THE RISKS OF CIVIL ENGINEERING PROJECT DEVELOPMENT IN EMERGING NATIONS

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198114850

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ABSTRACT

This research reviews the challenges and obstacles confronting multinational civil engineering consulting and contracting companies seeking to conduct project developments within Emerging Markets, specifically with regard to the regions of Africa and the Middle East. With the increasing convergence of the global economy towards an interconnected and co-dependent system, the emerging economies of previously underdeveloped parts of the world are now capturing the focus of the civil engineering industry as the primary area of operation. Multinational companies that historically were restricted to construction of the developed world must now adapt and reposition themselves with a footprint in these emerging markets, if they are to take advantage of the changing conditions within the global infrastructure construction industry.

For companies historically unfamiliar with operating in Africa and the Middle East, a plethora of potential risks are associated with project development. This research incorporated a substantial literature study that determined a number of critical issues that directly and indirectly influence a company's ability to complete a project within time and under budget. The literature bank was then tested against the expert opinions of four selected respondents utilising a case study research methodology, as detailed by Yin (1994: 1-17). The respondents represented two selected civil engineering consulting firms, one based in a developed country with an extensive interest in the Middle East, and the other based in an emerging country itself, with operations throughout Africa. The outcome of the research
highlighted several internal risk factors affecting development in Africa and the Middle East, such as capacity, staff experience, available resources and corporate culture. External factors were, however, the primary focus of respondents’ feedback, and included the reliability of energy supply in the target country, the condition of the built infrastructure such as roads and ports, tax rates and cost of finance, the prevalence of corruption as well as the risk of civil conflict and political instability.

The Project Risk Guideline was the final output of this research process, which represented a synthesis between the literature review, the case study investigations as well as synthesis of various accepted risk evaluation techniques. The Guideline is a stage-gate sequential process, and may be utilised by civil engineering consulting or contracting firms with an interest in risk profiling and mitigation for project developments in emerging nations.
DECLARATION

I hereby declare that all information contained within this document is my own, unaided work except where referenced or acknowledged. This research has been submitted towards partial fulfillment of the degree Magister in Business Administration at the Nelson Mandela Metropolitan University. It has not been submitted for any purpose to any other university or institution. All permissions to carry out this research have been obtained from the relevant parties.

Signed: …………………………………………………………………………….. (Richard M. Fyvie)

Date:………………………………………………………………………………
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# LIST OF ACRONYMS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>AERC</td>
<td>African Economic Research Consortium</td>
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<tr>
<td>AIDS</td>
<td>Acquired Immune Deficiency Syndrome</td>
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<td>APEC</td>
<td>Asia-Pacific Economic Cooperation</td>
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<td>BEPEC</td>
<td>Built Environment Professions Export Council</td>
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<td>BOO</td>
<td>Build, Operate, Own</td>
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<tr>
<td>CDM</td>
<td>Clean Development Mechanism</td>
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<td>CDO</td>
<td>Collateralised Debt Obligation</td>
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<tr>
<td>CEPA</td>
<td>Closer Economic Partnership Agreement</td>
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<td>CER</td>
<td>Certified Emissions Reduction</td>
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<td>CESA</td>
<td>Consulting Engineers South Africa</td>
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<td>CH</td>
<td>Collier-Hoeffler</td>
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<tr>
<td>CO²</td>
<td>Carbon Dioxide</td>
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<td>CRA</td>
<td>Country Risk Assessment</td>
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<td>DETR</td>
<td>Department of Environment, Transport and the Regions</td>
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<td>DRC</td>
<td>Democratic Republic of Congo</td>
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<td>EAC</td>
<td>East African Community</td>
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<td>ECIC</td>
<td>Export Credit Insurance Corporation</td>
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<td>ECOWAS</td>
<td>Economic Community Of West African States</td>
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<td>ETM</td>
<td>Emissions Trade Mechanism</td>
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<td>EU</td>
<td>European Union</td>
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<td>FCCC</td>
<td>Framework Convention on Climate Change</td>
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<td>GCL</td>
<td>Geotextile Clay Liner</td>
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<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>Acronym</td>
<td>Full Form</td>
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<tr>
<td>GFCF</td>
<td>Gross Fixed Capital Formation</td>
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<td>GHG</td>
<td>Green House Gas</td>
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<td>IMF</td>
<td>International Monetary Fund</td>
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<td>JIM</td>
<td>Joint Implementation Mechanism</td>
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<td>LNG</td>
<td>Liquid Natural Gas</td>
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<td>MCA</td>
<td>Millennium Challenge Account</td>
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<td>MDC</td>
<td>Makhetha Development Consultants</td>
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<td>MDG</td>
<td>Millennium Development Goal</td>
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<td>NSRF</td>
<td>National Strategic Reference Framework</td>
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<td>OECD</td>
<td>Organisation for Economic Cooperation and Development</td>
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<tr>
<td>PESTLE</td>
<td>Political, Economic, Social, Technological, Legal, Environmental</td>
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<tr>
<td>PPP</td>
<td>Public Private Partnerships</td>
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<tr>
<td>R&amp;D</td>
<td>Research and Development</td>
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<td>SADC</td>
<td>Southern African Development Community</td>
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<td>SPV</td>
<td>Special Purpose Vehicle</td>
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<td>SRT</td>
<td>Specialised Road Technologies</td>
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<td>TTT Africa</td>
<td>Transportation &amp; Traffic Technology Africa</td>
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<td>UK</td>
<td>United Kingdom</td>
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<td>UN</td>
<td>United Nations</td>
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<td>USA</td>
<td>United States of America</td>
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<td>WEF</td>
<td>World Economic Forum</td>
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<td>WTO</td>
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CHAPTER 1  INTRODUCTION

*I speak of Africa, and golden joys...*

Shakespeare

Henry IV, Part 2, Act V, Sc. iii (Meredith, 2007)

As the rate of globalisation in the twenty-first century grows, an increasing amount of the developing world has been opening up to developed nations as a potential source of direct investment and market expansion. So too have emerging economies begun courting the rest of the world in an attempt to attract vital foreign investment and boost their economic growth. Economic development of developing countries must inevitably be based upon industrialisation, which can create rapid growth in GDP and employment as well as providing the basis for technological advance and an increasingly skilled workforce (Gwynne 1990:196).

Such interaction brings with it considerable positive opportunities for both quarters, however, equally a number of significant challenges. These challenges of industrialisation are manifested in perhaps no greater measure than on the African continent, where the majority of countries have huge deficits and have to rely on external resources for the total finance of their development expenditures (Abdi 1977:50). Historically, however, foreign powers have been resistant to invest in Africa, seeing it as poor, politically unstable, lacking in human resources and with inadequate infrastructure (Kingsbury, Remenyi, McKay and Hunt 2004:154).
The civil engineering and construction industry is the pioneering field for development in any emerging economy, establishing the bulk infrastructure that all other economical activities rely upon. Engineering projects in Africa and the Middle East have increased rapidly in the last few years, with public-private partnerships being an important mechanism for foreign and local collaboration, as discussed by Akintoye, Beck and Hardcastle (2003:23). The rate of infrastructural development in Africa particularly, however, has been stunted when compared with that of emerging countries in other parts of the world. This is due to a collection of critical factors that need to be overcome by the civil engineering and construction industry should it wish to increase the number of operations and their economic success in Africa, as well as that of the Middle East. This treatise will examine the trends of problems associated with project management of civil engineering schemes on the African continent and within the Middle East, and will attempt to provide a practical framework for their pre-emptive identification and mitigation.

1.1 Problem Statement

Whilst other developing regions are faced with similar developmental, economic and population problems as Africa is, this is the only world region registering absolute declines on virtually all indices of socioeconomic development from the end of the colonial era to the early nineties (Lubeck, 1992:520). Since the mid nineties, however, Africa’s countries have slowly increased in rates of GDP growth, with the rest of the world beginning to take notice and increasing their investment in the “dark continent” (Hoskisson, Eden, Lau & Wright, 2000:249). This has led to increased focus on the infrastructural development of Africa, pioneered by the civil
engineering and construction industry. As the number of engineering projects in Africa increases, however, so too does the list of projects that run into trouble. The Middle East has enjoyed relative prosperity for a number of decades, as a result of the world’s increasing demand for oil; however, the region has been plagued by conflicts for centuries and continues to be so (Creane, Goyal, Mobarak & Sab, 2006: 479). This brings with it a unique range of business difficulties that face all industries operating in the region, including that of the civil engineering sector.

A large amount of research has been done in the field of developing economies, however, not always focussed on Africa nor the Middle East specifically. Smith (1997:234) identifies a number of generic exogenous, government failure and mixed exogenous and policy failure factors to explain why business activities in Africa fail, whilst Michaels (1992/93:95) details potential causes for the lack of direct foreign investment on the continent. Dinwiddy and Teal (1996: 81-96) apply a cost-benefit approach to failures in market development of emerging economies and Meyer (2004: 259-276) delves into the role of multinational enterprises in investing in emerging economies, but from a globally focussed approach. A more specific analysis pertaining to the challenges facing the civil consulting and construction industry in Africa and the Middle East from a practical as well as strategic management point of view appears, however, absent from much of the existing research.

The problem of how to approach a civil engineering project in an uncertain African and Middle Eastern market, in a way that practically identifies and mitigates risks, is faced by all multinational consulting engineering firms and construction
companies with an international focus. This applies to South African-based firms operating up into the continent and on its adjacent islands, as well as international companies with African and Middle Eastern concerns, including those in South Africa itself. Issues of finance are critical, with up to 80% of foreign direct infrastructural funding in some African countries coming from developmental organisations such as the World Bank and International Monetary Fund (Goodland, 1990:149).

Other issues include corruption, logistics, language, staff, quality control, conflict and environmental constraints, to mention a few. Finding ways to deal with these challenges will make it more attractive to firms to accept appointments in African and Middle Eastern countries, as on-the-job project management is simplified with sufficient pre-emptive planning. This would also allow firms to be more competitive than firms not applying such measures, as the depths and extents of crises affecting many African states particularly, are sufficiently significant to lead to complete collapse of a project and the firms involved with it, as discussed by Lubeck (1992: 519-540).

Certain global consulting firms already apply a risk assessment process to projects in developing markets. These are evaluated and compared to other models of risk aversion, such as the British “Countries at Risk of Instability” model (Patrick and Brown, 2007:16), and the Special Research Forum on Emerging Economies devised by Hoskisson, Eden, Lau and Wright (2000: 249-267).
The focus of this treatise is to review the factors leading to problematic management of civil engineering projects in Africa and the Middle East from the point of view of South African and international consulting engineering and construction companies. Some of these may include problems unique to the civil engineering industry, such as tendering processes as well as the logistical difficulties of large infrastructural development in inaccessible terrain. This has been achieved through primary data collection and case study review of specific projects that firms have been involved with and the problems effecting results delivery.

The final output of the treatise is an empirical and practical stage-gate Risk Guideline that firms in the industry can apply to job-specific project management in Africa, the Middle East, or any other unknown foreign environment.

1.2 Research Objectives

1.2.1 Primary Research Objective

The purpose of this study is to investigate the factors contributing to the problematic management and potential outright failure of civil engineering projects in emerging nations, with focus on African and Middle Eastern countries. This is assessed from the perspective of a South African as well as an international consulting engineering firm, using a phenomenological case study technique and allows for the development of a project risk model that consulting engineering and construction firms may utilise in evaluating their future involvement in potential new projects in emerging nations.
1.2.2 Secondary Research Questions

A number of secondary research questions are investigated to achieve the primary objective. These include:

- What are the political variables that impact upon the success or failure of projects within Africa and the Middle East?
- What are the personnel and experience variables that impact upon the success or failure of projects within Africa and the Middle East?
- What are the budgeting and financial funding variables that impact upon the success or failure of projects within Africa and the Middle East?
- What are the logistical variables that impact upon the success or failure of projects within Africa and the Middle East?
- What are the cultural, conflict and socio-economic variables of the host country that impact upon the success or failure of projects within Africa and the Middle East?
- What are the strategic and corporate variables contained within the consulting or contracting firm itself, that impact upon the success or failure of projects within Africa and the Middle East?

A schematic of the variable linkages connecting the primary research objective and secondary research question with process flow for the design of the study is in depicted in Figure 1.2.2 overleaf.
1.2.3 Research Design Objectives

The following research design objectives are pursued in this study:

− The conducting of a thorough literature review of the civil engineering industry and profiling of the two firms selected for involvement in this study;

− The conducting of a thorough literature review of the international market and influence of globalisation;
− The conducting of a thorough literature review examining past paradigms that have already been postulated for project management on the African continent and the Middle East, and their validity for specific civil engineering applications;

− Based upon the secondary research questions, a research questionnaire was designed for primary data gathering of factors influencing projects in Africa and the Middle East;

− Approval of the questions, layout, length, validity and suitability of the questionnaire was obtained from an expert source, represented by the project academic supervisor;

− Primary data collection was then conducted through the co-operation in completion of the questionnaire by directors and project leaders from a South African-based civil engineering consulting firm, as well as a UK-based firm;

− Completed data collection and capture on MS Excel software;

− Review and analysis of the content data, cross-referencing across similar exploratory variables in other responses;

− Interpretation and validation of the data with theories postulated in the literary review;

− Development of a generic stage-gate risk model of threats to project success and potential mitigation measures for consulting and contracting civil engineering firms.
1.3 Research Methodology

Two generally accepted paradigms have been identified in the field of research methodology, namely qualitative and quantitative paradigms. A qualitative paradigm is concerned primarily with descriptive explanations and non-numerical characteristics while a quantitative paradigm generally concerns data collected in a numerical form. A phenomenological paradigm tends to produce qualitative data, whilst a positivistic paradigm tends to produce quantitative data (Collis & Hussey, 2003: 49).

Primary data has been gathered through a case-study approach that suits such a phenomenological treatise (Gerring & McDermott, 2007: 688-701). This is necessary as it is anticipated that conditions relating to the success or failure of projects in Africa and the Middle East will vary from scheme to scheme and consultant to consultant. The subject matter is highly complex, requiring in-depth review, discussion and interaction with the study material. The research methodology follows an inductive process within a dynamic research model that is constantly evolving as new categories are identified during the research process, as described by Bradley (1993: 434). This approach is therefore beyond the ambit of a positivistic study, which generally would follow a more static design format. The relationships among variables are not generally statistically tested, which would have required a quantitative approach.

1.3.1 The Sample

Non-probability expert sampling is used to select companies to partake in the study. Targeted respondents comprise of market leader firms in the civil
engineering consulting. Firms have been selected on their geographical spread and past history with operations within Africa and the Middle East in an unbiased selection manner as suggested by Collier and Mahoney (1996: 56-91). Top management professionals and senior project leaders have been approached within each firm in order to obtain as high-level and strategic data as possible. One South African-based company has been selected, with the Managing Director and an Executive Board Director agreeing to take part in the study. The UK firm selected agreed to the co-operation of the Managing Director of an international strategic business unit, as well as a highly experienced Technical Director. All respondents are considered to be experts in the field of international civil engineering.

Respondents were contacted prior to the research process and briefed on the subject matter by the researcher. This was then followed up with the formal questionnaire and covering letter detailing the study and response format to be followed. The questionnaire covered successful as well as unsuccessful projects conducted by each firm, based upon their involvement on the African continent or the Middle East. Anonymity and confidentiality were strictly guaranteed. None of the pre-selected firms suggested they would be unwilling or unable to partake in the study.

1.3.2 The Measuring Instruments

A self-constructed scale was used to measure respondent’s answers to close-ended questions. These evaluated differing opinions in the field of strategic, personnel, funding and contractual, socio-political, logistics and project-specific
variables. The questions were anchored on a Likert scale, ranging from strongly disagrees to strongly agrees. The levels of strategic, personnel, funding and contractual, socio-political, logistics and project-specific variables were also measured by calculating the mean scores for the responses to the questionnaire items. In addition, open-ended questions were asked to capture qualitative data on the variables investigated in the study. These open-ended questions were structured to stimulate potential discussion opportunities during the review of research findings through exploration into associated factors that may not be included in the closed question section of the questionnaire. Such a non-deterministic and inductive approach is pivotal to case study research (Yin, 1994: 20).

1.4 Outline of the Study

The study is divided into seven chapters. This first chapter outlines the scope of the study, the problem statement, the objective of the study, the conceptual framework and the research methodology. Chapter 2 provides a brief background into the industry and it’s main workings, with short background of the subject firms partaking in the study. Chapter 3 offers a concise literature review on the globalisation phenomenon and its impact on the way civil engineering companies conduct operations, and the new and emerging localities in which such operation may be found.

Chapter 4 examines a focused literature study into the targeted regions for the study, where previous strategic, personnel, funding and contractual, socio-political
and logistical research in Africa and the Middle East is discussed. Chapter 5 describes the methodology used in the study, including the research paradigms, sample description and measuring instruments. In chapter 6 the empirical results of the study are discussed, as well as the validity and reliability assessments of the instruments that were used in the study. The stage-gate risk model is described and derived at the culmination of this chapter. The final chapter, Chapter 7, summarises the results and outlines opportunities for further research in the subject.

The following chapter provides greater depth in description of the civil engineering industry as a global activity, reviewing the history of the industry, factors that influence which projects are financed and kinds of financing available, as well as an appraisal of the South African working environment. Jeffares & Green and Mouchel plc, the two firms selected for participation in this study, are also profiled.
CHAPTER 2  INDUSTRY ANALYSIS

Engineering is the art of modelling materials we do not wholly understand, into shapes we cannot precisely analyse so as to withstand forces we cannot properly assess, in such a way that the public has no reason to suspect the extent of our ignorance.

Dr AR Dykes (British Institution of Structural Engineers, 1976)

2.1 The Global Civil Engineering Industry

The civil engineering industry is the premier field responsible for the creation of manmade infrastructure, from roads and bridges to dams and tunnels, from single-storey homes to skyscrapers almost a kilometre high. The discipline represents the oldest engineering field, dating back to the ancient cultures of Egypt and Mesopotamia who pioneered the first large-scale civil infrastructure projects. They were soon followed by the Chinese, Greeks, Aztecs and Indians. Probably the most famous engineers of the ancient world, however, were the Romans, who perfected a number of engineering and construction techniques of older civilizations. Such was the expertise and success of the ancient Roman engineers, that a number of their structures still persist today (Duruy, 1884: 17).

The global civil engineering industry today is a trillion-dollar a year business, and may be broken down into several sub-disciplines namely geotechnical engineering, structural engineering, water engineering, environmental engineering, municipal/urban engineering, transportation engineering and materials engineering
As the majority of the sector is focused on sizeable public infrastructure projects such as roads, bridges and dams, the bulk of funding is from the public purse. The construction economy specifically is a well defined element of every national economic framework and is identified as a component of gross fixed capital formation (GFCF) within gross domestic product (GDP). South Africa’s largest construction company, Murray & Roberts, suggests that an established global benchmark is that GFCF should average between 20 and 30 percent of GDP and construction investment should represent between 20 and 30 percent of GFCF (4 to 9 percent of GDP) (http://www.murrob.com, 22 March 2010).

Public-private partnerships have also increasingly become prevalent as forms of structuring funding requirements where government lacks sufficient resources for direct financing. In developing economies, another form of funding for the industry is through donor finance agreements with such bodies as the World Bank and International Monetary Fund, as well as through individual country-based donor organisations such as The British Council and US AID (www.usaid.gov, 14 March 2010).

