Engineering Doctorate Research Thesis

Management Of Risk In Delivering Complex Research And Development Projects

METHODOLOGY CHAPTER

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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 contains the research philosophy, methodology, research design, population, sample, data collection, data analysis, and the conclusion.

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

Research Philosophy

The researcher's quest to understand the drivers or the risk factors that impact project management in R&D environment was placed at the core of the research. This understanding is based on the researcher's belief that every stakeholder is entitled to their own truth or version of truth. The researcher kept an open mind and adapted the participants' views to build a model of the factors.

This quest and the researcher's belief have shaped the research philosophy and methodology. The researcher has kept pragmatism philosophy under consideration, which asserts that, the reality is as important as the inner world of an individual's experience (Hore, 1984). Pragmatic philosophy is observed to seek a middle ground between the philosophical dualism. Thus, to understand the research problem in a better manner, this research was conducted using exploratory qualitative method.

Methodology

Research methodology refers to the process through which the researcher conducts the research (Bryman and Bell, 2015). Research methodology is the key to a research study. Every research study requires the researcher to choose an appropriate research method in order to ensure that the research study ends with the appropriate results and findings. Selection of the research methodology highly affects the effectiveness of the research study (Bryman and Bell, 2015). Choosing an appropriate research method is one of the critical tasks for the researcher. There are several options of the research methods that the researcher can choose from (Bryman and Bell, 2015). There are majorly two kinds of research methods; qualitative and quantitative research methods, which are the most widely used research methods and are used in almost every kind of research study (Bryman and Bell, 2015).

Qualitative Research Method

The qualitative research method is one of the most frequently used research methodologies. Qualitative research is the scientific method which gives non-statistical data (Bowen, 2009). The qualitative research method is implemented across several academic disciplines, majorly focusing specifically on the natural sciences, social sciences, market research, journalism, and business (Bowen, 2009). The qualitative data involves the open-ended questions where the information have been gained through interviews (Lambert, Colin and Economopoulos, 1987; Kelly, 1986).

The aims and objectives of the qualitative research vary with the background of the research study. The qualitative research method is the best for the research study containing research questions about how and why questions (Bowen, 2009). The common approaches of conducting a qualitative research study are grounded theory, theoretical perspective, ethnography, personal interviews, and discourse analysis (Bowen, 2009). Qualitative method is effective in determining intangible factors such as

social norms, gender roles, socioeconomic status, religion, and ethnicity (Bowen, 2009).

Rational for Using Qualitative Research

The qualitative research has been conducted in this research in order to gain a better understanding of the research issues affecting theoretical challenges as well as attain first-hand knowledge. The researcher was aiming to gain the better knowledge of what and how social issues affect the theoretical achievement. Also, by doing this, the researcher was aiming to obtain the first-hand data and information. The researcher merged the data and analyzed results from which the factors emerged from the themes.

Research Design

The research design is defined as the set of processes and methods used in collecting and assessing measures of the factors specified in a study (Creswell, 1994). The research design of a study describes the kind of study; correlation, descriptive, experimental, review, semi-experimental, and meta-analytic (Creswell, 1994). The research design links the research problem, the purpose and strategy of the research study. It is a responsibility of every individual to ensure that the research design clearly describes all the details related to the method, approaches, and strategies used in the research study (Bryman, 2008). The research design is the framework which has been developed to determine the answers to the research questions.

Important Consideration in Research Design

The research design is a road map or a blueprint for what a study will accomplish and has two main functions: formulating a plan of work, and making certain that the plan will yield the desired results (Kumar, 2014). The research design is referred to as the strategy that the researcher selects to integrate the various parts of the research study logically and coherently (Bryman, 2008). Therefore, it ensures that the researcher will effectively describe the research problem. The research design comprises the whole structure of research from research method to data analysis (Bryman, 2008). The selection of the research design is completely dependent on the type of research topic or study (Bryman, 2008). Researchers are required to choose an appropriate research design so that they can research in cost and time effective manner. The outcome of a thesis or research paper is highly dependent on the selected research design. Furthermore, the effectiveness of a research study is significantly influenced by the approach of designing research (Bryman, 2008).

