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# Management Of Risk In Delivering Complex Research And Development Projects: A Case Of The Research & Development Center Of The United Arab Emirates Armed Forces

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**ABSTRACT**

**Risk management continues to be a major feature of the project management of large construction, engineering, technological, and research and development projects in an attempt to reduce uncertainties and to achieve project success. There are uncertainties and risks at every stage of R&D projects through the product lifecycle. Therefore, management of the risks is an important challenge for the R&D project managers, and the close linking of project risk management with the success of the project is acknowledged across the world. Thus, the focus of this study is on the management of risk in delivering complex research and development projects within the United Arab Emirates Armed Forces. Even though the management of risks related to the military environments has been studied for several years, studies on the risks pertaining to research and development of the military environments are still comparatively low and almost negligible in the UAE. This gives value to such type of study for filling in the literature. This chapter highlights the research purpose, objectives, questions, problem statement, and motivation together with implication of the research to theory and the wider community of practice.**

**Keywords:** Armed Forces, R&D, Complex Project, Risk Management

## INTRODUCTION

### Overview

Project management is a framework to successfully develop new services, products, processes and in the form of a mechanism for successfully applying change within the organization. There are primarily ten knowledge areas that are needed for successfully executing a project (Snyder, 2013). Risk management is one of these areas that can be applied to the process groups of Initiating, Planning, Executing, Monitoring/Controlling and Closure. As per the Project Management Institute (PMI), project risk is an uncertain condition or event that has a negative or positive effect on the objectives of a project (Hayes, 2016).

There are uncertainties and risks at every stage of R&D projects through the product lifecycle (Gassmann and Han, 2004). Therefore, management of the risks is an important challenge for the R&D project managers (Liu and Han, 2014; Moehrle and Walter, 2008). In addition, the close linking of project risk management with the success of the project is acknowledged across the world (Perera et al., 2014). This emphasizes the role of effective risk management for increasing the success rates of the R&D projects. Uncertainties in the R&D projects from a variety of sources can possibly antagonistically influence the success of the projects (Jalonen, 2011; Sicotte and Bourgault, 2008). Apparently, the expansive number of sources of such uncertainties infers countless project risks along with the adverse effects. Ignoring various uncertainties and risks involved with complex R&D projects are directly linked with lower success rates of projects (Van Zyl, Du Preez, and Schutte, 2012). To enhance the success rates of such tasks, the project managers are required to apply particular strategies and methods that will enable them to recognize and deal with the uncertainties as adequately as possible.

Risk management keeps on being a noteworthy element of the project management for the extensive development, building, and innovation. R&D projects extend helping hand to manage the uncertainties and for achieving project success. Risk management is a critical undertaking in recognizing and evaluating the uncertainties intrinsic in the complex R&D projects (Carbone and Tippett, 2004). Management of such risks better guides minimization of the risks and maximization of the associated opportunities in such undertakings. Thus, it assists complex projects in realizing their potential to minimize exposure to the prospective adverse results.

Several studies have been conducted for the identification of the distinct risk management techniques and tools. These tools can be used by New Project Development (NPD) and R&D project managers for the management of uncertainties in an effective manner (Teller, 2013). Studies have put forward two main risk types, namely, unambiguous risks and ambiguous risks. Unambiguous risks are those risks that are related to the consumer marketing and acceptance while ambiguous risks are the ones that take place when the difference of opinion exists in relation to the project management and the organization. In view of this, these studies set forward a rundown of prescribed activities that the R&D project managers could use to aid to better recognizable proof and administration of basic project risks. The studies recommend that the project supervisors should consider the ambiguous risks since they can possibly affect the project success.

Academic literature additionally distinguished two principal kinds of risks in the R&D Projects (Van Zyl, Du Preez, and Schutte, 2012). These risks have been classified as external and internal. The risks which initiate from the organizational, technological and operational aspects of the project have been grouped as internal. On the other hand, the risks that emerge from the supplier and market aspects have been categorized as external.