A growing trend in the international engineering industry has become the rise of the emerging economies and the resultant acceleration of capital investments in infrastructure. The significant growth being experienced in developing states is being driven at a grassroots level by the large populations of the countries in question. Fortune Weekly, a weekly newspaper in Wenzhou Province, one of the most prosperous regions in China, posed this question to readers: “If forced to
choose between your business and your family, which would it be?" Sixty percent of the respondents chose business; twenty percent chose family and twenty percent could not decide (Hessler, 2007).

With the opening of the Chinese economy in the late 1970’s, the global engineering sector gained access to what would become the largest consumer market on the planet. The opening of China was followed in 1986 by the restructuring of the Soviet Union, which aided its implosion in 1991 and the subsequent economic freeing of the countries of Eastern Europe. Hungary had been busily privatising since 1968 and thus was prepared for capitalism when communistic rule collapsed there in 1989. The modern Czech Republic and Slovakia came into being in 1993. In the same year, India instituted a number of fundamental reforms that produced its own burst of internal growth and international expansion, notably characterised by wide-scale bulk infrastructure programmes developed by joint venture partnerships between local and foreign firms (Sirkin, Hemerling & Bhattacharya, 2008: 22.)

Brazil, Bulgaria and Turkey have equally been recent additions to the international rise of emerging heavyweight economies, with 6-7 percent annual growth in gross domestic product and near-doubling of exports until the recent economic crisis (Sirkin et al 2008: 23). In the wake of the crisis the emerging nations look set to recover at significantly faster rates than some of the ill-struck developed countries, where growth has been slow to manifest despite sizeable capital bailout packages from their respective governments. As a result, a number of engineering firms in
the US and Europe have been forced to implement restructuring and downsizing programmes (www.telegraph.co.uk., 14 March 2010).

2.2 The African and Middle Eastern Civil Engineering Industry

Faced with international competition and saturation in their home markets, a number of global companies in traditionally developed nations have been attempting to revitalise their business by looking overseas (Helsen, Jedidi & Desarbo, 1993:60). As market presence increases in a growing number of countries, global segmentation of countries into geographical zones is a prevalent operational technique. Hassan and Katsanis (1994: 47) describe market segmentation as being the process of identifying specific segments, whether they be country groups or individual customer groups, of potential customers with homogeneous attributes who are likely to exhibit similar behaviour. Such country grouping geographical segmentation streamlines operational and marketing considerations for multinationals, thus simplifying and focusing their global presence.

Whilst each multinational differs on their choice of geographic segmentation method, based upon their market exposure, a general division often utilised amongst pharmaceutical, automotive and engineering companies is to cluster the Americas together as a single grouping, Europe, Middle East and Africa, Asia and finally the Oceania nations. The Middle East and Africa grouping is often the area of highest operational frustration, owing to the developing status of the region. It is however, the region that promises to attract the greatest interest in the future,
owing to its rich wealth of resources and growing populations. It is therefore of critical importance in future global business considerations. Engineering on the African continent specifically, has long been beset by logistical, financial and conflict issues, however, with the rise of globalisation and the stability that large parts of Africa are starting to enjoy, such difficulties are being viewed as surmountable challenges by foreign engineering firms on the back of the promise for large reward. According to the South African engineering publication *Engineering News*, opportunities exist to invest over a trillion US dollars in infrastructure in 12 African countries over the next 40 years. An increasing role is being played by quasi private-public entities from the East and Middle East, while China has already invested an average of $1.75 billion a year in various countries across the continent between 2000 and 2006 (Inggs, 2009: 19.)

There has been a major change in sentiment towards investing in Africa over the past 20 years, as it is no longer seen as such a high risk investment but rather as one that can deliver high-risk-adjusted returns. An important driver that has been piquing the interest of developed-world firms has been the increasing levels of urbanisation in Africa, with the potential for an extra 500 million urban dwellers over the next ten years in sub-Saharan Africa, compared with the 200 million that inhabit cities today. Such a development would require massive amounts of infrastructure spend (Inggs, 2009: 19).

A further significant attraction for Africa and the Middle East has been the growth in gross domestic product (GDP) of a large number of African and Middle Eastern countries over the past two decades, a consequence of economic growth.
Table 2.2: Percentage Annual Change in GDP.

<table>
<thead>
<tr>
<th>Country</th>
<th>Units</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>Ave</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Selected African &amp; Middle Eastern Nations</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Angola</td>
<td>Annual % change</td>
<td>11.183</td>
<td>20.613</td>
<td>18.563</td>
<td>20.28</td>
<td>13.176</td>
<td>0.241</td>
<td>14.0</td>
</tr>
<tr>
<td>Congo</td>
<td>Annual % change</td>
<td>6.64</td>
<td>7.884</td>
<td>5.586</td>
<td>6.257</td>
<td>6.151</td>
<td>2.666</td>
<td>5.9</td>
</tr>
<tr>
<td>Egypt</td>
<td>Annual % change</td>
<td>4.092</td>
<td>4.472</td>
<td>6.844</td>
<td>7.088</td>
<td>7.171</td>
<td>4.7</td>
<td>5.7</td>
</tr>
<tr>
<td>Israel</td>
<td>Annual % change</td>
<td>4.998</td>
<td>5.1</td>
<td>5.283</td>
<td>5.203</td>
<td>4</td>
<td>-0.086</td>
<td>4.1</td>
</tr>
<tr>
<td>Kuwait</td>
<td>Annual % change</td>
<td>10.244</td>
<td>10.623</td>
<td>5.143</td>
<td>6.484</td>
<td>9.7</td>
<td>5.878</td>
<td>6.6</td>
</tr>
<tr>
<td>Malawi</td>
<td>Annual % change</td>
<td>5.42</td>
<td>3.269</td>
<td>6.747</td>
<td>8.648</td>
<td>9.7</td>
<td>5.878</td>
<td>6.6</td>
</tr>
<tr>
<td>Morocco</td>
<td>Annual % change</td>
<td>4.802</td>
<td>2.979</td>
<td>7.76</td>
<td>2.706</td>
<td>5.583</td>
<td>5.003</td>
<td>4.8</td>
</tr>
<tr>
<td>Mozambique</td>
<td>Annual % change</td>
<td>7.884</td>
<td>8.388</td>
<td>8.683</td>
<td>7.022</td>
<td>6.8</td>
<td>4.3</td>
<td>7.2</td>
</tr>
<tr>
<td>Namibia</td>
<td>Annual % change</td>
<td>12.267</td>
<td>2.492</td>
<td>7.075</td>
<td>5.479</td>
<td>2.926</td>
<td>-0.739</td>
<td>4.9</td>
</tr>
<tr>
<td>Nigeria</td>
<td>Annual % change</td>
<td>10.585</td>
<td>5.393</td>
<td>6.211</td>
<td>6.972</td>
<td>5.984</td>
<td>2.905</td>
<td>6.3</td>
</tr>
<tr>
<td>Oman</td>
<td>Annual % change</td>
<td>3.413</td>
<td>4.891</td>
<td>5.999</td>
<td>7.738</td>
<td>7.779</td>
<td>4.066</td>
<td>5.6</td>
</tr>
<tr>
<td>Qatar</td>
<td>Annual % change</td>
<td>17.723</td>
<td>9.24</td>
<td>15.03</td>
<td>15.348</td>
<td>16.395</td>
<td>11.467</td>
<td>14.2</td>
</tr>
<tr>
<td>South Africa</td>
<td>Annual % change</td>
<td>4.864</td>
<td>4.965</td>
<td>5.321</td>
<td>5.098</td>
<td>3.062</td>
<td>-2.171</td>
<td>3.5</td>
</tr>
<tr>
<td>Syria</td>
<td>Annual % change</td>
<td>6.719</td>
<td>4.5</td>
<td>5.1</td>
<td>4.235</td>
<td>5.154</td>
<td>3.019</td>
<td>4.8</td>
</tr>
<tr>
<td>Tanzania</td>
<td>Annual % change</td>
<td>7.828</td>
<td>7.37</td>
<td>6.737</td>
<td>7.148</td>
<td>7.437</td>
<td>4.954</td>
<td>6.9</td>
</tr>
<tr>
<td>Turkey</td>
<td>Annual % change</td>
<td>9.363</td>
<td>8.402</td>
<td>6.893</td>
<td>4.669</td>
<td>0.898</td>
<td>-6.5</td>
<td>4.0</td>
</tr>
<tr>
<td>United Arab Emirates</td>
<td>Annual % change</td>
<td>9.691</td>
<td>8.192</td>
<td>9.388</td>
<td>6.338</td>
<td>7.412</td>
<td>-0.172</td>
<td>6.8</td>
</tr>
<tr>
<td>Zambia</td>
<td>Annual % change</td>
<td>5.395</td>
<td>5.311</td>
<td>6.249</td>
<td>6.259</td>
<td>5.753</td>
<td>4.537</td>
<td>5.6</td>
</tr>
<tr>
<td><strong>Selected Developed Nations</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>Annual % change</td>
<td>2.274</td>
<td>1.941</td>
<td>2.416</td>
<td>2.26</td>
<td>0.323</td>
<td>-2.358</td>
<td>1.1</td>
</tr>
<tr>
<td>Germany</td>
<td>Annual % change</td>
<td>1.176</td>
<td>0.732</td>
<td>3.176</td>
<td>2.516</td>
<td>1.248</td>
<td>-5.297</td>
<td>0.6</td>
</tr>
<tr>
<td>Japan</td>
<td>Annual % change</td>
<td>2.744</td>
<td>1.934</td>
<td>2.039</td>
<td>2.337</td>
<td>-0.705</td>
<td>-5.369</td>
<td>0.5</td>
</tr>
<tr>
<td>Britain</td>
<td>Annual % change</td>
<td>2.951</td>
<td>2.173</td>
<td>2.853</td>
<td>2.559</td>
<td>0.742</td>
<td>-4.385</td>
<td>1.1</td>
</tr>
<tr>
<td>United States</td>
<td>Annual % change</td>
<td>3.573</td>
<td>3.054</td>
<td>2.673</td>
<td>2.141</td>
<td>0.439</td>
<td>-2.73</td>
<td>1.5</td>
</tr>
</tbody>
</table>

(Source: International Monetary Fund, October 2009)

Table 2.2 above, presents the percentage change in GDP figures for selected African and Middle Eastern countries for the past five years. The effect of the recent global economic downturn can be seen in the reduced GDP estimate for 2009. Review of the respective GDP data shows a clear corollary between the rapid growth being experienced by the developing nations of Africa and the Middle
East, and the relative stagnation of GDP growth in developed countries. The natural result of such a discrepancy is a global interest in the increased public spending being conducted in the developing world, specifically in the field of engineering and construction.

As detailed in the first chapter, the experiential information discussed in this paper draws from practical case studies of two consulting civil engineering firms, one based in a developed country with an increasing project portfolio in the developing world, specifically the Middle East; and the other based in a developing nation with a wealth of experience in not only the home nation but throughout the African continent.

2.3 The History of Mouchel plc

*Mouchel plc* (public listed company) is a consulting and business services group based in the United Kingdom. The *Mouchel Group* was established in 2003 as the result of a merger between two successful engineering firms, *Mouchel* and *Parkman*. *Parkman* was established in 1888, *Mouchel* in 1897. Both companies developed as multi-disciplinary consulting engineers, establishing pre-eminent positions in water, public health, power, highways and structural engineering ([www.mouchel.com](http://www.mouchel.com), 27 March 2010.)

Individually the two companies were responsible for a number of significant milestones within British engineering, including the introduction of reinforced concrete to the UK, one of the most far-reaching inventions to shape twentieth -
century civil engineering, as well as the development of the pre-cast concrete ‘Mulberry’ harbour with the War Office in 1943, which played a key role in the Allied invasion of Europe (www.mouchel.com, 27 March 2010.)

*Parkman* floated on the London Stock Exchange in June 2001, with *Mouchel* following suit in 2002. In September 2003 the two companies merged to form Mouchel Parkman plc, with a focus on a wide variety of markets pertaining to the human and built environment. These include the sectors of Central and Local Government contracts, aerospace and defence, education, energy, health and waste engineering, highways and local roads, rail and public transport, reclaimed land and water engineering (www.mouchel.com, 27 March 2010.)

Since the 2003 merger the company has undertaken a strategic growth strategy incorporating acquisitions and internal organic growth. The firm now boasts a staff compliment in excess of 12,000 people with over 120 offices spread across the UK, Middle East and Africa. Annual turnover for 2008 was in excess of £365 million (Mouchel 2009 interim report, 2009: 1). In 2007 the firm rebranded to *Mouchel plc* to establish a common position, identity and vocabulary to describe their business (www.mouchel.com, 27 March 2010).

### 2.4 The History of Jeffares & Green (Pty) Ltd

The foundations for the firm of *Jeffares & Green (Pty) Ltd* were laid in Johannesburg in 1922 when John Lett Sealy Jeffares began operating as *Mr JLS Jeffares Consulting Practice*. Five years later he recruited Harry Holland Green, the
man that would one day become his partner. In 1946 the company was joined by John Hawkins and for a brief period the firm was known as Hawkins, Jeffares & Green. When that partnership was dissolved in 1947 the firm reverted to the name of Jeffares & Green, a name it has borne ever since. With almost ninety years of history, Jeffares & Green is one of the oldest consulting civil engineering firms in South Africa (Jeffares & Green, 2007: 9.)

The firm has been responsible for some significant engineering projects throughout Africa. These include the survey of a railway line route between Blantyre and Lake Nyasa (now Lake Malawi) in 1927, survey of Kariba Gorge for the new dam site in 1941, the independent design review of slope stability of Chapman's Peak Drive in Cape Town and more recently the construction of what will be the largest dam in Botswana, the Dikgatlhong Dam. The firm is also currently involved with the upgrading of the Nacala Dam in Mozambique, a $2.7 million appointment being funded through the US-based Millennium Challenge Account (MCA) (allAfrica.com, 22 May 2009).

Jeffares & Green is widely experienced in all disciplines relating to the civil engineering industry. The firm offers services in airports, bridges, industrial and civil structures, earth sciences, environmental services, geological and geotechnical engineering, geographical information systems, green business and environmentaly efficient sustainable design, institutional and social development, land development and housing, mining infrastructure, project management,
railways, roads, stormwater and river catchment management, transport and traffic, waste management, water engineering as well as water resource planning (www.jgi.co.za, 29 March 2010).

Jeffares & Green currently employ a staff compliment of approximately 300 people, divided across the company’s nine permanent South African offices and numerous site offices in South and Southern Africa. The Jeffares & Green Group currently comprises of a number of specialist firms including:

- *Dynatest Africa (Pty) Ltd*, a firm specialising in pavement evaluation, pavement management and non-destructive testing of road and airport pavements;
- *Jeffares & Green (Pty) Ltd*, the main operating company offering all aspects of civil and structural engineering and project management;
- *Terratest (Pty) Ltd*, a geotechnical, environmental and earth science consultancy;
- *SRT (Specialised Road Technologies)*, a pavement surveillance and asphalt testing company; and
- *TTT Africa (Transportation & Traffic Technology Africa)*, a company that specialises in traffic and transportation engineering.

Jeffares & Green also owns 25 percent of Makhetha Development Consultants (MDC), a black-owned and managed consultancy specialising in sanitation (www.jgi.co.za, 29 March 2010).
Both *Mouchel plc* and *Jeffares & Green* are market leaders in civil engineering, with extensive order books for domestic as well as international projects. Despite the size difference between the two firms, both employ a similar strategy regarding the procurement of overseas contracts to spread their risk profile across a range of differing markets and countries. *Mouchel* is, however, in a unique situation with regard to the available number of large infrastructure developments taking place in the domestic market, as Britain is highly regulated in terms of developing new open space. The firm therefore has an increasing focus on the international market for supply of turnkey infrastructure projects and has diversified its domestic revenue stream to include non-engineering disciplines, such as education and facilities management.

*Mouchel* and *Jeffares & Green* both compete in an ever more complex international community, where rival firms use every advantage at their disposal to ensure they are awarded lucrative projects. An increasing number of firms are competing for a slice of the pie, and thus the factors that allow sustained competitive advantage are of critical importance. In the following chapter the range of competition factors in the global civil engineering industry will be evaluated in an attempt to identify those that play a role in securing international appointments. The growth of the industry into these foreign markets will also be reviewed in order to identify broad challenges faced by firms in specific countries.
CHAPTER 3 GLOBALISATION AND GROWTH OF THE INDUSTRY

If you are a mid-sized orangutan, up against a 400-pound gorilla, you have three options: exit the game; become a boutique orangutan and differentiate yourself from the gorilla; or marry the gorilla!

(Ilbury & Sunter, 2007: 77)

3.1 The Nature of Globalisation for the International Construction Industry

According to a World Economic Forum (WEF) on globalisation, sixty-one percent of South Africans viewed globalisation as having a positive effect on them and their families, while eighteen percent viewed it as having a negative impact. The WEF conducted 25,000 in-person or telephonic surveys in 25 countries, home to 67 percent of the world’s population, making it the largest ever public opinion poll on globalisation. According to the WEF findings, 62 percent of the citizens in the G20 nations believed globalisation would benefit them and their families even though wealthy nations would be more likely to benefit than poorer nations (Hough, Neuland & Bothma, 2003: 27).

Clearly globalisation is not something new, even if the latest terminology and description of what it encompasses might be. It has been a natural and unstoppable force that has carved its way through every facet of the world’s economies since the dawn of man’s first interaction with his neighbour. The increasing complexity of global markets has meant, however, that at no previous point in history has global competition been as intense as it is today. The world has steadily moved beyond the concept of independent states as this growing fabric of
inter-relationship and mutual dependency has evolved to the point now where even a minor occurrence on one side of the globe has immediate effects and ramifications to people living on the other. Equally so, a significant event may then sends ripples through the civilised world with an increasing snowball effect, resulting in a combined net reaction that sizeably outweighs the initial trigger.

An obvious and most recent such event was the sub-prime mortgage crisis in the US, which resulted in the near crippling of world banks, suppression of global markets for a number of years and the closure of innumerable organisations and companies. Funds and banks around the world experienced such economic distress because they purchased bonds, or risk related to bonds, backed by bad home loans, often bundled into financial instruments called collateralised debt obligations (CDOs). The losses often surprised the investors, and in some cases, the fund managers and the executives of the banks, who were unaware of the extent of their risks (www.nytimes.com, 1 September 2007).

When the fiscal crisis deepened and became global from mid-2008, it could have spelled the end for the infrastructure boom that had been predominating for the previous few years and which The Economist had called “the biggest investment boom in history” (www.economist.com, 7 June 2008). Spending on infrastructure prior to 2008 was a largest percentage of global GDP than it had ever been in recorded history, thus with the squeezing of capital markets in the wake of the credit crunch observers were predicting a stemming of the tide as banks and capital funds radically cut back on their spending. The opposite, however, seems to have occurred. Reductions in private funds have been offset by hundreds of
billions of public dollars for stimulus spending. Heads of state, led by US president Barack Obama and China premier Wen Jiabao, have singled out investment in infrastructure as a key means to create jobs and keep the economy from slumping. China was the first mover when its State Council, in November 2008, passed a $586 billion stimulus plan, predominately focusing on the investment in infrastructure. In February 2009 the USA followed suit, with the US Congress passing Obama’s $787 billion new deal. India has a $475 billion plan, and the UK, Germany, France and a number of other nations have made similar arrangements (Flyvbjerg, 2009: 345).

