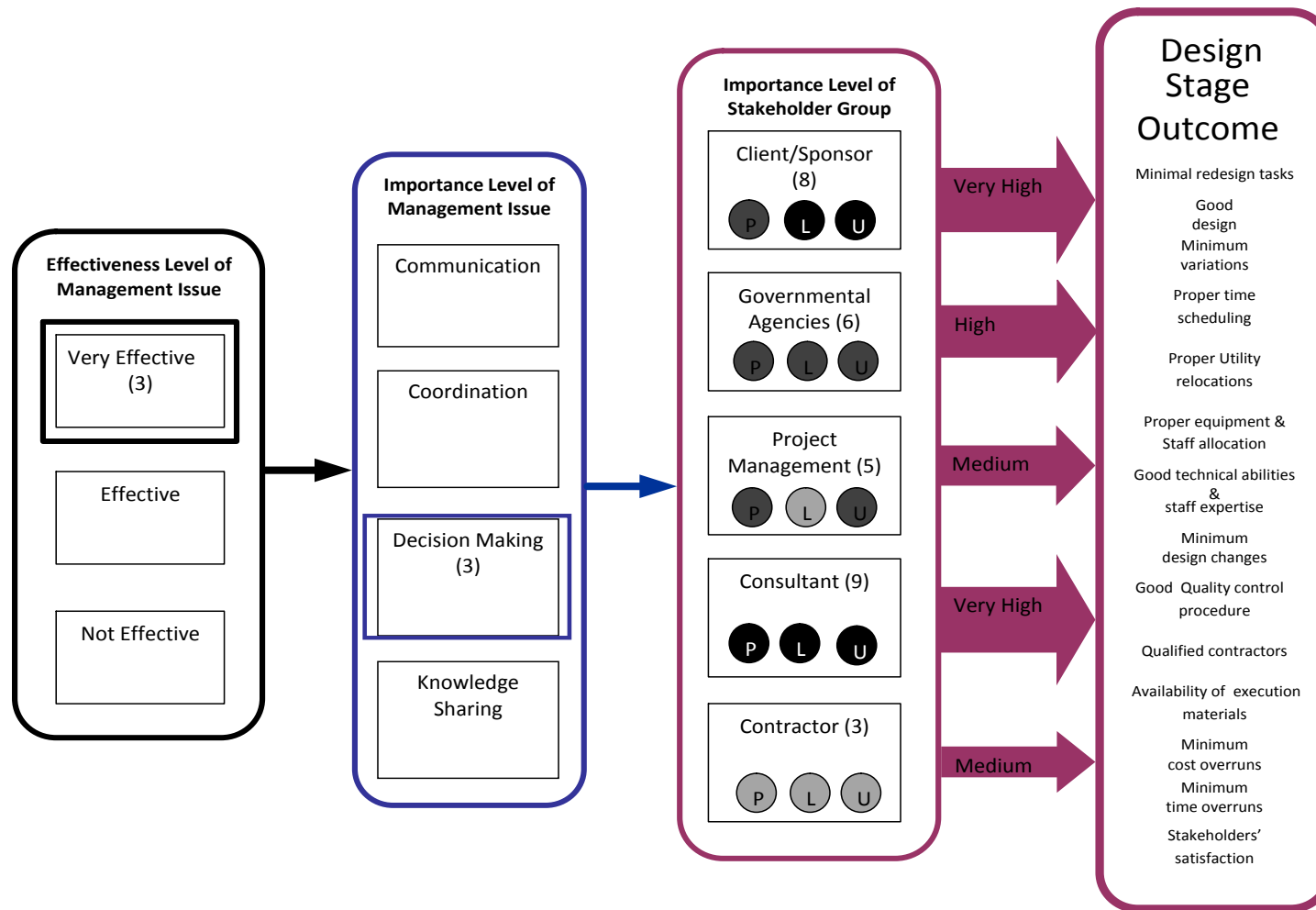


Figure 7.4: Project Outcomes when coordination is during design is very effective by various stakeholder groups

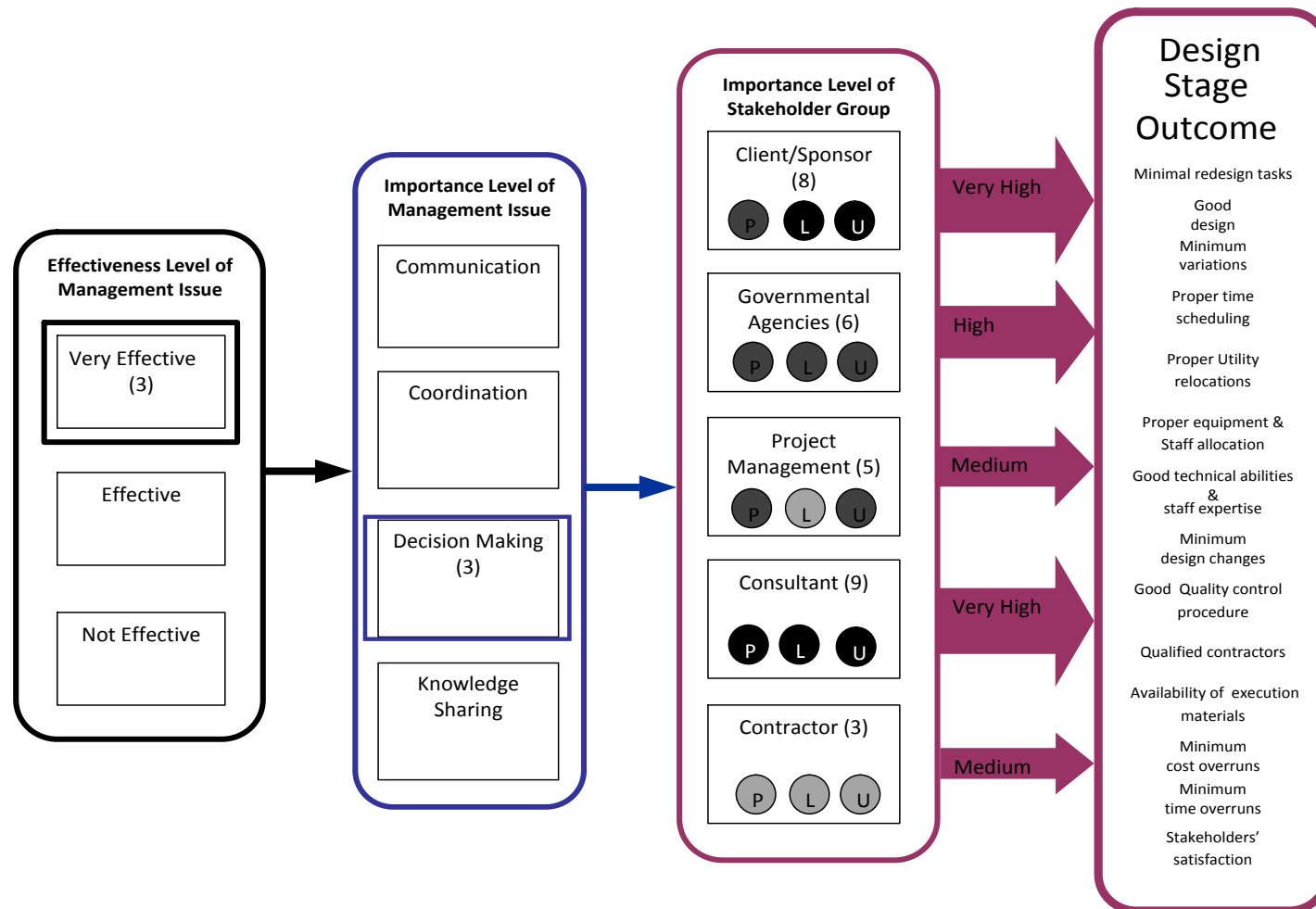


Figure 7.5: Project Outcomes when decision-making during design is very effective by various stakeholder groups

