



**An exploration of the impact of project management practitioner
heterogeneity in energy projects in Oman**

دراسة حول تأثير الممارسات اللامتجانسة في إدارة المشاريع على مشاريع الطاقة في
سلطنة عمان

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Acknowledgment

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ملخص

تعرض هذه الدراسة الآثار السلبية المترتبة على الممارسات اللامتجانسة في ادارة مشاريع الطاقة في سلطنة عمان. تعتبر هذه الدراسة هامة للغاية بسبب إدراك قطاع مشاريع الطاقة سواءا في عمان او العالم بأهمية العمل بأساليب نظم إدارة المشاريع عوضا عن الطرق التقليدية المتبعة سابقا في هذا المجال والتي أثبتت أثرها السلبي على نجاح المشاريع. تتمحور هذه الدراسة حول قطاع الطاقة العماني فقط للتأكد من استنباط نتائج تلامس الواقع لإعطاء حلول عملية لحل المشكلات المترتبة على هذه الممارسات الخاطئة في إدارة هذ النوع من المشاريع.

تدور هذه الدراسة حول ثلاثة محاور رئيسة وهي :

- معرفة صور الممارسات اللامتجانسة في إدارة مشاريع الطاقة في السلطنة
- معرفة آثار هذه الممارسات السلبية على مشاريع قطاع الطاقة في السلطنة
- معرفة الخسائر المادية المترتبة على هذه الممارسات الخاطئة في ادارة مشاريع الطاقة في السلطنة

للحصول على إجابات شافية و وافية للمحاور أعلاه استوجب علينا تصميم استبيان و توزيعه على مائة من القائمين على ادارة مشاريع الطاقة في السلطنة.

نتلخص أهم ما توصل له هذا البحث في التالي:

- تظهر صور الممارسات اللامتجانسة في ادارة مشاريع الطاقة في السلطنة في صورتين تتمثلان في بيئة العمل و طبيعة الأشخاص
- نجاح أو فشل المشروع يترتب بصورة مباشرة بتجانسس ممارسات إدارة مشاريع الطاقة
- تطبيق الممارسات المتجانسة عادة تحول دون وقوع مشاكل في المشاريع فهذه الممارسات تضمن زوال العوائق و سهولة مواجهة التحديات التي تصادف المشاريع عادة.

في النهاية أهم ما توصلت له هذه الدراسة أن تطبيق المشاريع المتجانسة في إدارة مشاريع الطاقة في السلطنة لها أثر ايجابي واضح تؤدي عادة لنجاحها وتحقيق أهدافها.

Abstract

The study evaluates the impact of project practitioners' heterogeneity on project performance. The rationale for the study was pegged on the rising popularity and use of the project management approach over the traditional functional management approach to global energy projects in Oman. In order to ensure the practicality of the obtained study findings, the research narrowed down its scope to Oman's energy industry projects. The study had three main deliverables; these were to establish existing forms of practitioner heterogeneity in Oman energy projects, establish the relationship between heterogeneity and project performance, and develop a cost-benefit analysis of project practitioners' heterogeneity on Oman energy projects.

In order to achieve its deliverables, the study collected quantitative data. In this case, a cross-sectional survey was conducted on 100 project practitioners in the Oman energy industry. The use of primary data ensured that the study achieved the most recent and relevant data. The analysis demonstrated three main findings:

1. Practitioners' heterogeneity observed is largely categorised into two levels - the cultural and personal traits heterogeneity aspects.
2. The existence of heterogeneity had a relationship to project success and failure.
3. The merits of heterogeneity exceed the challenges, thus the conclusion is that heterogeneity should be encouraged in Oman energy projects.

Overall, the study findings are projected to make a contribution to the existing literature, as well as to perpetuate a heterogeneity preference culture among project managers and coordinators in the Oman energy industry.

CHAPTER ONE

1. INTRODUCTION

1.1 What is a project?

Stackpole (2013) defined a project as an enterprise that involves a design or research and aims at achieving particular goals and aims. The word ‘project’ originated from the Latin word *projectum* and the Latin verb *proicere* that means “before an action”. The Oxford Dictionary defines the word thus: “A project is an individual or collaborative enterprise that is carefully planned to achieve a particular aim (Pearsall and Hanks, 1998, p.89)”. A project can be defined as a group of tasks that are interlinked with each other and they have to be executed over a certain period of time and under some fixed conditions. The PMI (2016) offers another definition: “A project is a temporary endeavor undertaken to create a unique product, service or result.”

A project always possesses a defined goal to be achieved. To move forward towards the achievement of the desired goal, the researchers move along some dependent and interrelated activities that lead them step by step towards the resultant destination. Sometimes a project is designated a limited time in which it has to be completed (Williams, 2011). The components of the projects which provide a unique approach to the researcher in terms of product, information or service. In the fifth edition of *Managing Successful Projects with PRINCE*, “A project is a temporary organization that is created for the purpose of delivering one or more business products according to an agreed Business (Hermarij & Bruce-Feijen, 2013, p.234).

Kendrick (2009, p.416) meanwhile states that “A project refers to a value creation undertaking based on a specific, which is completed in a given or agreed timeframe and under constraints, including resources and external circumstances” So, overall, we can assert that a project is a unique process which contains a set of controlled activities and tasks with specific start and end dates and an aim to be achieved.

1.2 Project Management and its Practitioners

The term ‘project management’ is given to a collection of techniques and tools that direct the individual towards the accomplishment of complex, unique and one-time tasks under specific regulations and limitations (Berkun, 2008). Every task requires a different quantity and quality of these techniques and tools according to the demands of the type of task. Lock (2013) views project management as a process of planning and managing a combination of ordered, planned, coordinated and controlled activities. These activities are not simple and easy to be managed - rather they need a firm sense of responsibility and consideration and, above all, a complete understanding of the required skills and knowledge (Dooley, Lupton & O'sullivan., 2005). Such responsibility can only emerge from the practitioner side. The diversity of literature on project management underpins the theory of heterogeneity into the management process (Project Management Institute, 2008).

Project management is also defined as a methodological approach towards guiding and planning a series of processes from the start until the end (Cicmil, Williams, Thomas & Hodgson, 2006). The Project Management Institute proposed the outline or ranking in which these processes are carried out which should be implemented by project management practitioners. In this order, first, initiation is required that is to take the first step towards the process. The second step is the planning and execution of the plan followed by the controlling and closing of the whole process (Cobb, 2011). These are the stages in which the process of project management moves (Dooley et al., 2005). The phenomenon of project management can be applied to almost any field and any project and this process is widely used to control the complex process of many global industry-related projects and the energy sector projects, one of which is the subject of the current research. The common resources of the project management practitioner are always present to complement these stages of project management (Tracy, 2013).

Another definition of project management states that “Project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements” (PMI, 2016). The purpose of project management actually revolves around three major objectives - i.e. schedule, cost and specifications (Turner, 2006). Meredith and Mantel (2012) stated that project management also focuses on the

expectations of the clients. Overall, all the definitions of project management focus on similar components - i.e. the planning, execution and delivery of the task according to the expectations of the client within the constraints of time, cost and resources (Bresnen et al., 2004). Similarly, the energy sector also goes through these five stages in the management of their energy projects at large. If such practitioners are from diverse backgrounds, their decisions can have an impact on organisational or project performance.

1.3 Decision Judgments of a Practitioner in Project Management

1.3.1 Stakeholder Decisions in Project

Hardman (2009) described a decision as the ultimate developed solution to resolve an existing issue. Similarly, the author argued that decisions can be classified as judgments, when they involve decisions on existing issues, between right and wrong, or relevant and irrelevant. There are various factors that influence the process of decision making in project management. As Gupta (2007) argued, they include culture, and existing environmental aspects. Sometimes the demographic values such as gender and age of project practitioner influence various decisions and sometimes the difference and the conflict in the perspectives and perceptions of different stakeholders stand between the decision that have to be made to carry out the process of project management. Researchers such as Dweiri and Kablan (2006) have investigated the interests of the project management scholars and showed that such interests have continued to increase over as they are related to the decision making (Ojiako et al., 2014). Behaviourists such as Rolls (2014) view the process of decision making as an act of articulation and expression of self-experience for a particular project situation. However, diversity in practitioners' attitudes and behaviours makes it difficult for the project to work on unanimous decisions (Dweiri & Kablan, 2006).

Coyne (2009) asserted that decisions by practitioners usually exist in two forms. Sometimes they are conscious or explicit and sometimes they occur in an unconscious or implicit manner. On the other hand, some analysts, such as Maloney (2015), link decision judgments with the sensory stimulants; i.e. smell, sight, hearing and feelings. In terms of stakeholders, many studies reveal that there are many differences among the project stakeholders depending upon the demands and requirements of the project. On the other hand, the perceptions of stakeholders also affect the decision judgments as these are related

to their judgments about what the overall outcomes of the project would be (Miller et al., 1998; De, 2000). Whatever they perceive about the outcomes of the project, they will deliver the same to the decision makers and the decision judgments will follow accordingly.

The past experiences of a particular project and organisational context also affect the action of decision judgments. If the stakeholder has had a bad experience of a particular decision or he perceives it to be a failure then he will surely not allow the decision makers to apply it to project management (Powell & Buede, 2009). Demographic differences among the stakeholders also affect the process of decision judgments. In the energy sector, the stakeholders have some set priorities and perceptions about the outcomes of the project too. These perceptions are largely based on the prior experiences of the project practitioners.

1.3.2 Capturing Expressed Decision Judgments

As Dinsmore and Cabanis-Brewin (2011) noted, there are two forms of decision – the expressed and the unexpressed decisions. On one hand, the unexpressed or implicit decisions are involuntary and occur under no structured approach. On the other hand, the expressed or explicit decisions are developed within a regulated formal framework. The process of project management relies on the use of a structured decision-making process. Thus, this section evaluates the concept of expressed decision making in the project team's management.

Table 1 below illustrates the core differences between the expressed and unexpressed decision-making processes.

Table 3.1: Differences between Expressed and Unexpressed Decisions

Aspect	Expressed Decision Making	Unexpressed Decision Making
Framework	Decisions are developed within set frameworks	Decisions are developed without any regulating framework or regulations
Planning	Decision making relies on factual well analysed data	Decision making is often emotional and intuition-based

Time for Decision	The process of decision making is often lengthy and takes a lot of time	The process of decision making is short and instant. Often through a reflex action
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Source: Summarised from the analysis

Along with many other factors affecting the process of decision judgment, the expressed decision judgments have also been taken into account. It has been observed in many studies that the disconfirmation of the perceived expectations sometimes leads to the fall of satisfaction parameters (Dinsmore & Cabanis-Brewin, 2011). This means when an individual does not get the expected or desired results from a particular event, he will surely be disappointed in the whole experience. The practitioners of project management in the energy sectors also work over the same criteria (Ojiako et al., 2014). Their expressed decision judgments are followed by the decision regarding the management of the projects.

The decision-making criteria reveal that if a person perceives that the project is behaving in such a manner that the fundamental performance criteria in terms of cost, time and quality are likely to be met, then he will have a positive outlook regarding the ultimate results of the whole project. On the other hand, if the situation goes in the opposite direction – i.e. the individual is not sure of the positive outcomes of the project, he will be disappointed and will develop a negative outlook for the project (Ojiako et al., 2014). When there are clearly expressed differences between the actual and the expected performance of the project at any stage, the practitioner will either be disappointed or he will revise the expressed decision judgment of the project.

1.4 Project Success and Project Failure in Projects

Dinsmore and Cabanis-Brewin (2011) described a project success as the ability by project management to complete a project within the estimated timelines, within budget, and deliver on expected deliverables. On the contrary, project failure is when a project is not completed on time and within budget, and fails to meet set deliverables. The ways the process of project management are measured and evaluated are directly influenced by the national culture. Moreover, the national culture also affects the probability judgments and perceptions as well as acceptance of all the expected risks in the planning and management of any project. The perception of success and failure of the project is constructed as an

expressed judgment either by the individual who is leading the whole project or by the stakeholders (Schibi, 2014). These perceptions are considered as the outcome of the explicit nature of the practitioners. Project 'failure' or project 'success' is defined as the ability of any project to deliver the expected or perceived outcomes of the project along with the fulfillment of all requirement criteria (Ojiako and Chipulu, 2014). According to this definition, the project 'failure' and the project 'success' can be termed as the mirror images of each other, in that they are directly oppositional. As discussed above, whether a project succeeds or fails is predominately dependent on the subjective perceptions of the project practitioner; therefore they are highly influenced by the social and cultural norms. The perceived results about the project 'failure' and the project 'successes' ultimately put a great impact on the process of decision making (Schibi, 2014). On the other hand, the basis of these perceptions has widely been found as the social and cultural norms experienced by the practitioner himself. Like any other existing phenomena, the field of management also relies upon the decisions of the practitioners. The complexities related to the social and cultural norms sometimes limit the practitioners from reaching the actual basis of their perceptions and sometimes if perceptions are wrong, the process of project management loses its affectivity.