3.2 Porter’s Five Forces Industry Analysis

The international engineering and construction sector is not removed from the effects of the increasing spread of global competition, and like all other industries, has adapted under the influence of what Adam Smith termed “the invisible hand” – the natural response of individuals and companies to changing market pressures and opportunities (Smith, 1776). The authority on competition writing and strategy, Michael Porter (1998: 21), defined five forces that shape competitive forces in any particular industry. These include the threat of new entrants, the bargaining power of customers, the threat of substitute products or services, the bargaining power of suppliers and the nature of the competition within the industry itself. The collective strength of these forces determines the profit potential of an industry, varying from being intense in industries like tyres, metal cans and steel, where no company earns spectacular return on investment, to mild in industries like oil field services.
and equipment, soft drinks as well as the latest audio visual technology, where there is the potential for relatively high returns.

3.2.1 The Threat of New Entrants

When assessing the international engineering and construction industry using Porter’s model, there is a barrier to entry for firms wishing to enter the industry and compete on an international level, as any multinational requires considerable economic and capacity reserves. This is particularly applicable to construction firms, where the capital costs of plant equipment are considerable. The contracting firm may require the resources to establish on site in a foreign country, commence construction and operate for a number of months until the first payment milestone may be reached and a payment certificate processed. Such fiscal requirements prevent all but the largest construction firms from tendering on international projects in the capacity as main contractor. A practical example of this was the recent completion of the Three Gorges Dam in 2008 at a total construction cost of US$26.5 billion. By the end of 2009 the dam was producing 80 billion kilowatts of electricity, which would aid in the project paying for itself by 2012 (www.loe.org, 25 April 2010). Only 31 percent of the contracts on the Three Gorges Dam were, however, awarded to local Chinese contractors, partially owing to a lack of market capitalisation of prospective tenderers (Allin, 2004: 26).

An additional barrier to entry is that most infrastructure projects utilise a tender system of bids based on international bidding law, which are evaluated partially on past experience of the tenderer. In order to tender, firms may have to pre-qualify to be accepted as a potential tenderer (www.mendip.gov.uk, 24 April 2010). Should
the firm not have completed construction of an equally sized or larger project in the past, it is unlikely they would be successful in even prequalifying as a prospective tenderer.

A final barrier to entry is the technical expertise of the engineering or contracting firm required for the bevy of complex tasks involved in engineering a mega-project. Whilst not all tasks are naturally completed by only a single contractor, the position of Main Contractor and Head Consulting Engineer require firms with extensive experience and staff capacity. Companies therefore require decades to build their capabilities and resources to allow them to take on ever-increasingly larger projects.

The Gautrain Project, for example, is a $3.5 billion rail project linking Pretoria, Johannesburg, Sandton and the OR Tambo Airport via the installation of approximately 150km of new track and tunnels in Gauteng Province, South Africa. The project is currently nearing completion of its first phase, with final completion scheduled for March 2011 (www.gautrain.co.za, 24 April 2010). As with most mega-projects occurring in emerging nations today, much of the expertise required for completing a project of this scale was sourced from the developed world. The main contractor on the Gautrain Project is the Bombela Consortium, a joint venture partnership between Murray & Roberts Limited, Bombadier Transportation UK, Bouygues Travaux Publics SA, SPG Concessions Ltd, Absa Capital and the J&J Group. Shareholding of the consortium is 50 percent owned by the Canadian firm Bombadier Transportation UK and French firm Bouygues Travaux Publics SA, owing to these firms being global leaders in their respective disciplines and the
required skills set not being available in South Africa (www.bombela.com, 24 April 2010).

The threat of new entrants is thus viewed as a weak force for the international construction and engineering industry.

3.2.2 The Bargaining Power of Customers

The traditional “customer” for international projects is usually represented by the client organisation and the project beneficiary. Where a project beneficiary is the same entity as that paying for the work, then only a single client exists. This is, however, rarely the case for projects occurring in developing economies. As has been mentioned previously, significant sums of money are required for the development of infrastructure projects, which often means that developing countries simply do not have the capital required for financing.

Regardless of who is ultimately paying for the work, the client entity holds strong bargaining power on any mega-project. Scope, budget, work quality and timelines are all controlled by the client organisation, and where one or more of these is behind the client’s requirements, the contractor or engineer will be held liable by way of a financial fine to be docked off future payments, or may even be dismissed from the project for breach of contract. Moran and Youngdahl (2008: 8-47) identify the tendency of client organisations to add to the scope of the project, known as “scope creep”, as one of the single most challenging issues facing the modern day project manager. They cite the example of the Millennium Dome project in the UK,
which was originally conceived in the mid-1990s by John Major’s Conservative Party, and then continued under the Labour Party of Tony Blair. The project was originally budgeted at £449 million; however, owing to a continuous change in strategic direction for the ultimate use of the structure and the resultant scope creep, it was completed in January 2000 at a cost of £728 million.

Steyn (2009: 55) lists the cause of the high number of World Bank projects failing as being due to issues revolving around a lack of clarity by the client and other stakeholders on projects. Often there is confusion and conflict from project stakeholders where unclear objectives of a “soft brief” are issued to the project engineers.

Owing to the strong position of the client as the ultimate authority on all projects, the bargaining power of the customer is viewed as another weak force for competition entry into the industry.

3.2.3 The Threat of Substitute Products or Services

It is the nature of the unending march of technology to gradually improve on product design and replace defunct systems and products with more efficient ones. In the international engineering and construction industry this phenomenon occurs as it does in all other industries, however, perhaps not at the pace that it does in the IT industry for example. Technology has allowed for the replacement of component parts within established projects, such as the use of a speciality high-strength concrete used during the construction of the Petronas Towers in Malaysia,
which replaced conventional structural steel and allowed for the project budget to be reduced (www.thetronastowers.com, 8 April 2009). Another example of a component replacement is the use of advanced geotextiles and geosynthetic linings for landfill sites and dams, instead of the previous method of compacting layers of impermeable clay. Where once a two metre thick layer consisting of multiple sub-layers of compacted natural clay had to be sourced and worked into the correct profile on site, to impede the flow of groundwater; now a synthetically produced Geotextile Clay Liner (GCL) of mere millimetres thick may be deployed over the excavation to ensure complete waterproofing (www.kaytech.co.za, 25 April 2010).

Technology has also allowed for the addition of new variations on old ideas within the industry, such as an expansion in the means of producing power. The advent of alternative energies such as wind power, solar power, marine power and nuclear power systems has heralded in a new age of infrastructure projects that simply did not exist fifty years ago, thereby creating a number of new disciplines and fields of engineering (http://discovermagazine.com, 1 August 2007).

It is therefore apparent that, whilst there are aspects of engineering and construction that are being replaced and changed under the influence of technology, the actual projects themselves are still necessitated. Roads are still required, as are dams, bridges, landfill sites and power stations, and will be for the foreseeable future. The lack of threat of substitutes for products or services within the international engineering and construction industry is thus viewed as being a strong force.
3.2.4 The Bargaining Power of Suppliers

Suppliers to the engineering and construction industry take every shape and form, and are as widespread as the types of engineering projects themselves. A large infrastructure project such as a dam makes use of literally hundreds of suppliers, in both services and materials. Suppliers for each aspect of construction are sourced by the subcontractor appointed to oversee that portion of the works. The bulk of materials required for construction are, however, relatively simple and uncomplicated. Bricks, stone, cement, steel and water are the basic building blocks of a wide variety of applications, and all are relatively easy to procure from natural or commercial sources.

The nature of the tender system is another aspect that limits the influence of suppliers in the industry, as bids for the supply of products or services are submitted for a project in direct competition against other suppliers. Often the list of tendering companies is made public in the interests of transparency, thus each tenderer is aware of against whom they are bidding. This encourages competition and reduces the ability of suppliers to dictate prices.

Whilst suppliers to the construction industry are fairly concentrated in developed nations, the developing world is largely without commercial sources. This necessitates the importing of components and materials for most projects, where materials can not be locally sourced, which is a contributing cause for the high cost of projects in developing countries. Suppliers of construction materials usually supply exclusively to the construction industry, such as the case with the world’s
largest manufacturer of cement, French group of companies *Lafarge*. *Lafarge* is present in 78 countries and supplies approximately sixty percent of the world’s cement, thirty-two percent of aggregates and concrete as well as eight percent of the global demand for gypsum (*www.lafarge.com*, 26 April 2010). This market dominance has given *Lafarge* a unique position amongst global suppliers of building materials, a position that somewhat single-handedly affects the analysis of negotiating power of suppliers to the industry.

Interestingly Lowe (1987: 57-71) describes how conditions emerged in the UK in the 1980s whereby suppliers to the construction industry had mutual co-operation agreements and relatively few holding companies that were actual separate legal entities. This created conditions where a monopoly could occur, however, such behaviour did not manifest. Lowe attributes this to the lethargy in the UK construction industry at the time, a state that persists even today in the UK market.

The bargaining power of suppliers is therefore a medium force within the international engineering and construction industry.

### 3.2.5 Competitive Rivalry within the Industry

Porter and Kramer (2002: 3-14) suggest that a company’s competitive context consists of four interrelated elements of the local business environment that shape potential productivity. These are factor conditions, or the available inputs of production, demand conditions, the context for strategy and rivalry, and relating and supporting industries. Ricart, Enright, Ghemawat, Hart and Khanna (2004:
175-200), however, have argued that in recent years international business appears to have focused more on management and organisation of multinational companies and less on the strategy of the firms involved. Even though several recurrent themes in the field of international business competition, including that of construction and engineering industry competition studies, have direct links to firms’ international strategy, global business seems increasingly to have focused on how multinationals do what they do, rather than what they do and why they do it in the first place. The academic literature appears to have accepted the strong belief that the logical response to globalisation is the multinational corporation itself.

Johansson (2006: 54-55) takes it one step further by suggesting that, because of the intense rivalry between global firms in many industries, competitive advantages have become increasingly difficult to sustain. This has happened not only in hi-technology industries such as computers and telecommunications, but also in more slow moving industries such as global civil engineering. Through competitors duplicating the best practices of rival firms by way of benchmarking and other strategic methods, modern-day multinationals within the same industry have become fairly indiscernible in terms of product mix, management techniques and geographical distribution. This has led to more than one scholar coining the term “hypercompetition”, describing the phenomenon that as competitive advantages erode, the firm has to compete by continuously moving to new ground in the spirit of “if we don’t do it, someone else will”. Hypercompetition effectively describes the mode of competition for many of the large global engineering consulting firms that perhaps had their origins in uniquely civil engineering
disciplines, but have since grown and expanded their fields of operation remarkably with the increasing pace of globalisation and the conversion to services focus that is occurring in many of their home nations. As one competitor enters a new market of geographic location, rivals follows. For example, the three largest consulting firms in the UK by market capitalisation are the Atkins Group, Arup International and the Mouchel Group (www.atkinsglobal.com, www.arup.com, www.mouchel.com, 26 April 2010). All three firms are active in similar markets and geographic locations and have comparable strategic focuses for global operations. The largest engineering consulting firm in the world, as ranked by the annual Engineering News Record survey (http://enr.construction.com, 26 April 2010), is the US-based firm AECOM, which also operates in similar market segments and geographies as the UK firms, apart from their involvement in military systems (http://www.aecom.com, 26 April 2010).

The world’s largest construction firms operate in more focused markets than the engineering design firms just discussed. Construction is exceptionally capital-intensive, with most firms integrating up the value chain to benefit from dedicated suppliers. Table 3.2.5 overleaf portrays a list of twenty-four the world’s largest construction firms and their turnover for the 2008 financial year end. Competition amongst these firms has been increasing in the past two decades, as focus moved from predominately their own domestic-markets, to international opportunities. Flyvbjerg (2009: 344-367) mentions that global infrastructure investments are shifting geographically from developed to emerging economies, with over half of the sum total of global projects now occurring in emerging states. He further gives
the example that over the past five years, China has spent more on infrastructure in real terms than in the whole of the twentieth century.

Table 3.2.5: The Top 24 Construction Firms by Nation and Turnover (2008).

<table>
<thead>
<tr>
<th>No</th>
<th>Company/Group</th>
<th>Country of Origin</th>
<th>EBITDA (US $ Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VINCI</td>
<td>France</td>
<td>$44,494</td>
</tr>
<tr>
<td>2</td>
<td>BECHTEL</td>
<td>USA</td>
<td>$31,400</td>
</tr>
<tr>
<td>3</td>
<td>CCC</td>
<td>China</td>
<td>$26,204</td>
</tr>
<tr>
<td>4</td>
<td>HOCHTIEF</td>
<td>Germany</td>
<td>$25,408</td>
</tr>
<tr>
<td>5</td>
<td>ACS</td>
<td>Spain</td>
<td>$21,300</td>
</tr>
<tr>
<td>6</td>
<td>SKANSKA</td>
<td>Sweden</td>
<td>$19,954</td>
</tr>
<tr>
<td>7</td>
<td>STRABAG</td>
<td>Austria</td>
<td>$18,231</td>
</tr>
<tr>
<td>8</td>
<td>Taisei</td>
<td>Japan</td>
<td>$18,060</td>
</tr>
<tr>
<td>9</td>
<td>Balfour Beatty</td>
<td>UK</td>
<td>$14,650</td>
</tr>
<tr>
<td>10</td>
<td>LEIGHTON</td>
<td>Australia</td>
<td>$13,491</td>
</tr>
<tr>
<td>11</td>
<td>SAIPEM</td>
<td>Italy</td>
<td>$13,433</td>
</tr>
<tr>
<td>12</td>
<td>Royal Bam Group</td>
<td>Netherlands</td>
<td>$11,756</td>
</tr>
<tr>
<td>13</td>
<td>Aker Solutions</td>
<td>Norway</td>
<td>$9,872</td>
</tr>
<tr>
<td>14</td>
<td>ENKA</td>
<td>Turkey</td>
<td>$6,956</td>
</tr>
<tr>
<td>15</td>
<td>SNC-Lavalin</td>
<td>Canada</td>
<td>$7,106</td>
</tr>
<tr>
<td>16</td>
<td>Hyundai E&amp;C</td>
<td>South Korea</td>
<td>$6,585</td>
</tr>
<tr>
<td>17</td>
<td>Larsen &amp; Toubro</td>
<td>India</td>
<td>$5,720</td>
</tr>
<tr>
<td>18</td>
<td>YIT</td>
<td>Finland</td>
<td>$5,241</td>
</tr>
<tr>
<td>19</td>
<td>Odebrecht</td>
<td>Brazil</td>
<td>$4,950</td>
</tr>
<tr>
<td>20</td>
<td>Murray &amp; Roberts</td>
<td>South Africa</td>
<td>$3,781</td>
</tr>
<tr>
<td>21</td>
<td>Orascom</td>
<td>Egypt</td>
<td>$3,720</td>
</tr>
<tr>
<td>22</td>
<td>Ellaktor</td>
<td>Greece</td>
<td>$2,545</td>
</tr>
<tr>
<td>23</td>
<td>MT Hojgaard</td>
<td>Denmark</td>
<td>$1,994</td>
</tr>
<tr>
<td>24</td>
<td>Budimex</td>
<td>Poland</td>
<td>$1,148</td>
</tr>
</tbody>
</table>

* EBITDA: Earnings before Interest, Taxes, Depreciation and Amortization

(Source: adapted from www.no1construction.com, 26 April 2010)

The world’s largest construction firm, the *Vinci Group*, now generates less than 40% of its turnover in its home country of France (www.vinci.com, 26 April 2010).
The competition within the international construction and engineering industry can thus be viewed as being moderately high within the historical domestic markets for global leaders, but of low intensity in foreign markets within the developing world, as there is little local expertise. Overall therefore, rivalry amongst competitors within the engineering and construction industry is judged to be a medium strength force.

In its entirety therefore, the overall industry may be viewed as slightly lower than a medium level force by way of a Porter’s Five Forces analysis.

### 3.3 PESTLE Analysis

Whilst a Porter’s Analysis, as provided in the previous section, is a useful tool in discerning the competitive environment in which a firm operates, it does little to highlight the broader issues facing firms operating within the industry. For multinational companies, such as those involved with engineering megaprojects, this is a crucial consideration, as it will largely determine the form of corporate strategy a company employs. For the company to successfully complete a foreign project, its management must carefully analyse the interaction between its own corporate policies, and the political, economic, social, technological, legal and environmental factors in order to maximise efficiency (Hough, 2003: 122). Such an analysis is referred to by the acronym of a PESTLE analysis, originating from the contributing issues making up the review. A PESTLE analysis for projects within the global engineering and environmental industry is here discussed, focusing on world emerging markets.
3.3.1 Political Considerations for the Industry

In a number of ways, the political climate of the country in which a business operates is more important than the topography, its natural resources or the meteorological conditions at the project site. Adverse physical conditions may all be overcome with modern-day engineering; however, an adverse political system may compromise or completely scuttle a progressing project (Phillips, 2006: 45-63).

Many of the political forces with which a multinational is faced are based upon ideological sources, however, are often foreign, complex and often contradictory. Such systems include nationalism, terrorism, traditional hostilities, unstable governments as well as the pressures from international organisations and observer groups (Ball & McCulloch, 1999: 301-348). Figure 3.3.1 overleaf represents data from the 2010 Freedom in the World Report, published by US-based Freedom House, showing the degree of freedom of political rights and civil liberties enjoyed by 193 countries and 15 disputed territories.

The Freedom House report measures the opportunity for individuals in those countries to act spontaneously in a variety of fields outside the control of the government and other centres of potential domination. The survey is thus primarily concerned with freedom from restrictions or impositions on individuals' life pursuits. While the survey considers restrictions on freedom imposed by governments, it does not measure actual government performance. Rather, it measures the wider state of freedom in a country or territory, reflecting both governmental and non-
governmental constraints. Similarly, the survey does not explicitly measure democracy or democratic performance. Rather, it measures rights and freedoms integral to democratic institutions. In Fig 3.3.1 below, countries deemed as “free” are represented in green, those “partly free” in yellow, and those “not free” in purple (www.freedomhouse.org, 26 April 2010).

**Figure 3.3.1: Freedom House’s world map showing political freedom in 2009.**

(Source: Freedom House, 2010)

The extent to which political freedom and government policies influences the potential for foreign investment, and with it investment in infrastructure projects as a first and foremost means of economic stimulation, cannot be overestimated. As large-scale infrastructure projects are essentially government driven, political influence in policies and legislation for a respective country is a major determinant for the degree of bulk infrastructure development within that country. Bagchi (1999: 3219-3230) gives the example of how political reforms in India in 1985, which were
legislated in 1991, preceded the opening of the Indian economy and a flood of foreign investment. The changes effected in 1985 covered all the major fields of regulation except the capital market. The rigour of the Monopolies and Restrictive Trade Practices Act (1969) was considerably reduced, making it virtually irrelevant as far as the expansion of monopoly houses was concerned. The government encouraged foreign investment into many areas which had earlier been barred to foreign investors and considerably liberalised the imports of capital goods and materials, especially of those needed for large projects in electricity generation, as well as in industries utilising natural gas and oil.

By the beginning of 1993, quantitative restrictions on imports in India were moderated or removed altogether, and import tariffs were brought down across the board. Earlier restrictions on foreign investment were done away with and a Foreign Investment Promotion Board was set up in order to attract foreign capital. Internal deregulation accompanied these changes in the foreign trade and payments regime. Many of the industrial sectors which had been earlier reserved for public enterprises were now thrown open to the private sector as well. The outcome of India's political policy reforms towards a market-based economic system has had a profound effect on investment in the subcontinent and the economy in general, with real GDP growth averaging nine percent up until the start of the global financial crisis (Thomas, 2006).