7.7 Chapter 7 Summary

In this Chapter, the major findings of the research were brought together and discussed and the important factors behind a successful mega TIP in the UAE were enunciated. Figure 7.1 outlined the nine principle factors identified through this research that are considered to be important for the future success of TIPs in the region. In addition, the links between these nine principle factors, effective project management and ultimate success outcomes have been identified.

The credibility of these findings was tested using a second focus group discussion and a follow-up survey leading to the development of the preliminary framework to help clients and sponsors, project managers and consultants assess the likely success of a new mega TIP. While this was really outside the scope of the research program, nevertheless, it helps point the way in which these findings could be further developed and implemented in a practical way to improve the success rates for these major infrastructure initiatives.

It is maintained that the conceptual model initially developed in Figure 4.3 showing the interaction between a project's construction stages, stakeholder importance, management processes and success indicators has been ratified by the findings in this Chapter.

The final Chapter 8 to follow elaborates on the outcomes of the research in terms of addressing its aims, objectives, and research questions, presents its academic and practical contributions to the field, discuss its strengths and limitations of the research, and recommends areas that warrant further research.

CHAPTER 8

CONCLUSIONS AND RECOMMENDATIONS

8.1 Introduction

This research program set out to provide an outline of what are successful management practices relevant for enhancing Transport Infrastructure Projects in the UAE. Given the lack of previous research in the UAE, it was expected that this would provide a major contribution to improving successful management practices of mega Transportation Infrastructure Projects (TIPs) in the region. The Chapter is structured in seven sections that address important aspects of the research program.

Section 8.2 discusses how the research program has addressed the three objectives outlined earlier and Section 8.3 outlines the findings as they relate to the six specified research questions. Section 8.4 discusses the academic contribution from the research program to our knowledge of the management of mega Transportation Infrastructure Projects. Section 8.5 addresses the practical outcome of the research for future TIPs in the UAE. Section 8.6 lists the strengths and limitation of the research program, while Section 8.7 summarises the research outcomes and lists recommendations for future research in this area.

8.2 Research Objectives

Three objectives were outlined in Chapter 4 for this research program. The following discussion relates how the research findings have addressed these key objectives.

8.2.1 Objective 1

The first objective was **“to develop a better understanding of Transportation Infrastructure Projects (TIPs) management practices and challenges in the UAE”**. This was achieved with the findings from the literature reviews in Chapters 2 and 3 as well as the research findings from Phases I and II.

Those interviewed in Phase 1 of the research program found that while 70% of the TIPs in UAE had been completed successfully, almost one-third had not. Reasons for this were attributed to unqualified stakeholders and poor coordination. They noted that communication and coordination were identified as critical to the success of the project, although they

claimed that there was considerable scope for improvements. In addition, the quality of decision-making and knowledge-sharing in TIPs in the UAE could also be improved.

Participants agreed that the most important stakeholders in UAE TIPS are government agencies, funding bodies and clients, and that the most critical stages of a TIP are planning and design. Project success is primarily determined by cost and time overrun, excellent quality, and stakeholder satisfaction. Quality of the product in the UAE was generally regarded as good, although the interviewees made many suggestions on how it could be improved in the region.

It was clear that the UAE is a unique environment and its needs must be taken into account in designing, constructing and implementing a mega TIP. Project management tends to be hierarchical where the main decision-maker is often a government sponsor or client who relies heavily on personal relationships and the trust of other stakeholders. Project success therefore will be more successful when interactions between key stakeholders are addressed.

8.2.2 Objective 2

The second objective sought **“to understand how the various stakeholders and management processes impact on project success throughout the different stages of project execution”**. This objective comprised the bulk of the research program reported in Chapters 5 from the interviews with key stakeholders, and in particular, the in-depth case study of the DFH project in Chapter 6. The materials collected from the DFH interviews, focus group discussions, examination of historical records, discussions with the Director-General and Minister of Public Works, as well as from site visit observations and discussions were especially useful in addressing this objective.

From these results, it is evident that the interactions between the various stakeholders and project management can have a profound effect on a successful TIP outcome in the UAE. The history of the DFH process was a clear example of how client specifications, design changes, planning, and consultants’ judgments can impact on the outcome measures. The cost and time overruns over the 10 plus years of the project can be directly attributed to insufficient forethought initially on the part of the stakeholders and managers (leadership) and the lack of appropriate structure and planning involving the key management processes (communication, coordination, decision-making and knowledge-sharing) in setting up the

project. Moreover, as reported by the current key stakeholders, little stakeholder satisfaction was generated from this project.

There are lessons to be learned from the research conducted in Phases I and II in what constitutes a successful project strategy and the importance of setting up clear guidelines and interactive processes between stakeholders and management processes when agreeing to undertake a mega TIP in the UAE. These elements are very important if the project is ultimately to return a high-quality and satisfactory outcome without expensive cost and time overruns. Stakeholder theory and dynamics are critical in establishing the roles and importance of each stakeholder in terms of their Legitimacy, Power and Urgency as outlined by Mitchell and his colleagues (Mitchell, *et al.* 1997), especially in the early design and planning stages of a mega TIP in the region. Senior Ministry people also acknowledged the importance of experience and how without an experienced management team and poor planning, such a project can quickly degenerate into an unsatisfactory and expensive project.

It is important to stress, however, that success has a number of additional measures beyond the classical set used here to define a mega TIP outcome. TIPs can generate social and indirect cost-benefits for generations to come. Judging their success entirely in terms of initial cost and time overrun alone can be a very narrow definition of success. Thus, decisions to undertake large TIPs may well also have longer-term benefits to societies that should also be taken into account.

8.2.3 Objective 3

Objective 3 was “**to summarise the findings and develop a preliminary framework for quantifying future project success of TIPs in the UAE**”. The findings in Chapter 7 addressed this objective and provided a comprehensive summary of the findings of the research. A list of principle factors involved in a successful TIP was further outlined, based on the findings of the research program.