1.4.1 The Role of a Project Manager as a Decision Maker

A project manager in project management holds multiple roles. The first responsibility for a project manager is human resource management. In this regard, Fabi and Pettersen (1992) argued that project managers are responsible for the management of all the team members. In essence, the human resources (HR) workforce is a major resource and is influential in the determination of the success or failure levels of any project activity. The role of a project manager in HR management includes the development and allocation of members into respective teams. In this context, at the project initial stage, teams are established based on the project mandate. It falls upon the project manager to decide on the teams' composition and operational frameworks as well as the respective teams' task breakdowns. At this juncture, the project manager's decision on the HR influences the extent to which existing team heterogeneity is either applied as an opportunity, or emerges as a team operational challenge. Thus, this indicates that the responsibility of team management and development falls under the project manager portfolio (Huemann, Keegan & Turner, 2007).

A second responsibility of a project manager in projects is in the allocation of resources. In this regard, an evaluation developed by Holzle (2010) outlined on the role of the project manager (PM) in developing key decisions on a project's timelines. This is executed through the PM's role in developing Gantt charts and critical path development. As such, the PM is entrusted with the role and decision of allocating resources. In this case, elements such as perception, and risk awareness and evasiveness heterogeneity aspects influence such decision-making processes among PMs.

1.5 The Notion of Heterogeneity of Project Management Practitioner

Heterogeneity is simply defined as "diversity". Carayannis and Chanaron (2006, p.109) defined it as "the quality of being diverse and not comparable in kind" This diversity or heterogeneity is often considered a "double-edged sword" in the theory of contemporary organisational structure as it is becoming more and more important for practitioners. The notion of heterogeneity is often observed in terms of the cognitive diversity that is present among the heterogeneous (diverse) members or practitioners of any organisation. This heterogeneity is considered a source of promoting innovation, creativity and problem solving that ultimately results in the highly ranked performance level of the teams that work in a cognitively heterogeneous work environment (Carayannis & Chanaron, 2006).

The relationship between heterogeneity and performance has been widely studied as it is considered as the most important relationship. Schibi (2014) argued that the positive relationship between the heterogeneity and the performance of any organisation ultimately results in the positive growth of the organisation. If seen in terms of project management, heterogeneity has a great deal to do with the performance. When the members of the team handling the project management work on heterogeneous grounds, they have numerous unique and diversified ideas. The only thing that is needed is collaborative team work (Powell & Buede, 2009). Otherwise if every individual of the team tried to move in his own direction or desired to have his idea implemented on the whole management process, these diversified ideas will ruin the essence of project management and this will surely lead to the project's 'failure'.

1.6 The Research Map

Current research situation	Research Aim (Purpose)	Research Problem	Research Objectives	Research Questions	Research rationale	Research Structure (refer to Voss et al; Stuart et al and Handfield & Melnyk)	Examples of Data Collection Techniques (refer to Voss et al; Stuart et al and Handfield & Melnyk)	Example of Data Analysis Procedures (refer to Voss et al; Stuart et al and Handfield & Melnyk)	Underlying theory
Energy projects traditionally involve project management practitioners from a wide demographic range. These demographical differences may lead to considerable differences in terms of decisions being made on the project and also perceptions held by these different practitioners on key elements of the project. If not accounted for and understood, such differences (heterogeneity) could lead not only to poor decisions being made on projects, but also to sub-optimal (not best) decisions being made as well.	To explore the concept of project management heterogeneity and congruence.	There appears to be limited research that has explored the concept of project management heterogeneity and congruence particularly as relates to project success and project failure in energy projects.	Undertake a systematic review and synthesis of the literature on project management heterogeneity and congruence particularly as relates to project success and project failure in energy.	What effect has heterogeneity and congruence on project success and project failure in energy projects?	Understanding and uncovering areas of research in of project management heterogeneity and congruence particularly as relates to project success and project failure in energy.	Unfocused and focused studies (systematic review)	Document Examination (Systematic review of literature)	Categorisation	(i) Project management heterogeneity (ii) Project success and failure theory (iii) Decision theory in project management
	To explore the relationship between project heterogeneity and project managers' decision-making process and the associated challenges and opportunities.	There is yet to emerge sufficient research that focuses on project management practices in the Oman energy industry. Although much has been evaluated on the Asian and Middle East markets, focus on Oman energy industry in particular is lacking.	To (i) evaluate the different aspects of project heterogeneity facing the Oman energy industry (ii) To examine the relationship between project heterogeneity and the rates of success or failure (iii) To establish opportunities gained by heterogeneous energy project teams over the homogenous teams.	(i) What are the existing aspects of projects heterogeneity in the Oman energy industry projects? (ii) What is the relationship between project heterogeneity and success or failure rates? (iii) What unique opportunities and challenges are associated with heterogeneous projects in the Oman energy industry?	(i) To establish existing heterogeneous aspects in Oman energy industry projects (ii) To establish the role and contribution of project heterogeneity to a project's success or failure extents.	The study uses a focused approach by limiting the scope to the Oman energy industry.	The study uses a primary data collection process. It will use closed-ended questionnaires distributed to project practitioners in the Oman energy industry.	The study uses a technique analysis approach. In this case, the collected data are analysed through a statistical analysis technique process. This includes inferential and descriptive techniques analysis.	Hofstede cultural dimension theory in decision making.
	To develop a framework for effective project management and decision-making models in heterogeneous projects in the energy industry.	The changing energy industry landscape encourages the use of project management teams. However, the project teams are facing numerous diversity challenges that need resolutions.	The overall aim is to establish opportunities and challenges associated with heterogeneous projects in the energy industry.	Are the heterogeneous projects in the Oman energy industry an opportunity or challenge for stakeholders' goals attainment?	To establish the underlying values and principles in heterogeneous projects as a means of increasing project management success in the Oman energy industry.	The study uses a sample of 100 project management practitioners to represent the entire population base of the Oman energy industry project management practitioners.	Closed-ended questionnaires are adopted for data collection.	The applied analysis tools are descriptive statistics and two paired bivariate correlation aspects.	Cross-cultural teams management theory.

CHAPTER TWO

2. Literature Review

2.1 Introduction

This section offers a critical analysis of the existing literature and empirical reviews in the market. As such, this includes the evaluation of elements and aspects such as the factors influencing the project decision-making process, involved resources in project decision making as well as the overall challenges experienced in making project decisions. The key focus of the literature review analysis is to establish the implications of the discussed aspects to the aspect of age and cultural heterogeneity in projects' management. In particular the study analysis offers a critical examination of the different aspects of heterogeneity in project management, including culture, skills, and personal traits aspects, respectively. In addition the review evaluates the documented best practice in managing heterogeneous projects as well as the ideal skills and competencies that should be evaluated in recruiting project managers for heterogeneous projects.

2.2 Elements of Projects Heterogeneity

This section explores and evaluates the various forms of heterogeneity existing in project management. Through a preliminary study analysis, three main forms of heterogeneity, namely culture, skills and personal traits are established. Thus, this section explores the empirical reviews illustrating and evidencing the presence of these heterogeneity aspects in projects.

2.2.1 Culture Heterogeneity in Project Management

Swaddling, Perkins and Haynes (2009) described culture as the way of doing things in a society and in a given group of people, over a given period of time. As such, the authors noted that cultures change over time. Along the same line of argument, Moore (2009) argued that cultural heterogeneity in management emerges where the stakeholders involved, such as team members, are from different cultures. The first evaluated aspect of heterogeneity in project management is the concept of culture. In this regard, the evaluation

of culture is discussed in the understanding of culture as a set of beliefs shared by a given group of people. Thus, culture as heterogeneity is evaluated based on its existence as a set of norms, beliefs, and way of life of a given group of people. In this context, it is understood that culture has many sub-cultures. For instance, although people in a given region would share the same culture, there would be numerous sub-cultures with different as well as shared common norms. For the sake of clarity and ease of analysis, culture in the context of this study analysis is perceived at the national level. This is guided by the Hofstede cultural dimensions theory, which argues that cultures vary at the national level. Thus, evaluation is based on differences in nationalities in the study analysis.

The first key evaluated study in this review is that of Chatman (2001). The author developed a study evaluating the concept of heterogeneity in projects' decision-making processes. In this context, the study adopted a case study of project teams with heterogeneous team members. The heterogeneity was evaluated in terms of the team members' cultural diversity aspects. In this context, as Shachaf (2008) noted, the main focus was on the correlation between project teams' heterogeneity to team work and cooperation among the team members. The adopted study sample was students' teams as well as a case study of a financial services firm, whose 10 units showed cultural diversity. In this case, the evaluation established that in teams with a higher cultural diversity, it was a major challenge to develop the cooperation group norm. The analysis evidenced that, due to cultural heterogeneity, there was minimal willingness to cooperate. The findings were attributed to variances in values and perceptions among the different team members.

As such, based on the above analysis it is clear that, in the management of heterogeneous project team, the project managers are most likely to face the challenge of minimal cooperation and support among the team members. However, as Vanaelst et al. (2006) illustrated, this is a temporal problem. The study was a longitudinal one where the sample base used was studied and evaluated over time. In the long run, the study evidenced that the heterogeneity decreased as the teams worked together. As such, the teams developed new shared norms and values, thereby reducing barriers. Eventually, there was increased collaboration and relationships development among the various team members from heterogeneous cultures. Thus, based on the above study analysis, it is apparent that rather than focusing on the elimination of the heterogeneity aspects, project decision makers

should focus on creating common grounds and operational opportunities through which to aid commonality and shared norms development among the team members.

The Chatman (2001) study findings can be correlated to an earlier study developed by Papadakis, Lioukas and Chambers (1998) who evaluated the factors influencing strategic decision making across global organisations. The only difference between the findings from Chatman (2001) and Papadakis, Lioukas and Chambers (1998) was that while Chatman (2001) focused on projects, Papadakis, Lioukas and Chambers' (1998) focus was generally in the organisational strategic decision-making process. The study focused on the evaluation of the key factors impacting and influencing the strategic decision-making process. In this context, among the evaluated factors were the environmental aspects on heterogeneity and hostility. In this context, the aspect of the environmental hostility and aspects was based on the differences in cultures across the evaluated market contexts. To this effect, the study established that both factors had direct impacts on the applied decision approaches. This was evaluated through the use of the Cronbach alpha reliability coefficients tool. The findings were an illustration that in formulating strategic decisions, it is vital to factor in the environmental hostility (Gorla & Lam, 2004).

On one hand, this supports Kitano and Tadokoro's (2001) findings that heterogeneity aspects among project members create hostility and generate minimal willingness to cooperate. However, as time passes, this hostility declines. This is an illustration of the fact that hostility varies and then declines along the project lifecycle. This means that at the start of a project lifecycle, the environment is highly hostile and heterogeneous. The hostility illustrated in the study can be analysed to imply the existence of differences among the project stakeholders. Initially, prior to the formation of such project teams, each of the stakeholder's categories has its own individual needs and interests. Thus, at the time of a project lifecycle start, each of the stakeholders has their unique drive.

This creates the risk of project teams' conflicts and disagreements as each stakeholder and team members pursue their own individual goals. However, this hostility declines over time. In the formulation of a project, similar to the formulation of groups, part of the forming stage is the norming stage. The norming stage includes the formulation of shared values and principles; in this case, there is compromise and consensus among the project

stakeholders to adopt a collective objective (Kerzner, 2013). The collective objective serves as a symbol of a compilation and combination of the different stakeholders' goals. Thus, once a shared objective and goal is attained, there is exponentially reduced risk hostility and conflicts among the stakeholders. Thus, in order to ensure project success, the project managers should formulate equally heterogeneous decisions to factor in all the stakeholders. However, as the project lifecycle nears maturity, hostility and heterogeneity declines. Equally, this means that at this time the project decision makers should concentrate on formulating decisions with less focus on heterogeneity, and more focus on the actual project needs (Hwang & Ng, 2013).

