RESEARCH COLLABORATION IN PUBLICLY FUNDED UNIVERSITIES: EXPLORING THE OPPORTUNITIES AND CHALLENGES FOR COUNTRIES IN THE GULF COOPERATION COUNCIL
(CASE STUDY OF SQU-UAEU RESEARCH FUNDING SCHEME)

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Saif Said Al Sinani

Global Development Institute (GDI)

School of Environment, Education and Development

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List of Acronyms and Abbreviations

AP:	Associate professor is an academic position between assistant professor and a full professorship. It is equivalent to a Reader position in the UK academic ranking system.
AS:	Applied Sciences include the disciplines of science that applies existing scientific knowledge to develop more practical applications, like technology or inventions
ATP	Advanced Technology Programme
BS:	Basic Science seek to discover new knowledge and information without the primary concern of how the knowledge they create might
BTTC	BRICS (Brazil, Russia, India, China and South Africa) Think Tanks Council
CERN	European Organization for Nuclear Research
CIO:	Central Informatics Organisation in Bahrain
CSB:	Central Statistical Bureau in Kuwait
EC:	European Commission which is the executive body of the European Union responsible for proposing legislation, implementing decisions, upholding the European Union treaties and managing the day-to-day business of the European Union
EU:	European Union is a politico-economic union of 27 member states that are located primarily in Europe
ERA	European Research Area
ESF	European Science Foundation
EUCE	EU Centres of Excellence program
FP:	Full Professor which is the highest academic rank at universities and other institutions of higher education in parts of the world
GCC:	The Gulf Cooperation Council

GDP	Gross domestic product
HE:	Higher Education
HSS:	Humanities and Social Sciences include a wide range of disciplines, including Economics, Education, History, Archaeology,
ICT:	Information and communications technology
IDRC	International Development Research Centre
ISTPP	International Science and Technology Partnership Program
IUCRC	Industry/University Cooperative Research Centers
KAU	King Abdul-Aziz University
KAUST	King Abdullah University of Science and Technology
KFAS	Kuwait Foundation for the Advancement of Sciences
KFUPM	King Fahd University of Petroleum and Minerals
KSA:	Kingdom of Saudi Arabia
KSU	King Saud University
KUNIV	Kuwait University
LC:	Lecturer is an academic position after earning a Doctoral degree and sometimes after several years of holding a postdoctoral researcher position. It is usually below the position of associate professor and is equivalent to the rank of assistant professor.
MoU:	A memorandum of understanding
NCSI:	National Center for Statistics and Information in Oman
NIST	National Institute of Standards and Technology
NSF:	National Science Foundation in USA
OCED:	The Organisation for Economic Co-operation and Development
OVSL	Oman Virtual Science Library project

PFU:	Public funded university which is fully owned and funded by the governments for all their activities, exist for non-profit objectives and follow the rules and regulations of the funding governments in all aspects
PI:	Principal Investigator is the holder of an independent grant administered by a university and the lead researcher for the grant
QSA:	Qatar Statistics Authority
R&D:	Research and development and it is a general term for activities in connection with corporate or governmental innovation
RA:	Research Assistant is a researcher employed, often on a temporary contract, by a university or a research institute, for the purpose of assisting in academic research.
RCUK:	Research Councils UK
SIDCA	Sweden International Development Cooperation Agency
SQU:	Sultan Qaboos University
SQU-UAEU	A joint funding scheme launched in 2003 by both Sultan Qaboos University and United Arab Emirates University to fund collaborative research activities.
STC	Science and Technology Centers
UAE:	United Arab Emirates
UAEU:	United Arab Emirates University
WoS:	Web of Science online data base
QU	Qatar University
UoB	University of Bahrain

Abstract

Collaborations between academic researchers and institutions provide opportunities to utilise available resources, improve infrastructure, enhance research quality and productivity, solve worldwide and regional research problems and strengthen academic networks. Given the benefits of research collaboration and the limited amount of collaborative research activities in the Gulf Cooperation Council (GCC) countries, the aim of this study is to explore the opportunities and challenges of collaborative research activities between the publicly funded universities (PFUs) in the GCC countries. To date much of the research in this area has been western-centric and there is the need to expand the understanding of the subject to other contexts, including the GCC. This study adopted the qualitative research paradigm by using the SQU-UAEU funding scheme established between Sultan Qaboos University (SQU) in Oman and the United Arab Emirates University (UAEU) in United Arab Emirates (UAE) as a case study to explore the phenomenon. In all, thirty one respondents (23 Principle Investigators and 8 Decision Makers) were interviewed. The case study was supported by secondary data extracted from relevant bodies, published data in international databases (i.e. SciVal software & Scopus), as well as the final reports of the joint funded projects.