Risk management continues to be a major feature of the project management of large construction, engineering, technological, and research and development projects in an attempt to reduce uncertainties and to achieve project success. Managing risk is an important task in identifying and quantifying the uncertainties inherent in complex research and development projects. Managing such risks better aids minimization of threats and maximization of opportunities in such projects, and therefore better assists such projects to realize their potential while minimizing exposure to potentially adverse outcomes.

Thus, the focus of this study is on the management of risk in delivering complex research and development projects within the United Arab Emirates Armed Forces. Even though the management of risks related to the military environments has been studied for several years,

 

studies on the risks pertaining to research and development of the military environments are still comparatively low and almost negligible in the UAE. This gives value to such type of study for filling in the literature. The research is based on a real case study focusing on risk management in Research and Development Center of the United Arab Emirates Armed Forces.

This chapter highlights the research purpose, objectives, questions, problem statement, and motivation together with implication of the research to theory and the wider community of practice. This chapter sets forward the basis upon which literature review, chapter 2, methodology, chapter 3, results, chapter 4, discussion, and chapter 5, conclusion, detail, and explore further the components and information about the findings of this scientific quest in the field of project risk management practices in the UAE.

## Focus of the Study

This section will explain the scope of the research at hand, its purpose, objectives, and the rationale behind the researcher's interest in seeking this scientific quest.

### *Research Scope*

Identifying project risk management practices within complex research and development projects in the United Arab Emirates Armed Forces will form the boundaries of this research. The vicinity of the United Arab Emirates Army will form the physical boundaries of this research. Project managers, military leadership, and customers of these intended complex projects will be involved in the study. The researcher had reviewed risk management literature and identified the gaps that support the quest of this research effort.

### *Research Purpose*

The purpose of this study is to analyze the underlying risks which are involved in the complex research and development projects within the working environment of Research and Development Center of the United Arab Emirates Armed Forces (RDCUAEAF). The aim is the identification and construction of an R&D risk management framework, which reflects the effect of risks on the large-scale R&D projects in the UAE environment. The understanding about the stakeholder's perception of the risk types recognized in the development work is at the center of the research so as to develop the suitable risk framework.

UAE is observed to be a unique environment wherein socio-economic, religion, tradition and culture impact work environments. The effect of such elements, as per the perspective of the stakeholders, along with the elements that arise from their viewpoints, have constituted the foundation elements to the development of a risk framework for the study. On the basis of this analysis, adoption of this framework will result in the generalization of the outcomes for the desired population.

### *Research Objectives*

There are five main objectives of this research as following:

- *Objective 1*: The first objective is to identify the challenges and risks which have been occurring within the various projects developed in the RDCUAEAF.
- *Objective 2*: The second objective is to explore stakeholders' views on how to manage these risks, what socio-economic determinants affect their decisions when managing these risks, and what factors they think have an impact on the risk management processes by noting their point of views in interview sessions.
- *Objective 3*: The third objective is to analyse the collected data and extract emergent themes in order to be used to achieve the fourth objective.

- *Objective 4*: The fourth objective will be developing a framework of R&D Risk management practices.
- *Objective 5*: The fifth objective is to recommend a risk management process to identify, measure, and control these risks, and apply improvements to the selected risk management processes. The recommendation will draw the lessons learned regarding the identification and management of the risks in similar complex projects and its applicability in similar departments and organizations in the Armed Forces, the UAE, and the region.

### *Study Motivation*

Although military innovative work has always remained confidential (Paret, 1989), it's no longer remains the privilege of a handful of industrialized, wealthy nations, and its belief that military's R&D will release and persist a new wave of proliferation (SIPRI 2018). R&D activities can be characterized as complex, interdependent, responsive to sudden research environment changes, and heavily reliant on expert judgment to maintain quality, relevance, and performance (Energy Facility 2010). Process improvement is historically considered as a critical element to the success of an organization or business.