The findings revealed agreement with the nine Principle Factors in ensuring the success of a mega TIP in the UAE. These included:

- 1. Leadership** - In order to successfully initiate and manage mega TIPs in the UAE, leadership needs to be very effective and should come from the very top.

2. **Staff Selection** – It is important to have the right staff, possessing the necessary qualification, commitment, and experience and importantly those who understand the local culture and environment in fast track mega TIPs in the UAE.
3. **Stakeholder Selection** - The importance of selecting key stakeholders with past success records from well qualified organisations and ensuring direct lines to key decision-makers is fundamental for a mega TIP success in the UAE.
4. **Education and Training** – To ensure committed and dedicated staff, the need for on-going appropriate education and training is critical to maintain individuals with the necessary skills and experience to undertake the responsibilities of the managerial positions of those that relate to the infrastructure development in the UAE.
5. **Budgeting** – The results confirmed the need to allocate sufficient funding to carry out detailed planning and design prior to commencing subsequent stages of the project to reduce variations and redesigns during the construction stage of a mega TIP in the UAE.
6. **Procedures** – While each Emirate in the UAE has its own procedures, standards, and rules in administering its daily governmental work, the development and implementation of common national administrative procedures to ensure effective and efficient decision-making and facilitate communication and coordination is absolutely necessary.
7. **Standards & Systems** - The need for appropriate international quality systems to be implemented was highlighted to ensure international best practice is adopted in managing and processing mega TIPs in the region.
8. **Project Success and Roles & Responsibilities** - A detailed project success management plan including problem identification, success index measures, responses strategies for delays, and planning and execution is essential to mitigate unexpected delays or overruns.
9. **Communication and Coordination Mechanisms** – finally, the need for mega TIPs to be overseen by a high-level on-going project management committee is needed with decentralized communication channels to address daily problems or difficulties that arise.

From these extensive research findings, a preliminary framework was then developed of potential value for TIP practitioners. The framework comprised weighting and loading criteria to address the various factors identified as critical path in this research program. The

framework included not only the views of the research team, but also those of a number of experienced key stakeholders in the field. Developing a complete, working framework was considered to be outside the scope of the research program but shows what could be possible with additional research to convert it into a workable set of guidelines.

8.3 Research Questions

A number of specific research questions were outlined to help guide the research program. Most of the answers to these questions have been discussed above but a brief rejoinder to each is included below for completeness.

8.3.1 Research Question 1

“What is the current state-of-the-art of UAE mega Transportation Infrastructure Project management?”

The current state-of-the-art in managing a TIP internationally and in the UAE was described fully in the literature review in Chapter 3. Of further relevance, the study conducted here concluded that management practices in the UAE need to be improved to meet best practice worldwide.

8.3.2 Research Question 2

“What are alternative international theories for managing infrastructure projects that could be relevant for the UAE environment?”

This was addressed from the findings from this research. Many examples of improved management practices have been highlighted by the observations of the research team and the key stakeholders who participated in providing their inputs during qualitative data collection.

8.3.3 Research Question 3

“What are the key factors necessary to enhance UAE TIP management practice?”

The nine key factors important in ensuring a successful mega TIP in the UAE have been identified above in response to Objective 3.

8.3.4 Research Question 4

“What are the key impediments to the successful completion of the projects for each stakeholder and for the whole network?”

The key impediments to success involve inexperience, complacency and lack of attention to adopting modern management and outcome processes, as detailed in the various research phases and summarised in Objective 2.

8.3.5 Research Question 5

“How can the success or failure of TIP projects in the UAE be judged and what measures best describe success or failure in the region?”

A number of direct outcome measures have been highlighted above, including cost and time overrun, technical (quality) outcomes and stakeholder satisfaction. In addition, other in-direct measures were noted, as well including long-term benefits to the society.

8.3.6 Research Question 6

“What are the data and system needs to help ensure successful TIP management practices in the UAE?”

Many of these were identified throughout the research program and essentially include improved records of performance, problems and difficulties, and solutions implemented, as well as more efficient and effective systems for improved communication, coordination, decision-making and particularly knowledge-sharing.

8.4 Theoretical Contribution

This thesis makes a number of important academic contributions. First, based on an extensive review of the relevant literature presented in Chapter 3, the thesis proposed a conceptual model for understanding the key elements for a successful transportation infrastructure projects (TIPs) in the United Arab Emirates (UAE). This model is presented as Figure 4.3 in Chapter 4. It is a three-level hierarchical model incorporating: (i) the six stages of a construction project (planning, scoping, design, tendering, scheduling and construction); (ii) the importance of key stakeholders with respect to their legitimacy, power and urgency; and (iii) management processes (communication, coordination, decision-making and knowledge-sharing). The interaction of these three TIP elements impact on project success in terms of cost, time, quality, and stakeholder satisfaction.

The conceptual model was found to be a highly valuable tool in examining mega TIPs in the UAE. It guided the research effort, enabling the researcher to complete the research study in a timely manner. However, within the time constraints, this PhD study only focused on

examining in details the design and planning stages of a mega TIP, namely the Dubai-Fujairah-Highway (DFH) Project. The value of the conceptual model was also appreciated by the key stakeholders involved in the focus group discussions conducted as part of the DFH Project case study. This model will be of value to other researchers interested in examining TIP stages other than planning and design.

Second, the study applied stakeholder theory in understanding how key stakeholders influence the various stages of a TIP in terms of their legitimacy, power and urgency. Section 3.4.1 in Chapter 3 presented a discussion on the stakeholder theory, including Figure 3.2 which presents the stakeholder typology based on the work of Mitchell *et al.* (1997). The stakeholder theory was used in understanding the influence that various stakeholders had on the DFH Project – see Chapter 6, section 6.10. Each significant milestone of the DFH Project was examined with respect to the legitimacy, power and urgency of the key stakeholders and how these impacted on the progress on the DFH project. Stakeholder theory was found to be a highly valuable theory for this PhD research program. It provided the means for understanding the importance of key players (stakeholders) in the UAE transportation infrastructure construction industry. Again, this theory will be useful for future researchers interested in examining other mega projects in the UAE and other countries.

Finally, the research led to the identification of the nine principle factors that impact on management processes and hence on TIP outcomes. These factors are identified from the results of Phases I and II of the PhD study presented in Chapters 5 and 6 respectively. The principle factors, discussed in detail in Chapter 7, are: (i) leadership, (ii) staff selection, (iii) stakeholder selection, (iv) education and training, (v) budgeting, (vi) procedures, (vii) standards and systems, (viii) project success and roles and responsibilities, and (ix) communication and coordination mechanisms. The existence of these factors is critical to the effectiveness of the four management processes (communication, coordination, decision-making and knowledge-sharing) examined in this study and ultimately the success of transportation construction projects. It is recommended and is absolutely essential that all of the major stakeholders collaborate in further discussing these factors and the most appropriate means for enhancing them within the context of the UAE. This is clearly an important future project that should be conducted as soon as possible.