In regard to academic researchers' motives, an analysis of the findings of the interviews uncovered fourteen motives behind their participation, in which they are grouped into four main categories: getting access to economic resources, getting access to scientific and technical human capital, enhancing quality, productivity, and efficiency and social related motives. The findings of this study reveals that research collaborations has improved research outcomes in the region by enhancing research productivity and quality of research produced, improved the utilisation of existing resources, develop management skills as well as improved the culture of collaboration in the GCC region. These notwithstanding, the findings also unearthed twenty main hurdles affecting joint research projects funded by the SQU-UAEU funding scheme. These hurdles were grouped into four categories based on their relationships: personal related factors, institutional related factors, external stakeholders' support related factors, and national level related factors. Moreover, the findings also indicated that opportunities are ripe to further develop regional collaborative activities between PFUs in the region. The research institutions and PFUs in the region can further complement each other by providing different research facilities, economic resources and human and technical research capital to achieve this objective. Additionally, there has been substantial regional investment in establishing higher education (HE) research institutions and centres, as well as the development of human resources and the allocation of various national levels of funding for research and development activities. These have provided strong incentives to develop and enhance collaborative research activities between the regional research institutions. To further improve regional research productivity, quality and maximise the utilisation of these available resources, the study recommends that policy makers in the region should strive to remove financial and administrative hurdles by making HE institutions more autonomous and also develop strategies and policies to enhance regional research collaboration. These could include establishing a regional body to foster research collaboration through funding programmes, joint research grants, centres of excellence, graduate scholarships, and other incentive systems, as well as regional scientific events to promote research. GCC countries also need to develop regional research priorities and improve both institutional and national level research culture.

Declaration

I declare that no portion of the work referred to in this has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

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Dedication

I dedicate this thesis to:

1. My parents who nurtured me and for reasons words cannot express; and
2. To my beloved wife and children who accompanied me to the UK to pursue the PhD programme. I hope to see you all obtain such academic heights.

CHAPTER ONE

1 INTRODUCTION

1.1 Introduction and Background

Evaluation of university research performance is of high importance to strategic decision-makers across most of the developed world (Geuna and Martin, 2003). Universities today are expected to be efficient in utilising their resources and to have their research outputs maximised (Massy, 1996; Geuna and Martin, 2003). Total funds invested in research and development (R&D) in all industrialised countries have grown rapidly and universities worldwide, aware of the demand to improve research performance, are striving to satisfy their national research requirements in order to justify public funding (Salter and Martin, 2001). Many initiatives have been implemented, mainly to utilise the resources and maximise the productivity and the quality of research. Research collaboration across disciplines and between academic scientists and research institutions is one of the most strategic instruments and researchers are highly encouraged to collaborate in their research activities. Boekholt et al. (2009) state that the policy attention for international research collaboration is growing rapidly in all countries. For example, the European Union (EU) Framework Programs (FPs) - mainly the Seventh FP (FP7) – allocated more than Euro 51 billion for collaborative research projects. The fund mainly aims to support every form of research activity carried out by numerous research bodies for multinational cooperation and to either achieve or strengthen leadership in important scientific and technology areas (CORDIS, 2013). Examples of other bodies providing funding for collaborative research projects are: the Economic and Social Research Council, the Arts and Humanities Research Council and the British Academy in the UK; the Australian Research Council and the Australian Cooperative Research Centres in Australia; the Collaborative Research and Development (CRD) program funded by the Natural Sciences and Engineering Research Council of Canada (NSERC); and the National Science Foundation (NSF)-funded Engineering Research Centres and National Institutes of Health (NIH) in the USA respectively.

Similarly, the Gulf Cooperation Council (GCC) countries – Bahrain, Kuwait, Oman, Qatar, Saudi Arabia (KSA), and the United Arab Emirates (UAE) – have been investing substantial funds into building their national R&D capacities during the last two decades. The majority of these investments are provided through the publicly funded universities (PFUs) in these countries. Governments in the region face high pressure from other sectors such as education and healthcare and need to make strategic decisions to improve the future economic lives of their people. Given that these R&D investments are at national levels, and given the existing cooperation between these countries in various other political and economic aspects, it is time to enhance research collaboration to a higher, regional strategic level. The secondary data collected (see chapter 3) during this inquiry indicated that limited amounts of joint research activities exist between these countries. Most of the current level of research collaboration happens between researchers in PFUs, and in particular at the individual researcher level. There have only been a limited number of initiatives (at a bilateral level) to establish formal regional research collaboration among the different PFUs, mainly to best utilise the available resources and improve research outcomes. For example, among these successful initiatives there is a formal research collaboration funding scheme (SQU-UAEU funding scheme) between the Sultan Qaboos University (SQU) in Oman and the United Arab Emirates University (UAEU) in the UAE. A joint research collaboration committee with members from both universities was established in 2003 to foster research collaboration between academic researchers in the two universities, in order to utilise the existing resources and improve the linkage, productivity, and quality of research. This committee has approved some collaborative research projects between researchers from both universities since 2004 and these projects were from different discipline backgrounds and mainly address issues related to both countries, as well as other basic research and global research problems (SQU, 2013).

The GCC countries share the same geographical landscape and face similar social, political, and economical research problems, and have many other similarities in terms of language, religion, and culture. Given those shared backgrounds and the various advantages achievable through collaboration, such as enhancing research productivity, knowledge transfer, or research efficiency and quality, this study examines the opportunities and challenges created through research collaboration between PFUs. The study will focus on the research collaboration between PFUs as they are the dominant higher education (HE) institutions in the region. These universities have many similar features such as their organisational structures, public research systems, and funding sources. The collected secondary data indicates that most of the research produced by the region was as a result of research output from these universities.

1.2 The Rationale behind the Research

The main aim of this study is to explore the opportunities and challenges of research collaboration activities between the PFUs in GCC countries. To date, much of the research in the area of research collaboration has been western-centric and there is a need to expand our understanding of the subject to other contexts such as the GCC context.