Therefore, the motive for this research, based on data collection and analysis, is the researcher's quest to discover and develop process improvements for identifying and managing risks that exist in the Research and Development Centre (RDC) projects in which it can be applied to similar complex projects in this environment and other related environments and organizations. The researcher, being part of this organization, has been witnessing a need for such inquiry, that will not only lead to an improved risk management practice and prompt an enhanced hazard administration process, but also to save precious resources, expertise and expenditures by minimizing threads and maximizing success of such projects. The researcher opts to make a scientific and practical contribution not only to the UAEAF but also to offer his knowledge in shared and collaborative learning with other government agencies throughout the UAE and the Gulf Cooperation Council (GCC) region. It is important to be among the main UAE subject matter experts in managing risks at this level of complex projects in a country with scarce human resources that lack the proper specialization in the field.

## Statement of the Problem

### *Organization Background*

The Armed Forces (AF) of the UAE is in the capital of the UAE, Abu Dhabi. It has primary responsibility for the defence of all the seven emirates (Wikipedia 2018) in addition to participate in the United Nations peacekeeping. The UAEAF has grown significantly over the years and due to its modernizations efforts it has acquired the most modern weapon systems, from a variety of foreign countries, mainly France, USA, and UK (Wikipedia 2018). Meanwhile, the UAE has begun to produce a greater amount of military equipment in a bid to reduce foreign dependence and help with national industrialization (Wikipedia 2018). In 2005, the AF has established new unit, the RDC, to handle the R&D concerns of the AF. Over the years, the RDC, has been going through developments and structure and organization changing in order to amass new threads and global technology trends.

Consisting of approximately 200 personnel, the RDC is one of the most diverse engineering and scientific research organization in the UAE and especially in the Armed Forces. The mission of the RDC is to provide science, technology, and expertise in engineering and environmental sciences in support of the UAEAF to make the Armed Forces safer, better, and up-to-date with ever changing technology.

 

RDC vision is to bring technologies and innovations to the country by carrying research and development in potential areas which are important to the advancement of the country and welfare of the people in addition to aid gaining diverse economy rather than the Oil. RDC is continuously cooperating with local and international industries, academic institutes, and privates and governments sectors to bring new ideas that will help the country in general and the Armed Forces specifically.

Furthermore, RDC conducts, its main mission, R&D for UAE's military in support of the soldiers, military installations, and the Corps of Engineers civil works mission. Since RDC is the first R&D organization in the UAE, it also provides these services to UAE federal agencies, state and municipal authorities, and with local and foreign industries through innovative work agreements.

### *Organization Current Status*

Working in RDCUAEAF is continuously challenging as new requests, developments are in daily demand, and its associated projects require variety of resources and expertise. Further, they include high degrees of uncertainties and risks which may potentially interfere with successful completion of these projects. Therefore, potential risks ascend which threaten the successful completion of the projects and in some cases these projects fail to deliver their basic outputs due to these risks.

One of the typical examples of the RDC complex projects is that UAEAF has purchased a huge fleet of military vehicles with basic structures without any installed configurations. UAEAF tasked the RDC, through arrangement with each end-users of these vehicles, to integrate different types of configurations consisting of different kits and armaments. Specific configurations were installed for each set of these vehicles. For example, for a predetermined number of these vehicles, UAEAF RDC have installed the following equipment:

- Different types of communication systems from multiple international manufactures.
- Different types of weapon systems, from different countries.
- Many basic mission related equipment such as display units and munitions which are either local or foreign products.

As a result, RDC has been placed in high uncertainty situation with very special, expensive, and complicated type of military vehicles which have multi complicated subsystems, tasked with R&D activities to integrate different system configurations of different standards from different countries, and communicate with end-users, suppliers, subcontractors, licensing and legal authorities, and team each with different countries, cultures and perceptions, to deliver efficient and reliable product that meet the expectation of the UAEAF. These complexities form risks that need to be addressed in such projects.