The key driver for the changes in the Indian economy was a change in political mindset for the administration. McDonald and Burton (2002: 10-34), Haque (1995: 173-178) and Agtmael (2007: 1-27) all discuss the popular held belief amongst
political observers that countries that are led by a democratically elected
government embrace the principals of a free market economy with greater ease
than those under the yolk of an oppressive regime. By actively competing in fair
global trade, such countries enable competition and thus further stimulate growth
and integration of their economies into the global marketplace. The pace of
integration accelerated in the last two decades of the twentieth century as trade
and capital account liberalisation and technological innovation in transportation and
telecommunications led to a dramatic increase in the international exchange of
factors of production and final products (Kessides, Noll & Benjamin, 2009: 2-4).

This opening up of markets has been a crucial factor in allowing access for
international investment in the form of infrastructure. The adverse is
correspondingly true, as has been made apparent by the complete state of
infrastructure disrepair in Zimbabwe. A news report from a branch of the United
Nations Office for Coordination of Humanitarian Affairs, IRIN, places the blame for
the death of 4,127 people from cholera in capital city Harare in early 2009 on the
collapsed water and sanitation infrastructure; a result of the totalitarian and corrupt
political regime in that country (http://www.irinnews.org, 3 April 2009). Sam Sipepa
Nkomo, the minister responsible for water resources and management in the
Zimbabwean government, told IRIN an audit of the state of water and sanitation
infrastructure was being undertaken. Initial estimates were that it would take
US$28 million annually to buy water treatment chemicals. According to Nkomo that
would not solve the situation, because there are issues of reviving the collapsed
infrastructure like water pipes, water treatment plants, and being able to pump
water to businesses and homes. At the moment it was a moot point as there was
no money. Nkomo explained that many Zimbabweans are simply surviving from hand to mouth (http://www.irinnews.org, 3 April 2009).

3.3.2 Economic Considerations for the Industry

Under the traditional model of infrastructure creation, finance used to be regarded as an ancillary function. Much of the spending for roads, railways, ports and most other major projects came directly from the public purse. Smaller projects are usually encapsulated into the infrastructure budget of the town or city in which they occur, while larger schemes may attract funding from a national treasury. This system is, however, now changing. This new business model proposes innovative and efficient mechanisms to consider a blend of Private Finance Initiatives (PFI) and Public Private Partnerships (PPP) and engage in development of local currency financing solutions through capital markets and currency swaps to meet the infrastructure development needs of particularly the emerging economies (Sagar, 2006).

Initiating project investment and implementation funding through private sector initiatives and public-private partnerships can be institutionalised through the medium of Special Purpose Vehicles (SPVs) that drive the processes. The SPVs allow private sector investors to channel funds into specific investments that will bear a positive return on capital. The three financing options available include:

- Grant Funds and Concessionary Loans;
- Public-Private-Partnership; and
- Private Investment.
An example of this last category is the SPV created to finance a power generating plant in Mozambique - the US $30 million Mavuzi and Chicamba Project. A private sector Norwegian company, *SN Power*, arranged finance to build the generating plant and sells electricity to the national and regional grids at the market price on a Build-Operate-Own (BOO) basis ([http://www.snpowerinvest.com](http://www.snpowerinvest.com), 26 April 2010).

Public sector intervention is often required to ensure that regulations do not preclude this type of investment and perhaps to provide assistance in establishing the SPV (Chakwizira, 2009).

The recent financial crisis has meant that some countries have seen a marked decline in available funds for public spending. Greece has seen a year-on-year reduction in spending in the construction sector by over 15 percent for 2009, with the result that local construction firms have seen their share price fall by one third since October 2009. Under an agreement with the European Union (EU), Greece has to find the funds to partially match EU financing to claim some 26 billion Euros of development money. Greece absorbed just 3.6 percent of the funds available under the EU’s National Strategic Reference Framework (NSRF) in 2009 and wants to increase that rate to 15 percent in 2010. It is preparing a law to cut red tape in approving NSRF projects. Greek GDP contracted 2 percent in 2009 versus the government’s projections for a contraction of 1.2 percent, increasing the reliance of builders on public works projects. Construction accounts for about one tenth of Greece’s GDP (Strupczewski, 2010).

The actual companies within the construction sector, however, appear to be remaining confident about industry conditions, despite the recent financial crisis.
This is according to the KPMG report “Navigating the Storm” which was released in November 2009 and which reflected the results of more than 100 interviews with senior leaders at engineering and construction companies in 30 countries worldwide. According to author Geno Armstrong (2009), the findings from the survey concluded that profit levels were expected to be maintained or increase by mid-2010. Armstrong states that there is a perception that the global financial crisis has devastated the construction industry, however, while it certainly has had a significant impact on the way these companies do business, the firms themselves view these conditions as an opportunity to get leaner. When the recovery does finally arrive, these companies should be well-prepared to succeed. More than half (54 percent) of global respondents said that their backlog volume of jobs had gone up or stayed level. The picture was similar with profits in the current order backlog with just 44 percent of respondents claiming a decrease. Contractors in Africa, Europe and the Middle East were hardest hit with 54 percent indicating their projected profit rates had fallen (Armstrong, 2009: 6-10).

In the 2008 KPMG global construction survey report entitled “Embracing Change?”, author Richard Wittington mentioned that companies spoke of having to turn work away due to a lack of capacity (Wittington, 2008: 3-8). Following several years of excess demand, the sector may have reached a temporary equilibrium. The length of most construction projects also means that many contractors may still be working off backlog contracts secured before the advent of the financial crisis.

Figure 3.3.2.1 overleaf, provides representation of the changes in backlog of projects within the construction industry for last 12 months, whilst Figure 3.3.2.2
shows changes in projected profit for the 2009 financial year versus the 2008 financial year.

*Figure 3.3.2.1: Changes in backlog in the last 12 months.*

(Source: Armstrong, 2009:9)

*Figure 3.3.2.2: Changes in projected profit for 2009 versus 2008.*

(Source: Armstrong, 2009:10)

There is some hope, but also some scepticism, regarding the impact of government initiatives to resuscitate global economies, especially in infrastructure projects. This caution is reflected in the 2009 KPMG survey findings, with only 15 percent believing that government intervention would give them significantly
greater opportunities over the following year, although the majority expected some kind of positive effect. From a regional perspective, the confidence in government packages was greatest amongst contractors in Asia Pacific. In Hong Kong and Australia, sizeable sums have been set aside for state infrastructure projects. Executives in the Americas, however, appear to be less certain over the benefits that such stimuli might bring (Armstrong, 2009: 11). Figure 3.3.2.3 below, demonstrates opinion of the construction sector towards the impact of government stimulus packages for the period November 2009 – November 2010.

**Figure 3.3.2.3: Perceived impact of government stimulus packages to November 2010.**

![Figure 3.3.2.3: Perceived impact of government stimulus packages to November 2010.](Source: Armstrong, 2009: 11)

3.3.3 Social Considerations for the Industry

A plethora of information prevails in the public domain on the positive social impact of infrastructure. In their report for the Central Bank of Chile “The Effects of Infrastructure Development on Growth and Income Distribution”, Calderón and Servén give quantitative evidence garnished from over 40 years of research.
conducted in more than 100 countries of how improvement in infrastructure can uplift the standard of living of the poor (Calderón & Servén, 2004). Even without the effects of hurricanes, floods, earthquakes and landslides, however, the immediate prospects for both the urban and rural poor in many parts of the world is bleak, with little or no access to even the most basic of infrastructure. At the sixth annual Brunel International Lecture entitled “Engineering Civilisation from the Shadow”, the British Institute of Civil Engineers vice-president Professor Paul Jowitt (2007) of Heriot-Watt University discussed how six of the eight United Nation (UN) Millennium Development Goals (MDGs) are directly concerned with the human condition, namely people’s physical health, their economic and social well-being and their capacity to play a full and useful role in the world. In one way or another, Jowitt (2007) suggest that all of the UN MDGs depend critically on the delivery of the underpinning infrastructure upon which civilisation depends. This means not just any infrastructure, but infrastructure that delivers real, pro-poor outcomes in the process of its planning, construction and operation (Jowitt, 2007).

Hoskisson, Eden, Lau & Wright (2000: 249-267) give evidence of how a defining aspect of the newly emerging economies is their focus on infrastructure development, evidenced by their annual spend in infrastructure development at a higher percentage of GDP than that of developed nations. Milano (2009) quantifies the point by describing how on average, emerging nations fuel their economies partially through spending 6 percent of GDP on infrastructure development, with that figure extending to between 9 and 12 percent for the past few years in China. By way of comparison, the United States spends on average 2 percent of their GDP on infrastructure spending. This provides for large opportunities for
construction and engineering firms to target these emerging economies as a source of new market growth (Hough, Thompson, Strickland & Gamble, 2008: 22). The most significant emerging economies currently being targeted in such a way by multinational engineering conglomerates are tabulated in Table 3.3.3 below.

**Table 3.3.3: Largest Emerging Markets**

<table>
<thead>
<tr>
<th>Country</th>
<th>Population (millions)</th>
<th>GDP (billions US $)</th>
<th>GDP (per capita)</th>
<th>Imports of goods and services (billions)</th>
<th>Exports of goods and services (billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Latin America:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Argentina</td>
<td>36.8</td>
<td>263.5</td>
<td>7165</td>
<td>19.4</td>
<td>34.7</td>
</tr>
<tr>
<td>Brazil</td>
<td>176.6</td>
<td>619.9</td>
<td>3510</td>
<td>63.8</td>
<td>88</td>
</tr>
<tr>
<td>Colombia</td>
<td>44.6</td>
<td>89.9</td>
<td>2017</td>
<td>19.1</td>
<td>18.6</td>
</tr>
<tr>
<td>Mexico</td>
<td>102.3</td>
<td>592.5</td>
<td>5792</td>
<td>189.2</td>
<td>177.9</td>
</tr>
<tr>
<td>Venezuela</td>
<td>25.7</td>
<td>102.9</td>
<td>4009</td>
<td>12.9</td>
<td>27.7</td>
</tr>
<tr>
<td><strong>Africa:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Africa</td>
<td>45.8</td>
<td>138.7</td>
<td>3026</td>
<td>37.6</td>
<td>37.4</td>
</tr>
<tr>
<td><strong>Asia:</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>China</td>
<td>1288.4</td>
<td>1375.2</td>
<td>5196</td>
<td>441.8</td>
<td>502.8</td>
</tr>
<tr>
<td>India</td>
<td>1064.4</td>
<td>543.7</td>
<td>511</td>
<td>83.7</td>
<td>88.6</td>
</tr>
<tr>
<td>South Korea</td>
<td>47.9</td>
<td>586.1</td>
<td>12232</td>
<td>213.8</td>
<td>266.4</td>
</tr>
<tr>
<td>Vietnam</td>
<td>81.3</td>
<td>38.2</td>
<td>470</td>
<td>28.6</td>
<td>23.9</td>
</tr>
<tr>
<td><strong>Europe:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>38.2</td>
<td>177</td>
<td>4634</td>
<td>60</td>
<td>56.7</td>
</tr>
<tr>
<td>Turkey</td>
<td>70.7</td>
<td>210.5</td>
<td>2997</td>
<td>69.5</td>
<td>66.3</td>
</tr>
</tbody>
</table>

(Source: Hough, Thompson, Strickland & Gamble, 2008: 22)

The case must be made, however, that the social impact of such accelerated infrastructure development for the societies inhabiting these main emerging economies and other developing countries, is not always positive. Elodie Djemai from the Toulouse School of Economics authored a paper in 2009 that provided statistical data from a survey conducted amongst the rural populations of six developing African nations, focusing on the impact of road infrastructure to community life. The survey showed that the spread of a formalised road network corresponded with the likelihood of AIDS infection amongst the populace, with
infection rates diminishing with habitation distance from the roads. Clearly the engineers and contractors cannot be blamed for the spread of AIDS that corresponded with their road, however, it is prudent to view any infrastructure development as part of a larger system that has both positive and sometimes very negative, effects (Djemai, 2009).

3.3.4 Technological Considerations for the Industry

As with most primary sectors of the economy, the influence of technological development and innovation within the engineering industry has been a primary consideration for effecting growth and competitive advantage, albeit not necessarily at the same pace as that of some other industries, such as electronics. In the first two or three decades of the 20\textsuperscript{th} century, the industry responded to rapidly escalating land values in the inner cities of the United States by producing buildings that made the best use of very expensive land, namely by developing skyscrapers. These were very innovative projects, making use of the major developments in materials and in particular, structural steel. Steel became cheaply available in large amounts towards the close of the 19\textsuperscript{th} century, a market response to demand as it was the best material for the frames of these emerging new superstructures. Steel combined high strength, high stiffness and the ability to be pre-cut, drilled, and rapidly erected on site (Sturges, Egbu & Bates, 1999).

Obviously the cutting edge of construction technology was centred in Africa for millennia with the dominance of Egypt and the exceptional skill and know-how required to produce constructs like the pyramids. In more recent times, however, the centre for technological innovation has been firmly rooted in the developed
world. The general weakness in technological development of emerging nations is reflected in the small number of patents they hold. From 1999 to 2003, all companies in the five largest rapidly developing economies cumulatively obtained only 3,900 US patents, compared to 166,000 and 54,000 for Japan and Germany, respectively. With the growing emergence of the developing nations, however, this phenomenon is changing. The main enabler of this change is cost. With about one-fifth of the research and development (R&D) costs of its Western competitors, a company such as Ranbaxy in China can achieve much with its $87 million R&D budget. For this reason, global multinationals are rushing to establish R&D centres in emerging economies (Sirkin, Hemerling & Bhattacharya, 2008: 52-53).

China and India have both declared technology and innovation to be strategic national priorities. In January 2006, China unveiled its fifteen year “Medium to Long Term Plan for the Development of Science and Technology”. The plan suggests that China must become “an innovation-orientated society” by 2020, and a global leader in science and technology by the middle of the century. It intends facilitating this through significant increases in R&D expenditures over then next ten years, reaching an anticipated 2.5 percent of GDP by 2020. The Plan also sets two significant goals. Firstly, that China must become one of the top five countries in the world in number of new patents granted for innovations, and secondly, for Chinese-authored scientific papers to become amongst the world’s most cited (Cao, Suttmeier & Simon, 2006).

India has technological aspirations no less impressive than those of China. The conveners at the 2005 and 2006 national R&D exposition in New Delhi captured
the national commitment to innovation in the slogans “World's Knowledge Hub of the Future” and “Think Innovation, Think India”. In support of such elevated goals the exposition sponsors reminded attendees that India has 380 universities and 11,200 higher-education institutions, producing approximately 6,000 PhDs, 200,000 engineers and 300,000 science graduates post-graduates annually. They also laboured the fact that R&D investment in India has been growing at a compounded annual growth rate of more than 40 percent (Sirkin, 2007).

Despite such ambitious future technological advances that will undoubtedly improve the rate of innovation within the construction and engineering industry, a number of industry observers claim that institutional and policy factors prevailing within the industry are the reason for the relatively slow rate of change (Sturges et al, 1999). The Egan Report (1998) for the construction industry, produced for the British Department of Environment, Transport and the Regions (DETR), has recommended that construction should learn from the manufacturing sector, and create a more innovative culture.

Sir John Fairclough (2002) is more critical of the industry in his “Rethinking Construction Innovation and Research”, a review of the UK government’s policies and practices in the construction industry. He claims that the primary reason for the slow pace of innovation within the industry is owing to fragmentation, which has given rise to a large number of relatively small firms, a large number of relatively small construction projects, and low barriers to entry in the small contracting sub-sector. He also states that the industry is fragmented because of the many disciplines involved, namely designers, constructors, professional consultants and
engineers, and specialist contractors, leading to a lack of movement in intellectual property between varying disciplines and a slow evolution in technological innovation.

3.3.5 Legal Considerations within the Industry

The engineering and construction industry is overseen by a myriad of legal considerations regulating role-players. In light of the fact that international contracting parties are enmeshed into the various rules of law, the conflict of laws and regulations is often a significant hurdle for resolving disputes. Any civil engineering project requires an attached legal process that regulates responsibilities and contractual issues associated with the project supply chain. Such a legal framework for a project will be governed, *inter alia*, by:

- Legal requirements of the country the project is being completed in;
- Legal requirements governing international suppliers to that project;
- Local municipal bylaws;
- The Form of Contract selected for the project;
- The financing agreement which may or may not be the project beneficiary;
- The Terms of Reference and contract specification; and
- The corporate codes of the companies involved.

Globalisation has changed the nature of many businesses, and the business of construction is no exception. The fast-growing international trade and developments, such as the World Trade Organization (WTO) agreements, the European Union of Free Trade agreements, the Asia-Pacific Economic Cooperation (APEC) forum, and the Closer Economic Partnership Agreement (CEPA) have provided new opportunities and challenges to the construction
industry. Facilitated by sophisticated communication technologies, advanced project management techniques and financial incentives, large-scale projects are no longer local events but international affairs involving parties of different nations, each possessing their own regulatory framework (Chaun & Suen, 2005: 582-609).

The international construction industry is becoming increasingly hostile and contentious in its legal outlook, according to Conlin, Langford and Kennedy (1996), as well as Kumaraswamy (1998). They suggest that, owing to the fact that projects are point-specific and unique entities, the industry has devised intricate procurement systems to manage these often complex construction processes and handle these special features. This has allowed for the fostering of adversity through fragmented functions and over-onerous checks and balances. With this increasing complexity of projects, the number of project claims has also drastically increased. Bastianelli (2008) mentions that fifty years ago there were only a handful of construction lawyers in the United States, that is, lawyers whose practice focused primarily on representing clients in the construction industry. In 2008 the number of construction lawyers in the US was placed at over 30,000.

Construction law has evolved far beyond claims preparation and prosecution. The construction lawyer’s practice now commonly involves a variety of issues covering topics such as construction insurance, suretyship, design professional liability, construction defects, construction failures, uniform commercial code, mechanics liens, employment and labour law, environmental law, finance, corporate law, false claims and compliance, and many other issues. Any dispute on an international
A project that cannot be resolved through an amicable process will most likely be submitted to arbitration (Wetter, 1995: 117-135).

3.3.6 Environmental Considerations within the Industry

Perhaps like no other industry, engineering and construction has the ability to impact upon the natural environment. The success with which engineers have prevailed in this period of advanced civilisation and technological wonder has come at an enormous price to the planet, with climate change now being an accepted detrimental side-effect of the modern age.

The Three Gorges Dam project mentioned earlier in section 3.2.1, is an often-cited example of infrastructure development being placed in front of environmental sustainability. It is a classic case of the difficulties facing emerging economies in their desperate need for resources to enable growth; however, without the social sentiment for protection of the planet that prevails in many developed nations, it is often at the cost of the environment. The vast scale of the environmental and social transformations of the watershed of the Yangtze both upstream and downstream of the Three Gorges Dam itself has drawn massive outcries from environmental lobby groups in the west, and even from some Chinese officials themselves, who admit that the environmental consequences of the dam are more significant than originally predicted (Gleick, 2008: 139-150).