In addition, and given the various benefits of research collaboration, there is a remarkable lack of studies on research collaboration between publicly funded institutions such as universities and the effects of their institutional structures and surrounding internal or external environments on such collaboration (Heinze and Kuhlmann, 2008). Among this limited number of such studies is that of Laudel and Gläser (1998), who analysed the function of institutional structures and boundaries in the development of research collaboration within German public collaborative research. Ten years later, Heinze and Kuhlmann (2008) investigated research collaboration in the nascent field of Nanoscience within the greatly fragmented German public research system, in which they identified governance structures that either maintain or impede researchers' efforts to participate in collaborative work interactions across institutional boundaries.

Both studies focused only on the role of institutional and governance structure in the creation of research collaboration at a national level within a developed country. Little attention has been given to research collaboration at higher levels, such as international collaboration between countries or nations (Katz, 1993; Jappe, 2007; Yu et al., 2013a), or to the motives, potentials, impediment factors, and strategies and policies which can be used to enhance it, or the mechanisms that can facilitate such types of successful research collaborations. Most policies are aimed at fostering collaboration at these higher levels rather than intra-level collaboration (Katz and Martin, 1997). In addition, most of the available literature addresses the context of developed countries and not that of developing nations where many contextual factors may affect research activities, such as both organisational and national cultures, and the bureaucracy within administrative matters.

Therefore, given the dearth of directly applicable literature, this study uses the SQU-UAEU funding scheme established in 2003 between SQU and UAEU as a case study, interviewing the key players in the research projects under this initiative. The study mainly explores the opportunities and challenges of research collaboration among PFUs in the region. It identifies the main motives behind the researchers to participate in joint research activities between the two universities. Moreover, the outcomes/impacts of the funding scheme among selected participants are listed. Also, the potentials of having joint research activities in the region are explored. In addition, the study identifies the different factors or challenges that can affect research collaboration between PFUs in GCC countries. Finally, the researcher questioned the participants on the suggested strategies and policies to enhance research collaboration between PFUs in the region. The case study is supported by some secondary data extracted from official websites and formal published reports such as international databases (i.e. Scopus), as well as the progress and final technical reports of the joint funded projects. As stated earlier, these secondary data confirm that current collaborative research activities are very limited and mainly happen between PFUs, particularly at the individual researcher level. However, the findings of this research, as well as other worldwide experiences, indicate that there are opportunities to enhance the level of collaboration at higher strategic, regional levels.

1.3 Research Aim, Objectives, and Questions

The main aim of this study is to explore, understand, and analyse the opportunities and challenges in research collaboration among the PFUs in GCC countries. Drawing on this general aim, the objectives of this research are to:

1- Explore the context of research in the GCC and collaboration among their PFUs using some key indicators (secondary data).
2- Explore the motives and the outcomes/impacts of research collaboration activities between SQU and UAEU.
3- Explore the hurdle/impediment factors affecting research collaboration activities between SQU and UAEU.
4- Explore the potentials of research collaboration among PFUs in the region.
5- The objective is also to recommend some strategies and policies to enhance research collaboration in the region.

The first objective is related to the specific context of the study, namely the research collaboration between PFUs in the region, with some key indicators (quantitative secondary data) identified from an official database (Scopus) regarding research and collaboration between GCC countries and between the major PFUs in these countries. The data is then compared with other research-intensive countries and research institutions, with other additional statistical data about the HE institutions in the region also presented. The last four objectives (i.e. objectives 2, 3, 4 and 5) are achieved mainly through a case study of research collaboration in the region, which is the SQU-UAEU funding scheme. Twenty three Principle Investigators (PIs) and eight Decision Makers (DMs) who were/are involved in research collaborative activities funded by the scheme were questioned and their perceptions about the SQU-UAEU funding scheme and how research collaboration in the region could be enhanced are identified. Finally, the findings generated by the research objectives are tied together to identify the main opportunities and challenges in research collaboration among PFUs in GCC countries.

On the one hand, this study shows the importance of collaboration in improving research outcomes in the region in terms of enhancing the productivity and quality of research produced, improving the utilisation of existing resources, and solving regional as well as global research problems. On the other hand, the study addresses different collaboration aspects (themes) such as the motives, opportunities, and challenges in collaborative research activities between academic researchers in PFUs in the region. Therefore, the main focus of this study is to investigate and answer the following questions:

Objective 1

1- What are the key indicators of the current research collaboration underway among GCC countries and specifically among their PFUs?

Objective 2

2- What are the motives behind research collaboration activities between SQU and UAEU?

3- What are the outcomes/impacts of research collaboration activities between SQU and UAEU?

Objective 3

4- What are the factors affecting research collaboration activities between SQU and UAEU?

Objective 4

5- What are the potentials for research collaboration between PFUs in GCC countries?

Objective 5

6- What are the recommended strategies and policies to build and enhance collaborative research activities between the PFUs in the region?

The main aim and the research questions will be addressed by reviewing: 1 – collaboration literature and published research, focusing specifically on research collaboration; 2 – available statistical data about collaborative research activities between PFUs in the region; and 3 – conducting a qualitative case study of the research collaboration funding scheme between the two public universities (i.e. SQU and UAEU) in the region.

Given the lack of studies addressing this subject in the region, this (exploratory) case study mainly attempts to identify and explore the motives, impacts, and the factors enhancing or impeding research collaboration between PFUs in GCC countries. Additionally, the participants will be asked questions about the potentials and the suggested strategies and policies which could enhance the joint research activities between the PFUs in the region. Table 1.1 below summarises the objectives, research questions, and how the research attempts to achieve them.