All the above discussed reviews adopted a project team approach. However, as the composition of a project team structure depicts, there is no project execution if there is no project manager. Thus, while appreciating the role of culture as a heterogeneity aspect among team members, it is vital to equally evaluate whether such cultural differences cause heterogeneity in the project managers' decision-making processes. To this end, Bartsch, Ebers and Maurer (2013) adopted a different lenses approach. On its part, the study evaluated the role of culture and integration on project managers and key organisational strategic decision makers. The focus of the analysis was to establish whether cultural diversity among managers had an impact on their decision-making process. Moreover, the evaluation investigated if the aspects of globalisation and increased international market integration played any role in reducing the decision-making heterogeneity, and as such created uniformity in the decision-making process. The study sample base comprised key organisational international business decision makers with cultural origins from Canada, Hong Kong, and the People's Republic of China. The analysis aimed to evaluate whether the cultural differences led to their varied decision making and how globalisation impacted on their decision-making processes and outcomes respectively.

The study developed a conclusion that indeed cultural differences led to diversity in decision making. In this context, the findings illustrated that for the Chinese and Canadian managers, their home cultures had an overall impact in their decision-making process as well as perception of problems (Rees-Caldwell & Pinnington, 2013). Thus, when faced with the same decision-making need, the two cultural managers were bound to make different decisions hedged on their cultural orientations. In addition, the analysis

established that due to increased globalisation and cultural integration in Hong Kong, the managers depicted a mixture of both western and Chinese attributes in their decision-making processes. This study finding was later affirmed by Liang, Kale and Cherian (2014) on the aspect of reduced heterogeneity in teams and perception due to increased and prolonged interactions among team members. In this case, through prolonged interaction of the Hong Kong managers with both the Chinese and Western cultures, they aligned their decision-making process with both cultures.

In order to demonstrate that findings from past studies such as Tse, Lee, Vertinsky and Wehrung (1988) are as applicable today as they were decades ago, Bredillet, Yatim and Ruiz (2009) developed a study evaluating the role of cultural heterogeneity in the deployment of project management operations. The study development was based on Hofstede's cultural dimensions. The theory holds that different nations have their unique and differing national cultures. As such, this means that project management practices in different cultures are bound to be influenced by different environmental aspects. As a development to Bartsch, Ebers and Maurer's (2013) study that used only three cultures in China, Hong Kong, and Canada Bartsch, Ebers and Maurer's (2013) study used a sample base of 74 countries and evaluated the correlation between project management deployment and decision-making process with the five different aspects of Hofstede's cultural dimensions model. In its analysis, the study concluded that project management was positively correlated with market GDP/per capita.

Similarly, it was negatively correlated to power distance and uncertainty avoidance. However, there was no established correlation between project management deployment and the masculinity or the individuality elements. The above study findings were an illustration that, indeed, aspects such as the decision makers' uncertainty avoidance levels, and willingness to participate and take risks directly impacted on the type and nature of decisions developed. Thus, this means that project decision makers, such as team leaders in projects from different cultures are bound to formulate and make different decisions. This leads to heterogeneity in project decision making. Bredillet, Yatim and Ruiz (2009) concluded with the assertion that there is need for the respective project deployment teams to incorporate such heterogeneity perspectives' in decision making as a means of increasing decision making quality in the long run period.

2.2.2 Tasks and Individual Traits Heterogeneity in Project Management

Lee and Pillutla (2015) attest to the fact that human beings are different. This means that they have distinctive differences in terms of gender, and bio-demographic aspects. This forms the core aspect of heterogeneity in projects. The second and third aspects of project management diversity include the heterogeneity in project team members' skills as well as the personal traits differences among the team members and the project managers, respectively. On one hand, the evaluation of skills heterogeneity is hedged on the understanding that many projects, including those in the energy sector, draw the team members from across the units. For instance, in the case of the energy industry cross-functional teams, there could be engineering, maintenance, distribution, and marketing professionals. This diversity in the team skills can be categorised as heterogeneity (Reuveni & Vashdi, 2015). On the other hand, the analysis section explores how individual biological differences such as age and gender serve as aspects of project heterogeneity.

One such first study to evaluate projects' heterogeneity in terms of individual skills diversity was that of Horwitz and Horwitz (2007). On its part, the study offered a new dimensional view on the concept of heterogeneity in project teams. In the above analysis, studies by Chatman (2001) and Papadakis, Lioukas and Chambers (1998) evaluated the concept of teams' diversity through a bio-demographic analysis such as through age and gender besides culture. On the contrary, Horwitz and Horwitz's (2007) study creates new knowledge in that the study conducts a critical valuation of project teams' heterogeneity through the task-diversity lens. In this case, the study focused on evaluating and establishing the extent and correlation between team-tasks diversity to the overall team performance levels. This study aimed to establish if drawing a heterogeneous team was profitable or a challenge in project performances realisation. Theoretically, the formulation of the study was an exploration of the correlation and rationale for using cross-functional teams over functional teams in project execution. The study analysis was developed through the Aubke, Wober, Scott and Baggio (2014) diversity paradigm tool. The study findings illustrated that there was a positive correlation between teams' tasks diversity and team performance levels. As such, this implied that through the presence of strong heterogeneous teams, there was improved tasks execution and improved performance levels. The findings serve as an illustration that teams' heterogeneity should not always be

perceived as a challenge to be overcome. Instead, in terms of tasks heterogeneity, the study findings were an illustration that such findings should be considered as an opportunity for improvement. Therefore, in such a scenario, rather than formulating decisions that seek to reduce the heterogeneity, the project decision makers should be focused on making heterogeneous decisions that stimulate the application of such heterogeneity to drive increased performance levels for the projects.

Although Horwitz and Horwitz (2007) illustrated that bio-demographic factors depicted no correlation to project performance, a successive study by Maier, Hulsheger and Anderson (2015) illustrated that although there was no correlation to performance, it led to perceptual differences. In this context, Maier and colleagues (2015) developed a study evaluating the aspects and correlation between the project management practitioners' bio-demographic aspects with their perceptions of project failure and success indicators. Although the study could be classified as an evaluation of the role of culture, it encompassed more than just culture. It evaluated the individual practitioners' bio-diversity as a basis of project management decisions heterogeneity. The study based its analysis on a total sample base of over 1313 practitioners' survey responses from across eight countries - the USA, Brazil, China, Greece, Nigeria, Thailand, the UAE and the UK. The study analysis process applied the multi-group, structural equation modelling as its analysis tool. In summary, the study established that in the determination of the project success and failure influencing aspects, the practitioners were not only influenced by their cultural heterogeneity (Horwitz & Horwitz, 2007). Instead, the differences between the practitioners' ages and gender were also a major influencing factor as found by Maier et al. (2015). Thus, the study findings served as a supplement to the earlier findings by Horwitz and Horwitz (2007), who had argued that there was no direct correlation between the project stakeholders' bio-demographics and project performance. However, it is clear that although the variances did not influence performance levels, they did have an impact on their perceptions of the success levels. For instance, while females would rate a project success through their emotional appeal and satisfaction levels, their male counterparts would rate project success based on the challenging tasks conducted.

In a further study, Ojiako et al. (2014) evaluated the role of bio-demographic factors in the formulation and revising of key project decisions across seven different countries. The

study collected data from over 1313 surveys on professional project practitioners; these data were then analysed through log-linear modelling in SAS9.2. Although the study aim was closely related to that of Chipulu et al. (2012), its aim was to develop an insight into the influence of bio-demographics in project decision making. In its analysis, the study established that heterogeneity in the respondents' ages and project roles impacted on their decision-making processes. However, it noted in its analysis that gender was not demonstrated as correlated to the process of decision making. Therefore, with the exception of Chipulu et al. (2012), both Horwitz and Horwitz (2007) and Maier, Hulsheger and Anderson (2015) indicated that the project practitioners' gender was not in any way a heterogeneity aspect in projects. This means that the level of project performance as well as the quality of the decision-making process is not related to the project practitioner's gender. This can be attributed to a number of aspects. As Ende and Wit (2002) discussed, in project management, the recruitment of project managers was hedged on the possession of generic management skills. Thus, regardless of gender, the recruitment project managers were qualified and equipped to meet the overall project expectations. Additionally, the global market, unlike the traditional set-up, has experienced increasing women's empowerment practices. Therefore, this has bridged the traditional gender gap experienced in the traditional markets resulting in gender homogeneity where project success or failure is reliant on other factors rather than on the gender of its key decision makers.

The above strategic analysis reviews illustrated that there are diverse aspects of project heterogeneity, showing that, in this context, project heterogeneity can be present in terms of culture, skills, and personal attributes of the team members and the project managers. Consequently, it is on these heterogeneity aspects that the study evaluation of the energy sector project heterogeneity was based.

2.3 Best Practices in Project Decision making

This second sub-section of the literature review analysis evaluates the best practices in making project management decisions in a heterogeneous environment. The analysis in this section is hedged on the understanding that there is need for project managers and coordinators to apply decision-making processes and approaches that allow for the

mitigation of any potential challenges posed by the above discussed diversity as well as embracing the opportunities it presents (Hwang & Ng, 2013).

One of the core best practices involved in the development and formulation of key projects decisions is the aspect of organisational strategic flexibility. This resource was analysed by Shimizu and Hitt (2004) who explored how organisations can propagate their project management decisions through proper systems flexibility. In this case, the study developed a preliminary analysis of the existing challenges on the development and execution of core project decisions in the market; findings established that in order to enhance effective flexibility in project decision making, organisations should follow six strategic steps in the decision-making process (Anderson, Sweeney, Williams, Camm & Cochran, 2015).. The first step is to measure and monitor decision outcomes. This stage of the process includes the development of objective-oriented approaches to measure decisions outcomes. Through such an objective approach, the managers and project coordinators are able to evaluate the impacts of the decisions on all the stakeholders and participants rather than using subjectivity and assumptions in the decision-making process (Shimizu & Hitt, 2004).

Through this analysis process, the project decision makers are able to explore the core potential implications and outcomes of a given project activity for all the age and culture heterogeneity aspects. An additional relevant aspect is the fourth and the last step, namely the consideration of different portfolios as well as the learning's. In this case, rather than focusing on a single decision approach to fit the heterogeneity aspects, Kerzner (2013) advocated that the project decision makers should consider developing equally heterogeneous and diverse decisions to capture and incorporate the needs of the heterogeneous team members. Finally, the core resource in the decision-making process advocated for was the need to develop a learning process. In this regard, the project decision makers should strive to learn from decision outcomes. This allows for the use and application of a continuous improvement process, reducing the potential for decisions negative implications.

In the wake of the realisation of the challenges facing project management practices, the UK's engineering and Physical Sciences Research Council (EPSRC) launched an initiative on rethinking project management in 2006. This resulted in the formulation of a conceptual

paper by Ojiako, Chipulu and Maguire (2013). The focus of the paper was demystifying the most effective tool in evaluating project performance. In this case, the aim was to evaluate whether the best approach was to measure or assess project outcomes to establish the failure of success rates in a project's execution. The development of the conceptual paper was grounded on the evaluation of secondary data findings in relation to project management. In general, the overall realisation was of a rapidly evolving global market environment, implying that the environment in which projects are executed varies over time and the subsequent need to re-engineer the outcomes evaluation measures (Schwalbe, 2015).

In its analysis, the study leaned towards the use of the stakeholders' theory in project outcomes evaluation. The theory argues that in the execution of any management approach, the evaluation and execution process should be based on the overall impacts on all the stakeholders, and not just a few internal stakeholders. This theory is mainly applied in the realisation that, in modern-day projects, there are many stakeholders. For instance, in public-private partnership (PPP) projects, there are both the public and the private stakeholders (Zou, Kumaraswamy, Chung & Wong, 2014); the above analysis also indicates that in such projects, there are numerous heterogeneous stakeholders, each of whom has their individual interest. Although the project aim serves as the collective interest, there are heterogeneous interests depending on the number and diversity of the involved stakeholders. Consequently, in order to address these heterogeneity differences, the study concluded that project outcomes should be assessed. The limitation of measuring is that such existing measurement and key performance indicators (KPIs) are only based on the quantifiable project outcomes (Ojiako et al., 2013). However, in the wake of changing and increasing stakeholders' heterogeneity, there is the need to assess the impacts and outcomes for such stakeholders, such as perception, that cannot be quantified.