In an attempt to reduce the impact of global infrastructure development, and to limit the pollution levels currently prevailing in developed countries, the concept of “carbon credits” has arisen and will be one of the primary means of financing global
infrastructure growth in the future. Generally speaking, carbon credits are "units" that an entity acquires for developing or funding a project that assists with the reduction of Green House Gases (GHGs) in the atmosphere. These "units" come in the form of tradable, intangible instruments and are issued in terms of three different international mechanisms, namely, the Clean Development Mechanism (CDM), the Joint Implementation Mechanism (JIM) and the Emissions Trading Mechanism (ETM). The mechanism that is applicable to projects undertaken in developing countries is the CDM. These projects could be in a wide variety of industries, including energy, mining, agriculture, forestry and construction (Reitz, 2010).

Two international instruments exist that govern the way carbon credits are utilised, namely the *United Nations Framework Convention on Climate Change* (UNFCCC) and the *Kyoto Protocol* (United Nations, 1998). Binding targets in terms of reducing GHGs were first adopted by the members to the UNFCCC in 1997 in Kyoto under the Protocol, which was then ratified in 2005. The countries that have binding targets are mainly developed countries, whereas developing countries do not have binding targets. The distinction between bound countries and non-bound countries is significant because it explains the different carbon trading mechanisms. Through the terms of the CDM, an emitter country can invest in a project in a developing country to gain Certified Emissions Reductions (CERs) for themselves, or buy CERs from someone who has invested in such a project is what has become known as “emissions trading” (Reitz, 2010). It is around this issue of emission trading that a storm of contention has risen, as some detractors of the process suggest it allows wealthy developed nations to disregard their responsibilities to the
environment by buying credits for carbon reductions from poorer developing nations. In an article written for *The Economic Times*, Banerjee and Rao (2007) mention that at present, the volumes of CERs of carbon dioxide (CO$_2$) recorded annually by the UNFCCC are 174 million tonnes. The price for CERs is kept quite low, at less than $20 per CER. Should there be no global carbon market and each country had to balance its own carbon budget, the economic cost incurred by the US would be $32 billion, by the EU would be $14 billion and for Japan it would be approximately $6 billion. This would indicate costs of reduction ranging from $41 to $55 per tonne of CO$_2$, which is more than double the existing price of the CERs.

Clearly much work needs to be done by the engineering industry to curtail environmental degradation, regardless of whether that degradation be in developed or developing nations. As stated by Professor Paul Jowitt (2007) during the 6$^{th}$ Brunel International Lecture, “as engineers we are a key profession in the implementation of society’s desires and needs. Yet, our profession needs to change in response to new social and environmental challenges. Where we claimed to direct the powers of nature for the use and convenience of mankind we now need to focus on working with the powers of nature for the use and benefit of society.”

The following chapter will examine how engineers are combating the multitudes of challenges arising from the natural and human environment in the focus region for this paper, namely Africa and the Middle East. What issues are unique to this part of the world, and how can the industry derive solutions to overcome them.
CHAPTER 4  CHALLENGES FACING DEVELOPMENT IN AFRICA AND THE MIDDLE EAST

If you believe in the long-term urbanisation success story of China and India, you buy Africa, because that’s where the commodities are going to come from

(Dr Martyn Davies, Frontier Advisory CEO, 2009).

The challenges facing the African continent and those facing the Middle East vary greatly; however, a number of similarities may be drawn between the two. For the purposes of this paper, the G8 definition of the Middle Eastern countries will be used, which includes the countries of Turkey, Cyprus, Armenia, Azerbaijan, Syria, Lebanon, Israel, Jordan, Egypt, Sudan, Eritrea, Saudi Arabia, Kuwait, Bahrain, Qatar, United Arab Emirates, Oman, Yemen, Iraq, Iran, Turkmenistan, Uzbekistan, Tajikistan, Afghanistan and Pakistan (Perthes, 2004).

Issues commonly arise as a result of historical legacy and their modern-day shared status as centres of emerging economies and current and future participants on the global economic stage. An expansive list of authors exists for writings on problems experienced by Africa, with slightly less so for the Middle East. A relatively impartial starting source, however, is that global financing and regulatory body, The World Bank, which has produced a number of reports in this regard since the 1960s. Most recently Ndulu, Chakraborti, Lijane, Ramachandran and Wolgin produced the World Bank report “Challenges of African Growth: opportunities, constraints and strategic directions” (2007). Their work drew heavily from three major earlier studies, namely The Political Economy of Economic Growth in Africa (1960–2000)
conducted under the African Economic Research Consortium (AERC); *Can Africa Claim the 21st Century?*, produced collaboratively between the World Bank and African partner institutions; and lastly the World Bank’s study, *Economic Growth in the 1990s: Learning from a Decade of Reform* (Ndulu et al, 2007). Commenting on the Middle East, Hazelton (2007) and Isakhan (2007) have discussed the issues surrounding a variety of forms of investment into the region and their associated difficulties, whilst Creane, Goyal, Mobarak and Sab (2006), writing for the International Monetary Fund (IMF), quantify constraints and success mechanisms for the financial sector development across Middle Eastern countries. Figure 4.0 represents the results of a 2004 World Bank survey of enterprises in Tanzania, showing a measure of the most serious and frequent problems associated with doing business, which are also symptomatic for most other African nations.

**Figure 4.0**: Percentage of enterprises rating problems as major or very severe constraints on enterprise operations and growth in Tanzania.

Ndulu (2007) is supported by other authors in highlighting four primary areas of concern that effectively summarise and incorporate the main issues facing prospective investors into these regions. These are principally investment climatic factors of the country, existing infrastructure of the country, innovation within the country, as well as institutional capacity. The significance to the civil engineering and contractor sector will be discussed under the most critical issues arising from these areas of interest.

4.1 Energy Supply
Factors that affect the investment climate of a country are numerous and widespread, but actively important for firms seeking to invest in that country, particularly when said investment is in the form of “on-the-ground” infrastructure development. The “investment climate” is an all-encompassing phrase that captures a broad array of concerns including institutional, policy and regulatory frameworks, business regulations and their enforcement as well as the general conditions in which the markets operate. All factors affect the direct costs to firms, which are generally infrastructure related, with energy and transportation topping the list of major impediments, and risks associated with security of property, crime, corruption, political instability and macroeconomic policies, playing a significant role (Ndulu et al, 2007).

Energy availability and cost is one of the most significant constraints for firms operating in Africa, as confirmed by Geginat and Ramalho (2009), Dollar, Hallward-Driemeier and Mengistae (2005) and Reinikka and Svensson (1999). Problems in
The poor quality of electrical infrastructure causes frequent power outages in many African countries. This has two associated costs for firms. The first is naturally the loss of productivity during down time, which is estimated at approximately nine percent in Kenya compared to two percent in China. The second cost is for the need to have energy back-up facilities. Fifty-five percent of Tanzanian firms have generators, compared to only twenty-seven percent in China. The costs of purchasing a generator can be prohibitively high for small or medium sized companies, meaning that this competitive advantage is usually restricted only to larger firms, as displayed overleaf in *Figure 4.1.1* (Foster & Jevgenijs, 2009: 2-40).

The percentage of firms generating their own electrical supply varies amongst geopolitical regions across Sub-Saharan Africa, as demonstrated in *Figure 4.1.2* overleaf. It is significantly more prevalent in the fifteen-country Economic Community of West African States (ECOWAS). In Mali, Ghana and Togo own generation accounts for more than 10 percent of installed capacity, whilst in Niger,
Guinea and Nigeria the figure exceeds 20 percent (Foster & Jevgenijs, 2009: 2-40).

**Figure 4.1.1:** Percentage of firms owning generators.

(Source: Ndulu et al, 2007).

**Figure 4.1.2:** Private generation as percentage of total installed capacity by sub-region for 2006.

(Source: Foster & Jevgenijs, 2009).

*Note: EAC = East African Community; ECOWAS = Economic Community of West African States; SADC = Southern African Development Community.*
Private generation is also considerably more prevalent in low-income countries than elsewhere, as shown by Figure 4.1.3, below.

**Figure 4.1.3:** Private generation as percentage of total installed capacity by national income for 2006.

(Source: Foster & Jevgenijs, 2009).

The share of own-generation capacity in low-income countries ranks at 12 percent, which is twice that of middle-income countries and five times that of upper-middle-income countries. Of the twelve Sub-Saharan countries where private power generation exceeds ten percent of installed capacity, eight are low income (Foster & Jevgenijs, 2009: 2-40).

### 4.2 Built Infrastructure

On practically all measures of built infrastructure coverage, Africa lags behind the rest of the developing world, as reflected by the figures supplied in Table 4.2.1 overleaf (Yepes, Pierce & Foster, 2008). The Middle East and North Africa are
considerably more developed in certain infrastructure, with a high density particularly of toll roads. This is indication of a more favourable investment climate in the Middle Eastern region, with large scale public-private partnerships being commonplace. Toll roads are a frequent attractor of this form of semi-private investment in infrastructure, but only in regions with a high enough per capita income that would allow users to pay for road use (Valero, 2010).

**Table 4.2.1: Infrastructure Endowments by World Region.**

<table>
<thead>
<tr>
<th>Sector and measure</th>
<th>Sub-Saharan Africa</th>
<th>South Asia</th>
<th>East Asia and Pacific</th>
<th>Europe and Central Asia</th>
<th>Latin America and Caribbean</th>
<th>Middle East and Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Density of paved road network (km/1,000 km², 2001)</td>
<td>49</td>
<td>149</td>
<td>59</td>
<td>335</td>
<td>418</td>
<td>482</td>
</tr>
<tr>
<td>Density of paved road network (km/1,000 arable km², 2001)</td>
<td>1,087</td>
<td>675</td>
<td>568</td>
<td>1,208</td>
<td>4,826</td>
<td>6,890</td>
</tr>
<tr>
<td>Density of total road network (km/1,000 km², 2001)</td>
<td>152</td>
<td>306</td>
<td>237</td>
<td>576</td>
<td>740</td>
<td>599</td>
</tr>
<tr>
<td>Density of total road network (km/1,000 arable km², 2001)</td>
<td>2,558</td>
<td>1,400</td>
<td>5,365</td>
<td>2,160</td>
<td>8,850</td>
<td>30,319</td>
</tr>
<tr>
<td>Information and communication technology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Density of fixed-line telephones (subscribers per 1,000 people, 2004)</td>
<td>33</td>
<td>30</td>
<td>90</td>
<td>261</td>
<td>197</td>
<td>100</td>
</tr>
<tr>
<td>Density of mobile telephones (subscribers per 1,000 people, 2004)</td>
<td>101</td>
<td>86</td>
<td>208</td>
<td>489</td>
<td>350</td>
<td>224</td>
</tr>
<tr>
<td>Density of Internet connections (subscribers per 100 people, 2004)</td>
<td>2.8</td>
<td>1.7</td>
<td>6.6</td>
<td>16.4</td>
<td>14.1</td>
<td>10.1</td>
</tr>
<tr>
<td>Energy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical generating capacity (MW per 1 million people, 2003)</td>
<td>70</td>
<td>154</td>
<td>231</td>
<td>970</td>
<td>464</td>
<td>496</td>
</tr>
<tr>
<td>Access to electricity (% of households with access, 2004)</td>
<td>18</td>
<td>44</td>
<td>57</td>
<td>—</td>
<td>79</td>
<td>88</td>
</tr>
<tr>
<td>Water and sanitation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water (% of households with access, 2002)</td>
<td>63</td>
<td>72</td>
<td>75</td>
<td>87</td>
<td>90</td>
<td>85</td>
</tr>
<tr>
<td>Sanitation (% of households with access, 2002)</td>
<td>35</td>
<td>48</td>
<td>60</td>
<td>78</td>
<td>77</td>
<td>77</td>
</tr>
</tbody>
</table>

(Source: Yepes, Pierce & Foster, 2008)

The degraded state of African infrastructure is not due to a historical legacy of underdevelopment on the continent. Africa’s road infrastructure was on par with that of South and East Asia in the 1960s, equally for telephones in the 1970s and
power supply in the 1980s. The comparison with South Asia, which has largely the same per capita incomes as Africa, is particularly significant. By the year 2000 however, Asian competitors had sizeably outstripped Africa for infrastructure development, with a density of paved roads triple that of Sub-Saharan Africa. The cost of addressing the backlog of infrastructure requirements in Africa is now estimated to be in the region of US $93 billion per year, more than twice that of the figure cited in the *2005 Economic Report on Africa* prepared by the United Nations Economic Commission for Africa (Foster & Briceno-Garmendia, 2009).

This chronic deficit in infrastructure has a direct impact upon engineering and contracting firms tasked with projects in the region. The nature of pioneer industries such as construction is that there is often no infrastructure available to access the site, thus the project costs often include the provision of roads and other necessary infrastructure to reach the site. This escalates the costs of African projects significantly. The actual services costs are also disproportionately higher in Africa when compared to other countries, including those of the Middle Eastern region, as reflected in Table 4.2.2 overleaf.

Whether for power, water, road freight, mobile telephones, or Internet services, the tariffs paid in Africa are several multiples of those paid in other parts of the developing world. The explanation for Africa’s higher prices has been attributed to genuinely higher costs, a result of harsh topographical terrain and the lack of ongoing maintenance that requires a more durable product be produced at inception; as well as the lack of competition and state-run monopolies that seek outsized profits (Foster & Briceno-Garmendia, 2009).
### Table 4.2.2: Africa’s High-Cost Infrastructure

<table>
<thead>
<tr>
<th>Service</th>
<th>Sub-Saharan Africa</th>
<th>Other Developing Regions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power tariffs (US$/kWh)</td>
<td>0.02–0.46</td>
<td>0.05–0.1</td>
</tr>
<tr>
<td>Water tariffs (US$/m³)</td>
<td>0.86–6.56</td>
<td>0.03–0.6</td>
</tr>
<tr>
<td>Road tariffs (US$/ton/km)</td>
<td>0.04–0.14</td>
<td>0.01–0.04</td>
</tr>
<tr>
<td>Mobile telephony (US$/basket/mo)</td>
<td>2.6–21.0</td>
<td>9.9</td>
</tr>
<tr>
<td>International telephony (US$/3min call to US)</td>
<td>0.44–12.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Internet dial up service (US$/mo)</td>
<td>6.7–148.0</td>
<td>11</td>
</tr>
</tbody>
</table>

(Source: Foster, 2008)

The high road tariff costs are of particular importance to the construction sector in calculating aspects such as mass haulage distance and logistics costs, which may be significantly higher than those in developed countries.

### 4.3 Tax Rates and Cost of Finance

Tax rates in Africa vary considerably across the continent, with variations within corporate tax, individual tax, sales tax and income duties being significant from country to country. The theory that all African countries apply taxes that are far in excess of those imposed by other developed or developing centres, is largely a fallacy, as whilst rates within countries such as Chad and the Democratic Republic of Congo are accepted as being high, countries like Lesotho, Botswana, Niger and the Sudan have some of the lowest tax rates in the world. This is reflected in Table 4.3.1 overleaf. Comparisons can be made against tax rates implemented by the developed world, where the public purse is weighed down by large social spending budgets in healthcare and social subsidies. According to the Organisation for
Economic Co-operation and Development (OECD), the combined corporate income tax rate in the United States was 39.1 percent in 2009, the United Kingdom was 28 percent, New Zealand and Australia were both 30 percent, France was 34.43 percent and Japan 39.54 percent (www.oecd.org, 30 May 2010). When viewed against the majority of African countries, these prevailing tax rates in the developed world are actually higher.

Table 4.3.1: Tax rates for selected African Countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Corporate</th>
<th>Sales (VAT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angola</td>
<td>35%</td>
<td>10%</td>
</tr>
<tr>
<td>Botswana</td>
<td>15%</td>
<td>10%</td>
</tr>
<tr>
<td>Burundi</td>
<td>35%</td>
<td>18%</td>
</tr>
<tr>
<td>Cameroon</td>
<td>38.50%</td>
<td>19.25%</td>
</tr>
<tr>
<td>Chad</td>
<td>40%</td>
<td>18%</td>
</tr>
<tr>
<td>Comoros</td>
<td>50%</td>
<td>10%</td>
</tr>
<tr>
<td>Congo, Democratic Republic</td>
<td>40%</td>
<td>13%</td>
</tr>
<tr>
<td>Congo, Republic</td>
<td>38%</td>
<td>18%</td>
</tr>
<tr>
<td>Egypt</td>
<td>20%</td>
<td>10%</td>
</tr>
<tr>
<td>Equatorial Guinea</td>
<td>35%</td>
<td>15%</td>
</tr>
<tr>
<td>Gabon</td>
<td>35%</td>
<td>18%</td>
</tr>
<tr>
<td>Gambia</td>
<td>35%</td>
<td>15%</td>
</tr>
<tr>
<td>Guinea</td>
<td>35%</td>
<td>18%</td>
</tr>
<tr>
<td>Kenya</td>
<td>30%</td>
<td>16%</td>
</tr>
<tr>
<td>Lesotho</td>
<td>10%</td>
<td>14%</td>
</tr>
<tr>
<td>Liberia</td>
<td>35%</td>
<td>12%</td>
</tr>
<tr>
<td>Mali</td>
<td>35%</td>
<td>18%</td>
</tr>
<tr>
<td>Mauritius</td>
<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td>Mozambique</td>
<td>32%</td>
<td>17%</td>
</tr>
<tr>
<td>Namibia</td>
<td>35%</td>
<td>15%</td>
</tr>
<tr>
<td>Niger</td>
<td>2%</td>
<td>CFAF 1500</td>
</tr>
<tr>
<td>Rwanda</td>
<td>35%</td>
<td>18%</td>
</tr>
<tr>
<td>Seychelles</td>
<td>20%</td>
<td>N/A</td>
</tr>
<tr>
<td>South Africa</td>
<td>28%</td>
<td>14%</td>
</tr>
<tr>
<td>Sudan</td>
<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td>Togo</td>
<td>37%</td>
<td>18%</td>
</tr>
<tr>
<td>Tunisia</td>
<td>35%</td>
<td>18%</td>
</tr>
<tr>
<td>Zambia</td>
<td>35%</td>
<td>17.50%</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>30.90%</td>
<td>15%</td>
</tr>
</tbody>
</table>

(Source: www.afribiz.info, 30 May 2010)
Project finance costs in Africa are associated with private funding where a government has insufficient reserves to meet the large budgetary requirements associated with development of infrastructure projects. The higher lending costs for project financing is associated with a higher risk profile for African projects, as well as a lack of experience record that global financial institutions may have for African investment.

In the Middle East less reliance is placed upon funding by commercial banks, as rich oil incomes mean that governments are able to fund a large number of infrastructure developments directly. Feller (2004) describes how Saudi Arabia has now announced it will tie the award of lucrative oil and gas projects to the construction of other infrastructure, such as desalination plants that are usually loss leaders. Lenders use a combination of debt and equity, usually with limited recourse. Underwriting is based on expected revenues from the project, rather than assets or creditworthiness of the borrower (Feller, 2004: 76).

After the recent financial meltdown of the Dubai Emirate, with 70 percent of the stock market’s value written off, infrastructure projects are slowly beginning to resuscitate and cautious banks begin lending again in the region (Lewis, 2009). The US$4.8 billion being spent on the Yemen Liquid Natural Gas (LNG) facility is being funded by 40 percent equity, 60 percent debt model, with financing funded by a syndicate of commercial banks in a move being viewed as a signal of increased risk appetite of international credit institutions (Project Finance, 2009: 36).
4.4 Corruption

Associate Justice of the US Supreme Court Louis Brandeis is famed for stating in 1914 that “sunlight is the best disinfectant”, referring to the benefits of openness and transparency in eradicating corruption in the public sector (Grumet, 2003).