Table 1-1: Summary of research objectives and questions

Objective	Research Question	Method and Structure
Objective 1: Explore the context of research in the GCC and collaboration among the PFUs using some key indicators (secondary data).	**RQ 1:** What are the key indicators of the current research collaboration underway among GCC countries and between their PFUs?	**(Chapter 3)** Quantitative secondary data collected from an international database (Scopus).
Objective 2: Explore the motives and the outcomes/impacts of research collaboration activities between SQU and UAEU.	**RQ 2:** What are the motives behind research collaboration activities between SQU and UAEU? **RQ 3:** What are the outcomes/impacts of research collaboration activities between SQU and UAEU?	**(Chapter 5 & 6)** Using the themes that emerge from the literature as a guide, as well a as a pilot study with two expert researchers, a qualitative research design using in-depth semi-structured interviews will be used to obtain in-depth information from PIs and DMs who have participated in research collaboration activities between SQU and UAEU.
Objective 3: Explore the hurdle/impediment factors affecting research collaboration activities between SQU and UAEU	**RQ 4:** What are the factors affecting research collaboration activities between SQU and UAEU?	
Objective 4: Explore the potentials of research collaboration among PFUs in the region. **Objective 5:** Develop and recommend strategies and policies to enhance research collaboration in the region, specifically between PFUs.	**RQ 5:** What are the potentials of research collaboration between PFUs in GCC countries? **RQ 6:** What are the recommended strategies and policies to build and enhance the collaborative research activities between the PFUs in the region?	**(Chapter 7 & 8)** Using both secondary data and in-depth semi-structured interviews to obtain in-depth information from PIs and DMs who participate in research collaboration activities between SQU and UAEU

Source: Author’s construct, 2014

1.4 Theoretical Overview

The general definition of "collaboration" is working together to do a task and to achieve shared goals. The term "research" refers to *"creative work undertaken systematically to increase the stock of knowledge including knowledge of humanity, culture, and society, and using this stock of knowledge to devise new applications"* (OECD, 2008:152). Consequently, collaboration in a research setting denotes researchers working collectively to achieve the mutual goal of yielding new scientific knowledge (Katz and Martin, 1997). Research collaboration can take many forms, ranging from contributing broad advice and insights to actively participating in a particular piece of research. Researchers from various institutions can collaborate by imparting data or ideas through correspondence, discussions at conferences, visiting each other, or by carrying out elements of a project separately and then integrating the results (Katz and Martin, 1997). Collaboration in research can be accomplished on many levels, including at an individual, organisational or even countries collaborating together on high level projects (Katz and Martin, 1997; Amabile et al., 2001; Sonnenwald, 2007; Manjarrés-Henríquez et al., 2009; Baba et al., 2009). However, some scholars such as Katz and Martin (1997) consider the collaboration between two or more researchers to be the basic unit of collaboration.

Research collaboration as a topic and the motives behind it has been studied by researchers from many different angles (e.g. Braun et al., 2001; Melin, 2000; Laudel, 2001; Amabile et al., 2001; Laudel, 2002; Bozeman and Corley, 2004; Senker, 2006; Sonnenwald, 2007; Heinze and Kuhlmann, 2008; Hu and Racherla, 2008; Raasch et al., 2013; Teirlinck and Spithoven, 2013). Indeed, the motives can be seen as the driving force behind the rising trend toward research collaboration and plays an important role in defining the levels and forms of research collaboration. For example, Senker (2006) points to three main motives behind the increase in research collaboration, citing firstly that long-established fields are now diverging and forming new, interdisciplinary combinations. Secondly, attaining a global edge in research now requires the use of expensive and sophisticated apparatuses, along with the related interdisciplinary links and technical services. Thirdly, the interdisciplinary nature of modern research means that advances in one field are often relevant to others, thus increasing the need for research collaboration.

Furthermore, many other researchers have focused on the factors which affect different forms and levels of research collaboration (e.g. Sargent and Waters, 2004; Corley et al., 2006; Walsh and Maloney, 2007; Birnholtz, 2007; Cummings and Kiesler, 2007; Buys and Bursnall, 2007; Vega-Jurado et al., 2008; Boardman and Corley, 2008; Bammer, 2008; Ponomariov, 2008; Stokols et al., 2008b; Heinze and Kuhlmann, 2008; Carroll et al., 2009; Sánchez-González et al., 2009; He et al., 2009; Defazio et al., 2009; Rigby, 2009). Some of those factors identified from the literature are interpersonal factors such as preparation (Stokols et al., 2008b), coordination skills (Cummings and Kiesler, 2007; Stokols et al., 2008b), communication skills (Stokols et al., 2008b), leadership (Stokols et al., 2008b), personal characteristics (Stokols et al., 2008b), team size (Adams et al., 2005; Walsh and Maloney, 2007; Stokols et al., 2008b; Rigby, 2009), environmental factors such as culture (Sorensen, 2003), funding (Defazio et al., 2009), institutional support (Birnholtz, 2007), stakeholder support (Bammer, 2008), infrastructure (Katz and Martin, 1997; Boardman and Corley, 2008) and other factors such as socio-political matters (Melin, 2000; Beaver, 2001; Sonnenwald, 2007).

The factors influencing research collaborations are of interest to individuals, institutions, and policymakers. For example, many national and international institutions and organisations implement policies in order to promote collaboration, such as providing funding for establishing research centres or offering funding for collaborative research as well as facilitating it (Sonnenwald, 2007). Again, the impacts of those factors on collaboration are highly influenced by the form and level of collaborative activities, where certain factors may influence the university–industry research collaboration but not university–university collaboration. Academic institutions and industry operate under different systems, with each having its own cultures, procedures, value systems, purposes, and objectives of existence.