The research design is one of the most critical elements of a research study. It encompasses the decisions on how the research would be conducted, how the data would be collected and how the data would be analyzed (Bowen, 2009). Moreover, the research design addresses the ethical issues that a researcher should take into consideration while conducting the research. The research design also requires the researcher to address the limitation of the research study, which has always been appreciated in order to allow for future research to tackle such limitations (Bowen, 2009).

The design of the methodology is led by the questions involved in the research (Greene et al. 1989). This research is aimed to understand the risks involved in the research and development in the UAE armed forces regarding the complex projects. The objectives also involve the development of a framework related to the factors. The study is performed based on the guidelines and the involved elements and variables that aid in understating the risks and the factors involved.

Types of Research Design

The type of research design is categorized into various categories; exploratory research, explanatory research, descriptive research, and evaluation research (Lambert, Colin and Economopoulos, 1987). Exploratory research is used where the research study requires the research team to explore the answer to the questions developed in 'how' or 'what' manner. In the descriptive research design, the researcher goes into more details than that in the exploratory research. This research design is also executed to answer the questions made in 'how' or 'what' manner but in more depth. Descriptive research design is mainly used where the researcher develops the abstract type of research questions, or the researcher study is revolved around the abstract type of research question (Lambert, Colin and Economopoulos, 1987).

Explanatory research design is majorly used when the research questions are made in how, why, and what manner, and in which it focuses mainly on the why questions (Bowen, 2009). In this kind of research design, the researcher becomes the subject matter expert of a particular subject or topic on which the research study is being performed. In the evaluation research design, the researcher is intended to evaluate the effectiveness of the research topic or study (Lambert, Colin and Economopoulos, 1987).

The way the researcher develops the research design is affected by the type of research questions developed in the research. This research study was a quest in understanding the opinions of the project managers into what they consider a risk factor in their environment. The researcher set the priority to know the participants' point of view, their experiences, and eventually echo their voices in the results' presentations. This quest to understand the different opinions, the underlying causes and the root issues when it comes to complex research environment will yield an aligned finding that forms the building block of the UAE Risk framework in such environment. The researcher was determined to understand the current procedures in place to deal with some of these risks, and the procedures that the participants suggest to improve the current environment. The voices of the participants are present in the interviews, results, and the discussion, and conclusion of the research.

The exploratory research type was used for this research. The primary rationale of using this particular type of research design is that this research study comprises several research questions and most of the research questions are developed in 'what' manner which call for a thorough understanding into the phenomena at hand, the special social environment surrounding the research and development in a UAE context.

Population

The research population is defined as the group of individuals or a set of objects that possess similar characteristics (Bryman and Bell, 2015). Objects and individuals with in a particular population, in general, have the same kind of characteristics. Population is the group or set from which the researcher selects participants to participate in the research study.

In designing a research, it is important to define who will constitute the research population (Kumar, 2014). Since the research study focus is risk management in RDCUAEAF, the population of the study, by definition, were the military personnel that took a role in the development of complex projects as project engineers. This population had two types of such managers; the ones who have been promoted to other positions in the research center or transferred outside the center but were involved in the past as project managers, and those who are still within the center and are still managing current projects.

Population Characteristics

Another design question criteria for the population was defining the way in which the population was identified (Kumar, 2014). This design consideration was carefully looked into, and the researcher had defined the differentiating characteristics of the population of the study as following:

- The first characteristic is that the person has to have played a role as project manager in the past or in the present
- The second characteristics was that a person had to be a UAE citizen, to gauge the impact of social aspects of the local culture, and to be able to select a homogenous sample of the population
- The third characteristics was that the person had to have an experience of at least three years in managing complex projects within the UAE Army. This was necessary so that the drawn sample to participate would have the experience and the deep insight and recollection of events that shaped their opinions on the risk involved in such projects.