The arguments cited by Zou et al. (2014) can be illustrated through a similar earlier study developed by Ojiako, Johansen and Greenwood (2007) with respect to the UK construction and IT industries. The study focus was to analyse and establish the extent and the level to which project failure was evaluated and measured across the industries, and to assess if heterogeneity existed in project failure and success evaluation measures. In this case, the study established that indeed there existed heterogeneity not only across the two industries

failure measurement, but across different projects in the same industry. In essence, it demonstrated that a project success or failure level was evaluated and determined based on the core project aims and goals. For instance, while as some of the projects could have yielded no economic value, there were times considered successful (Tserng, Ho, Chou & Lin, 2014). The analysis was hedged on the application of the stakeholders' theory. As illustrated, the theory advocates for the customisation of the project failure or success level based on the stakeholders' changing collective and individual needs (Ojiako et al., 2007). Thus, the findings can be interpreted to mean that in the evaluation of a project success of outcomes, it is not ideal and sufficient to apply the traditional measurements tools. Instead, it is vital to apply a holistic assessment process on the project delivery of all the stakeholders' heterogeneous needs. The only limitation of the study is that it had not highlighted the alternative process of evaluating project outcomes. This is the gap addressed in the study by Tserng, Ho, Chou and Lin (2014) cited above.

A third strategic best practice approach through which project management heterogeneity can be mitigated is illustrated through a study developed by Ende and Wit (2002). This is despite the fact that the study was not specifically developed through a focus on a project management process. Instead, it evaluated the process of decision making and the use of technologies in the case of two Dutch banking institutions. Nevertheless, the issues impacting the process of decision making in the two case studies used is similar to the scenario in project management endeavours. The study analysis was hedged on the evaluation of the role of ICT systems application in the decision-making process. It evaluated the role of ICT in supporting downstream and upstream flows of information. In the case study analysis, this included the flow of information from the executive and middle level managers as the key decision makers, and from the low-level employees (Davies & Harty, 2013).

This is a similar scenario to the case in project management, where the project manager and team leaders are the key decision makers and the project team members are the followers. In its analysis, the study established that the use of ICT systems increased low-level employees' participation in the decision-making process. This was attributed to increased decisions quality as well as incorporation of the diverse employee needs and perceptions (Ende & Wit, 2002). This review argues that one of the strategic best practices in the

project management decision-making process is the use of ICT systems and the decentralisation of the decision-making process. As such, rather than the project manager formulating all the decisions, the team members are included in the decision-making process. Every team member, with a heterogeneous bio-demographic or task-skill heterogeneity is bound to offer a different perspective. The ultimate inclusion of all the responses and perspectives would increase the quality and accommodative nature of the project management decisions.

2.4 Project Management Skills and Competencies

Linked to Ende and Wit's (2002) study on mitigation strategies to overcoming project management heterogeneous challenges, Chipulu, Neoh, Ojiako and Williams (2013) developed a study evaluating the required competencies for project managers to be effective. In this regard, Erez et al. (2013) had illustrated that effective project managers and business leaders in a heterogeneous set-up seek to decentralise the decision-making process. However, in order to achieve this, key project management skills and competencies are required. Chipulu et al. (2013) evaluated the common competencies required for project managers across industries and across the globe in order to assess project management skills required in heterogeneous project set-ups. A sample of 2306 project management online job advertisements was used from the UK, Canada, the USA, China, India, Hong Kong, Malaysia, and Singapore. Data were analysed through the three-way multidimensional scaling tool (Cummings, Kiesler, Zadeh & Balakrishnan, 2013). The overall analysis in the article was the realisation that project managers' generic management skills were more valued and required across the industries and nations. In this case, this meant that besides the need to have skills in project management, the advertisements emphasised key generic management skills such as interpersonal and communication skills in the market. A review of the above analysis illustrates that indeed the possession of key generic management skills is a vital tool in recruiting project managers. It is only if the managers have the required management skills and consideration for the employees that proposed approaches such as decentralisation of the decision-making process discussed above can be achieved and effected (Espinilla, Andres, Martinez & Martinez, 2013).

In what can be perceived as a rejoinder study to Bredillet, Yatim and Ruiz (2009), Janssen, Van Der Voort and Veenstra (2015) developed a similar study. The only difference between the two studies was the rationale for theory implications and application in the global market. On its part, the study by Chipulu et al. (2016) aimed at evaluating and establishing the extent to which organisations applying global project managers' recruitment were bound to benefit from the acquired heterogeneity. As already seen from the discussed studies, it is clear that culture heterogeneity plays a critical role in creating decision-making process diversity. Thus, the study aimed to establish whether such heterogeneity was of any value or if project management recruitment practices should be localised to the domestic markets (Davis & Laflen, 2015). The study used online project management advertisements placed by 2040 companies across seven industries and seven countries, respectively. In this context, the study set out to establish which of Hofstede's cultural dimensions commanded the highest role and consideration in the recruitment process.

The study findings were indeed similar to those of Bredillet et al. (2009) that, while masculinity had no correlation, uncertainty avoidance and collectiveness had the highest correlation aspects. This means that different project managers from different cultural backgrounds were bound to have varying levels of risk uncertainty avoidance and risk-taking willingness. Similarly, they are bound to have differing levels of engagement with the other stakeholders in a project execution (Lander, 2013). Hence, this analysis suggests that the above findings can be applied as a best practice in developing and acquiring the right set of skills and competencies for the project management process. As such, the review argues that due consideration should be given to the projects' risks taking propensity and the need for decision-making needs. As such, through a global recruitment sourcing, project practitioners from cultures that fit into the project needs will be acquired and as such selected.

2.5 Summary

This chapter offers an insightful yet critical evaluation of existing literature with respect to heterogeneity aspects in project management. First, the review illustrated that there are

different forms of project management heterogeneity aspects including personal traits differences, skills diversity, as well as culture. As such, it argued that in the evaluation and auditing of heterogeneity aspects in the energy sector projects, focus should be developed on the three heterogeneity aspects. Moreover, the study evidenced that, through effective decision-making processes, project managers can transform heterogeneity challenges into effectiveness and performance opportunities. Thus, in the study evaluation on the energy sector projects, focus was developed to correlate the applied decision-making models in the industry projects with the best practices discussed in literature. This would support the evaluation of existing strengths and weaknesses in managing heterogeneous projects. Finally, the chapter evaluated the standardised skills and competencies required for project managers to effectively execute their responsibilities. As such, it demonstrated that generic management skills coupled with project management expertise were core. Thus, in the study analysis, the efficiency of the management process was evaluated against the nature and level to which the respective project managers applied effective management skills and competencies. The next chapter focuses on the literature theories and models.

CHAPTER THREE

3. Theoretical and Conceptual Frameworks

3.1 Introduction

Chapter three offers an evaluation of existing models and theories in the topic. In this context, the chapter evaluates existing theories, models and frameworks that influence and impact project management practices, and in particular on the heterogeneous projects. The evaluation of the models and theories offers a background analysis through which the conceptual framework for the study was developed based on existing theories and models as well as in light of the existing gap in the management of heterogeneous projects in the energy industry.

3.2 Theories and Models

3.2.1 Hofstede's Cultural Dimension Theory

Hofstede's cultural dimensions theory is one of the founding theories in the management of cultures in the global market. Due to its focus on different cultural aspects, the theory has increased in both popularity and adoption in the management of diverse cultures. In its fundamental form, the theory argues that cultures vary from one another at a national level. The theory was developed through a cross-examination of IBM employees working across cultures in its international subsidiaries (Bakir, Blodgett, Vitell & Rose, 2015). The establishment and realisation of the study was that the international cultures varied from one nation to the next. The overall summation of the Hofstede cultural dimensions theory is illustrated in figure 3.1 below (Mazanec, Crotts, Gursoy & Lu, 2015).

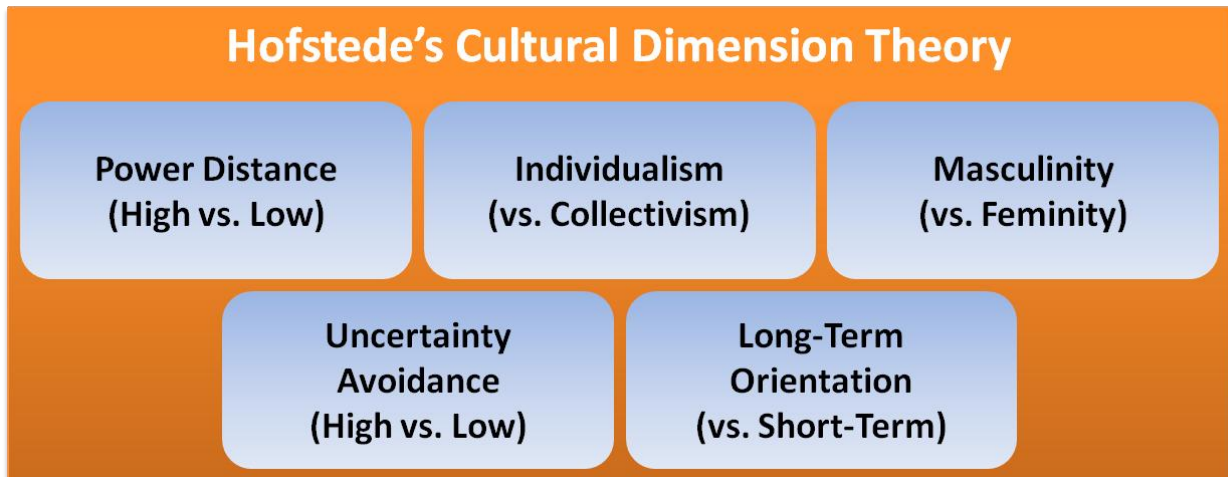


Figure 3.1: Hofstede's cultural dimensions theory

Source: Mazanec, Crotts, Gursoy and Lu (2015)

The above figure shows that Hofstede's model is based on five main pillars, or dimensions. The five dimensions represent and indicate how national cultures vary from one another. The first is the concept of power distance. This indicates the willingness by the leaders to share decision making as well as the team members' willingness to participate in the decision-making process. This has a direct impact and application in the case of the heterogeneous project management decision-making process. As such, the cultural background of the project managers and the team members influences their willingness to participate and share in the decision-making process. Additionally, different cultures have varying levels of uncertainty acceptance, which both limit and alter the magnitude of risk taking in heterogeneous projects. Therefore, while some project managers and team members would be willing to make risky decisions, some with high uncertainty avoidance cultures are bound to object to these decisions (Mazanec et al., 2015).

Thus, this model analysis argues that this is likely to emerge as a challenge and point of conflict between team members in heterogeneous project management teams. The second concept is the issue of masculinity and femininity where cultures, particularly those from the emerging markets and Asia, have a more masculine culture in that the traditional cultural orientation does not accept women and female leadership. If these cultures persist in project management teams, it is bound to have conflict impacts in heterogeneous project teams. Additional dimensions mentioned in the theory analysis are the concepts of

individualism and collectiveness. As such, collective cultures allow for teamwork and cooperation. On the contrary, individualistic cultures focus on individualistic task performance and execution with minimal cooperation in the task's executions (Bakir et al., 2015). Finally, the concept of long-term or short-term orientation impacts on the type of decisions developed in project management teams, by both the project managers and the teams. Thus, this analysis establishes that the concept of cultural variances and heterogeneity in projects is likely to impact on such projects operations leading to either failure or success in the long run.

3.2.2. Critical Chain Theory (CCT) and the Systems Theories

The critical chain theory was first introduced into the field of project management theory and practice in 1997 through a book titled 'Critical Chain' by Dr. Eli Godratt. The theory development was hedged on the earlier arguments developed by the theory of constraints (TOC). On its part, the theory of constraints in project management argued that in the execution of a project, there were often varied activities that required execution (Leach, 2014). However, the resources needed to execute the tasks are often committed or limited. Thus, the theory held out that in the process of executing such tasks, a constraints approach should be applied, supporting and prioritising the most critical activities and tasks in a project. The development of the CCT theory was based on the understanding that the longest chain of activities indicates the longest period that it takes to complete a project. In this case, through the CCT theory, there are three main categories (Leach, 2014).

The above review indicates that the first step in the implementation of the CCT theory is the planning stage. At this stage, the theory holds that there is the ultimate need to ensure that there is proper planning prior to commencing a project to ensure efficiency. Among the considered aspects in the planning process are the project and resources buffers. On one hand, the project buffer is the time allowance between the completion data for the last task in the critical chain and the project completion data. Through this time buffer, in the event of activities delays, the overall project completion time is not affected. On the other hand, a resource buffer is set around the critical chain activities (Kerzner, 2013). Thus, this ensures that in the event of variations in resource requirements and consumption, there is available buffer to cover these additional resource needs. Unfortunately, as Kerzner (2013) indicated,

the setting of the buffer time and resources adds to the overall project execution costs and timelines, risking project efficiency reduction. Thus, although an effective approach, the application of this theory would reduce the efficiency of projects in the market. Hence, this study evaluates how the principles underlying the theory application impact on the success or failure of energy projects in Oman.