Researchers have acknowledged that research collaboration is vital for both the production and diffusion of knowledge within technology and science (Persson et al., 2004). The impact of research collaboration on productivity and the quality of research has also been extensively addressed by many researchers (Newman, 2004;

Cronin et al., 2004; Glänzel and Schubert, 2005; Wagner and Leydesdorff, 2005a; Wray, 2006; Leydesdorff and Wagner, 2008; Hou et al., 2008b; He et al., 2009; Savanur and Srikanth, 2010; Yu et al., 2013b). For example, in terms of measuring the collaboration output, many researchers use co-authored publications as a fundamental element for gauging collaborative activity (Smith, 1958; Katz and Martin, 1997; Laudel, 2002; Newman, 2004; Glänzel and Schubert, 2005; Savanur and Srikanth, 2010). Smith (1958) was one of the first researchers to address the effect of collaboration on published multi-author papers, examining more than 4000 papers published in the *American Psychologist* between 1946 and 1957 and finding that the mean number of authors per paper increased from 1.3 to 1.7 over the period (Katz and Martin, 1997). He suggests that this type of indicator can be employed as a proxy measure for collaboration among researchers.

Beaver and Rosen (1979), Wray (2006) and Yu et al. (2013b) have all produced evidence to support Smith's finding that co-authoring has been increasing through research collaboration, although some of them have observed that the rate of increase varies according to subject area and in some cases is insignificant (Yu et al., 2013b). Given that there is no clear description of the roles, activities, or the relationships of all the persons involved in a co-authored paper, Smith (1958) and Subramanyam (1983) state that most of the collaboration in a piece of work cannot be quantified. A cutting-edge idea or suggestion by a researcher or scientist may have a more significant effect on the quality of the output of a research project than the daily work in the lab by other collaborating researchers or scientists. However, an advantage of using the measurement of co-authored publications is its invariability and verifiability, with access given to the same data-set to reproduce the results (Katz and Martin, 1997). Also, it is an inexpensive and practical method for quantifying collaboration. In addition to that, the sample size can be vast, which will be reflected in the results in terms of statistical significance (Katz and Martin, 1997).

Studies which address the international level of research collaboration emphasise the growth of such collaboration using bibliometric indicators such as co-publications (Luukkonen et al., 1992; Glänzel, 2001; Glänzel and de Lange, 2002; Jin and Rousseau, 2005; Jappe, 2007; He, 2009; Wang et al., 2005). There is, however, a lack of qualitative studies on the research collaboration between PFUs, neither at the national level nor the international level, and particularly by what means such institutional conditions and structures facilitate or impede research collaboration (Heinze and Kuhlmann, 2008). As stated earlier, Heinze and Kuhlmann (2008) are among the few authors who have dealt with the role of such types of organisational structures. However, they focus on intra-national (national) collaborations rather than international collaboration between countries, whereas other factors may affect such a higher level of collaboration. The presumed primary reasons for the lack of such studies are their time-consuming and resource-heavy nature, as well as the difficulty in accessing and collecting data from those universities because of their organisational structures (public institutions).

In conclusion, there is a limited number of studies addressing research collaboration between public universities/institutions, particularly at international level. Additionally, there is very little published research on the collaborative research activities between GCC countries and specifically between their PFUs. Given the dearth of directly related literature, this case study research will provide the platform for carrying out the research to identify the motives, impacts, and the factors that affect international research collaboration, especially between PFUs in GCC countries. Additionally, the study will suggest some strategies and policies to enhance the research collaboration between these universities.

1.5 Significance of the Study

Given the limitation of comprehensive studies that investigate the determinants of successful collaborative research between publicly funded institutions (Heinze and Kuhlmann, 2008), especially at an international level of collaboration, this study will look at some of the GCC countries' universities and how the institutional structures and both internal and external environment affect the research collaboration between them. Therefore, from a practical viewpoint, this study will provide policymakers, researchers, and administrators in GCC countries with some guidance toward improving the collaborative research activities in the region. More specifically it will identify the issues that should be focused on to improve research collaboration among the different PFUs in the GCC countries. Many policies have been initiated toward improving the links between them and have been afforded the availability of resources and many supportive political, social, and environmental factors. A gained understanding of those issues will indicate points of departure for policymakers aiming to stimulate research collaboration activities in the region. The researcher's experience working in one of those universities and participating in many formal and informal meetings between them gave him the opportunity to look at and investigate this issue in depth. Theoretically, this study will contribute to the existing literature on the different themes of collaborative research activities such as motives, impacts, and factors that could affect research collaboration in general and between PFUs specifically, especially in developing countries and economies similar to those of the GCC countries. The research will provide insight into the position of those PFUs as strategic actors attempting to effectively use the resources available to them.

1.6 Methodology

As stated earlier, this study mainly aims to explore, understand, and analyse the opportunities and challenges in research collaboration among the PFUs in GCC countries. The nature of this research is that of an exploration study, relying on empirical methods, carried out mainly using primary qualitative data collection through interviews and case studies. This type of research will generate new ideas for future research rather than testing or confirming a hypothesis (Robson, 2002), making this approach the appropriate one in order to explore the context in-depth. For example, exploring the motives, impacts, and the factors affecting collaboration in specific academic contexts requires deep investigation. Since there is a lack of studies in the GCC countries regarding collaborative research activities, a qualitative study is most suited to provide a basic understanding of the motives, impacts and the factors affecting the collaborative research activities in the region. However a set of secondary qualitative and quantitative indicators were also used to facilitate the understanding of the primary qualitative data on the chosen topic.