8.5 Practical Contribution

This research program also offers a number of practical outcomes in the context of the UAE. Foremost are the findings from Phases I and II of the study that will be of significant value to the key stakeholders involved in transportation infrastructure projects (TIPs) and to the UAE community and economy as a whole. The results of this research program will help each stakeholder in developing and allocating the scarce resources available in the future for managing TIPs. Both planning and design stages of a TIP must be allocated sufficient resources (budget, time, competent staff etc.), stakeholders must be selected carefully and their level of influence on each stage of the project must be assessed prior to the execution of the stage to ensure success. The importance and effectiveness of the four management processes (communication, coordination, decision-making and knowledge-sharing) must be taken seriously in these projects.

A major practical outcome from this PhD study is the development of a preliminary framework that stakeholders can use to assess project outcomes. Chapter 7 illustrated how this framework could be used, both in a tabular form and as a visual tool. By using this framework, each stakeholder can assess the outcome from each stage of the project. Given the constraints of undertaking a PhD study within a limited period of time, it was not possible to test and validate this framework with practitioners. It is recommended that this work be extended as an important future project.

8.6 Research Strengths & Limitations

8.6.1 Research Strengths

The research reported in this thesis is the first detailed investigation conducted on the importance of management processes and stakeholder influence with respect to mega Transportation Infrastructure Projects (TIPs) in the United Arab Emirates. Over the past two decades, the UAE has experienced massive infrastructure development with a large variety of mega projects completed, including the Dubai-Fujairah-Highway (DFH) Project which is considered as one of the largest mega projects in the UAE requiring involvement of very important stakeholders at the national level (see Chapter 6). However, there has been no empirical research conducted examining management related issues. As mentioned at the beginning of this thesis, several media reporting on construction projects in the UAE, highlighting significant cost and time overruns and a variety of management related issues.

This PhD project has examined these issues in detail and has provided a number of important insights. It is expected that both the academic and practical contributions discussed in earlier sections of this Chapter will enable future TIPs and other construction projects to be implemented with superior outcomes.

This research program was able to obtain multiple stakeholder perspectives on TIPs in the UAE. These perspectives were invaluable in completing the investigation and in addressing the research objectives and research questions. With the assistance of the Ministry of Public Works (MPW), it was possible to gain access to important stakeholders in completing both Phase I and in Phase II of the study. The MPW was also able to provide access to important documents and made arrangements for the Phase II case study site visit. Additionally, the MPW made available its facilities in Dubai where focus groups were held as part of Phase II and Phase III of the PhD study. The support of the MPW and the willingness of the stakeholders to be involved in the interviews and focus group discussions was a major strength of the PhD program. The participants in this study shared their knowledge and experience willingly and enthusiastically and it was gratefully received.

Some additional research strengths are noted below:

- a) Phase II involved four types of data collection methods to expand the research findings and their reliability, including historical review of documentation, additional interviews, site observations, and focus group and Ministerial discussions.
- b) The development of an innovative preliminary framework for assessing TIP outcomes that, with further development, would provide those involved with mega TIPs in the UAE in the future to have much greater technological control over issues shown to inhibit successful outcomes.
- c) The workshops conducted during this research program were attended by a range of senior management and experienced construction individuals and organisations, leading to raising public awareness of the research and research findings in the UAE.
- d) The development of the conceptual model for understanding the key elements for successful TIPs in the UAE. This identifies the principle factors that impact on management processes and hence on TIP outcomes.

8.6.2 Research Limitations

As is the case with most research studies, this PhD study also acknowledges a number of limitations. Project management is broad in terms of covering different applications, methodologies, means of data collection, and measures of validity and success (Haughey, 2010; Abudi, 2010). The UAE has been undergoing huge infrastructure developments with different applications (UAE Year Book, 2007; Elewa, 2007) and it was not possible to examine all of these in a single research project. Recognizing the diversity of project sizes, applications, the nature and availability of data, and the methodological approaches to tackle the problem in hands, the following limitations are highlighted:

1. Within the time constraints of a PhD research program, it was only possible to carry out a single detailed in-depth case study of a mega TIP in Phase II (the Dubai-Fujairah Highway project). While this case study was selected as an exemplar project, given the number of difficulties and problem experienced, it would have been useful to have contrasted this with a successful project. This may have provided stronger evidence of the findings outlined above. Nevertheless, the insights gained from the single, in-depth case study that covered a period of more than 10 years provide major insights of significant value to the research topic.
2. Again, time constraints limited the extent of the project management phases that could be included in the analysis, namely planning and design. The Phase I results identified these as the most critical stages of a project life cycle. This is not to say that the other project stages (scoping, scheduling, tendering and construction) are of lesser importance: indeed, they, too, can have an influence on the project outcome's success. In this respect, the extent of this influence is still an open question and clearly a topic requiring further research.
3. The literature review in Chapter 3 identified the managerial processes of coordination, communication, knowledge-sharing and decision-making as key issues in project success or failure from past research. For this reason, the research program model included these four key managerial factors. Given the academic and practical focus adopted here, this was appropriate and justified. However, in any future research, it would be interesting to explore this issue in more detail.

4. The UAE workforce is made up of people representing many nationalities and cultures. This can have a dramatic impact on how effective management processes are performed and hence TIP project outcomes in the region. It is recognized that the topic of cultural diversity is an important one for the UAE that requires special attention. Because of this, the current study did not dwell on issues relating to labor and cultural diversity. It is suggested that separate research be conducted on this topic to complement the work reported here.
5. The stages in the construction of a mega TIP involve complex interactions between stakeholders and tasks that are rarely carried out independently. While some attention was paid to these interactions during the course of the research, it primarily focused on the critical stages of a project life cycle identified in Phase I of the research work, namely planning and design. This focused the research more on analysing the important management processes and stakeholder influences than other equally important aspects.
6. Initial investigation and early interviews conducted in the research work highlighted the difficulty of obtaining detailed data on mega projects for many reasons including the limited archiving of earlier projects completed, the confidential nature of information, staff availability, willingness to be total open with their real views, etc. Such limitations are acknowledged as constraints here, as they are often in these types of projects. In the interest of increasing our knowledge of successful TIP management processes, however, it is both necessary and legitimate to pursue qualitative research methods, albeit with proper scientific checks and rigor in the conduct of the research program.

8.7 Recommendations for Improving Future TIPs

A number of recommendations for improving the success of mega Transport Infrastructure Projects emanate from the research finding reported here.

1. Among the most important recommendations of this work is the need to improve the project management skills of all key stakeholders. To achieve this, the introduction of a Project Management Certificate could be a mandatory requirement for all stakeholders involved in infrastructure mega projects, including consultants, project managers, and clients. This certificate can be designed to provide different guidelines for management and engineering leadership in all aspects required for carrying out successful projects.

Improving the level of competence of all stakeholders is necessary for successful management of a project, and hence smoother, less challenging initiation and execution of these mega projects.