The second and third levels of the CCT theory are the project execution and review stages, respectively. The point of focus in these two stages is the process of standardisation of the project management operations in the global market. Based on the above CCT theory analysis, this review argues that the theory can be objectively applied to overcome potential heterogeneity challenges. As discussed in chapter 2, project heterogeneity creates variances in perceptions and focus on tasks' execution (Kerzner, 2013). As such, there are bound to be variances in the perceptions and budgeting for resource usage and time taken. Thus, through the creation of a buffer on both resources and timelines, any heterogeneity variations in planning and expectations among the team members and leaders are harmonised in the market. Thus, the application of this theory can be applied to mitigate potential heterogeneity risks posed in planning and managing resources and execution of projects' tasks in the market.

The application of the CCT theory in project management is closely related to the systems approach theory. Although traditionally a scientific theory, the CCT theory has evolved to be applied in the management field, including in project management. The systems theory holds that, in management, the key decision makers should perceive the entire project as a system. Therefore, rather than focusing on decisions that are poised on single components and activities, the decision-making process should be geared towards the bigger picture (Kerzner, 2013). For instance, while a decision could be profitable and of merit to a single activity and task execution, it could also have negative implications for the entire project as a whole. This is the same scenario for decisions and regulations. As such, although some regulations, decisions and policies in project management could be favourable to a given stakeholders group, they would be unacceptable to others. Thus, the systems theory holds that in making decisions and execution activities, the executors should apply a holistic approach where the heterogeneity of all stakeholders involved is incorporated. Nevertheless, the adoption of this holistic and systematic approach has its limitation in that

it reduces the decision-making process efficiency. As such, due to the wide consultations involved in any project, the decision-making process is impeded. As such, this study evaluates how the systems approach theory was applied (Alexander, 2013).

3.2.3 The Chaos Theory in Project Management

The chaos theory has emerged as a new theoretical approach through which to manage organisations as well as projects. In its fundamental state, the chaos theory holds that there emerges changes and dynamism in any management situation. In essence, the operations in management structures are based on the execution of and conformance to existing rules and standards in the market. However, this is not always the case in today's highly dynamic market situation where changes and deviations occur. In most cases, the existing structures provide for punishments and consequences for deviating from the existing set rules and regulations in a management context, such as in project management. Nevertheless, through such limitations, there is reduced innovation and creativity. The theory arguments are evidenced through a series of studies; Hendy et al. (2012), for example, established that in organisations where policies and procedures were strictly followed, there was minimal creativity and innovation among the employees. Thus, the chaos theory tries to create a balance between creating coordination and operations standardisation as well as allowing for agility.

The concept of agility is of critical value in heterogeneous projects. In the case of heterogeneous projects, the team members and the project managers have diverse cultures and bio-demographic differences, as well as skills variances. Thus, this implies that their approaches to doing things and executing tasks are bound to vary (Hill, Jones & Schilling, 2014). As such, the use of strict operational guidelines would lead to conflicts as well as limiting the actualisation of some of the stakeholders' overall skills and capabilities. For instance, if the project management systems create strictly formal communication systems, this would limit the inputs of team members who prefer to interact and contribute through informal approaches and settings such as social interaction teams and groups (Svejvig & Andersen, 2015). Additionally, the setting up of strict project task execution procedures would limit new innovative and creative approaches to executing the tasks that could be less expensive or less time consuming. In this scenario, the use of the chaos theory emerges

as a valid alternative. The theory advocates for the provision of teams' self-rule as well as operational flexibility. As such, this review argues that the theory application can be a major approach and tool through which heterogeneous project challenges can be resolved through creating an accommodative space for all diversity and heterogeneity among the project stakeholders.

The risk of the theory application as Ahern, Leavy and Byrne (2014) noted is the elimination of standardised operations. As such, rather than reducing the diversity through standardisation, the chaos theory tends to increase the diversity. This has a negative impact on creating a norm in the established teams as each retains their individual perceptions and heterogeneity with no middle operational grounds. As such, the study evaluates how the use and application of the theory allowed for heterogeneity positive management and project success and how failure to apply it led to eventual conflicts and project failures in the Oman energy industry.

The application of this theory is aimed at evaluating the role of creating innovative and 'off the box' decisions allows for project heterogeneity success. Contrary to other decision making theories, the chaos theory allows for situation and context based decision enactment. As such, the study evaluates how the use and application of the theory allowed for heterogeneity positive management and project success and how failure to apply it led to eventual conflicts and project failures in the Oman energy industry.

3.2.4 The Game Theory

Game theory was first developed and introduced as a mathematics theory. The theory evaluated the concepts of probability and win-lose situations. In this case, the theory held that while as one end gained, there was an almost equal end losing on a proportional or disproportional value. However, this theory has evolved over the years to incorporate project management as a new application field. Its main application is in project decision making. As Pengcheng and Jin (2012) mentioned, a project execution operation involves not only the strategic planning goals and decisions, but also the short-term day-to-day operational decisions. In the making of such decisions, the managers have to formulate and make strategic sacrifices and contributions. This is related to the theory of bounded rationality in decision making.

The bounded rationality theory holds that, in making a decision, the decision maker should focus on the available information and the most rational outcome of the decision. As such, any decision that has the best possible output is one that has a high value and benefits to many stakeholders and involved parties, with minimal negative implications for fewer stakeholders (Ahlemann, El Arbi, Kaiser & Heck, 2013). This is the fundamental argument underlying the game theory application in project management. The theory allows the project managers and other stakeholders to make decisions that allow for maximum possible gains. This review argues that the application of this theory could either allow or reduce conflicts in heterogeneous projects. For instance, through game theory application, it is possible to incorporate the heterogeneous interests of a majority of the stakeholders (Pengcheng & Jin, 2012). However, the reduced focus on the decisions of the minority of stakeholders is considered a worthy sacrifice, but would reduce their effectiveness and efficiency in such projects. Thus, an evaluation of how the application of the game theory in project decision making allows for either success or failure of energy projects in Oman is undertaken in this study.

The use of the game theory is mainly pegged on the need to evaluate how understanding team heterogeneity is relevant to effective decision making. In this case, the researcher had to establish to what extent project managers who understood the diversity and heterogeneity issues adopted and developed theories, approaches, bounded rationality decisions were more effective than those without such understanding of their teams on the Oman oil industry projects.

3.3 Conceptual Framework

Based on the evaluated theoretical models, a framework was developed based on the developed conceptual framework that the study developed and executed. The conceptual framework is as illustrated in figure 2 below.

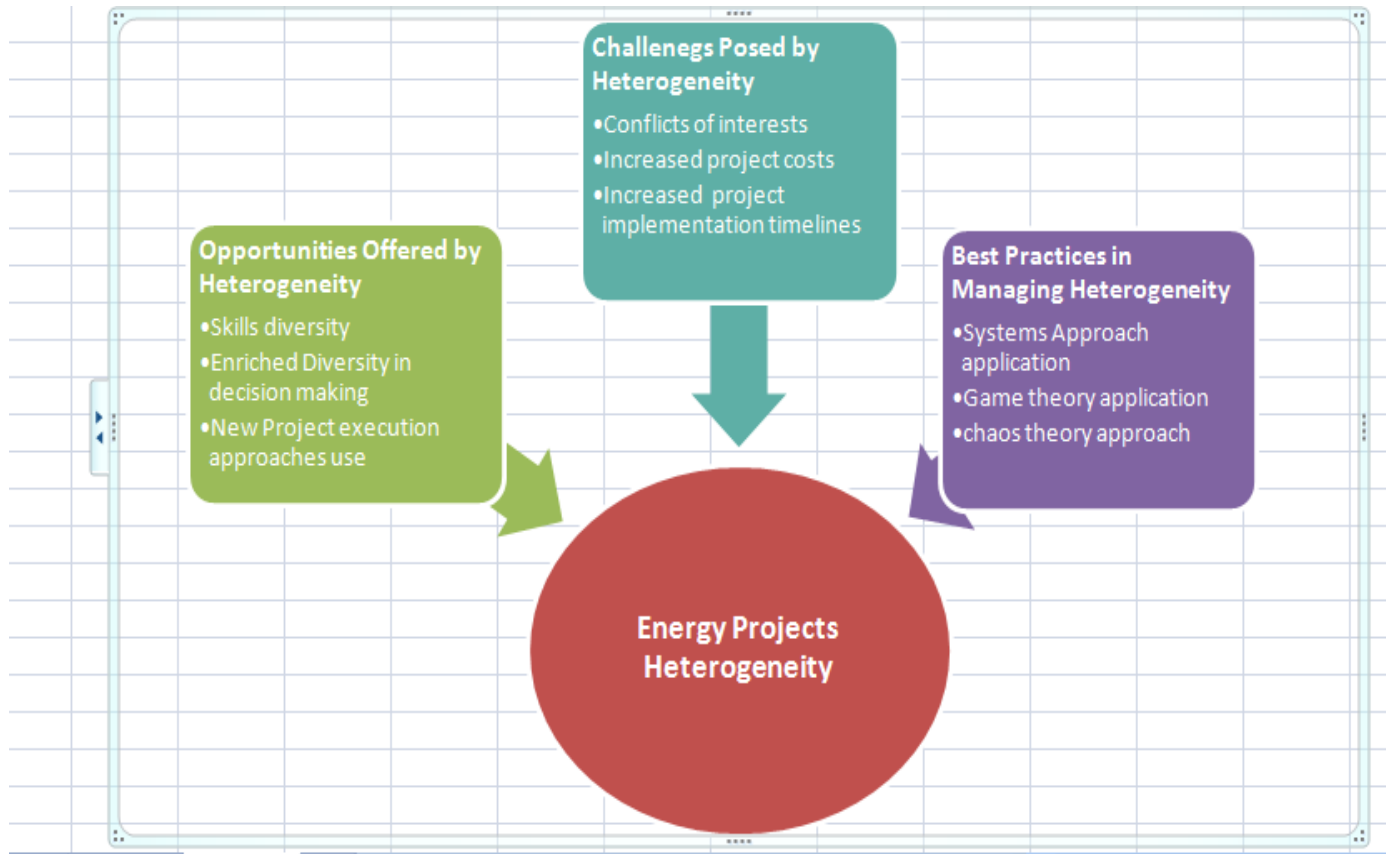


Figure 2: Study Conceptual Framework

Source: Summarised from the study

Based on the above analysis, the study focused on three main objectives as discussed below.

- i. ***An evaluation of opportunities offered by heterogeneous project teams:*** The focus of this evaluation was to explore and investigate the gains that Oman energy projects could derive from the use of heterogeneous project approaches. Theoretically, the established benefits included diversity and a wider scope in decision making, possession of diverse skills, and increased creativity and innovations. As such, the study evaluation focused on evaluating and establishing whether the mentioned theoretical benefits were achieved in the Oman energy industry projects.
- ii. ***An evaluation of the challenges presented by heterogeneous projects:*** The focus of this section was an evaluation of the underlying challenges posed by

heterogeneous projects. This was developed based on theoretical and empirical literature studies in chapters 2 and 3. The evaluated aspects in the industry included conflicts of interest, increased project costs, and implementation timelines.

- ***Evaluation of best practices in heterogeneous teams' decision-making process:***

The focus of this section was to establish and reveal fundamental practice applied across the globe and in the energy industry to effectively manage project heterogeneity. In this regard, the valuation focused on how the application of core theories such as the systems approach, and the chaos and game theories were effective as best practices. This included highlighting their negative implications in the market.

3.5 Summary

In summary, chapter 3 analysis offers a critical evaluation of the existing and applicable theories in heterogeneous projects. Among the evaluated theories are the systematic review theory, the critical chain theory, game theory and chaos theory. In particular, the chapter demonstrates how each of the theories can be applied as a best practice in heterogeneous projects management and related challenges. Consequently, based on these reviews and subsequent to empirical reviews in chapter 2, the chapter has developed the *conceptual framework* for the study. The framework focuses on three main areas –opportunities, challenges, and best practices–in heterogeneous projects.

CHAPTER FOUR

4.0 Research Methodology

4.1 Introduction

This chapter offers a descriptive analysis of the process through which the research study was executed. The focus of this chapter is to demonstrate the relevance, reliability and validity of the applied approaches in collecting and analysing the study data. The core sub-sections in the chapter include the research philosophy, research approaches, data collection method and type, as well as the sampling and tools used to collect the required study data.