The researcher carried out a case study (SQU-UAEU funding scheme) by interviewing the key participants in the completed, terminated, and on-going collaborative research projects between SQU and UAEU. Yin (2009:23) defines the case study as an *"empirical inquiry that investigates a contemporary phenomenon within a real-life context where the boundaries between phenomenon and context are not clearly evident and in which multiple sources of evidence are used".* The findings of this case study helped to understand and generate ideas about the collaborative research activities in the region and the processes and factors affecting such activity. Such sorts of study build a theoretical background about the region and can be used latterly as a base structure for further studies and investigations into the collaborative research activity between research institutions, either in the region or in similar developing countries.

To develop the possible framework for the study, a literature survey was performed in which themes were gathered that are assumed to contribute to research collaboration in general. Secondly, some secondary data were collected from different online websites and databases (e.g. Scopus) in order to give a general idea about the regional collaborative research activities. Next, a case study was carried out by conducting thirty one semi-structured in-depth interviews of collaborative PIs and DMs in the two selected universities in order to address the major themes related to research collaboration such as motives, impacts, and factors contributing to research collaboration. On the one hand, the PIs are those who have some knowledge or experience of research collaboration between the two selected universities (SQU in Oman and UAEU in UAE) across all disciplines. They were asked questions related to their experiences in collaborative research activities such as their motives and the factors affecting their collaboration. Additionally, questions regarding how the collaborative research activities in the region can be enhanced and encouraged were also asked. On the other hand, the DMs are senior level officials such as the Deans/Assistant Deans of colleges/schools or DVCs for research and postgraduate studies at both universities, opinions on the importance of research collaboration in general and between PFUs in the region were elicited. Similarly, questions related to their university research strategies and specifically on issues related to research collaboration were asked. Each participant was physically interviewed in their workplace during the office hour for approximately one hour.

1.7 Ethical Considerations for the Research

The researcher acquired ethical approvals from The University of Manchester as well as from both SQU and UAEU. The main ethical issues with this type of research and participants (interviewees) are confidentiality, anonymity, and transparency. The research has taken some steps to address these issues. Firstly, a formal authorisation from both SQU and UAEU was obtained to allow the researcher to contact target research participants. Next, the researcher applied for ethical approval from the University of Manchester. The potential participants were contacted and made fully aware of the research and its purposes. The researcher contacted via email and telephone to inform them about the study ahead of time, so that meetings and interview schedules could be agreed. They were also informed about their selection due to their experiences in the proposed study. Potential participants were made aware that their participation is entirely voluntary. They were notified that their participation can also be revoked at any time during the process. Those who agreed to participate were given the prerogative to determine when interviews may be conducted to suit their own convenience. Before the interviews took place, all participants received a consent form explaining what the research is about and how it will be used, as well as how personal information will be handled. To ensure anonymity and confidentiality, the researcher informed the participants that information shall be kept strictly for the purpose of this academic research alone. Data in the form of documents was stored in a safe and secure place, accessible only to the researcher. In addition, data stored on the researcher's computer was securely encrypted and accessible to the researcher alone. Participants were also asked to give consent for audio recording of the interviews. Audio recordings and field notes were stored in a safe place and wiped once transcription was completed. The participants had the choice of signing the consent form and either proceeding or withdrawing from the process.

1.8 Structure of the Thesis and the Research Activities

Chapter Two will provide background information to this research by reviewing the literature on the different aspects such as definitions, motivations, levels, forms, and impacts of research collaboration activities. The chapter concludes by reviewing the literature on the factors that affect research collaboration and provides insight on aspects related to research collaboration between PFUs.

Chapter Three presents the background context of this study. First, an overview of the GCC and its member states is presented with some key data, strategies, and policies regarding HE and research. Thereafter, key data about research and the collaboration between GCC countries, as well as between the main research institutions, is presented and compared with some of the research-intensive countries around the world. The chapter concludes with an overview of the SQU-UAEU funding scheme.