2. Contracts need to be modified to reflect more the UAE culture in conducting business, rather than simply adopt international best practices. Some business norms, rules and procedures are quite different in the UAE and can be difficult for foreign consultants and contractors to comprehend. Some stakeholders suggested the use of alliance contracting systems, rather than the typical confrontational ones. This will help create better business opportunities for all stakeholders with fewer problems and difficulties. The contract needs to be written to alleviate and/or limit the frequency of work variations. While international standards and rules need to be adhered to, these contracts also need to reflect UAE business practices and expectations.
3. Stakeholders' powers and influence need to be pre-defined and communicated to all other stakeholders involved prior to any project initiation to minimize confusion. Different stakeholders possess varying levels and types of power and control throughout the project and while the level of power may change over the same project life cycle, it needs to be spelled out at the start and agreed to. This will ensure that all involved are clearly aware of the roles, obligations, and responsibilities of all parties involved.
4. The consultants and contractors need to have greater involvement early on in the planning and design stages of a project to will allow early interactions among all stakeholders and reduce or eliminate design variations due to later changes. It also allows for the roles of the various stakeholders to be specified early on, and will also facilitate consulting firms' familiarization to UAE culture and business norms ahead of time. This is particularly critical when the consultant or contractor is a foreign company; which is mostly the case, operating in a multinational community with various different backgrounds such as that included in the UAE work community.
5. The need for a reliable and timely mechanism for knowledge-sharing continually arose as a key issue during this research. While the end result of a project tends to be shared publicly, the transference of knowledge widely during the project life-cycle needs to be addressed. The participants recommended an annual conference as the bases for such a

mechanism, while others thought that such knowledge would be better shared through journals publications for the industry or through an electronic system.

6. The motive for knowledge-sharing should be regarded as a societal welfare and not just to generate profit. Professional societies and other networks in the UAE should not be seen as profit-making enterprises. Value propositions need to be more promoted and emphasized.
7. The need to create and apply a standardized project success measure for all mega TIPs that includes as a minimum, time and cost overruns, stakeholder satisfaction, and total project quality as key measures.
8. Ineffective coordination among key stakeholders of a project was a key issue for the DFH project. Ineffective project management, too, led to time and money wastage and cast a doom over this project for those involved and the community. It is important, therefore, to ensure effective management processes of communication, coordination, decision-making and knowledge-sharing continue throughout the life of a TIP and not just to limit it to a particular stage or phase of a project.
9. End users are also important stakeholders whose thoughts and concerns should be taken into account when conducting a transportation infrastructure project.
10. While creating and imposing a nationalised, standard project management system is not advisable or practical, nevertheless, a mixed or hybrid project management system that combines international best practice with national requirements and constraints would seem sensible and achievable.
11. It is important to work towards the creation of a management culture that embraces the various cultural influences of the diversified labor-force working on infrastructure projects in the UAE. Such culture will be more practical to apply and much easier to be followed by the multinational labor force within the UAE labor market.

8.8 Conclusions and Future Research

This extensive research program provided an outline of what are successful management practices of relevance for enhancing Transport Infrastructure Projects in the UAE. The three

objectives and the six research questions, established to help guide the research have been addressed successfully. In addition, the research program provides not only a number of practical relevant outcomes but also a theoretical contribution to project management issues in the UAE and elsewhere. Like all such programs, there were several limitations identified with the research and also areas that warrant further research effort. It is hoped that the research outlined here will foster additional interest in the topic and lead to additional ongoing research programs in the UAE.

It is argued that this research program is the first of its kind in the region and one that offers many insights into the unique cultural environment that exists in the United Arab Emirates. This is a rapidly growing society with many urgent transportation challenges. It is a fruitful area for improved transportation practices and research to provide greater appreciation of infrastructure construction methods and processes in the UAE. In particular, there is an ongoing need for the information contained here to be widely disseminated among the TIP community. The establishment of guidelines and software packages, based on these research findings, will greatly enhance the transfer of this knowledge to the benefit of the UAE and other Middle-East societies.

8.8.1 Recommendations for Future TIP Research & Development

A number of topics warranting further research were identified during this research program. Many of these are contained in the previous section on research strengths and limitations. Additional topics for future research are outlined below.

1. It is clear that there would be value in disseminating the knowledge acquired here widely among the construction community. This could involve providing booklets, CDs, and other materials in readable formats for widespread distribution throughout the UAE and surrounding regions. Special workshops and public forums could be established among key stakeholders to alert them to the various principal issues and factors associated with what makes a successful TIP.
2. Chapter 7 presented a preliminary model that needs further development for distribution and use among project managers and support staff. From this additional research, guidelines and software packages could be developed, based on these research findings that will greatly enhance the transfer of this knowledge to those responsible for

implementing and managing Transport Infrastructure Projects. The assessment of risk would be a useful adjunct measure in this respect.

3. As noted above, management processes in this research program were constrained to coordination, communication, decision-making and knowledge-sharing. Additional aspects may include, but not limited to, human resources, public relations, and contractual issues, to name a just a few.
4. Further research work is required to examine technological aspects such as Critical Paths methods for construction activities, scheduling, and follow-up. Advanced project management software, and its effect on implementation of TIPs in UAE would also be useful in ensuring effective and efficient project management techniques.

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APPENDICES

Appendix A - Phase I Interview Protocol

Appendix B - In-depth Case Study

Appendix C - Dubai-Fujairah Highway (DFH) Project Focus Group

Appendix D - Frame Work Focus Group Discussion

Appendix E - Frame Work Follow-up Survey

Appendix A

Phase I Interview Protocol

Interview Form- All Groups

***Transcript:** Thank you for your time in conducting the interview. I appreciate your involvement in this important project. The outcomes are likely to provide significant benefits to your organization as well as the transportation infrastructure sector.*

I would like to ask if it is acceptable to you if we record this interview. It will enable us to capture all the important information that you provide and to enable us to conduct comprehensive analysis. Under Monash University's ethics requirements, we insure complete confidentiality. Only the research team will have access to the data and no individuals will be identified by name.

Demographic Information

Questionnaire Code: _____

To be filled by student researcher to maintain anonymous identity of participants.

Name: _____

Age: _____

Gender: _____

Highest academic qualification: _____

Profession/Position:

_____ / _____

Current Affiliation: _____

Address: _____

Telephone: _____

Fax: _____

Email: _____

Day of Week and date: _____

Researcher's Name: _____

Location of Interview: _____

It is important for us to understand the network of stakeholders in the area of Transportation Infrastructure Projects (TIP's), and how organizations are structured. As such, we will start by asking few questions about your organization and your role.

1. Please tell me briefly about your role in your organization
2. Please describe the work that your department (division) undertakes with respect to TIPs
3. In which other organizations / departments did you work previously?
4. For how long have you been working in this department?
5. How many years of total experience do you have?
6. What specific job responsibilities do you have currently?
7. Who (position) do you report directly to?
8. Who are your direct reports? (Or who reports to you?) positions

As you will be aware, all construction projects involve six stages, namely planning, scoping, scheduling, design, contracting, and construction. In the following set of questions, we are trying to capture your opinion on what is/are the most critical stages.