4.2 Research Philosophy

A research philosophy is described as the guiding perception and world view in a research study. As Howell (2013) noted, there are different world views and research philosophies that can be applied in a research study. The most common philosophies in social science research are the positivist, interpretive, and mixed research philosophies. On one hand, the interpretive research philosophy holds that the social constructs surrounding a research phenomenon influence its approach and data analysis. Thus, the philosophy proponents hold that different social constructs impact on the phenomena under investigation; and these impacts need to be evaluated based on the research objective. Thus, this world view holds that socially constructed elements such as time impact on analysis of a phenomenon (Khan, 2011).

On the contrary, Kakkuri-Knuuttila, Lukka and Kuorikoski (2008) established that the positivist world view perceives a phenomenon as a static object. This allows for the elimination of any interference by external social constructs. In this world view, the proponents of this philosophy argue that the findings of a phenomenon remain constant regardless of the external social constructs. The proponents of this philosophy argues that the quantification of a phenomenon analysis allow for increased objectivity and scientific evaluation of a research area. The third research philosophy is the mixed research philosophy. This is a new philosophy that is raising in use and adoption among social science research projects. The mixed philosophy offers a middle ground would view (Kakkuri-Knuuttila et al., 2008). On one hand, it argues that a phenomenon can be evaluated through scientific statistical measures. However, the philosophy insists that in

some of the aspects, the social constructs surrounding a phenomenon impact on its nature, and on the type of data collected. Thus, the mixed philosophy allows for the use of scientific statistical data as well as qualitative social construct data (Dennis, Carspecken & Carspecken, 2013).

The study is grounded in the mixed research philosophy, based on the nature of the evaluated study objectives. On one hand, the study aimed to establish the existing impacts of heterogeneous projects on the Oman energy industry. In this case, the evaluation was pegged on the number of statistically successful and failed projects. In this objective, the evaluation was purely scientific and the opinions of the respondents had no impacts on the facts. Thus, the factual analysis was on whether the heterogeneous projects in the energy industry were successful or not, and no opinion or perception would change such factual aspects. On the other hand, the study sought to establish the perceived opportunities and challenges presented by the different heterogeneous projects within the energy industry. In the evaluation and establishment of these objectives, the study relied on the varying opinions and perceptions of the respondents. For instance, while one respondent would perceive an issue as a challenge, there is a likelihood the other one would not; or may even consider the same issue as an opportunity. This clearly indicates the influence of social constructs on the type of data collected. Therefore, through the use of the mixed research philosophy, the study ensured that all the required data to deliver on its objectives were acquired and used.

4.3 Research Approach

Research approaches are classified based on either the type of data collected or the process through which a research study is developed. Thus, there are two main categories of research approach – the quantitative vs qualitative, and the inductive vs deductive approaches (Pickering, 2008). This section describes and justifies the approaches applied for the study research process and data collection respectively.

4.3.1 Inductive vs Deductive Approaches

The main difference between the inductive and deductive research approaches lies in the underpinning objectives. While deductive research tests an existing hypothesis, the inductive research involves the development of a new hypothesis. In this regard, inductive

research employs data to create new knowledge that is modelled and summated into a new theory, model, or framework (Bryman, 2015). On the contrary, the deductive research approach aims at validating an already existing theory. For instance, it can be applied to evaluate whether a given theory applies and is valid across different industries, situations, cultures, and over a given period of time (Ormston, Spencer, Barnard & Snape, 2014).

This study undertakes an analysis of the theory of heterogeneity in project management. As illustrated through reviews in chapters 2 and 3, the application of the heterogeneity theory in project management has increased in popularity. This is grounded on the understanding that it allows for increased project opportunities, reduced challenges, increased success rates, and reduced failure instances. Consequently, the study aimed to establish whether these theoretical underpinnings in theory are applicable and valid in the Oman energy industry. Thus, the study adopted the deductive research approach format for testing and validating an already existing theory and model in energy industry project management.

4.3.2 Quantitative vs Qualitative Approaches

The quantitative and the qualitative research approaches vary depending on the type and nature of data collected for a study. On one hand, the quantitative research approach includes the compilation and collection of data that are quantifiable and can be measured and analysed statistically. The quantitative approach is hedged on collecting factual-based data that are not influenced by social constructs such as the respondents' opinions (Tesch, 2013). On the other hand, the qualitative approach includes the collection of data that are not quantifiable, and their collection and analysis are reliant on the respondents' and the researchers' social constructs. The use of this approach is hedged on the evaluation of new knowledge and study-based opinions and contributions that could not be evaluated through quantitative statistical measures. Recently, as Bryman (2015) noted, the need to bridge the existing gap between quantitative and the qualitative research approaches led to the emergence of the mixed/triangulation approach. This is a new approach that allows for the use of both qualitative and quantitative methods.

This study applied the triangulation method. First, quantitative data on the rate of success and statistics indicating successful or failed heterogeneous projects were collected and

analysed. Secondly, qualitative data on the respondents' opinion on the opportunities and challenges posed by heterogeneous projects were employed.

4.4 Research Method and Data Type Collected

In conducting research, a decision has to be formulated on the type of data required as well as the approach and process through which such data are to be collected. The decision is based on the required level of validity and reliability for the specific study scope and objectives.

4.4.1 Primary and Secondary Data

As Bryman and Bell (2015) described, there are two main types of data in a research study - primary and secondary. On one hand, primary data are collected directly from the original sources. These data are original and there is no similar existing data in literature. Although the use of primary data allows for new data to be included in literature, the time and costs incurred are often high, making them expensive and unachievable with minimal timelines and budgetary allocations. On the other hand, a secondary data source is the already existing literature. In this case, the data in existing journals, and other empirical studies and reports are used as raw data for analysis. The ultimate outcomes for using secondary data are based on adding value to the already existing data content. However, the risk of relying on faulty and un-credible sources reduces the validity and reliability of secondary data sources (Hair et al., 2015).

Based on an understanding of the above challenges, the study used the primary data sources as its main source of data for analysis. The decision to use primary over secondary data sources was based on the limited nature of the heterogeneous projects within the Oman energy industry. Although there are numerous available data on heterogeneous projects across the global industries, these forms of data are not available specifically for the Oman energy industry. Thus, this created the need for the study to source data directly from the Oman energy industry.

4.4.2 Data Collection Method

In the collection of primary data, there are alternative data collection methods. Wiid and Diggins (2009) listed these as surveys, case studies, observations, and focus group approaches. On one hand, the survey approach is used when the focus is a large population

base, while the case study approach is applied where the focus is on a specific scenario. Additionally, the observation approach is applied where the evaluated aspects are easily observable in the market. Finally, focus groups are used when there is the need to use and harmonise the perspectives of different persons and stakeholders.

Due to its complex nature, the study employed both the survey and the focus groups approaches. On one hand, the survey approach was used to collect quantitative data from respondents across the Oman energy industry project management roles. On the other hand, a focus group approach was used to collect the desired qualitative data on the opportunities and challenges posed by the Oman energy industry heterogeneous projects.

4.5 Research and Data Collection Tools and Sampling

Once a research study develops a focus on the research method to apply in collecting data, the second and subsequent stages are which sampling approaches to apply and which data collection tools to adopt. This section outlines the applied study sampling technique as well as the adopted data collection tools, with justifications for use.

4.5.1 Sampling Technique

In executing a study through primary data collection, Kothari (2005) argued that at times it is not possible to include an entire study population. Thus, in order to ensure that the used respondents in such a study are representative of the group under study, it is vital to adopt a relevant sampling technique. Theoretically, there are two main sampling techniques - probability and - non-probability sampling (Lim, 2013). On one hand, probability sampling uses the probability approach to select a study sample. The key merit for this technique is the elimination of the researcher's bias in selecting a study sample, as their role in the selection process is significantly reduced. However, probability sampling could generate an unrepresentative sample. On the other hand, the non-probability sampling technique empowers the researcher to select the study sample. However, the challenge is the potential for researcher bias (Kothari, 2005).

It was important to ensure that the used sample was representative of the different heterogeneous aspects mentioned in chapter 2 including skills, cultures, and biodemographic factors. Thus, a probability sampling approach was inapplicable as it would not guarantee this diversity representation. Hence, for both the survey and the focus group,

the study applied the non-probability convenience sampling technique. As such, only the respondents who were readily available and willing to participate in the study were used.

4.5.2 Data Collection Tools

One of the data collection tools employed was a focus group; this was due to the complex nature of the study. In this case, through the focus group, the researcher effectively explored the varied opinion of experts from across the industry. As Easterby-Smith, Thorpe and Jackson (2012) illustrated direct engagement among the experts not only allowed for the formulation of quality arguments but also informed and expert-based study conclusions. For the focus group, the study used Oman energy industry project managers from across cultures, skills, and bio-demographic diversities. The focus group had a total of 10 members and the researcher acted as facilitator. Pre-determined questions on opportunities and challenges posed by heterogeneous projects were posed for discussion and overall findings recorded for study analysis purposes. The focus group was held once for a period of 45 minutes. Due to movement and geographical challenges, it was executed virtually.

The second approach was the use of questionnaires through a survey approach. First, the use of a survey approach was based on arguments developed by Easterby-Smith, Thorpe and Jackson (2012); they contended that through a survey approach, there is the attainment of a representative sample that allows for findings generalisation. In the study, the use of a survey ensured that the findings were valid for generalisation to other industry settings. Secondly, the use of questionnaires allowed for the collection of quantitative data that other primary data collection methods such as interviews and focus groups could not collect. For the survey approach, closed-ended questionnaires were distributed in the industry. The target sample base was 150 respondents including both the team members and project leaders in the industry's heterogeneous projects. A five-point Likert scale was used for the closed-ended questions to ensure uniformity of findings and ease of analysis.

4.6 Summary

In summary, chapter 4 of this dissertation offers a description of the guiding principles and approaches for the study. As such, it demonstrated that the study was guided by the mixed research philosophy and employed the triangulation and deductive research approaches. Additionally, the study employed primary data collection methods through surveys and

focus groups. Finally, it was shown that the study applied the non-probability sampling approach to source a sample base for its questionnaire survey and focus group.

CHAPTER FIVE

5.0 Data Findings and analysis

5.1 Introduction

This chapter describes the findings of this study and their analysis. This is achieved through the use of figures, pie charts and tables for ease of understanding and clarity. In order to enhance the clarity of the discussion, the contents of the chapter were categorised into different sections - namely the respondent's background, the project failure/success perceptions, and the participants influencing a project success/failure, respectively.

5.2 Respondent's Background

The concept of the respondent's background in a primary study is critical. In this regard, the respondent's background helps in evaluating and accessing the reliability and validity of a given study sample base. Thus, it is only upon the respondents' background analysis that the reliability and response validity can be evaluated. In the evaluation of respondents' backgrounds, the study focused on the respondent's age, gender, years of residence in different countries, languages spoken, and identification with different cultures, respectively. The following findings were established.