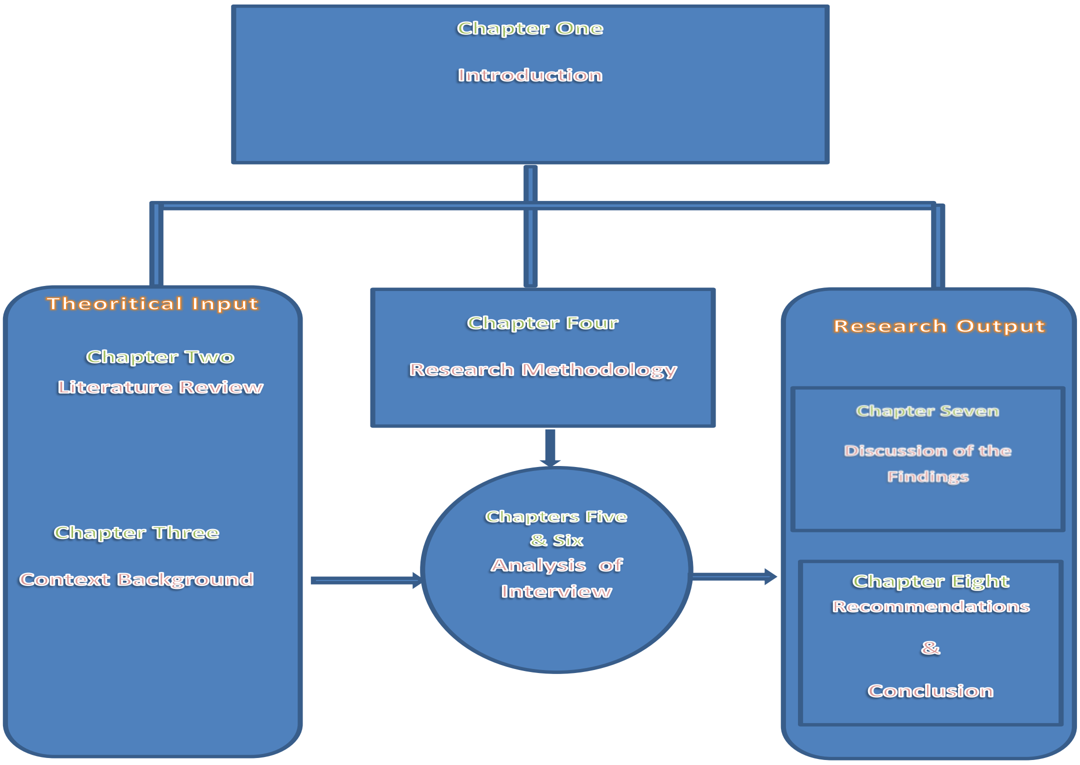
Chapter Four discusses the methodology used for this research. In addition, the chapter presents the data collection methods, sampling and participant selection, the interview process, and data analysis. Finally, research quality related concerns are presented at the end of the chapter, to address issues pertaining to the validity and reliability of data collection and analysis.

Chapters Five & Six present the findings of the study. While Chapter Five presents the findings of participants' motives and the outcomes/impacts of research collaboration between the two selected universities, Chapter Six will present the findings of the factors that influence the effectiveness of joint research activities between the two institutions. Moreover, the chapter will present the participants' perceptions about the potentials of regional research collaboration between PFUs.

Chapter Seven discusses the findings of this study. The findings of the previous two chapters are drawn together and discussed to identify the opportunities and the challenges of research collaboration among PFUs in the region.

Chapter Eight will conclude by presenting some recommended strategies and policies to enhance research collaboration between PFUs in the region. In addition, the chapter will include both the theoretical and practical contributions of the study, as well as present the limitations and possible recommendations for future research.

Figure 1-1: Structure of the thesis



Source: Author's construct, 2017

This research took approximately three and half years to complete. The table below summarises the main activities into three different stages which were carried out during the research period.

Table 1-2: The main research activities

Stage	Period	Main Activities	Main Outputs
Stage 1: Research Design	October, 2013- September , 2014	• Literature Review • Methodology • Contexts • Secondary Data Collection	• Continuation Report Review
Stage 2: Fieldwork	October, 2014- September , 2015	• Ethical Approvals • Secondary Data Collection • Primary Data Collection	• 31 Semi-structured Interviews
Stage 3: Data Analysis and Writing up	October, 2015- March, 2017	• Transcribing Data • Coding and Analysing • Writing up • Editing	• Final PhD thesis

Source: Author's construct, 2014

1.9 Chapter Summary and Conclusion

This chapter sets the tone for the proposed research. It has provided an introduction and background to the topic under investigation. The research aim, objectives, and questions were specified. Next, a brief theoretical overview was presented to give the reader a general idea about the previous research done in the area of research collaboration. After that, the significance of the study was explained. Finally, the methodology which was used during the study was presented. The chapter concluded with the thesis structure and the research activities.

The following chapter will provides an overview of the research collaborations in which a theoretical understanding of the topic will be provided.

CHAPTER TWO

2 LITERATURE REVIEW

2.1 Introduction

The main aim of this chapter is to provide a general overview on research collaboration and to set a terminological platform for the thesis, in order to improve our understanding of this topic and subsequently propose the development of a framework for this research. First, a brief about the core theories of research collaboration that inform this study will be presented. After that, a general overview and international programs about research collaboration is presented. Next, a brief summary about the historical background of studying research collaboration will be presented. After that, the rationale of this study will be presented, followed by an outline of the concepts of research collaboration and collaborators. Following that, the motives (driving forces) behind research collaboration will be discussed and the different levels and structures of research collaboration will be presented. After that, the expected benefits/impacts of research collaboration will be presented. Finally, a literature review on the factors that enhance or impede research collaboration will be identified from the literatures. The chapter will conclude with a proposed conceptual framework for the process of research collaboration which will be used as a guide to this study.

2.2 Theories on Research Collaborations

Collaborations are mostly drawn from the social constructivist learning theories of Dewey (1963) and most of the theories that have been used in research collaborations include, social interdependence theory (Johnson and Johnson, 1994; Johnson and Johnson 2003; Johnson and Johnson 2008), team-member exchange (Seers 1989; Cohen and Bailey, 1997), theory of co-operation and competition (Deutsch 1949) and collaborative public management **(**Agranoff and McGuire, 2003;

O'Leary and Vij, 2012). This study adopts the SIT because it provides conceptual understanding of cooperation in groups (Parolia et al., 2011; Lee et al., 2015) and has been applied extensively in education, business and service organizations (Johnson and Johnson, 2003) to promote the development of collaborative skills, improve critical and creative thinking, aid complex problem solving, and transfer positive attitudes towards tasks (Johnson and Johnson, 1989; Bell, 2010; Lee et al., 2015). The theory relies on the interdependence of members of a group to achieve common goals.

