



ENGINEERING MANAGEMENT IN CONSTRUCTION  
OF MULTINATIONAL PROJECTS IN DEVELOPING  
COUNTRIES, WITH SPECIAL REFERENCE TO SUDAN

BY

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## ABSTRACT

As a result of globalization, one of the most major factors affecting the success of the construction industry would be the formation of a winning multicultural project. As construction projects leaders continue to command globally, there is a serious demand for managing professionals and a workforce that is more diverse than ever. The multinational workforce has distinctive views on project culture, work ethics, communication, operations management and incentives; finding common grounds is very essential. Multicultural or multinational projects has become more prevalent in recent years, contemporary international management literature has identified that the engineering management of multicultural projects is an important aspect of human resource management, without its proper practice a lot of benefits of these projects will turn into losses. Recent studies have focused on the positive effects of using multicultural teams (Earley and Mosakowski, 2000) stated that multicultural engineers and workforce are been utilized because they are perceived to out-perform monoculture teams, especially when the performance requires multiple high skills and judgment. In developing countries where approximately 85% of the world's population lives in (Human Development Report, 2011), governments develop multinational mega construction projects to achieve their social and economical development goals and objectives. In contrast, many developing countries suffer from having a short age in providing the essential knowledge, skills, capabilities and finance which ultimately creates a set of challenges towards achieving competitive success rates. This study aims to identify and validate the challenges related to multicultural /multinational projects in developing countries with a special reference Sudan, and the potential resolutions to improve their success. The study presented a model by employing AMOS software that was derive from the results of the questionnaire carried out in order to study the factors and possible answers for better development and advancement of the construction industry management systems. The data obtained, reflected that four major aspects that were found to affect the development and success of multinational construction projects, which are the risk management, building materials industry modernization, international financing and contracts and technology transfer. It was found out that technology transfer through international management practices should be practiced on many different levels under legal, technical, cultural and human resources consideration. Additionally, construction organizations and companies in Sudan should aim for better joint international conventions, international consortium and insurance policies to attract and protect investors into the construction industry.

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## DECLARATION

I hereby declare that this dissertation is the result of my own investigation, except where otherwise stated. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at IIUM or other institutions.

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*To my dear brother soul, Dr. Mansour Khalid Mansour (MHRP). My Kind Family for  
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## LIST OF ABBREVIATIONS

AICs	Advanced industrialized countries
AU	African Union
BCA	Building and Construction Authority
BMI	Building materials industry
BMs	Building materials
BRE	Building Research Establishment
BRRI	Building and Roads Research Institute
C&D	Construction and demolition
CBOS	Central Bank of Sudan
CBOs	Community based organizations
CBS	Central Bureau of Statistics
CDW	Construction and demolition waste
CI	Construction industry
CIB	International Council for Research and Innovation in Building and Construction
CID	Construction Industry Development
CIDB	Construction Industry Development Board
CIDC	Construction Industry Development Council
CNS	Comprehensive National Strategy
CPA	Comprehensive Peace Agreement
CSOs	Civil Society Organization
CU	Contractors Union
DCs	Developing Countries
EC	Engineering Council
EE	Embodied Energy
EIU	Economist Intelligence Unit
ELA	Environmental load assessment
FIDIC	International Federation of Consulting Engineers
GCIEMW	General Corporation for Irrigation and Earth Moving Works
GDCF	Gross domestic capital formation
GDP	Gross domestic product
GFCF	Gross fixed capital formation
GNP	Gross national product
GSM	Graded sand mix
IDPs	Internally displaced persons
IGAD	Intergovernmental Authority on Development
IICO	International Islamic Charitable Organization
ILO	International Labour Organization
IOA	Input-output analysis
ITT	International technology transfer
KTPs	Knowledge transfer partnerships
LBM	Local building materials
LDCs	Least developing countries
MICs	Middle income countries
MOF	Ministry of Industry