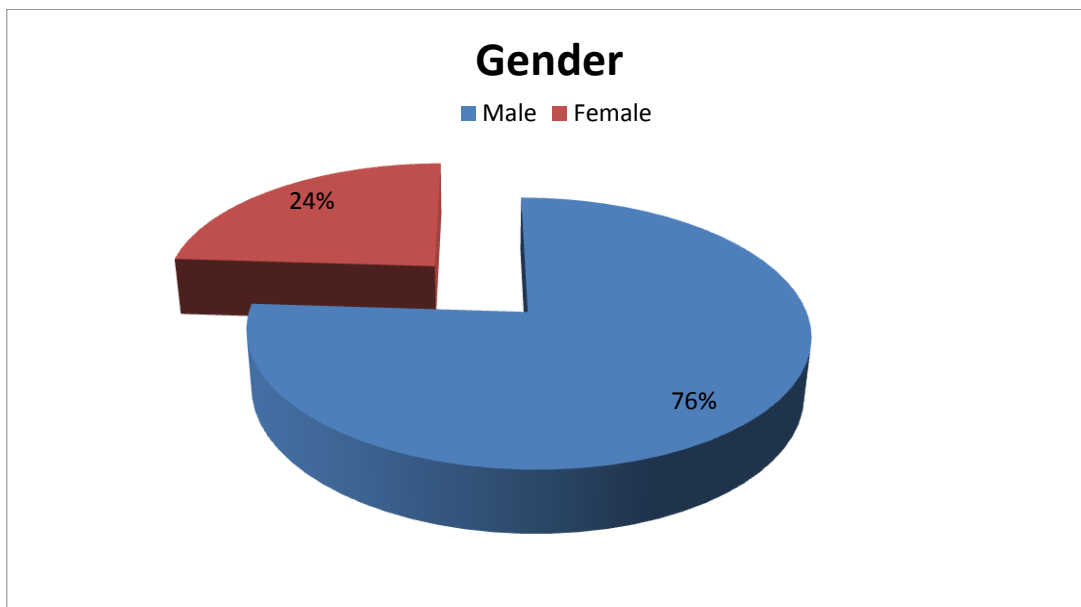


Chart 5.1: Respondents' Gender

Source: Summarised from the study

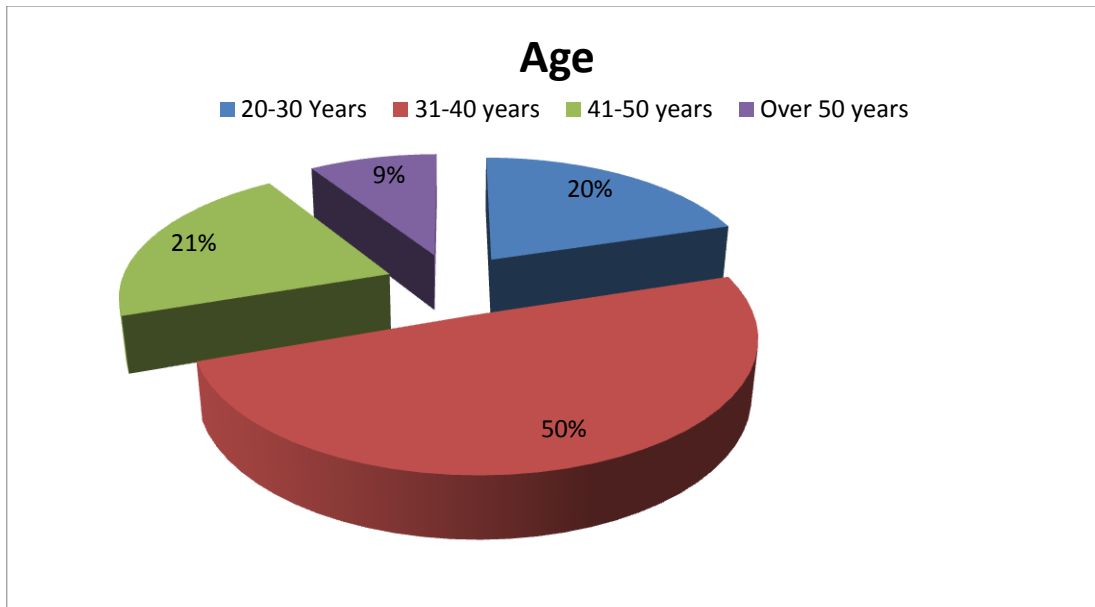


Chart 5.2: Respondents' Age

Source: Summarised from the study

Based on the analysis of charts 5.1 and 5.2, it is evident that the age and gender aspects of the study respondents were representative of the existing sample population. On one hand, the majority, 71%, were aged between 31-50 years. This is because this is the most economically viable age bracket that is involved in project management. The low representation of the lowest age bracket of 30 years and below was because most in this age group are in the initial stages of their careers, and lack the required experience on project failure and success elements needed in the study analysis. On the other hand, there are more male than female project management practitioners: this is represented by the high proportion of male respondents at 76% against the 24% female respondents.

Table 5.1: Respondents' Country of Origin

Country of Origin	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Oman	62	62.0	62.0	62.0
UK	7	7.0	7.0	69.0
India	16	16.0	16.0	85.0
America	2	2.0	2.0	87.0
Venezuela	6	6.0	6.0	93.0
Malaysia	1	1.0	1.0	94.0
South Africa	2	2.0	2.0	96.0

Germany	1	1.0	1.0	97.0
Italy	2	2.0	2.0	99.0
France	1	1.0	1.0	100.0
Total	100	100.0	100.0	

Source: Summarised from the study

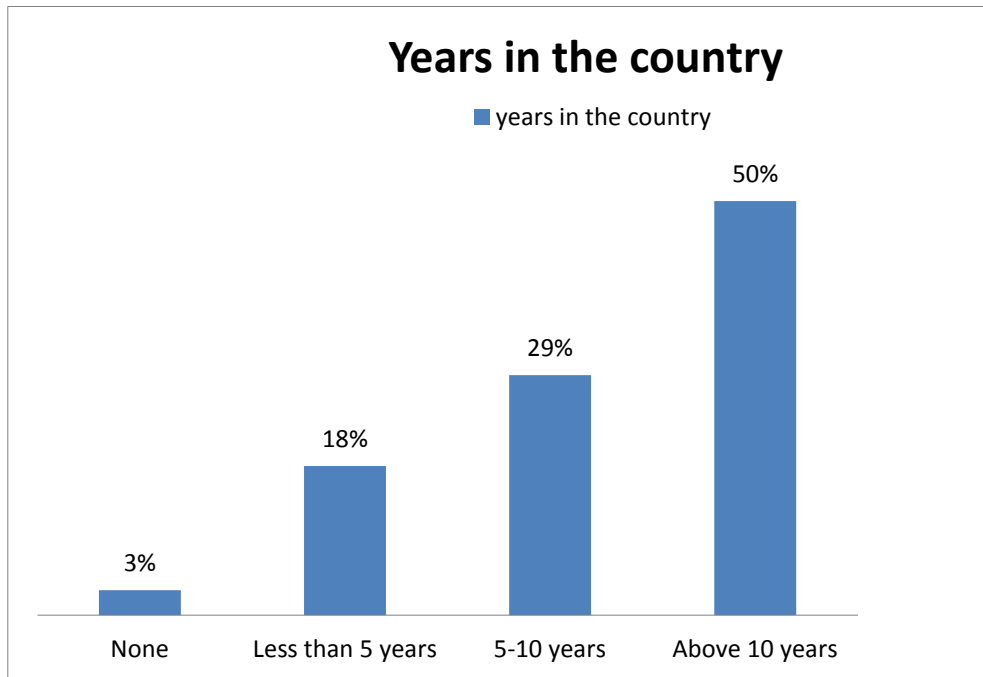


Figure 5.1: Years spent in the Oman

Source: Summarised from the study

Table 5.2: Spoken Languages

Languages					
	Frequency	Per cent	Valid cent	Per	Cumulative Per cent
1 language	8	8.0	8.0		8.0
2 languages	54	54.0	54.0		62.0
Valid 3 languages	34	34.0	34.0		96.0
Above 4 languages	4	4.0	4.0		100.0
Total	100	100.0	100.0		

Source: Summarised from the study

An overall analysis of the experience in terms of years in the country and languages spoken illustrated that the sample was experienced enough for inclusion in the study analysis. This indicated that the sample was effective and could be relied upon to offer accurate and unbiased study responses.

5.3 Project Failure/Success Perceptions

Descriptive Statistics

Table 5.3: Project Success/Failure Perceptions

	Minimum	Maximum	Mean	Std. Deviation	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Contributions to Business Goals	1.00	5.00	2.8700	.91734	-.137	.241
Contribution to Society	3.00	5.00	4.2959	.50173	.399	.244
Achieve Intended Outcomes	2.00	5.00	3.5800	.72725	-1.088	.241
Planned and Approved Scope	3.00	5.00	4.2424	.45380	.882	.243
Planned and Approved Time	4.00	5.00	4.7900	.40936	-1.446	.241
Planned and Approved Budget	4.00	4.00	4.0000	.00000	.	.
Planned and Approved Performance Criteria	4.00	4.00	4.0000	.00000	.	.

Project Leadership and Decision Making	4.00	5.00	4.2100	.40936	1.446	.241
Project Team	3.00	5.00	3.9200	.64636	.075	.241
Communication Risks	4.00	5.00	4.1600	.36845	1.883	.241

Source: Summarised from the study

The above section has evaluated the aspects, reasons and attributes that the respondents cited most as the causes of project failure/success reasons in their respective experiences.

The analysis process relied on the use of a five-point Likert scale, where the median value was 3. The variables means were evaluated and analysed in relation to being above or below the median value 3.

Descriptive Statistics

Table 5.4: Project Participants

	N	Minimum	Maximum	Mean	Std. Deviation
Client	97	1.00	5.00	3.8144	.99300
Project Manager	99	1.00	5.00	3.8283	.79591
Other Participants	96	1.00	5.00	3.0729	1.23327
Internal Environment	97	1.00	5.00	3.3093	1.24466
External Environment	96	1.00	5.00	2.8229	1.08574
Politics	96	1.00	5.00	2.9479	1.25966
Culture	99	1.00	5.00	3.0707	1.16280
Benchmarking	100	1.00	34.00	3.1900	3.26814
Objectives Clarity	98	1.00	5.00	3.2347	1.18235
Customer Satisfaction	98	1.00	4.00	3.5204	.73540
Communication	94	1.00	5.00	3.4894	.92451
Knowledge Sharing	97	1.00	5.00	3.3402	.97774
Human Resources	98	1.00	5.00	3.5714	1.02545
Planning and Management	98	1.00	5.00	3.3367	1.12097
Contractual Agreements	100	1.00	5.00	3.8600	.84112

Project Leadership	99	2.00	5.00	3.8889	.78101
Project Teams	100	1.00	5.00	3.3100	.96080
Risk Managements	97	1.00	5.00	3.4124	.97631
	75				

On one hand the analysis established that out of the maximum value 5, a majority of the attribute variables had an overall mean value of over 4. They included contribution to society, planned and approved scope, time, budget, performance criteria, and leadership and decision making. The above variables had a less than 1 standard deviation showing that there was a minimal discontenting response by the majority respondents.

On the average influence category were the variables with an average mean value of 3 including both the achieving of intended outcomes as well as the role of project teams. Similarly, the variables had a low standard deviation value of less than 1, implying a low variance between the offered responses. Finally, the study established that the concept of either contributing or not contributing to the overall business goals played an insignificant role in influencing the success or the failure of such projects.

5.4 Project Participants Influencing Project Success/Failure

Source: Summarised from the study

The analysis in this section evaluated the key project participants who play a role in the success or the failure of a project. In this case, the focus was to evaluate the level of influence and contribution that each of the participants has on project success or failure, respectively. This was achieved through a five-point Likert scale. As such, with a minimum value of 1 and a maximum value of 5, the median value for the study was 3. Thus, any obtained mean value for the study that was above the median value 3 was considered to have significant influence on project success or failure. This is in contrast to any mean of below the median value 3, which was considered to have an insignificant effect on project failure or success.

In the analysis, as indicated in table above, regarding influence, four of the participants –the client, the project manager, the overall project leadership and the contractual agreements – were identified as the most influential variables. In this case, for all the four mentioned

variables the mean value was over 3.8 with standard deviations of less than 1. This meant that the variance in perception between the many participants was minimal. As such, the finding was that a large proportion of the respondents believed that the four participants were the most critical and influential towards the success or the failure of a project.

In addition, the study established that although for some of the participants in project management the mean value was over 3, the standard deviation was large, at over 1, leading to an overall least mean possible of below the median value 3. Among these stakeholder aspects that had their least possible mean values at below 3 included other participants, internal environment, culture, benchmarking, objectives clarity, human resources, planning and management, respectively. This means that although a majority was of the view that they had a significant influence on the failure or success of projects, this perception was not shared across the sample base. As such, a significant number of the respondents held the view that the stakeholder aspects played insignificant roles, leading to the established high standard deviation value of above 1.

Finally, the study analysis established that two of the evaluated stakeholder aspects had a below average mean. This showed a majority agreement that the participants' political status and the external project environment had minimal and insignificant influence on the success or failure of the respective projects.

5.5 Summary

In summary this chapter offers a number of findings. They include:

- The used sample base was reliable and credible. This was because it represented the actual population diversity required.
- Other than the aspect of contributing or not contributing to overall business goals, the study established that the other evaluated variables on perception had an above average impact on the success or failure of a project
- Politics and external environmental context as components of project participants have a below average influence on project success or failure. This meant that they are of no significant value to enhancing project success or in causing project failures.

CHAPTER SIX

6.0 Discussion of Findings

6.1 Background of Overall Aims

The overall study aim was to evaluate the role and impacts of projects' heterogeneity on the success or failure of energy projects in Oman. In this regard the deliverable of the study was to establish if the existence of project heterogeneity offered opportunities for energy projects success, or if it presented challenges that led to energy projects failure in Oman. The overall end aim was to develop a cost-benefit analysis of project heterogeneity to assess which of the two costs and benefits - exceeds the other.