9. Can you tell me which of these stages is your department and naturally you are principally engaged in?
10. For your organization, does it involve in more than one of these stages? (If yes) what are these stages?
11. In your opinion, and based on the time and effort involved what are the most important stages?

As you know some stages (e.g. planning, scoping, design or scheduling) might take short time or effort but they have a significant effect on the project completion. So in your opinion:

12. What are the stages that influence the project completion as a whole, the most?
13. Does your organization/department have any role in these critical stages?
14. What does your organization/ department do in order to achieve outcomes relating to budget, time, quality, etc.?

“Stakeholders” by definition are those organizations or people that are affected or get affected by a given project. The stakeholders for TIP are many. We are focusing this research on stakeholders who are involved in the development of TIP such as financing agencies (like Abu Dhabi or Dubai Executive Councils), clients (e.g. Ministry of Public Works, or Abu Dhabi Municipality), governmental agencies (e.g. police and utility companies), project management firms, consultants, and contractors. The development of TIP is a shared responsibility among these stakeholders. The following set of questions are meant to identify the level of importance of each stakeholder

15. In your opinion, who are the important stakeholders affecting the successful completion of TIP projects?
16. How would you judge (or measure) the “importance” of stakeholders in successful project completion? In other words, how would you value a stakeholder to be important, very important or not important?
17. For the critical stage (s) identified before, who are the key stakeholders involved?
18. Who is the stakeholder (s) that affects this (these) critical stage(s) the most? In a positive and negative way.

As you know, different stakeholders differ in their view and definition of success and failure of projects. In the following set of questions, I am trying to capture your views on success indicators of TIP’s.

19. In your experience, roughly what proportions of TIPs are completed successfully?
20. How do you define project success?
21. Do you think other stakeholders (e.g. contractors, consultants, government agencies, etc) would agree with you on this definition or do they use different criteria for defining success and failure?
22. (If answer to 21 is other stakeholders use different criteria, ask) different in what sense?
23. What are the project success measures of your department/ organization?
24. Do you agree with these measures? (In your opinion, how can project success be measured?)
25. Most projects are judged in terms of meeting cost / budget, time schedule, quality and key stakeholders' satisfaction targets. Which of these do you believe to be the most important?
26. Why?

Having talked about success measures of projects, let us shift to unsuccessful ones.

27. How would your department/ organization define unsuccessful implementation of projects?
28. What are the project failure measures used by your department/ organization?
29. Do you agree with these measures? (In your opinion, how can project failure be measured?)
30. What are the factors that could cause unsuccessful project completion? (rank as per importance)
31. In your opinion, what are the major reasons for project delay? (rank as per important)
32. From your prospective and based on your experience, what are the major reasons behind cost overrun? (rank as per importance)

Management of TIP's is a talent that requires elements such as communication, coordination, ability of decision-making and knowledge-sharing. The lack or inadequate application of any element is a concern that is likely to affect project completion or success. Now I would like to ask few questions about key management concerns in UAE with respect to TIP's.

33. What are (if any) the management concerns or deficiencies in the implementation of TIP's in UAE?
34. Are these concerns valid throughout the whole project or only in few stages? What stages?
35. How would you rank the management practice in the implementation of TIP's in UAE? (Excellent, good, fair or poor)
36. Why do think it is?

Others have said that effective communication amongst stakeholders is critical for the success of projects.

37. Do you agree with this?
38. What are the most commonly used communication methods (electronic such as email, e-meetings, phone, writing, meetings and minutes of meetings or what?)
39. Why do you use?
40. Is it effective?
41. In general, how effective is communication in your organization regarding TIP's?
42. How effective is communication among stakeholders regarding TIP's?

43. What could be done to improve communication?
44. Coordination is also said to be important amongst stakeholders. Can you elaborate on the effectiveness of coordination amongst stakeholders of TIP's?
45. What could be done to improve coordination?
46. For the TIP industry in general and / or your organization in specific, what are your views with regard to decision-making in terms of speed and quality?
47. What could be done to improve decision-making?

It is said that knowledge-sharing (among stakeholders and within same organization) is a key management element for project success. Knowledge gained from previous projects on success or failure factors can be very valuable: for example, in selection of contractors, budgeting, etc.

48. Do you agree?
49. Does your organization or department have any mechanism for internal knowledge-sharing?
50. To what extent knowledge is shared amongst the key stakeholders?
51. How is this knowledge shared?
52. How could knowledge-sharing be introduced (or improved) in your organization?

I would like to finish this interview by confirming your views in brief words on the key factors that contribute to project success and failure. In brief:

53. What could be done to improve the TIPs quality?
54. What could be done to reduce time?
55. What could be done to reduce cost, and reduce cost overruns (as compared to budget)
56. How could you (as a stakeholder of TIP) be satisfied?

In conclusion, I would like to thank you for your time and efforts. Please rest assured that the data will be treated in total confidence. Your responses have been extremely helpful.

Two final questions:

57. Would you be prepared to answer any follow up questions or answer any queries (if needed)?
58. This research project has two more phases; In-depth case study work and a focus group discussion. Would you be willing to participate in these research phases?

Thank you for your generous participation.

Appendix B

In-depth Case Study

Interview Form – Focus Group

***Transcript:** Thank you for your time in conducting the interview. I appreciate your involvement in this important project. The outcomes are likely to provide significant benefits to your organization as well as the transportation infrastructure industry.*

I would like to ask if it is acceptable to you if we record this interview. It will enable us to capture all the important information that you provide and to enable us to conduct comprehensive analysis. Under Monash University's ethics requirements, we insure complete confidentiality. Only the research team will have access to the data and no individuals will be identified by name.

Demographic Information

Questionnaire Code: _____

To be filled by student researcher to maintain anonymous identity of participants.

Name: _____

Age: _____ Gender: _____

Highest academic qualification: _____

Profession/Position: _____ / _____

Current Affiliation: _____

Address: _____

Telephone: _____

Fax: _____

Email: _____

Day of Week and date: _____

Researcher's Name: _____

Location of Interview: _____

On studying the Dubai–Fujairah highway as our case study project, it is important for us to understand the network of stakeholders involved, and how the organization is structured. As such, we will start by asking few questions about your organization and your role.

1. Please tell me briefly about your role in your organization

After conducting our field interviews with individuals in TIPs projects in the UAE, we discovered that the early stages of any project, namely Planning and Design, were the most significant stages in almost all TIPs projects life cycles.

2. Does your organization/department have any role in Planning and Design Stages of Dubai – Fujairah highway project?
3. Do you agree on the importance of Planning and Design stages on the success of Dubai–Fujairah project on hand?
4. Why?
5. In what way do those early stages of Planning and Design affect the completion of this project?
6. How does Planning and Design Stages affect this project in respect to budget, time and quality?