As the researcher comes from the same environment, it was an easy task to locate personnel who resemble the characteristics mentioned above.

The population have been identified to be 10 people fit the profile and characteristics of the study. All the identified members in the population were males. This was not surprising as more UAE males join the military than females, and the fact that working in these projects were requiring a lot of field tests and long hours that extended beyond working hours. There were two female managers in the past, however, both of them have opted to transfer to other units, and both of them did not fit the third characteristics of having held project manager position for three years.

Sample

Sample is defined as the group of individuals or objects selected from the targeted population of the research study to conduct the survey or the interview (Denscombe, 2007). There is a specific process through which research extract sample from the target population of the research. The process starts by identifying the goal of the study and ends with selecting the sample (Denscombe, 2007). In this research, the researcher has made use of judgmental research design. In the judgmental sampling, the researcher chooses the sample from the population based on professional judgment and knowledge (Denscombe, 2007).

The primary rationale for selecting this particular type of sample design is that this research study involves qualitative research method and data in which the researcher has selected managers of RDC. Another rationale for this selection is that the managers are closely associated with the risk and challenges related to the projects.

The researcher had to decide either to include the whole population as participants or draw a sample from the population (Kumar, 2014). This principle is affected by the number of the population and the chosen data collection method. As the total population is 10 people and the method of collecting information was chosen to be interviews, it was not required to have more than 6 participants to the study. However, the researcher took into consideration that not all invited managers will take part in the research, and decided to send invitation letters to all the population.

The anticipated rate of participation was 70% to 80% of the population. This yield to 7 to 8 participants. This also allows to exclude research bias when selecting a sample. The researcher have worked in the past with some of these managers and would have had a work relationship with them to be favored over others he didn't work with. Eight participants agreed to take part in the research, confirming the 80% participation rate of the population. The two who declined were the two managers that the researcher have worked with before, one declined because of his busy schedule and the other was pursuing his PhD outside the UAE. The advantages of that is that all participating eight members who constitute the sample of the study are managers who did not work with the researcher and thus could express their views

discreetly about their working relationships with their project teams or other managerial risks they would normally decline to mention if the researcher was part of their team.

Data Collection

Qualitative research study does not provide research with any kind of numerical data (Bowen, 2009). The researcher gets the data and information in the form of concepts, theories, and real facts (Bowen, 2009). Therefore, the chosen data collection method for the research was interviews. These interviews with participants helped gaining insights on their opinion and perspective related to the complex R&D projects and the various aspects of the R&D process.

The aim was to collect data regarding risks and difficulties exists within RDCUAEAF projects. The researcher collected the data related to completed and on-going projects. The interviews were used to get the general information about the perceptions of employees of RDC about the risk management of the projects.

A set of questions were used for the interview sessions. the protocol consisted of five questions. The first question was a warm up followed by a convergent question and then two main topic questions followed by a wrap up and conclusion question. In addition, probe questions were used, and they were extracted from the responses of each interviewee to extract more detailed data and evidences on certain subjects or opinions. It is noteworthy that the protocol was developed with the help of the main supervisor. Then a test interview was conducted with the UAE-based advisor to check the clarity and clear any misconceptions the questions might provoke. This step resulted in a more robust questions using simpler terms.

Conducting the Interviews

This section describes the actual settings and conduction of the interviews with the research participants. In this section a discussion of the permission requests, informed consent explanation, settings of the interviews, and reflections after each interview are discussed.