With the increasing pace of globalisation in recent years, a greater number of authors have examined the phenomenon of corruption and its role in reduced service delivery. Barro (1999) describes the quantitative link between a higher degree of inequality in relation to the country’s Gini coefficient and Kuznets curves, indicating interesting enough that a high level of inequality retards growth in poorer countries, but actually increases growth in wealthier nations.

Habib and Zurawicki (2002) examine the impact of corruption on foreign direct investment, showing that generally foreign investors avoid corruption as it is perceived to increase operational inefficiencies. They also indicate that corruption is widespread in countries where the administrative apparatus enjoys excessive discretionary power and where there is a lack of economic development, an aspect corroborated by Li and Zou (2002), as well as Hailu (2010). Tanzi and Davoodi (2000) illustrated the inverse proportionality between the GDP of ninety-seven countries and their levels of levels of government transparency as further evidence of the damaging nature of corruption to economic growth, whilst Sung (2002) and Zhang, Cao and Vaughn (2009) argue that the drivers of corruption within a country are less dependant upon the ideals or beliefs of individuals, but rather are derivatives of the cultural, institutional and political context on which the nation is constructed. Zhang et al (2009) further indicates a clear correlation exits between
social support in country and reduced levels of corruption, as the mechanisms of
social support such as public healthcare and social grants contribute to an
improvement in human development and resultantly, confirmative and ethical
behaviour.

Transparency International is the global monitor tasked with reporting on levels of
country corruption the world over. Their definition of corruption is “the abuse of
entrusted power for private gain” (http://www.transparency.org, 3 June 2010).
Whilst they campaign globally against outright corruption, a form of corruption
characteristic of African countries is defined by the World Bank report “Silent and
Lethal: Africa Development Indicators 2010” as “silent corruption”. Silent corruption
occurs when public servants fail to deliver services or inputs that have been paid
for by the government. It does not make newspaper headlines in the way that
bribery scandals do, and has yet to be identified by Transparency International and
other global indexes of corruption, however, is pervasive in Africa and
disproportionally affects the poor (Arbache, Habyarimana & Vasco, 2010).

The impact of such operational inefficiencies in the public sector of African
countries has major ramifications for project costs for the engineering sector.
Where “grease payments” are delayed or withheld, certain applications submitted
to organs of state will be declined or rejected, leading to considerable delays in
project scheduling. This will greatly increase the employer-imposed penalties that a
contracting firm may be liable to pay, should they not complete the project within a
stipulated timeframe. Table 4.4.1 overleaf, shows the incidences of corruption and
perceived corruption rates for sub-Saharan African countries. It may be noted that
in almost half of the thirty-five countries listed, firms expected to be required to pay additional costs to public servants to “get things done” (Arbache et al., 2010).

**Table 4.4.1:** Incidence of corruption and perceived corruption in sub-Saharan African countries.

<table>
<thead>
<tr>
<th>Country</th>
<th>Incidence of corruption</th>
<th>Perceived corruption</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% of firms expected to pay informal payment to public officials (to get things done)</td>
<td>% of firms expected to give gifts to get an operating licence</td>
</tr>
<tr>
<td>Angola (2006)</td>
<td>46.8</td>
<td>10.08</td>
</tr>
<tr>
<td>Benin (2004)</td>
<td>57.65</td>
<td>41.25</td>
</tr>
<tr>
<td>Burkina Faso (2006)</td>
<td>86.96</td>
<td>0</td>
</tr>
<tr>
<td>Burundi (2006)</td>
<td>56.46</td>
<td>40.26</td>
</tr>
<tr>
<td>Cameroon (2006)</td>
<td>77.6</td>
<td>50.81</td>
</tr>
<tr>
<td>Cape Verde (2006)</td>
<td>5.63</td>
<td>0</td>
</tr>
<tr>
<td>Congo, Dem Rep (2006)</td>
<td>83.79</td>
<td>66.25</td>
</tr>
<tr>
<td>Congo, Rep (2009)</td>
<td>49.21</td>
<td>42.79</td>
</tr>
<tr>
<td>Côte d’Ivoire (2009)</td>
<td>30.64</td>
<td>31.8</td>
</tr>
<tr>
<td>Ethiopia (2006)</td>
<td>12.42</td>
<td>2.7</td>
</tr>
<tr>
<td>Gabon (2009)</td>
<td>26.09</td>
<td>0</td>
</tr>
<tr>
<td>Gambia, the (2007)</td>
<td>52.42</td>
<td>23.42</td>
</tr>
<tr>
<td>Gambia, the (2006)</td>
<td>52.42</td>
<td>23.42</td>
</tr>
<tr>
<td>Ghana (2007)</td>
<td>38.77</td>
<td>22.6</td>
</tr>
<tr>
<td>Guinea (2006)</td>
<td>84.75</td>
<td>51.87</td>
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<tr>
<td>Guinea-Bissau (2006)</td>
<td>62.72</td>
<td>15.33</td>
</tr>
<tr>
<td>Kenya (2007)</td>
<td>79.22</td>
<td>28.75</td>
</tr>
<tr>
<td>Liberia (2009)</td>
<td>55.22</td>
<td>49.63</td>
</tr>
<tr>
<td>Madagascar (2009)</td>
<td>19.2</td>
<td>18.6</td>
</tr>
<tr>
<td>Malawi (2006)</td>
<td>35.65</td>
<td>4.92</td>
</tr>
<tr>
<td>Mauritania (2006)</td>
<td>82.12</td>
<td>33.23</td>
</tr>
<tr>
<td>Mauritius (2009)</td>
<td>1.59</td>
<td>0</td>
</tr>
<tr>
<td>Namibia (2006)</td>
<td>11.36</td>
<td>0</td>
</tr>
<tr>
<td>Niger (2006)</td>
<td>69.7</td>
<td>8.33</td>
</tr>
<tr>
<td>Nigeria (2007)</td>
<td>40.9</td>
<td>40.29</td>
</tr>
<tr>
<td>Senegal (2007)</td>
<td>18.12</td>
<td>21.09</td>
</tr>
</tbody>
</table>
Sierra Leone (2009)  |  18.8  |  8.71  |  8.58  |  33.85  |  36.87  
South Africa (2007) |  15.09 |   0    |  3.13  |  33.2   |  16.87  
Tanzania (2006)    |  49.47 |  20.05 |  14.7  |  42.69  |  19.73  
Uganda (2006)      |  51.7  |  12.86 |  14.53 |  46.43  |  23.57  
Zambia (2007)      |  14.33 |  2.61  |  4.89  |  27.39  |  12.08  
Spearman Correlation Index with perceived corruption  |  0.28  |  0.15  |  0.23  |  0.18  

(Source: Arbache et al, 2010: 15)

Svensson (2000) revealed from his studies on bribery and corruption in Uganda that there is no set amount expected by officials for bribes, but is rather dependent upon the individual or company paying the bribe. The greater the company’s ability to pay, the greater the expected size of payment; the more frequently a firm is prepared to pay, the more frequently they are expected to pay. This trend was confirmed by Reinikka and Svensson (2006). Uneke (2010) describes how “lubrication payments” in Nigeria, particularly during the military regimes of Ibrahim Babangida and Sani Abacha respectively, have run into millions of US dollars.

4.5 Conflict and Political Instability

Conflict in the Middle East has been a characteristic of the region since the dawn of civilisation, even predating the Egyptian empire and extending to the modern day with the enduring Israeli-Palestinian conflicts. Much rhetoric and debate surrounds the cause of the Middle Eastern conflict, which largely revolved around the region’s location at the confluence of so many historical trade routes, and then changed with an increasingly complex mix of ethnic, economic and cultural factors. Whilst the Middle East has traditionally been one of the most conflicted regions on earth, it has been experiencing reduced levels of hostility since the 1980’s, with Africa and Asia now being equally turbulent (Sørli, Gleditsch & Strand, 2005).
The Middle East and Africa both lag behind the rest of the world in economic, social and political development (Fukuda-Parr, Woods & Birdsall, 2002). A large amount of literature exists that makes a case for the causes of war, predominately civil war, with these two regions. Contrary to the proponents of ethnic divides, natural resources, economic growth and human development appear to be the primary drivers (Addison, Le Billon & Murshed, 2001; Le Billon, 2001; de Soysa, 2002).

Much work has also been done in this area by Collier and Hoeffler (2002; 2005) who devised the Collier-Hoeffler (CH) model of civil conflict. The CH model comfortably explains the causes of war across most Africa, showing that greed is a motivator five times more prevalent than any battle against oppression. This was confirmed by Collier (2003), as well as Collier, Hoeffler and Söderbom (2004). In their much publicised report to the World Bank entitled “Breaking the Conflict Gap: Civil War and Development Policy”, Collier, Elliot, Hegre, Hoeffler, Reynal-Querol and Sambanis (2003) elaborate on the CH model and reveal that empirically, the most striking pattern is that civil war is concentrated in poorer countries. War causes poverty, but the more important reason for the concentration is that poverty increases the likelihood of civil war.

The key root of wars across most of Africa can therefore be attributed to the lack of economic development on the continent. In the absence of economic development, neither good political institutions, nor ethnic and religious homogeneity, nor high military spending provide significant defences against large-scale violence. Once a
country has regressed into conflict, cyclical forces tend to lock it into a syndrome of further conflict (Collier et al., 2003).

The Middle East can be seen to be a point of high conflict due to its historical strategic positional significance and dependence upon oil, but also due to the lack of political and social development. The region remains the world’s authoritarian stronghold and has yet to experience a wave of democratisation. Of the region’s nineteen states, only Israel and Turkey can be viewed as being roughly democratic in governance (Sørli et al., 2005). The role of Islam in the political development of the region has also been widely debated, with Fish (2002) finding that Islam is widely associated with autocracy and attributes this mainly to the subordination of women in Islamic states.

The effects of periodic war and unrest in much of Africa and the Middle East has been a particular co-ordinated response from multinational firms seeking to operate in conflict zones, including construction and engineering companies. Country Risk Assessments (CRAs) are now a regular form of appraisal conducted by banks or businesses seeking to trade in foreign countries. The CRA evaluates economics, policies, politics, exposure time-frames and conflict in the target country and draws up a risk profile against assets being compromised. This has in turn led to a global insurance industry that specialises in risk countermeasures, including insurance covering ransom payments on kidnapped foreign staff, antiterrorist schools, and companies to handle negotiations with kidnappers. The world’s largest kidnapping and extortion firm, Cassidy and Davis, is a London-based underwriter that insures over 9,000 clients in foreign markets (Ball et al., 1999). Such precautions naturally
significantly increase the costs of firms operating in conflict zones in Africa and the Middle East. Idahosa (2002) discusses the operational precautions taken by Talisman Oil Company in the operation in Sudan during the civil war, where the economic benefit of continuing to operate had to be quantified against the threat of security to staff, the risk of loss of assets or the seizure of the company’s concession by government or rebel forces. Companies operating in areas of civil conflict are now also experiencing evermore scrutiny from the international community on the impact of their operations in fuelling local conflict. Talisman Oil reportedly paid oil royalties to the Sudanese government of the order of US $1,000,000 per day, which coincidentally matched the amount spent by the government on the procurement of arms, import of foreign oil and aid relief in government-friendly territories (Idahosa, 2002; Lyon, 2000).

Leander (2005) mentions another social consequence of multinational companies operating in unstable regions in Africa, namely that of private security companies. Whilst hired to provide protection for the work compound or concession, private militia may actually lead to scarcity of capacity within government security structures, further exacerbating regional instability. Carmola (2006) goes on to mention the conflict that frequently erupts between private security firms working for contractors, and the authorities in Iraq. Such side effects of operations are a crucial point of review for engineering firms and others seeking to operate in the respective conflict territories of Africa and the Middle East.

In conclusion, it may be seen that a wide consideration of micro and macro issues may affect infrastructure project developments in Africa and the Middle East, with
most authors confirming that existing power supply, built infrastructure, tax structures, access to finance, conflict, politics and corruption are the primary challenges. These are only the most significant issues, however, with a long list of further contributing factors prevailing that increase the risk profile of African and Middle Eastern projects.

In the following Chapter the methodology and outline of research structure utilised in this paper will be discussed.
CHAPTER 5 RESEARCH METHODOLOGY

As described within Chapter 1, two generally accepted paradigms have been identified in the field of research methodology, namely qualitative and quantitative paradigms, with case study research being composed of components of one or sometimes both paradigms (Yin, 1994: 14).

The nature of the subject under research is one of a high degree of subjectivity and complexity. Problems and struggles experienced by one firm when operating in a foreign environment may be unique to that particular firm and their operational processes, as a result of prevailing conditions within that country or a general issue experienced by many organisations. As a result, the researcher selected a more qualitative than quantitative approach for gathering and processing information, as it lends itself towards an intense and/or prolonged contact with a real-life situation. The qualitative researcher’s role is to gain a holistic overview of the context under study: its logic, its arrangement, and its explicit and implicit rules. By capturing data on perceptions of events directly from local actors through a process of deep attentiveness and empathic understanding, the qualitative researcher is able to deconstruct the cause and effectual relationships between contributing factors in a manner not easily replicated in pure quantitative research (Miles & Huberman, 1994: 6).

5.1 Research Framework

The focus of this research study has been concerned with identifying the primary linkages between the prevailing adverse conditions in emerging countries for the
international infrastructure engineering industry, targeting Africa and the Middle East. The contrast between operational conditions within the developed world are often considerably different to those within emerging markets, thus the research framework utilised market leader firms within both socio-economic spheres. Within these firms, key project managers were identified that bore experience within the targeted areas.

The primary output of the research was an attempt to derive a risk matrix that categorised the most significant factors facing engineering infrastructure firms seeking to operate within Africa and the Middle East and provided mitigation measures where possible to do so. This was achieved through an extensive literature review, as presented in Chapters 2, 3 and 4, and then through non-directed review of specific experiences garnered from the targeted project managers. The literature review highlighted a number of areas of significant concern, which culminated in the derivation of the following Problem Statement:

Identifying and Mitigating the Risks of Project Development in Emerging Nations for Civil Engineering Firms, with Focus upon Africa and the Middle Eastern Regions.

Through identification of five broad targeted areas, risk categorisation could be employed in a focussed and deliberate manner. The five categories included:

- Energy supply;
- Built Infrastructure;
- Tax Rates and Cost of Finance;
− Conflict, and
− Corruption and Political Instability.

The appropriateness of recommendations of the risk matrix would be specific mitigations that prevented or minimised exposure of firms to these five categories.

5.2 Research Design

This research was conducted using a case study approach, based upon the past experiences of respondents in their applicable fields of expertise. To this end, non-probability sampling was applied. Non-probability sampling is a departure from the often times used probability sampling method, where each member of the research population stands an equal chance of being included in the sample. The form of non-probabilistic sampling known as purposive sampling was utilised for this study, where the samples were individually selected from the population by the researcher, as they had the most valuable data to contribute (Denscombe, 2003: 15).

Within the general purposive sampling sphere, a particular methodology known as expert sampling was implemented. Expert sampling involved the pre-selection of “experts” to be approached as research respondents, based upon their high level of professional knowledge (www.socialresearchmethods.net, 22 July 2010). Experts were first screened based upon a few simple criteria used to ascertain their suitability. These criteria included:

- Highly experienced in consulting civil engineering or contracting;
- Bulk of their experience gained within the research focused geographies;
- Experienced at a senior level of project responsibility e.g. Project Manager;
- Still employed in the applicable relevant capacity.

Within the engineering industry the use of case study format is particularly relevant, as it allows for in depth research on issues that are often difficult to quantify. Denscombe (2003) also makes the point that case studies are appropriate to research where the basis of the investigation is normally something that already exists, not where the situation has been artificially generated for the purpose of the research.

### 5.3 Instrumentation

A multi-dimensional approach was pursued in gathering data for this study. This is termed *triangulation*, being a combination of methodologies in the study of the same phenomena. Data triangulation is listed by Patton (1990: 187) as the use of a variety of data sources; theory triangulation is the use of multiple perspectives to interpret a single set of data, whilst methodological triangulation describes the use of multiple methods to study a single problem. All three forms of triangulation applied to this study.

A variety of data sources entailed the use of an extensive literature survey, liaison with key individuals experienced in the study area to formulate questioning direction, and a research questionnaire in gathering primary data from selected respondents. A copy of the covering letter is attached in Appendix A, and the research questionnaire attached in Appendix B.
5.4 Research Procedure

The two firms selected to participate in this study were *Jeffares and Green Consulting Engineers (Pty) Ltd* and *Mouchel plc*, as discussed in Chapter 2: Industry Analysis. The two firms were selected based upon a number of factors. Firstly, they are both multidimensional consultancies with interests and operations within the geographies under study. *Mouchel plc* has wide operational experience in the Middle East, whilst *Jeffares & Green* is heavily involved with developments in Africa. Mouchel plc is based in the UK and thus represents a developed world perspective, whilst Jeffares & Green is a South African firm and therefore provides information from an emerging market point of view. Lastly, the researcher has been an employee of both firms in the past and is thus intimately knowledgeable of the applicable divisions and staff to be approached in the interests of data retrieval.

The form of research model utilised in this study was defined by Yin (2003) as a “multiple-case replication” case study format. This replication approach is graphically illustrated in Figure 5.4 overleaf. As the model suggests, the theory was first evolved based upon the extensive literature review conducted on the subject, as described in chapters two, three and four. The two participative firms were then selected, based upon their exposure to the target markets, and case studies addressed on an individual basis. Each case study consists of a “whole” study, in which convergent evidence was sought regarding the facts and conclusions for the case, with each case’s conclusion then providing the information requiring replication by other individual cases. The “feedback loop” shown in Yin’s model represents the redesign potential required when unexpected elements emerge.
from cases that require adjustment to the original theory, or potential inclusion of additional case studies (Yin, 2003: 49-50).

**Figure 5.4: Case Study Method utilised by the Cosmos Corporation.**

(SOURCE: Yin, 2003: 50)

**5.4.1 The Questionnaire**

According to Denscombe (2003), there is no “golden formula” for questionnaire design which, if slavishly adhered to, will ensure success and fend off all potential criticisms. Almost inevitably, the researcher will need to apply discretion, make trade-offs and exercise judgement when producing and implementing a questionnaire. One of the key issues in designing the questionnaire is that it is required to be as crisp and concise as possible, asking just those questions which
are critical to the research. The following principles were recommended by Denscombe (2003: 154), and utilised in formulating the most suitable questions:

− Avoid the use of “leading” questions that suggest an answer or prompt the recipient towards a certain kind of answer;
− Avoid asking the same question twice in different fashions;
− Make sure the wording is completely unambiguous;
− Avoid vague questions;
− Give sufficient options in the answer;
− Use only a minimum amount of technical jargon;
− Keep the questions as short and straightforward as possible;
− Include only those questions vital to the research;
− Co-ordinate numbering of questions and sections in a logical format;
− Do not make unwarranted presumptions in the questions; and
− Avoid any words or phrases that cause offence.