“Stakeholders” by definition are those organizations or people that are affected or get affected by a given project. The stakeholders for TIP are many. We are focusing this research on stakeholders who are involved in the development of TIP such as financing agencies (like Abu Dhabi or Dubai Executive Councils), clients (e.g. Ministry of Public Works, or Abu Dhabi Municipality), governmental agencies (e.g. police and utility companies), project management firms, consultants, and contractors. The development of TIP is a shared responsibility among these stakeholders. The following set of questions are meant to identify the level of importance of each stakeholder

7. In your opinion, who are the important stakeholders affecting the successful completion of this projects?
8. How would you judge (or measure) the “importance” of stakeholders in successful completion of Dubai – Fujairah project? In other words, how would you value a stakeholder to be important, very important or not important?
9. For the Planning and Design stages, who are the key stakeholders involved in this project?

As you know, different stakeholders differ in their view and definition of success and failure of projects. In the following set of questions, I am trying to capture your views on success indicators of Dubai–Fujairah highway project.

10. What are the project success measures of your department/ organization that are used to measure the success of Dubai – Fujairah highway project?
11. Do you agree with these measures? (In your opinion, how can project success be measured?)
12. Most projects are judged in terms of meeting cost / budget, time schedule, quality and key stakeholders’ satisfaction targets. Which of these do you believe to be the most important for our case study project on hand?
13. Why?

Having talked about success measures of projects, let us shift to unsuccessful ones.

14. Would you consider Dubai – Fujairah Highway project a success or a failure project?
15. What are the project failure measures used by your department/ organization for this project?
16. Do you agree with these measures? (In your opinion, how can project failure be measured?)
17. If you consider this project to be an unsuccessful project, what are the factors that could have caused it to be unsuccessful? (Rank as per importance)
18. In your opinion, what are the major reasons for delays in this project? (Rank as per important)
19. From your prospective and based on your experience, what are the major reasons behind exceeding the budget for this project? (Rank as per importance)

Management of TIP's is a talent that requires elements such as communication, coordination, ability of decision-making and knowledge-sharing. The lack or inadequate application of any element is a concern that is likely to affect project completion or success. Now I would like to ask few questions about key management concerns in UAE with respect to TIP's.

20. What are (if any) the management concerns or deficiencies in the implementation of Dubai – Fujairah project?
21. Are these concerns valid throughout Planning and Design Stages?

Others have said that effective communication amongst stakeholders is critical for the success of projects.

22. What are the most commonly used communication methods in Dubai – Fujairah project?
23. How effective is this communication method used?
24. How effective is communication among stakeholders regarding Dubai – Fujairah project?
25. What is the influence of Stakeholders' communication effectiveness on this project?
26. What could be done to improve communication?

Coordination is also said to be important amongst stakeholders.

27. What is the level of coordination among important stakeholders in Dubai – Fujairah project?
28. What are the deficiencies of this coordination?
29. What could be done to improve coordination?
30. For Dubai – Fujairah highway project, what are your views with regard to decision-making in terms of speed and quality?
31. What could be done to improve decision-making for this project?

It is said that knowledge-sharing (among stakeholders and within same organization) is a key management element for project success. Knowledge gained from previous projects on success or failure factors can be very valuable: for example, in selection of contractors, budgeting, etc.

32. To what extent knowledge is shared amongst the key stakeholders in this project?
33. How is this knowledge shared?
34. How could knowledge-sharing be introduced (or improved) for this project?

I would like to finish this interview by confirming your views in brief words on the key factors that contribute to project success and failure. In brief:

- 35. What is the level of quality achieved in Dubai – Fujairah project?
- 36. What could be done to improve Dubai – Fujairah project quality?
- 37. What is the difference between the time initially scheduled for this project and actual time?
- 38. What could be done to reduce time overrun (as compared to planned scheduled time)?
- 39. What is the difference between the budget initially allocated to this project and the actual cost of the project?
- 40. What could be done to reduce cost overruns (as compared to budget)?
- 41. Do you think key stakeholders of this project are satisfied?
- 42. Why?

In conclusion, I would like to thank you for your time and effort. Please set assured that the data would be treated in total confidence. Would you be prepared to answer any follow up questions or answer any queries if needed?

Thank you for your generous assistance.

Appendix C

Dubai-Fujairah Highway (DFH) Project - Focus Group -

Introduction

Transcript: Thank you very much for coming I know the position of such busy people but it's really valuable for what we are trying to do so we appreciate your input. My name is <facilitator's name> and I am one of the supervisors of the <student> who is undertaking this project. Professor <Main Supervisor> is the main supervisor for this research project.

What we want to do today is to talk about the issues related to the DFH project that I think most of you were interviewed over during the last few months. This meeting today is really an opportunity to follow-up some of the issues that you raised during the original interview from transcriptions. It is certainly not intended to be a witch-hunt and I hope the questions aren't offensive. What we would like to do is to dig a little deeper and understand more of the history of this important project.

What is said today will be treated as strictly confidential. I know that sitting at the end of the room is the man with the camera who is recording all this events but I assure you that they will go no further than the study team. I would like to start by asking you all to introduce yourselves and say a little about the organisation you represent.

Participants introduced themselves.

Main supervisor to give a brief overview of the research project

Facilitator to give an overview of a PhD program requirement

Questions (discussion starters) to be addressed:

1. Looking at the history of the DFH project, it seemed have taken a long time to get started. Do you have any comments to make about this?
2. Do you think the project has been typical in terms of the process of developing such a highway?
3. Has it been successful in your view?
4. Is a 4 year period a typical time for a mega project such as this to commence in the UAE?
5. One of the issues that we are interested in is knowledge-sharing. Do you think that there was good sharing of knowledge in this project?
6. We understand that the time and budget allocated has grown substantially. Do you feel this may have influenced the scope and viability of the project?

7. Does running through 4-emirates complicate the project?
8. With so many key stake holders and players do you think that the level of communication and collaboration been sufficient?
9. Has there been sufficient communication and coordination at a practical level?
10. How much of at the top has fed down to the constructors?
11. What has been the level of teamwork on this project and is this typical?
12. Was there good communication between the project management, consultants, the designers, and the constructors?
13. Have the decisions made in this project been sound and useful?
14. Who makes the decisions in the project? How much input does the construction team have in what you are doing for or are you reliant almost entirely on other people?
15. Do decisions filter down or up?
16. Can you summarize what the key lessons learned from the project?
17. If you were to start this project again, what could be done differently to enhance its success?
18. From an engineering point of view, how could things have been better?
19. From the constructor's point of view, how could things have been done differently?
20. It seems that there have been a number of mistakes in good collaboration, communication, decision-making and knowledge-sharing throughout this project. Have they improved during the project life-cycle?

Wind-up Text

We are extremely grateful for your involvement and they have provided us with a more thorough understanding of the DFH project. I want to reassure you again that your personal details will be treated in confidence and not revealed outside of the study team.