NCC	National Construction Council
NCR	National Council for Research
NFHR	National Fund for Housing and Reconstruction
NGOs	Non-governmental organizations
NICs	Newly industrialized countries
OECD	Organization for Economic Cooperation and Development
OCCF	Organizing Council for Consultancy Firms
OCEWC	Organizing Council for Engineering Works Contractors
QMC	Quarrying and Mining Committee
RRC	Resettlement and Rehabilitation Commission
SBMI	Sudanese Building Materials Industry
SCI	Sudanese Construction Industry
SDTF	Sustainable Development Task Force
SGAHS	Sudanese Group for Assessment of Human Settlements
SIA	Sudanese Institute of Architects
SLM/A	Sudan Liberation Movement/Army
SMPPPU	State Ministry of Physical Planning and Public Utilities
SOMBC	Sudanese Organization for Building Materials and Construction
SPSS	Statistical Package of Social Science
SSA	Sub-Saharan Africa
SSMO	Sudanese Standards and Metrology Organization
TI	Transparency International
TT	Technology transfer
UN	United Nations
UK	University of Khartoum
WCED	World Commission on Environment and Development

# **CHAPTER ONE**

## **INTRODUCTION**

### **1.1 INTRODUCTION**

As the world of construction is rapidly developing new concepts and methodologies that are being introduced to the industry continuously, mainly in the management directions, as well as, the serious need for the application of engineering management modern practices increases. In many developing countries recently, the mega projects are taking the form of multicultural projects different designers, consultants, contractors, subcontractors and suppliers from all over the globe participate together to achieve construction excellence, but such projects bring along with them many challenges on how all these individuals from different cultural backgrounds, religion, organizational structure, banking strategies, different legal philosophies and varied ways of work can attain harmony and finalize the projects within accurate value and time.

Here appears the serious necessitate for construction engineering and construction management to design and provide systems that allows the construction process to be organized, harmonized and achieve the best quality from such activities and projects simultaneously minimizing risks to the minimum possible rate.

The increased number of citizens of the globe and its urban population calls for more construction activities, particularly for accommodation purposes. In developing countries, in general, the rate of construction is far below the demand for shelter, infrastructure and other amenities. Many factors such as demographic growth, shifts and migration from rural to urban areas, natural and human made resource depletion, and significant changes in expectations and lifestyles, all combine in their

various ways to impose considerable pressure on the construction industry of developing countries.

Indeed, the construction industry has been identified as one of the main engines of growth in any economy. It provides the infrastructure required for other sectors of the economy to flourish, provides housing as the basic human need.

Therefore, a nation's development is highly dependent on the level of performance and efficiency of its construction industry, and that demand is increasingly important in Sudan, more than ever, after the end of the oil production period. Ofori, (1990) describes the construction industry as " having several different sectors producing heterogeneous products, which are more immobile, complex, durable and costly". (Turin, 1980) ascribes the following features of construction: immobility, uniqueness, heaviness, bulkiness, complexity, long duration of the production process, high expenses and durability and observed that whereas a few of these might be shared by other artifacts, no other product share them all.

The characteristics of construction products cited by (Moavenzadeh, 1978) include: custom built nature, immobility, high initial expenses, complexity and continuously changing technology. Sudan, as a developing country, has experienced great development throughout the previous decades. These developments took place in many fields, of which the construction industry is an important one and the demand for this to continue is highly required.

*Engineering Management* or Management Engineering which is a specialized form of management and engineering that is concerned with the application of engineering principles to business practices. Engineering Management is a career that brings together the technological problem-solving savvy or the knowledge of

engineering and the organizational, administrative, and planning abilities of management in order to oversee complex enterprises from conception to completion.

Construction Engineering and Management (CEM) is the art of bringing the project in on time and within budget regardless of all the variables and specialties within a project as well as the high fragmentation within the construction industry (Bennett, 1996). This two bodies of knowledge will be acting as pillars for the literature review in this study and their application and knowledge is a necessity in the multinational construction industry in Sudan to move it towards a more modern and sophisticated industry to give back or turn in to the economy in a positive effects.

## **1.2 PROBLEM STATEMENT**

The role of the construction industry in economic evolution has been adverted to by many writers and international bodies, many of whom have focused on developing countries (Turin, 1973; World Bank, 1984, Wells, 1986; Ofori, 1990; Palalani, 2000). Developing countries in general and Sudan in particular face major problems in regards to extending urbanization, which are the results of war, conflict, socioeconomic factors and environmental depletion.