Communicating with Participants

It is not enough to have known the population, but also to have a proper, ethical-based communication channel to invite them to participate (Kumar 2014). The first contact was an official letter sent to the UAE Department of Defense (UAE DOD) by the researcher. In this letter, the research study, objectives, aim, and sample questions were explained. The contacts of the researcher, his advisors, and the ethical section of the university were also mentioned in case the researcher breaches the ethical code of conduct of the research. Also, the informed consent paper was part of the letter, explaining to the participants their rights and their freedom to participate or decline and that taking part in the research will not harm them in any manner.

The UAE DOD sent the letter to the UAERDC for their response. During this time, the researcher did not get involved with either entities' HR to know the status of the invitation letter. This was in line with the ethical code to not interfere with the free will of the invited sample to participate. The response came after 4 months with the approval. The researcher was then interviewed by the head of the UAERDC and the introductory session set the stage for the research study to be conducted.

In this interview, the researcher explained further the benefit of the research to the military and the project management practice and showed interest in taking part in sending the invitation letters to the participants. This co management of the research sample ensures that the proper sample, the one that fits the research characteristics, is being contacted and chosen.

Interviews Venue

When the eight participants responded with their agreement a month later, two other factors were then to be determined; the type of interview and the time and place of it. Four participants showed interest in being present for the interview while the other four requested to send them the interview questions and that they will fill it up and send it back to the researcher because they didn't have enough time for a meeting. The researcher sent the informed consent to those participants who were not available for a face to face meeting and they sent back to him signed. After that, the interviews questions were sent to them. It took another month and had a weekly reminder email to get the interview feedback from the four participants.

With the four participants who accepted a face-to-face meeting, the researcher had to set a time and a place for the interviews. The main principle was that the interview must take place outside the work environment, in a quiet area. There was a public library close to the UAERDC which a discussion room for group work. The researcher contacted the library and they have agreed to lend them the room for the interviews. This ensured that the participants will have the privacy and the comfort to talk without the feeling of being surrounded by work environment. When the dates and times were confirmed back and forth between the researcher and the remaining four participants, the interview schedules were followed and the remaining interviews were conducted within a span of three weeks.

Data Analysis

Every research study requires the researcher to invest a significant amount of time, money, and resources in analyzing the data. There are several tools and techniques which the researcher can use to analyze the collected data. The widely used tool for qualitative data analyzes is NVIVO. After collecting the data through interviews, NVIVO software was

used to organize the results. This software is a qualitative data analysis tool (software application) for organizing, storing and analyzing unstructured or non-numeric data obtained from the qualitative research study (Arkkelin, 2014). NVIVO has been used for importing, coding, querying, taking memos, visualizing, reflecting, and exploring interviews data. The researcher used transcribed text in order to create nodes, test theories, key points, ideas, and display connections.

Long Table approach

The researcher used long table approach guidelines to help the thematic analysis of the results. In the long table approach, the interviews data were sections and grouped into meaningful blocks. Each block of information was labelled in a group. When a new block of information is analyzed, it is compared to the current groups and if it doesn't match, a new group is created. When the researcher came across information that is not related to the question it was set aside. Once all answers of each questions were treated in the same manner, the information that was lift aside was then revisited. If the information fit into any of the answer groups to any question, it was then added. If it still did not fit, it was then gathered on the side as a side finding of the research.

For each group of answers to each question, a table was produced. In this table, the name of the group and the participants quotes were displayed for each answer. The participants were not labelled in the order of the interview but rather a random sequencing has been applied and they were given a number such as participant 1, participant 2 and so on. These tables helped organize the writing of the results chapter.

Conclusion

This chapter detailed the plan for collecting and analyzing the data needed to answer the research question. Starting with the main research question and then its subsections, the main direction of the study was exploratory. This quest dictated that the qualitative methodology be the main overarching choice of conducting the field information gathering. The chapter also covered the aspects of population characteristics and the careful sample considerations.

The researcher efforts to design the data collection questions, then communicating with participants and then conducting the interviews was laid in details. Analyzing data with long table approach was then executed to extract the thematic groups and preparing these themes for the results chapter, which presents the results in thematic groups.

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