Two forms of questions prevail in questionnaires, these being “open” and “closed” questions. Open questions allow the respondent to phrase an answer in their own words, deciding on the wording, the length of the answer and the matters to be raised in the answer. Generally these forms of questions are relatively short, whilst the corresponding answers are relatively long. The advantage of open questions is that the information gathered by way of the responses is more likely to reflect the full opinion of the views held by the respondent. These questions do, however,
require more effort on the part of the respondent and provide the researcher with large quantities of raw data requiring analysis (Denscombe, 2003: 155-156). Closed questions structure the answers by allowing only answers that fit into categories that have been established in advance by the researcher. A form of closed question, known as a Likert scale, allows participants to give more discriminating responses, as well as stating if they have no opinion, by providing them with some form of a rating scale. This turns the question into a statement and asks the respondent to indicate their level of agreement with the statement by ticking a box (Collis & Hussey, 2003: 184).

5.4.2 Testing the Questionnaire

The questionnaire was first tested prior to being released to respondents. This testing was conducted by the researcher’s promoter, who is in possession of a Doctorate degree in Business Administration. Required corrections and additions were made by the researcher, after which final testing was conducted and approval for release obtained.

5.4.3 Layout and Content of the Questionnaire

The questionnaire consisted of two sections, a Demographic Information section requiring input of background data on the respondent, and then a Project Information section which consisted of forty-five “open” as well as “closed” questions. Whilst “closed” questions lend themselves towards more quantitative than qualitative data, their inclusion served to ensure variety in the questioning methodology and thus maintain the interest of the respondents, as well as providing critical data for quantitative analysis.
The Project Information section was divided into five categories, each reflective of the five primary issues emerging from the literature review. Category A consisted of six questions revolving around the importance and impact of energy considerations to projects in Africa and the Middle East. Category B comprised of nine questions, targeting issues surrounding the remaining forms of built infrastructure, such as roads, harbours and airports. Category C had eight questions that queried respondents experience with tax rates and the cost of finance in Africa and the Middle East. Category D consisted of eight questions that evaluated the frequency and extent of corruption in the targeted regions, whilst the final category, Category E’s ten questions, reviewed conflict and political instability.

A covering letter outlined a brief summary of the need for the questionnaire, its layout and instructions for its completion.

Initially two respondents were contacted within each of the two target companies, some months prior to the questionnaire being produced, and yielding four respondents in total. When respondents were issued with the questionnaire it transpired that one of the original respondents had left the employ of the company, and thus a different respondent within the same firm was identified as being suitable, contacted by the researcher and agreed to participate in the survey.

The covering letter was emailed to all respondents in .pdf format, whilst the questionnaire itself was emailed in Microsoft Word 2003 format. As mentioned earlier in Section 5.3, a copy of the covering letter is attached in Appendix A, whilst the research questionnaire is attached in Appendix B.
5.5 Documentation Process

The completed questionnaires were received back from all respondents via email. Only one out of the four respondents returned the answered survey within the allotted time period – the remainder had to be prompted by the researcher to complete and return the questionnaire. The responses were all transferred to a master Microsoft Excel spreadsheet by the researcher and then critically analysed.

5.6 Analytical Procedure

Cross-referencing of the respondents answers, both qualitative and quantitative, was conducted on all cases. Calculation of indices, graphical production of results and analysis of trends was completed for quantitative data in MS Excel through use of standard statistical modelling. Qualitative data was review by systematic deconstruction of the individual case being discussed, identification of similar issues within other cases, and then integration of common drivers for each of the respective targeted categories in an interpretive framework (Henning, 2004: 19). As described by Yin (2003), the importance of dissecting a case study is that the case must be maintained in the context of being a “whole study”. Any replication across cases could then be integrated into a universal conclusion, shared amongst cases. Variations in responses owing to cultural and/or language differences must be reviewed in the context of the respondent providing the case study response (Atkinson & Delamont, 2005: 821).
5.7 Case Participant Profiles

The subject of this research was an investigation into the varying experiences of engineering firms operating in Africa and the Middle East. As discussed earlier in this document, these experiences may or may not be perceived differently for companies, based upon whether they are themselves based in a developed or developing nation. One firm was thus selected that was based in a developed economy, the United Kingdom; and another from a developing “emerging” economy, South Africa.

Chapter 2 of this dissertation provided an industry analysis and review of the firms selected as participants in the study, namely UK-based Mouchel plc and South African-based Jeffares & Green (Pty) Ltd.

5.7.1 Jeffares & Green (Pty) Ltd

The respondents from Jeffares & Green were Mr Chris Robinson and Mrs Jan Norris. Mr Robinson was educated at South Africa’s Pretoria University and has nearly forty years experience in civil engineering, in South Africa and most other African countries. Mr Robinson has been Jeffares & Green’s Managing Director for the past fifteen years.

Mrs Norris was educated at Birmingham University in the UK and holds a Masters degree in geotechnical engineering. She has close to twenty years experience in civil engineering in the UK and across Africa. She is the current Director-in-charge of Jeffares & Green’s Earth Sciences Division and sits on the firm’s Executive Committee.
5.7.2 Mouchel plc

The respondents from Mouchel were Dr Julian Maund and Mr David Binns. Dr Maund is a Technical Director in geotechnics at Mouchel, where he has been working for the past eight years. Dr Maund has over 24 years experience in a wide variety of geotechnical engineering schemes from slope stability assessments and building foundations to roads, railways and pipelines in the UK, Ireland, New Zealand and the Arab Emirates. He is currently based in Mouchel's Sutton Coldfield office in the West Midlands, UK.

Mr Binns is currently the Managing Director of the Regulated Industries division at Mouchel, possessing over thirty-four years experience in civil engineering, having been educated at the Imperial College of London, UK. He has fulfilled a wide variety of roles, including managing power station projects in South East Asia, running engineering businesses as well as being Commercial and Contracts Director in water, energy, rail and infrastructure in the Middle East.

5.8 Research Summary

The research methodology described in this chapter has been developed based upon a framework of accepted academic best practice, adapted to the opportunities and constraints provided by the research topic. The research framework and design, instrumentation and research procedure were discussed, including elaboration on the form of questionnaire used and how it was tested. The documentation process and analytical procedure were detailed, as well as the biographies of the selected respondents. In the following chapter the results of the
research survey analysis will be discussed and compared against the body of data provided in the preceding literature review.
CHAPTER 6     DISCUSSION AND REVIEW OF RESULTS

A phrase by Edwards Deming, often used in organisations today is “In God we trust, all others must bring data.” Modern companies lean heavily upon this principal, using the analysis of information to guide nearly every decision (Evans, 2007: 2). The interpretation of data from which one derives useful and relevant information must be conducted in an unbiased manner, according to the guiding principles of the scientific method. Such an approach was used in the evaluation of results for this study.

The format used in describing the questionnaire results will be as recommended by Yin (1994: 106), whereby the case study respondents’ feedback is compared against that of the literary sources discussed already in chapters 2, 3 and 4. Key similarities and correlations of the responses with literature are outlined. Yin refers to this as “pattern-matching”, where the researcher compares an empirically based pattern with a predicted one, or with several predictions. Where the patterns coincide, the results can help a case study strengthen its internal validity. Where the responses from sources differed in terms of opinion or experiences, these variations are discussed and compared against the literature bank. Potential reasons for discrepancies and differing responses are offered by the researcher where possible.

Each of the questionnaire’s respective sections, correlating with the primary driving themes emerging from the literature review, is discussed in turn. The respective
question as posed in the questionnaire is repeated for each section, and then the collective responses discussed. Where a question in the questionnaire had a follow-up query relating to an extension of the primary question, the follow-up response is included in the discussion of results for that question. For ease of reporting, the four respondents are identified in this discussion and review of results by means of their initials, as reflected in Table 6.1, below.

### Table 6.1: Respondents’ Identifying Initials.

<table>
<thead>
<tr>
<th>Respondent Name</th>
<th>Identifying Initials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binns, David (Mouchel plc)</td>
<td>DB</td>
</tr>
<tr>
<td>Maund, Julian (Mouchel plc)</td>
<td>JM</td>
</tr>
<tr>
<td>Norris, Jan C. (Jeffares &amp; Green)</td>
<td>JCN</td>
</tr>
<tr>
<td>Robinson, Chris J. (Jeffares &amp; Green)</td>
<td>CJR</td>
</tr>
</tbody>
</table>

Not all respondents reported answers for all questions, as areas of exposure to different geographical areas varied. Jeffares & Green principally operates within Africa, whilst Mouchel has a wide history of operations within the Middle East.

### 6.1 Questionnaire Section A: Energy Supply

1. Have any of your past projects encountered problems associated with energy supply during investigation, construction or operational phase?

Energy supply was identified as one of the most significant constraints for firms operating in Africa by Dollar, Hallward-Driemeier and Mengistae (2005), Reinikka and Svensson (1999), Eifert, Gelb and Ramachandran (2005), Ndulu, Chakraborti, Lijane, Ramachandran and Wolgin (2007) and most recently, by Geginat and
Ramalho (2009). This was confirmed in practice by CJR, who revealed that operational constraints were encountered with an “extremely erratic” energy supply from the national grid during a mining operation undertaken by *Jeffares & Green* in Tanzania. This compelled the use of diesel to power the operation’s processing plant, which had a significant impact on the operating costs. DB also confirmed that, in his experience, electrical outages in Africa were common. Electrical downtime in the Middle East was suggested by DB to be a far lesser constraint, owing to the relative stability of supply. Neither JCN nor JM have encountered power supply problems with their past projects in Africa.

2. How much of a factor would you view reliable energy supply as being an influence on your decision not to operate within certain countries, owing to likely ensuing budgetary or time overruns?

Both JCN and DB suggested that power supply would be a moderately significant factor in their decisions not to operate within certain countries, whilst CJR and JM suggested that it would be only marginally significant.

As discussed earlier in Section 2.2 of Chapter 2, and again in Section 3.2.1 of Chapter 3, the nature of civil engineering projects usually requires firms to operate in often extremely rural settings. This suggests that consulting and contracting firms are quite used to completing point-specific developments without the benefit of an established power supply. As a project is completed as a single work package, after which the firm pulls out of the location and passes the completed project over to the jurisdiction of the Client, firms are able to tolerate a higher degree of risk to erratic electrical supply, as this may be overcome through use of
generators. It is therefore logical that none of the respondents suggested that they would not operate in any country, purely owing to electrical supply issues.

3. Does your firm have a protocol of factoring in energy blackouts and the provision of generators for pricing operations within certain countries?

It is interesting to note that none of the respondents reported any form of protocol utilised by their firms that related to erratic power supply, when pricing operations within any African or Middle Eastern countries.

4. What percentage of projects completed by your firm in African or Middle Eastern countries within the last 5 years have, to your knowledge, been related to the construction or upgrade of energy infrastructure, e.g. hydroelectric dams, power stations, alternative energy facilities?

**Figure 6.1: Maximum percentage of projects completed in Africa and the Middle East within the past 5 years that were associated with energy facilities.**
Figure 6.1 gives graphical representation of the percentage of projects that the respondents have been directly involved with in Africa and the Middle East over the past five years. It may be noted that up to eighty percent of the projects on the African continent that CJR has conducted in the past five years were related to the construction or upgrade of energy facilities, whilst JCN recorded a maximum of forty percent. JM showed a maximum of sixty percent for projects conducted within the Middle East. As discussed in Section 4.1 of Chapter 4, Foster and Jevgenijs (2009: 2-40) document the high number of firms operating in Africa that require use of generators to supplement the energy supply from the national grid, which highlights the demand in improved electricity for much of Africa. It is therefore logical that the results from respondents show that engineering firms are being occupied significantly in energy-related construction in Africa, as confirmed by JCN and CJR.

The low involvement of DB and JM in African energy projects may be accounted for by Mouchel’s minimal operations within Africa, which likewise accounts for the low involvement of JCN and CJR on Middle Eastern energy schemes, owing to the lack of Jeffares & Green exposure in that region.

6.2 Questionnaire Section B: Built Infrastructure

1. Have past or present projects undertaken by your firm in Africa or the Middle East encountered financial or logistical difficulties relating to the poor standard of built infrastructure, e.g. roads, harbours or airports?

As discussed in Section 4.2 of Chapter 4, a number of authors cite the poor state of Africa’s infrastructure as having a significantly adverse financial and logistical
effect on firms operating on the continent (Yepes, Pierce & Foster, 2008; Foster & Briceno-Garmendia, 2009; Foster, 2008). To a lesser degree, the Middle East is also subject to increased operational costs for practicing companies, owing to poor infrastructure (Valero, 2010). This literature review is unanimously corroborated by all respondents. JCN reports that project costs in the Democratic Republic of Congo (DRC) are elevated by the poor quality of roads, necessitating the use of off-road vehicles. Some roads are in such a state of disrepair that, even when using all-terrain vehicles, it may still take over an hour to travel 20 kilometres, which significantly inflates the required professional fees for a project undertaken in the DRC. JCN also states that some sites in African countries are completely inaccessible due to the poor state of access roads, requiring all staff, equipment and supplies to be flown in, once again elevating project costs.

CJR confirms JCN’s feedback, relating the “enormous cost and delay in moving mining plant to northern Tanzania as a result of poor roads and no bridge access from Kenya”. The poor state of harbour infrastructure in Cameroon was listed by CJR as a constraint for past operations in that country, as a shipping container containing exploration supplies to the value of US$500,000 is still held in the primary port of Douala, after a two year delay. This required the project being resupplied by road, further increasing financial cost and time delays. DB stated that aid-funded work on roads in Ethiopia, Kenya and Tanzania was currently necessitated due to the poor standard of existing roads in those countries. JM confirmed this, stating that a project currently being undertaken in Uganda was being influenced by the poor quality of roads in the areas, which was further aggravated by seasonal rainfall events. JM was the only respondent to relay
experiences with adverse road conditions in the Middle East, suggesting that a major highway reconstruction between Dubai and Fujairah in the United Arab Emirates (UAE) was required owing to the poor quality of the existing road linking the two emirates. JM further detailed a significant financial problem associated with receipt of payment for work done on road construction projects in Dubai. This is, however, not a constraint linked with the quality of existing infrastructure, and thus will be discussed in the next Section of this Chapter that reviews finance issues.

2. Have any of your firm’s recent appointments on projects in Africa or the Middle East required ancillary infrastructure works, such as significant access road construction, prior to commencement of the main contract?

As discussed in Section 4.2 of Chapter 4, Foster and Briceno-Garmendia (2009) describe how the cost of project development in Africa is often escalated by the need for preparatory infrastructure, constructed so that a site may be accessed for the primary infrastructure to be built. This was confirmed by JCN, who suggested that most of the projects she had been involved with in Africa had included road access construction as part of the over-all contract, such as remote hydro-electric power projects including the upgrade or new construction of access roads as part of the contract brief. CJR stated the same, specifying the Central African Republic and Tanzania as cases in point.

DB was also in agreement, however, JM suggested that he had not come across this project requirement on African schemes. This may be due to two causes – either the projects that JM had been involved with to date did not require this aspect, or the literature review and the feedback from the other three respondents
had been misleading. The researcher considers the former explanation to be the most likely, based upon the weight of available evidence in this regard. DB detailed that access roads in the Middle East were often required to reach a project site. The good condition of available existing access roads in the Middle East meant, however, that the construction of new roads was usually not required.

3. Based upon your experience, does the lack of built infrastructure in Africa or the Middle East elevate the cost of project developments in those regions?
Both JCN and CJR reported that, in their opinion, the lack of built infrastructure in the rest of Africa did indeed elevate project costs, with both respondents suggesting that costs were forty to sixty percent higher than similar project costs in South Africa. Interestingly both DB and JM suggested that project costs as a result of poor built infrastructure in Africa were only ten to twenty percent higher than similar projects in the UK.

This disparity in perception reveals an interesting difference in the civil engineering operational environments of South Africa and the UK. As detailed in Section 4.3 of Chapter 5, the transactional costs of most African countries may be significantly less than those of the developed world, especially where cost of labour and materials are concerned. As a result, the total construction budget for the construction of a new development in South Africa may be sizeably lower than a similar development in the UK. When operating in the rest of Africa, the increased project costs associated with poor built infrastructure make a project notably more expensive than it would have been in South Africa. Considering the high cost of
project development in the UK, however, a UK-based firm would not find the increased project costs of working in Africa to be as significant.

DB reported that he did not consider there to be any increased costs associated with poor infrastructure in the Middle East, however JM suggested there were, although these would be less than five percent. This disparity between the opinions of respondents is therefore not considered to be a significant difference.

4. Does your firm have a protocol of factoring in additional contingency costs for pricing operations within certain countries, owing to the poor state of built infrastructure?

Whilst JCN suggested that there was no formal protocol followed by Jeffares & Green in pricing operations within certain countries, she did reveal that the increased risk of operating in the rest of Africa was still factored in to project proposals with an “African Factor” contingency included. This increased quantum varies from project to project, based upon the country of operation and the project details. CJR reported that no formal protocol was utilised by the firm.

DB suggested that no formal protocol was implemented by Mouchel, however JM was of the opinion that there was. Further explanation of the nature of the protocol by JM, however, revealed that the question may have been misinterpreted by the respondent, as the reply suggested that the increased costs of operating within certain countries was associated with increased per diem allowances and tax rebates, as opposed to a response to the poor standard of built infrastructure.
6.3 Questionnaire Section C: Tax Rates and Cost of Finance

1. Please confirm the source of funding for your firm’s last five projects completed, or currently being undertaken, in Africa and the Middle East. Please list both the country of operation, and the funding agency.

All respondents indicated a variety of differing funding agencies operating within Africa, as mentioned earlier in comments by the funding organisation US AID (2010) appearing in Section 2.1 of Chapter 2, as well as discussed by Inggs (2009) in Section 2.2 of Chapter 2. These are cumulatively tabulated in Table 6.3, below.

Table 6.3: Sources of African Project Funding.

<table>
<thead>
<tr>
<th>Respondent</th>
<th>Country</th>
<th>Funding Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>JCN</td>
<td>Mozambique</td>
<td>Millennium Challenge Account (Moz)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Millennium Challenge Corporation (US)</td>
</tr>
<tr>
<td></td>
<td>Botswana</td>
<td>Southern African Development Community</td>
</tr>
<tr>
<td></td>
<td>DRC</td>
<td>Private Mining House</td>
</tr>
<tr>
<td></td>
<td>Mozambique</td>
<td>European Investment Bank</td>
</tr>
<tr>
<td></td>
<td>Liberia</td>
<td>The World Bank</td>
</tr>
<tr>
<td>CJR</td>
<td>Mozambique</td>
<td>Millennium Challenge Account</td>
</tr>
<tr>
<td></td>
<td>Lesotho</td>
<td>Millennium Challenge Account</td>
</tr>
<tr>
<td></td>
<td>DRC</td>
<td>Private Mining house</td>
</tr>
<tr>
<td></td>
<td>Sierra Leone</td>
<td>Private Mining house</td>
</tr>
<tr>
<td></td>
<td>Tanzania</td>
<td>Private Investor</td>
</tr>
<tr>
<td>DB</td>
<td>Ethiopia</td>
<td>The World Bank</td>
</tr>
<tr>
<td></td>
<td>Nigeria</td>
<td>The European Investment Bank</td>
</tr>
<tr>
<td></td>
<td>Kenya</td>
<td>The African Development Bank</td>
</tr>
<tr>
<td>JM</td>
<td>Uganda</td>
<td>Private Investor</td>
</tr>
</tbody>
</table>

Sources of project for Middle Eastern projects were listed by DB as all stemming from the UAE government or private sources. JM corroborated this response,
however gave further details into the specific emirate source providing the funding. These were described as being *Nakeel*, a Dubai governmental organisation, and *Khalifa Port*, an Abu Dhabi governmental firm. These responses are congruent with the literature review, as the Middle Eastern project funding regime is primarily government based (Feller, 2004).