Should we have a need to want to follow-up any of the issues raised today with you or need your assistance at a later date, would you be willing to be involved further?

Thank you all for your frank and enlightening comments today.

Appendix D

Frame Work Focus Group Discussion

Communication

Name:..... Stakeholder Group.....

Project Stage	Key Stakeholders				
	Client or Sponsor	Government Agency	Project Management	Consultant	Contractor
1_Planning					
2_Scoping					
3_Design					
4_Scheduling					
5_Tendering					
6_Construction					

Stakeholders Importance Scale (1 to 9)

Not Important	1	2	3	4	5	6	7	8	9	Very Important
---------------	---	---	---	---	---	---	---	---	---	----------------

1. Task today is to assign a number from 1 to 9 representing your view about how important you believe effective **COMMUNICATION** is for a successful Transportation Infrastructure Project (TIP) in the UAE for each of the 6 project management phases.
2. We ask that you focus **primarily** on the Stakeholder Group you represent. If time permits and you wish to rate other groups, that is OK too.
3. Please make your ratings independently

Coordination

Name:..... Stakeholder Group.....

Project Stage	Key Stakeholders				
	Client or Sponsor	Government Agency	Project Management	Consultant	Contractor
1_Planning					
2_Scoping					
3_Design					
4_Scheduling					
5_Tendering					
6_Construction					

Stakeholders Importance Scale (1 to 9)

Not Important	1	2	3	4	5	6	7	8	9	Very Important
---------------	---	---	---	---	---	---	---	---	---	----------------

1. Task today is to assign a number from 1 to 9 representing your view about how important you believe effective **COORDINATION** is for a successful Transportation Infrastructure Project (TIP) in the UAE for each of the 6 project management phases.
2. We ask that you focus **primarily** on the Stakeholder Group you represent. If time permits and you wish to rate other groups, that is OK too.
3. Please make your ratings independently

Decision-Making

Name:..... Stakeholder Group.....

Project Stage	Key Stakeholders				
	Client or Sponsor	Government Agency	Project Management	Consultant	Contractor
1_Planning					
2_Scoping					
3_Design					
4_Scheduling					
5_Tendering					
6_Construction					

Stakeholders Importance Scale (1 to 9)

Not Important	1	2	3	4	5	6	7	8	9	Very Important
---------------	---	---	---	---	---	---	---	---	---	----------------

1. Task today is to assign a number from 1 to 9 representing your view about how important you believe effective **DECISION-MAKING** is for a successful Transportation Infrastructure Project (TIP) in the UAE for each of the 6 project management phases.
2. We ask that you focus **primarily** on the Stakeholder Group you represent. If time permits and you wish to rate other groups, that is OK too.
3. Please make your ratings independently

Knowledge-sharing

Name:..... Stakeholder Group.....

Project Stage	Key Stakeholders				
	Client or Sponsor	Government Agency	Project Management	Consultant	Contractor
1_Planning					
2_Scoping					
3_Design					
4_Scheduling					
5_Tendering					
6_Construction					

Stakeholders Importance Scale (1 to 9)

Not Important	1	2	3	4	5	6	7	8	9	Very Important
---------------	---	---	---	---	---	---	---	---	---	----------------

1. Task today is to assign a number from 1 to 9 representing your view about how important you believe effective **KNOWLEDGE-SHARING** is for a successful Transportation Infrastructure Project (TIP) in the UAE for each of the 6 project management phases.
2. We ask that you focus **primarily** on the Stakeholder Group you represent. If time permits and you wish to rate other groups, that is OK too.
3. Please make your ratings independently

Stakeholders' Importance in (TIP) in UAE

Name:..... Stakeholder Group.....

Project Stage	Key Stakeholders				
	Client or Sponsor	Government Agency	Project Management	Consultant	Contractor
1_Planning					
2_Scoping					
3_Design					
4_Scheduling					
5_Tendering					
6_Construction					
Overall					

Stakeholders Importance Scale (1 to 9)

Not Important	1	2	3	4	5	6	7	8	9	Very Important
---------------	---	---	---	---	---	---	---	---	---	----------------

1. Task today is to assign a number from 1 to 9 representing your view about how important you believe each of the 5-key Stakeholders groups are in a successful Transportation Infrastructure Project (TIP) in the UAE for the 6-Project Stages.
2. We ask that you focus **primarily** on the Stakeholder Group you represent. If time permits and you wish to rate other groups, that is OK too.
3. Please make your ratings independently

Appendix E

Frame Work Follow-up Survey

Communication Coordination Decision-Making Knowledge-sharing

Name	<hr/>
Stakeholder Group	<hr/>

The researcher truly appreciates your time and effort in filling the following form and of course insures the confidentiality of the information you are providing. The form has two parts. The first one aims at ranking the management issues during the planning and the design stages. The second part aims at ranking the various stakeholders based on their importance. The particular attention to the accuracy and carefulness in filling this form shall be highly appreciated. Please use your best judgment and thoughts in ranking the stakeholders during the planning and design. More explanation on each part is given below.

Part A: Importance of the Management Issues

In the earlier phases on this research, the planning and design stages were identified to be the most critical stages that affect the project success, cost overrun and time overrun. The researcher is seeking your opinion on how these two stages (the planning and design) are affected by the management issues of communication (in and among the various stakeholders), the coordination (among the various stakeholders), the decision-making (how fast and effective), and the knowledge-sharing (of previous experience among the various stakeholders).

In the following table below, kindly rank the communication, coordination, decision-making and knowledge-sharing according to their importance and their impact on the project success (e.g. the cost and time overrun, the stakeholder satisfaction). For instance, if you feel that the cost or time overrun that may be experienced in the design stage is mostly due to decision-making then rank this as 1. Use the rank [1-4], where 1 is used to rank most important issue and 4 is used to rank least important issue.

	Soft Issue Overall Importance Rank with a number 1, 2, 3 or 4 1 indicating most important and 4 indicating least important Please don't use the same rank twice on the same raw			
Project Stage	Communication	Coordination	Decision-Making	Knowledge-sharing
Planning				
Design				

Part B: Importance of the Stakeholder Groups

Similarly, please rank the stakeholder groups according to their importance. The importance here refers to how the project stage is affected by the stakeholder. For instance, if you feel that the planning cost or time overrun is mostly affected by a specific group rank them 1st. The most important stakeholder group should be ranked with 1, and the least should be ranked 5. Rank them consecutively, and don't use the same rank twice on the same raw. Each project stage should be ranked separately. For instance, one specific group may be found to rank 1 in planning while ranking 4 in the design stage. The rank should be between 1 to 5, while 1 indicates most important and 5 indicate least important.

	Stakeholder Groups Importance Rank each stakeholder with a number 1, 2, 3, 4, or 5 1 indicating most important and 5 indicating least important Don't use the same rank twice on the same raw.				
Project Stage	Client or Sponsor	Governmental Agency	Project Management	Consultants	Contractors
Planning					
Design					