This is creating exceptional demands for space and services as well as, new management approaches and techniques to be catered by the building industry, which provides facilities necessary for the economic growth and the well being of people. In Addition to, providing more employment opportunities .Therefore, construction is a vital sector contributing to the survival and economic output of nations, its function is inevitable.

Many researchers have categorized the problems facing the development of the CI (construction industry) in DCs (developing countries) (Ofori, 1980; Al-Omari,

1992; Fox, Hills, Fong, Hon, & Skitmore, 2006). Nearly all the researchers tend to see the same set of factors, simply under different categories. Wells (1984) summarizes the problems confronting the CI in DCs as: inadequate local production of BMs (building materials); poor quality of technology available in the country; heavy reliance on old techniques and management systems; lack of skilled professionals and labours; and low participation of local companies in mega projects.

There is a general consensus that most of these problems do exist in many DCs. Nevertheless, setting strategies for the maturation of the CI is a country specific issue rather than a shopping list prescribed for all nations. Unfortunately, many DCs have not reviewed the quality and quantity of their construction industries (Gueli, 2007), therefore these industries remain undeveloped. (Ofori, 1993b) argues that many DCs fail to develop their CIs because these problems are not prioritized.

Thus, it is important for each country to identify areas which require more focus and urgent actions in order to develop the whole industry. Like too many DCs, Sudan faces severe problems in its multinational construction sector, including: rising construction costs; costs overrun; delays; lack of skilled trade union active movement. The depressed quality of construction work which pulls in the sector is really not attractive for foreign companies and international organization to invest in, which have affected the economy quite negatively (Ofori, 1993b).

The relative significance of these problems and the interrelationship among them has never been studied in depth. No doubt, prioritizing these problems and understanding the interface between them is essential for the progression of the CI.

By all independent measurements available, Sudan presents one of the most challenging business environments in the world to the would-be investor. The country ranked 135th out of 183 in the 2012 World Bank Doing Business report (KPMG,

2012). Foreign direct investment statistics prove that inward investments in Sudan had dropped between the years 2006 - 2010 from 3534 to 1600 (KPMG, 2012). This forces the country to adapt serious measures in improving the multinational projects environment to attract more investments.

For the past few years, the Sudanese construction industry (SCI) has grown in size, complexity and high demand by client, causing projects to get more difficult for objectives of time, cost, operation, performance and quality to be attained. The basic problems and challenges facing the Sudanese construction projects are the genes that affect multinational projects in the developing countries. As all the major tasks are borne out by multinational organizations, societies and teams these challenges need to be addressed and strategies to conquer them need to be identified and confronted.

### **1.3 RESEARCH QUESTIONS**

1. What's the general situation of multinational construction projects in Sudan?
2. What sort of management practices is commonly used in multicultural or multinational projects in Sudan and how are they affecting the projects and the industry?
3. Finding and identifying the pitfalls and problems in the construction industry in Sudan in general and in multinational projects in specific?
4. Distinguishing the factors that can affect improving the performance of multinational / multicultural projects in Sudan and developing countries?
5. Attempting to discover the best strategies and their implementation that will affect the multinational projects in Sudan positively and present them in practical concepts?

#### **1.4 AIM AND OBJECTIVES**

This study aims to investigate the factors that strongly affect the performance of multinational and multicultural construction projects in Sudanese construction industry and how to conquer and minimize their negative impact in practical ways.

1. To be able to discover the pitfalls and shortcoming problems in the multinational construction projects in the Sudanese construction industry and how they are affecting the industry development and progress.
2. To examine the challenges facing the Sudanese construction industry in regards to multinational projects and understands the magnitude of their effects.
3. To be able to implement the study findings in a practical way through improvements and understanding of risk management aspects and techniques in developing countries.
4. To ensure positive reflections that will enhance the industry in the right direction to have a modern, healthy and competitive environment for international investment.
5. To provide a set of effective solutions and beneficial guidance to managers, construction organization, and the responsible authorities to advance the industry in Sudan.

#### **1.5 SCOPE OF THE STUDY**

This research on engineering management of multinational projects in the construction industry of developing countries (Sudan) is limited in scope to the following:

1. A review of the engineering management, construction management and the impacts of multinational projects in developing country's literature;