2. *Has your firm experienced problems with collecting payment for services rendered, when working for any particular funding organisation, or host government within Africa or the Middle East?*

In their report to the World Bank in 2007, Ndulu *et al* (2007) discuss how a country’s investment climate is critically influenced by stability, both for those residing within the country and for those conducting work there, as mentioned in the preamble to Chapter 4. Non-payment for services rendered within that country may rapidly destabilise an emerging market economy, a risk run equally by a number of the larger civil engineering consulting and contracting firms operating the world over, as confirmed by Allin (2004) in Section 3.2.1 of Chapter 3.

JCN confirmed the difficulties faced by her firm in obtaining payment from certain Clients, as did CJR and DB. Interesting the country of operation in Africa is less important a factor as the source of the funding. JCN described how the European Union are slow to pay invoices for EU-funded projects, as everything has to be checked by local EU in-country representatives before being dispatched to Brussels for re-checking and authorisation. The firm has, however, evolved to adapt and continues to work for the EU. An aspect mentioned by both JCN and CJR is the effect of the recent global economic recession on the receipt of
payments, particularly from private mining houses. This is confirmed by the extracts from the *New York Times* (1 September 2007) and *The Economist* (7 June 2008) referred to in Section 3.1 of Chapter 3, as well as by Flyvbjerg (2009) in the same section. JM is in agreement with the effect of the recent recession, citing the difficulties in cash flow that stemmed from the Dubai credit crisis specifically, as being a contributing factor to his firm’s subsequent withdrawal from operations in Dubai. DB corroborated JM’s assessment of happenings in the Middle East; however, was also the only respondent that provided positive feedback of a country’s fiscal management. He described how funding from donor firms was often slowed when funds were first paid to the host nation government, prior to being transferred to the consultant. This was prevalent throughout Africa, except in the case of the Ethiopian government, who DB described as being “an excellent payer”.

3. Has your firm engaged with any host country banking institutions during the course of the five projects mentioned earlier? If so, what were the costs of finance in descriptive terms, relative to your firm’s home country lending institutions?

None of the respondents reported having any projects that were funded through home-nation banks of the countries in Africa in which they had worked, apart from South Africa. JN elaborated, stating that almost without exception, projects were funded by international donor agencies. JN suggested that this was an acceptable state of affairs, as the tendering process of international funding entities was usually transparent, and the projects were well managed.
4. Do your firm’s fixed asset and Professional Indemnity (PI) insurance organisations place a risk premium on your project operations in any African or Middle Eastern countries?

None of the respondents reported any insurance escalations on premiums for projects conducted in any African or Middle Eastern countries. This is somewhat surprising to the researcher, given the attention given to macroeconomic instability and its importance in deterring foreign direct investment for selected African countries, as suggested by the World Bank Report (2004) cited in the introduction to Chapter 4.

6.4 Questionnaire Section D: Corruption

1. Has your firm encountered corruption of any kind from government officials, police, contractors, sub-contractors or Clients while conducting projects in Africa or the Middle East?

According to the authors cited in Section 4.4 of Chapter 4, corruption would be expected to be widespread in Africa, as the majority of governments enjoy a large amount of discretionary power and their respective economies show comparably low economic development (Habib and Zurawicki, 2002; Li and Zou, 2002; Hallu, 2010). The respondents feedback showed a clear correlation with this belief, as both JCN and CJR that work predominately in Africa described numerous examples of corruption. CJR suggested that corruption occurred at all levels within Africa, but that: “at a lower level we have been asked for bribes by customs officials in every country we work.” Comparably, neither DB nor JM, who both work predominately in the Middle East, mentioned any incidences of corruption in Africa.
or the Middle East. JM did concede, however, that the risk remained present. Again, interestingly, JCN suggested that the most frequent incidents of corruption had been encountered in South Africa – more so than in any other African nation.

2. **Please describe your firm’s policy regarding dealing with corruption.**

As would be expected from two highly ethical consulting firms, all respondents reported that a zero tolerance standpoint towards corruption was non-negotiable for all staff. This confirms the required high ethical behaviour required of firms competing in the modern day global marketplace, as discussed in Section 3.3.5 of Chapter 3 (Chaun & Suen, 2005).

3. **Have any employees of your firm, to your knowledge, been invited to pay a bribe or “grease payment” to expedite a service?**

As discussed in Section 4.4 of Chapter 4, authors such as Arbache, Habyarimana and Vasco (2010) have suggested that within sub-Saharan Africa organisations such as Transparency International have recorded widespread expectations of “grease payments” in almost half of all countries polled.

JCN and CJR confirmed that staff had been approached for bribes on numerous occasions whilst operating in Africa, including extensively in South Africa. Neither DB nor JM recorded any knowledge of staff being approached for a bribe on projects in Africa or the Middle East.
4. How much of a barrier to investment, in your opinion, is corruption in Africa and the Middle East?

As discussed in Section 4.4 of Chapter 4, Tanzi and Davoodi (2000) as well as Sung (2002) drew correlations between the inverse proportionality between levels of corruption in an economy and economic growth. This socially accepted paradigm was confirmed by the respondents, with all suggesting that corruption varied from being of “moderate” to “very significant” importance. The exception was JM’s isolation of corruption as only being a “marginal” barrier to investment in the Middle East. The relatively low levels of perceived corruption in the Middle East, as reported by Transparency International, may be the reason for JM’s response in this regard.

6.5 Questionnaire Section E: Conflict and Political Instability

1. Have any projects that your firm has been involved with in Africa or the Middle East been affected through delays or cancellations resulting from civil or international conflict?

In Section 4.5 of Chapter 4, the fact that Africa and the Middle East are both beset by unrest and war is discussed by Addison, Le Billon and Murshed (2001); de Soysa (2002); Fukuda-Parr, Woods and Birdsall (2002); Le Billon (2001) and Sørli, Gleditsch and Strand (2005). As detailed by these authors, such warfare activities may critically hamper economic development in a country, including the business activities of all international firms operating within active conflict zones. JCN and CJR both confirm having encountered conflict situations in Africa that led to projects being significantly delayed. These included the outbreak of civil wars in the
DRC, the Republic of Congo and Guinea Bissau. JCN relates how project teams had to be evacuated at night out of the DRC after a curfew was imposed after the outbreak of war in that country. DB and JM, with less experience operating in Africa, do not report encountering any conflict situations on that continent, nor within the Middle East. The reason for the lack of Middle Eastern conflict encounters may potentially be attributed to Mouchel’s focus on the UAE, which has to date been relatively been conflict free.

2. Does your firm make use of Country Risk Assessments (CRAs) prior to accepting appointments within certain countries?

Jeffares & Green utilises Omega Risk Solutions for conducting country assessments prior to working in new locations. Mouchel advises that they utilise the British Foreign Office, as well as Transparency International. This is in agreement with authors such as Ball and McCulloch (1999), discussed in Section 4.5 of Chapter 4, who describe how CRAs are becoming prevalent amongst the operational divisions of multinational firms.

3. Does your firm conduct any other political instability, economic hazard or conflict-based risk assessment, prior to tendering or accepting appointments in foreign countries?

Authors such as Idahosa (2002) and Lyon (2000) cited in Section 4.5 of Chapter 4, as well as documents such as the Freedom in the World Report 2010 as discussed in Section 3.3.1 of Chapter 3, all review the impact that political instability has on the potential for civil conflict within a country. Both respondent firms appear to be sensitive to mitigating the possible risks of operating in unstable countries and
make use of internal systems to enhance the quantification of risk prior to working in an unknown international location, whether that be by way of an international approvals panel, or through use of a customised risk management spreadsheet. Jeffares & Green also refers to the experience of the Export Credit Insurance Corporation (ECIC) of South Africa when adjudication international opportunities, as well as the Consulting Engineers South Africa’s (CESA) Built Environment Professions Export Council (BEPEC).

**4. Are there any African or Middle Eastern nations in which your firm will not operate, for any reason?**

As a result of past experiences with excessive corruption, CJR and JCN both mention the firm’s unwillingness to work in Nigeria. CJR also relates that Equatorial Guinea is under the control of a “brutal dictatorship” that is infinitely corrupt, and thus would not seek to operate in that country. JM suggested that the firm would be cautious accepting appointments in the DRC and Sudan, owing to internal strife in those countries. He also reiterated that their firm had recently withdrawn from the UAE and the majority of the Middle East, owing to lack of payment and financial concerns of operating in the region.

DB declined to comment on the questions posed in this regard, possibly confirming the high degree of sensitivity and confidentiality that accompanies may companies’ operations in foreign territories where conflict and political instability occur, which corroborates information postulated by Leander (2005) as discussed in Section 4.5 of Chapter 4 of this dissertation.
6.6 Derivation of the Project Risk Guideline

Projects are complex undertakings involving a unique set of tasks and activities conducted within a set of constraints to meet defined objectives. Risk in projects is also complex, arising from a wide range of sources and having a broad scope of possible effects on the project (Hillson, Grimaldi and Rafele, 2006). Steyn (2009: 340) suggests that project control is simplified through following a series of five sequential steps that apply to most stages of a project lifecycle, from inception to project completion and handover. These include planning for risk management, identification of risks, analysis of risks, evaluation of risks and finally, resolving the risk.

The degree of engagement that a firm should give to a risk is comprised of two basic dimensions, namely probability and consequence. This is represented by Steyn (2009: 335) as:

\[ \text{Risk} = \text{Probability} \times \text{Consequence}, \text{ or alternatively,} \]

\[ \text{Expected loss} = \text{Probability} \times \text{Total Loss} \]

The probability that a specific risk event will occur is evaluated against the consequence or impact on the project outcomes that the event will have if it does occur (Steyn, 2009: 335). As mentioned in the preceding chapters, the potential impacts of a number of factors upon a project conducted in Africa or the Middle East, should they go unmitigated, may be critical. Evidence from the feedback of the case study respondents shows that even the largest and most experienced firms may face challenges operating in these environments that they had not identified as possible risks, prior to commencing the project. Although some firms
follow a series of in-depth screenings of projects risks prior to tender stage or the acceptance of new appointments, a gap remains in full interpretation of all potential threats that may be encountered. To this end, the researcher has formulated a simple guideline to stimulate awareness of the most significant threats that have emerged from the literature survey, respondent feedback and analysis of results. The guideline follows the basic flowchart and decision tree principal of iterative factor linkages, as utilised by Geva (1983: 387), Hulett and Hillson (2006: 37), Johnstone and Bedard (2003: 1007) and Schilling and Hill (1998: 70). The guideline takes a company operating in an international environment and faced with a provisional new work opportunity. Six stages of risk are reviewed, with specific areas of concern for African and Middle Eastern environments being focused upon. It is not intended as a full and complete list of all threats and mitigation measures relevant to operations, but rather as a starting point from which a firm may evolve their own customised framework. The guideline is provided in Section 7.2 of Chapter 7.

This chapter has drawn together the primary points of relevance emerging from the literature review chapters and compared them with empirical feedback provided by the respondents. Where a respondent’s information was at odds with that of other respondents, or the literary sources, this has been discussed and potential explanations provided. The following chapter is the final summary of the research process, synthesising the format used in this study, the origins of information cited, the validity and pertinence of the respective respondents to the subject, as well as highlighting gaps in the study and opportunities for further research. The Summary of Findings and Conclusion forms the final chapter in this dissertation document.
CHAPTER 7 SUMMARY OF FINDINGS AND CONCLUSION

This final chapter will provide a review of the research process utilised during this study, outlining the respective steps and discussion points as well as the principal findings stemming from the enquiry. Final concluding remarks as well as areas benefitting from further research will also be provided.

7.1 Research Objectives

The primary subject of this research was to review the problems and challenges confronting the civil engineering industry for point-specific projects in emerging nations, focusing on countries within Africa and the Middle East.

The initial steps were to provide an industry analysis in Chapter 2, offering background information on the characteristics of the civil engineering consulting and contracting fields. This included a review of the main areas of function, operating methods, forms of contract, budgetary arrangements and geographies of operation, for the international industry. Focus was then channelled to the African and Middle Eastern environments, where the industry exhibits a range of unique and alternative working methods, evolved as a response to a range of challenges prevailing in those regions. Chapter 2 also reviewed the two firms that would be the later focus of research, namely Jeffares & Green and Mouchel plc. Background information on each company, history, staff compliment, operating environments and publicly declared annual turnover were provided and elaborated upon so as to
provide a starting benchmark from which their respective operational systems could be reviewed.

Chapter 3 commenced the second literature review chapter, where a deeper review of the global state of engineering was discussed. The nature of globalisation and its effect upon the international construction industry was an important starting point for critical industry review, laying the groundwork for the current movements within multinational companies that compete across borders, and how they have responded to recent global events. A Porter’s Five Forces analysis was conducted on the industry to explain the mechanisms of global competition, before a PESTLE analysis provided the holistic view of political, economic, social, technological, legal and environmental factors facing international civil engineering companies.

Chapter 4 was the third and final literature review chapter, within which the researcher focussed in upon the targeted regions of Africa and the Middle East. The literature sources consulted and discussed during this chapter repeatedly highlighted a range of specific challenges facing operations within the subject regions, the most significant of which where cited from a range of varying sources to form the secondary research problems that informed the further research presented in the study. These included:

- Energy supply;
- The state of built infrastructure;
- Tax rates and cost of finance;
- Corruption; and
- Conflict and political instability.
Each secondary problem was examined from the point of view of prospective multinational firms operating in Africa and the Middle East, and cross-referenced against validity and pertinence to the civil engineering consulting and construction industry.

The methodology for research was outlined and detailed in Chapter 5, giving the research framework and design, a defence of the form of research method adhered to in this study, the instrumentation used, research procedure and documentation process, method of analysis as well as the profiles of the respondents to whom the case study enquiries were directed.

Chapter 6 was a discussion of the results of the research, based upon respondent’s feedback on critical research issues and triangulated against other case study responses. These were then also compared with the literature bank derived in Chapters 2, 3 and 4, with similarities and divergences investigated and explained. Chapter 6 concluded with the derivation of a risk model, specific to African and Middle Eastern operational environments, that may be utilised by civil engineering firms to highlight and mitigate unforeseen risks across the primary risk exposure areas.

### 7.2 Summary of Findings

Energy supply was shown to be a variably significant impact upon the activities of consultants and contractors operating in Africa and the Middle East. It would appear that this impact is more relevant to permanent installations and businesses
operating in the focus area, rather than the manner of temporary operations conducted by the respective respondent firms. Temporary operators going into hostile environments are reasonably well versed in the use of diesel generators and alternative forms of power, as there is rarely a dedicated power supply from the national grid. When operations move out of temporary stasis to more permanent entities, such as the Tanzanian mine mentioned in Section 6.1 of Chapter 6, reliance on nationally provided electrical power becomes infinitely more important.

By comparison, the presence of built infrastructure is an issue of crucial impact to civil engineering companies in Africa, being slightly less important to Middle Eastern operations owing to the improved standard in those countries. There are direct cost implications for companies operating in countries of bad or non-existent roads, necessitating use of off-road vehicles or air support to overcome logistical difficulties. In countries where shipping ports are in a poor operational state, or airports inaccessible to applicable parts of the country, cost implications once again apply. Whilst none of the respondent firms indicated having formal protocols in place for budgetary adjustments to tenders, taking into account poor infrastructure within specific countries, all firms relied upon senior staff experience in working within those countries to price in for suitable contingencies.

Sources of funding for projects within Africa have been almost exclusively foreign-based, with EU and American funding providing the bulk, but with Chinese sources starting to play an increasing role. No projects outside of South Africa were reported as being funded by African home nations, with only selected involvement
by SADC and the African Bank. This may be a sign that development of African infrastructure is still being funded by the international community. Comparably Middle Eastern projects were funded only by state-funded development agencies, possibly as a result of large oil-revenues enriching many Middle Eastern countries.

Receipt of payment for projects completed within Africa is generally within allowed time frames and effectively managed by the international funding organisations making the payments. Middle Eastern operations are, however, substantially more problematic, perpetrated to be as a result of the recent global economic slowdown. The significance of delayed or cancelled payments has been sizeable, with a respondent firm being forced to pull out of existing and future operations in the Middle East.

Risk insurance agencies have surprisingly yet to increase premiums for exposure to specific African or Middle Eastern countries, regardless of whether they are higher risk.

Corruption is confirmed as being a significant and widespread barrier to development in Africa, but not prevalent in the Middle East. Corruption is reported as occurring at all levels of engagement, from the lowest to the highest governmental levels. All respondent firms adhere to a zero tolerance approach to corruption, which occasionally has resulted in lost potential award of contracts or logistical delays. Corruption is viewed by the industry as being a significant barrier to future development in Africa, but less significant to the Middle East, owing to the lower levels of perceived corruption in that region.
Civil conflict within Africa has impacted on a number of projects, leading to cancellation or significant delays in projects. Conflict was essentially absent from the review of personal experience of the respondents operating in the Middle East, however, this is credited as being a result of limited exposure to more turbulent countries in the region. All respondent companies make use of Country Risk Assessments in evaluating possible threats before working within a new foreign location. Some respondents use external firms for evaluating economic risk exposure, whilst others use internal spreadsheets and past staff experience as a guide.

The Project Risk Guideline has been devised by the researcher as a synthesis between literary sources such as Geva (1983: 387), Hulett and Hillson (2006: 37), Johnstone and Bedard (2003: 1007), Schilling and Hill (1998: 70) and Steyn (2009: 340); as well as from respondent feedback. The guideline is intended to highlight those risks viewed as being most significant to consulting engineering or contracting firms working within unknown African or Middle Eastern locations. The model provides for a stage-gate approach to risk review, whereby successive steps allow for project rejection or progression to the next phase. The guideline is presented in Figure 7.2: Project Risk Guideline, overleaf.
Figure 7.2: Project Risk Guideline.
7.3 **Opportunities for Further Research**

Based upon the research conducted within this study, opportunity exists for the following research to be pursued:

- Multiple case study analysis of consultant or contracting civil engineering firms operating within a specific African or Middle Eastern country;
- Multiple case study analysis of the impact of the recent economic slowdown on the civil engineering industries with Africa or the Middle East;
- Multiple case study analysis of the relevancy of the secondary research problems to other industries involved in the built environment with Africa and the Middle East, such as architecture, surveying, planning and mining.
- Single case study analysis on the impact of foreign financed infrastructure development for emerging local firms within specific African or Middle Eastern firms;
- Single case study analysis on challenges facing a developed world-based civil engineering firm with strategic direction to diversify into emerging markets.

7.4 Concluding Remarks

A wide range of challenges face the modern multinational company seeking to operate within Africa or the Middle East, including those outlined in this study and others more pertinent to other industries. The civil engineering industry will naturally shift its focus as the global market opportunities become available, switching from local to an increasingly global outlook. Such is the future for all companies aiming to compete in the international arena. The most successful will be those able to draw on the experiences of forerunners and adapt to the risks presented in an innovative and competitive way, ensuring not only their own sustained economic prosperity, but also contributing to the revival and regrowth of the countries within which they work. The engineering industry is currently playing the groundbreaker role in this opening up of new markets, from which other industries and the countries involved can only benefit.
LIST OF SOURCES


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APPENDICES

APPENDIX A: QUESTIONNAIRE COVERING LETTER
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