In order to deliver on the presented overall study deliverables and aim, specific research questions were posed.. The questions are:

- i) What are the existing aspects of p heterogeneity in the Oman energy industry projects?
- (ii) What is the relationship between project heterogeneity and success or failure rates?
- (iii) What unique opportunities and challenges are associated with heterogeneous projects in the Oman energy industry?

6.2 Aspects of Projects' Heterogeneity

The first study question was to evaluate the existing forms of heterogeneity in projects. In this case, the question sought to address and create a unified approach. The understanding was that the term 'heterogeneity' would lead to different perceptions among respondents and the audience. Therefore, through clearly stating the forms of heterogeneity covered, the study ensured that there was a uniform understanding and perception of heterogeneity of projects, thus developing a proper study analysis background by eliminating potential misunderstandings in the analysis process.

In addressing the issue of heterogeneity in projects, the study posed questions to the respondent on the common heterogeneity aspects in projects. In this case, the respondents were offered a series of factors and aspects in projects, and asked which among them represented heterogeneity in energy projects in Oman. The posing of this question was based on the understanding that heterogeneity of the Oman energy projects would vary from that of other global energy and non-energy projects. Analysis of the responses established that there were different forms of project heterogeneity. One of them was cultural heterogeneity. Of the sampled respondents, it was clear that they all had diverse nationalities. This ranged from the UAE, Oman, Europe, and the MENA region, among other regions. Consequently, this implied that the Oman energy project teams represented huge diversity in terms of cultures of the respective participants. Secondly, the study analysis established that the Oman energy projects' heterogeneity was evident through the applied leadership approaches. To this effect, the respondents stated that in the different projects they have participated in the past, the structures and the project managers' and coordinators' leadership approaches were different. Therefore, the study concluded that the main forms of heterogeneity in Oman energy projects were in terms of culture and leadership diversities.

The above study findings reflect of the evaluated and discussed literature on project heterogeneity. On one hand, the aspect of participants' cultural diversity could be explained through Hofstede's cultural dimensions. In its analysis, the theory holds that diversity in cultures at the national level can be demonstrated through five key dimensions. They are collectiveness/individualism, risk taking, masculinity/femininity, long-term/short-term perception, and power distance. In this case, the different dimensions lead to diversity in the decision-making process and participation exercises in teams. The second similarity of the study findings was in relation to diversity in personal traits. In this case, the study findings established diversity in terms of gender and age. However, it did not clearly demonstrate diversity in terms of the decision-making process or preferences among team members. The reason for the variance between the literature and the study findings can be explained through two aspects. First, the study was static, in that it did not evaluate the behaviours of the respondents sampled. In this regard, studies such Rolls (2014) and Dweiri

and Kablan (2006) which demonstrated that respondents had heterogeneity in their decision-making process and approach were longitudinal, allowing for the decision-making process observations. On the contrary, the study on heterogeneity in Oman projects was time-bounded, thus denying it the ability to observe respondents' traits. Secondly, the variance could be a result of the low sample size, which limited the scope of the potential findings observed in the study analysis.

6.3 Relationship between Project Heterogeneity and the Success/Failure of Projects

The study examined the existing relationship between project aspects of diversity and heterogeneity that accrue from leadership and cultural heterogeneity and project success/failure. The questions posed were to establish an empirical analysis and basis through which the extent of influence, nature of influence, and the relationship form were exhibited. The main deliverable aspect of the study was to establish key heterogeneity aspects that had more impact and influence on Oman energy projects than others.

The research question was addressed through the use of a Likert scale ranking approach. In this regard, the study listed a number of the heterogeneity aspects in the Oman projects and asked the respondents to rate their influence on project success/failure. The five-point Likert scale had a median value of 3. Thus, any score over 3 was considered as having an above-average influence, while any score below 3 was considered as having a below-average influence. The study established that a majority of the resulting heterogeneity aspects from culture and leadership differences had significant impacts on the success/failure of the energy projects. For instance, the aspects of leadership and decision making, which is a heterogeneity aspect emanating from the use of different leadership approaches, had a mean of over 4, indicating a high level of influence. Similarly, aspects such as performance tracking and evaluation criteria, which are equally closely hedged on the level of cultural heterogeneity in a project, had a huge impact on the success/failure of Oman energy projects. However, some heterogeneity aspects were shown to have

insignificant influence; these included the diversity of the relationship between the project goals and the overall business goals.

The findings from this study are supported by the literature review. On one hand, the reviews undertaken by Ojiako et al. (2014) and Dinsmore and Cabanis-Brewin (2011) underscored the role and contribution of a decision maker to a project success or failure. In this regard, the existing literature illustrates that the decision-making approach, its nature, level of including other members, external perceptions, and overall quality determines whether a project's triple bottom-line goals are achieved. In this context, a project's triple bottom line is described in terms of costs budgeted for, timelines scheduled for completion, and the quality of expected deliverables. To this extent, the decision-making process determines the rate and extent to which these goals are achieved. Thus, the realisation that the project decision-making process has a very significant influence on project success is in relation to the existing literature. However, the study findings depict some variances from the existing literature. This is relation to the finding that the relationship between project goals and the business goals has no influence on project success. On the contrary, Hwang and Ng's (2013) findings can be used. The studies established that the extent to which a project's overall goals were aligned and integrated with a business's overall goals influenced the project success as it influenced the management decision to allocate funds and budgets for such projects. This variance could be due to the fact that, firstly, the study sample was small and secondly, because the respondents had not participated in different projects. The fact that a majority of the respondents had only participated in a few projects at the operational level and not the strategic level indicates the lack an understanding of the strategic relationship between projects and business organisational goals.

6.4 Opportunities and Challenges Associated with Oman Energy Products

The third and final research objective was an evaluation of the nature and extent to which the existing heterogeneity offered opportunities for projects' success, or posed challenges leading to project failures. This research question was posed to develop a cost benefit

analysis of the heterogeneity aspects of projects, to form the basis for deciding whether project heterogeneity in Oman energy projects should be encouraged or avoided. The question was addressed through evaluating the impact of different heterogeneity aspects on project operations, and findings were developed via a five-point Likert scale analysis and a median value of 3. On one hand the study established that some of the merits of projects' heterogeneity were increased decision-making quality, creativity and innovation; conversely, the study concluded that some of the challenges included slow decision making and increased risks of conflict among the respondents. The above study findings were in congruence with and offered a reflection of the existing literature.

First, reviews developed by Chipulu et al. (2016) and Bredillet, Yatim and Ruiz (2009) showcased the merits of projects' heterogeneity. This was in relation to teams' personal traits diversity, as well as cultural diversity and heterogeneity elements. The studies established that heterogeneity in teams allowed for creativity and innovation. This had direct impacts on increasing projects' quality, reducing overall costs through adoption of innovative practices and reducing project completion timelines. Thus, as illustrated in literature, the existence of projects' heterogeneity allowed for the attainment of the projects' triple bottom-line goals. Similarly, reviews such as that by Janssen et al. (2015) indicated that the risk of conflict was rife in heterogeneous projects. However, this study review established that besides the challenges of conflicts, there were alternative ways to address such issues. This led to the ultimate finding that the existence of heterogeneity offered more merits than challenges to Oman energy projects.

CHAPTER SEVEN

7.0 Conclusions

7.1 Relevance of the Topic

The topic is of critical value and importance to the Oman energy industry. Over the years, the Oman economy has relied on the energy sector as the largest single industry contributor to the GDP. Therefore, ensuring effectiveness in this industry is critical to the Oman economy. Over the last decade, the use of projects in the energy industry has increased. This is due to the perceived merits of projects. Unfortunately, many of the projects have failed to deliver on their expected triple bottom lines and overall goals. Arguments such as those developed by Schibi (2014) and Dinsmore and Cabanis-Brewin (2011) pointed to the possibility of projects' heterogeneity and diversity in nature as a major cause of the failures. This flagged the need to evaluate how the projects' heterogeneity aspect impacts on projects' success, and eventually the process through which such heterogeneity aspects can be managed for long-term project success.

Therefore, the study set three main study objectives. The first objective was an evaluation of the forms of heterogeneity evidenced in Oman energy projects. This ensured that the concept of heterogeneity was clear in the subsequent analysis process. Secondly, the study evaluated the relationship between project success and failure to the aspects of heterogeneity. Finally, once the relationship was established, the study evaluated the cost-benefit analysis of heterogeneity, evaluating if it causes more challenges that lead to project failures or whether it offers more opportunities which, if exploited, could enhance projects' success well into the future.

7.2 Overall Study Findings

The study established a number of findings in relation to the posed study questions and objectives. First, it established that heterogeneity does indeed exist in Oman energy projects, and that, in this context, the main forms of heterogeneity can be classified into

two main categories – *cultural and personal* or *leadership-related* heterogeneity aspects. On one hand, in relation to the cultural heterogeneity aspects, the study established that these included decision-making perceptions, power distance, long-term/short term perceptions, and willingness to participate in teams. On the other hand, the personal and leadership-related heterogeneity aspects included gender and age groups.

Second, in relation to the existing relationship, the study established that there existed direct a relationship between heterogeneity in projects and project failure/success. Finally, the analysis established that Oman energy projects' heterogeneity benefits and merits exceeded the posed challenges. As such, it developed the conclusion that although there are clear heterogeneity challenges such as team conflicts, the merits, such as innovation, creativity, and increased decision-making quality, are relevant. This led to the ultimate study conclusion that projects' heterogeneity in the Oman energy industry was a necessity for the achievement of projects' triple bottom lines.

7.3 Distinctive Contribution of the Paper

The core distinctive contribution of the paper is the conclusion that heterogeneity is an added advantage in projects. In this case, the study findings dispute earlier assertions that heterogeneity leads to management challenges that yield eventual project failures. On its part, the analysis evidences that there are indeed a number of merits of heterogeneity; these include increased innovation, creativity, and quality decision making. Additionally, the study established that although there is the risk of conflicts, heterogeneity provides surplus merits and as such should be encouraged in Oman's energy projects.

7.4 The Academic and Managerial Implications

The above findings have far-reaching academic and managerial implications. First, for academics, it bridges the existing literature. As illustrated in the literature review, a majority of the studies were developed in the Western market. Only a few of the studies focused on the GCC nations and to the best of the author's knowledge, none focused on the

Oman market in particular. Therefore, the study findings served as a critical approach to bridge the existing literature gap. In this context, the study concluded that the impact of projects' heterogeneity in Oman was similar to the global market heterogeneity in terms of the forms of heterogeneity present, the relationship, and the value of the heterogeneity features. This leads to the conclusion that projects' heterogeneity is a global phenomenon that is not affected by or dependent on industry, region, or organisations.

Secondly, the study's conclusion and findings have additional implications for managerial approaches. First, the study evidenced that heterogeneity in projects is an added advantage. The direct impact of this finding is that project managers and coordinators will change their perceptions. As such, rather than trying to reduce heterogeneity at project formation, they will seek to increase and diversify the teams. In this case, it is expected that future energy projects in Oman will have more diversified and heterogeneous teams in terms of culture, gender, age, skills, and orientation. This is expected to culminate in the creation of a managerial preference shift from homogeneous to heterogeneous energy project teams. The second managerial implication is for leadership and decision making. In this case, the finding that heterogeneity allows for creativity and innovation can positively change the managers' decision-making process. In the current situation, the decision-making process is mainly centered and thus the team members have minimal inputs in the decision-making process. However, from the findings, it is expected that managers will realise the potential and value within heterogeneity. Therefore, this will lead to increased participation of team members in decision making in future projects.

7.5 Future Research Opportunities

This study focused on the evaluation of the project management practitioners' heterogeneity on energy projects' performance. However, there is still a great deal that needs to be addressed in this context. First, future studies should seek to address heterogeneity aspects that are context- and industry-based rather than those that are practitioner-based. Through such an investigation, it would be possible to develop a general conclusion on whether all forms of heterogeneity are beneficial or whether some are

beneficial while others are not. Secondly, future research should focus on detailing the extent and level to which project practitioner heterogeneity enhances project success.

7.6 Limitations of the Current Work

Although the study delivered on its overall goals, it had its share of limitations that need to be considered when analysing the findings and relating these to the already existing literature. One of the key limitations of the study was that it was conducted over a specific period of time. Thus it was a cross-sectional study. However, this limited its ability to evaluate the behaviour and trends in aspects such as decision making, leadership styles, and team playing aspects, respectively. This implies that the study findings' scope does not include or cover such aspects that require a longitudinal study approach. The second limitation of the study was the sample base used, of 100 respondents. This sample could have been small enough to showcase the context and nature of heterogeneity in Oman energy projects.

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