It is noteworthy to know that lower rate of adaptation of formal Project Risk Management (PRM) practices lead to ineffective project performance (Mojtahedi, Mousavi and Makui, 2010). There are many variables used for project risk management studies like tools, techniques, structure, perspective, outputs, goals, agility and adaptability (Mikkelsen, 1990). However, the presence of different risk management guidelines, frameworks and standards are not any kind of assurance that the organizations will apply their processes and principles. Many project risk management processes possess rigid framework and thus project managers could not adapt to the project conditions effectively, observe them as too costly or complex, as used a weak structure that lack innovative techniques and tools for increasing the depth of the analysis. The

UAE has been fairly recent in the field of complex projects with the military taking the lead initiative in this effort.

Given the former issues with risk management for complex projects, there is a lack in the understanding of project management practices and culture to address these risk factors and the region-specific factors that impact risk management practice within the UAE.

Therefore, a further look into improving the process and system of identifying and managing the threats that exist in these projects and project's environment are required. There is a need for a scientific approach, to uncover user perception of risks associated with such complex endeavour, and the elements that impact the management of such processes within the context of the UAE environment. This will fill a void in the literature, where current studies, to the best of the knowledge of the researcher, fall short of studying these risks in the UAE Military. The benefits and recommendations will yield a framework of managing risks that fits UAE and neighbouring Gulf Countries which share culture and traditional values.

## Research Question

### *Main Question*

Are current RDCUAEAF risk management strategies adequate and sufficient for the management of complex projects in a military research organization?

### *Sub-Questions*

- **SQ1:** What are the main risk factors, from the point of view of impact and likelihood of occurrence, in the undertaking and delivery of current RDCUAEAF complex projects?
- **SQ2:** What is the effectiveness of these risk factors with respect to the completeness, accuracy, validity and correctness of the execution, testing and delivery of complex projects undertaken by RDCUAEAF?
- **SQ3:** Are current RDCUAEAF procedures and practices adequate for managing the risks in complex projects in a significant military research organization?
- **SQ4:** What innovative risk management approaches can the management of RDCUAEAF use to effectively manage and control the risks associated with the undertaking of complex projects in a military research organization?

## The Contribution of the Research

The importance of this study stems from the important impact the results and recommendation have on the community of practice within the project management profession. The research has important contribution to the body of knowledge, the practice of project risk management, and a regional impact as following:

### *Contribution to Theory*

This study contributes to the body of knowledge in project risk management by filling the gap in the literature when it comes to risk management practices of complex projects within the UAE Armed Forces where such studies are scarce at best. This collected suggested best practices from the academic and industry literature of risk management performance of complex R&D projects.

### *Contribution to Practice*

The research at hand contributes to practice of risk management by establishing a framework of risk management practices in the UAE, where local and cultural factors have an impact on those factors. Also, the study recommendations for best practices when it comes to project risk management serves as a guide for military organizations in the UAE for successful

implementations of both current and future projects undertakings. The recommendations draw the lessons learned regarding the identification and management of the risks in similar complex projects and its applicability in similar divisions and organizations in the Armed Forces, the UAE, and the region.

### *Contribution to the Wider Community*

This study has implications that it can be used not only within the UAE but across all the other GCC countries including: Saudi Arabia, Bahrain, Oman, & Kuwait. The rationale behind this is that many of the cultural and societal factors exploited in the study are a commonality shared between these countries.

## CONCLUSION

In this chapter, UAE risk management terminology have been introduced with focus on the social and local practices to manage these risks. The focus of the study showed the main aims and purpose of the current research as well as the rationale behind seeking this effort. The current research problem have been presented followed by the research question and the benefits of the study to theory and practice. The next chapter will shed the light on risk management literature in complex projects.

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