2.2.1 Social Interdependence Theory (SIT)

Social interdependence exist when the accomplishment of one's goals are affected by the actions of others (Deutsch, 1962; Johnson and Johnson, 1989; Johnson and Johnson, 2003). Literature has shown two main types of social interdependence, positive (cooperation) and negative (competition) interdependence. Positive interdependence exists when individuals perceive that they can reach their goals only if other individuals with whom they are cooperatively linked also reach their goals thereby promoting each other's efforts to achieve the goals (Johnson and Johnson, 2003; Johnson and Johnson, 2009). Negative interdependence on the other hand exists when individuals perceive that they can only obtain their goals if other individuals with whom they are competitively linked fail to obtain their goals. They deliberately impede each other's efforts to achieve the goals (Johnson and Johnson, 2009). Positive interdependence results in effective collaboration with beneficial outcomes such as *"mutual help and assistance, exchange of needed resources, effective communication, mutual influence, trust and constructive management of conflict"* (Johnson and Johnson, 2005:936) as well as cohesion, esprit-de-corps, and social support (Johnson and Johnson, 2009)**.** Negative interdependence results in divergent perceptions of the same situation, goal incongruence, conflicts, resistance and unnecessary delays (Kazanjian et al., 2000; Parolia et al., 2011).

The SIT perfectly fits very well with international research collaborations because social interdependence facilitates the pulling of cultural, relational and material resources together to facilitate not only collegial support but improve research innovation and conceptual framings for practice (Drew et al., 2016) as well as transfer new ideas and techniques from one place to the other (Johnson and Johnson, 2008). SIT would therefore lead to higher achievement and productivity (Johnson and Johnson, 2008). Individuals, who hitherto could not achieve more, would achieve tremendously under SIT when they work collaboratively (Johnson and Johnson, 2005). There is therefore the 'power of unity' in collaboration to achieve much.

2.3 General Overview and International Programs

Given the advancements in all the life aspects across the globe, especially within Information and Communication Technology (ICT), international partnerships and strategic alliances will become a standard practice in which all the international borders will be removed and partnership between individuals, institutions, businesses, community services, organisations, and governments will become a standard practice (Phoocharoon et al., 2001). The internationalisation of research and knowledge production is seen as a primary mechanism of these developments. This type of internationalisation can be seen in several forms such as researchers' mobility, inter-institutional collaboration between countries, and informal knowledge exchanges through meetings and conferences (European Commission, 2007; Boekholt et al., 2009; Edler et al., 2011). International research collaboration is becoming highly important as more countries experience similar problems (Stead and Harrington, 2000). Stokols et al. (2008a) argue that international research collaboration between scientists, institutions, and countries is essential across disciplines in ameliorating many of the world's most vexing environmental and social calamities, as well as other public health issues like diabetes, AIDS, cancer and heart disease (citing Kahn and Prager, 1994; Abrams, 2006). Wilson (2000) states that many complex research problems across the world have been solved through collaboration between scientists, because by collaborating the researchers are bringing both human and financial resources together.

Huxham (1996:4) states:

> *". . . This rests on the belief that the really important problem issues facing society – poverty, conflict, crime, and so on – cannot be tackled by any single organization acting alone. These issues have ramifications for so many aspects of society that*

they are inherently multi-organizational. Collaboration is thus essential if there is to be any hope of alleviating problems"

There is currently a surge in interest among both researchers and policymakers to stimulate collaboration between researchers and other societal actors, especially at an international level (Luukkonen et al., 1992; Etzkowitz and Leydesdorff, 2000; Kaufmann and Tödtling, 2001; Wray, 2006; Jappe, 2007; Smits and Den Hertog, 2007; He, 2009). Many strategic policies have been developed by governments, private foundations, and policymakers to improve links between researchers in order to increase knowledge and improve the output and quality of research, which will have positive impacts on people's lives.

Some of the most important examples of policy implemented in the EU are five key funding opportunities that support research and innovation between union countries. These are:

> *"... the Research Framework Programme, the Competitiveness and Innovation Framework Programme, the Structural Funds and the Cohesion Fund within the Cohesion policy; the European Agricultural Fund for Rural Development and the European Fisheries Fund within the rural development policy and the Common Fisheries Policy"* (European Commission, 2013).

In addition to these programs, the European Commission launched the 'European Research Area' (ERA) in 2000. The ERA primarily aims to improve integration within the European research system and increase the level of coordination and cooperation among its key players to improve the efficiency and effectiveness of regional research efforts in order to improve the Europe's competitiveness (European Commission, 2007). Another funding agency in Europe is the European Science Foundation (ESF), and as well as this, each individual European country supports different levels of research collaboration, such as the strategic partnership of the UK's seven research councils – Research Councils UK (RCUK) which allocates funding for research collaboration between different institutions and sectors within the UK.

In the USA, the National Science Foundation (NSF) launched an Integrative Partnerships programme called the 'Science and Technology Centers' (STCs) which support cooperation between scientists on large-scale research projects that require collaboration among research institutions, laboratories, industries, other public/private sector entities, and those at the international level (NSF, 2014). In addition, the NSF's Industry/University Cooperative Research Centers' (IUCRCs) programs mainly aim to support research collaboration between academic institutions and industry in order to promote R&D efforts in the USA. There is also the US Department of Commerce's National Institute of Standards and Technology (NIST), which develops many research programs. One such programme is the Advanced Technology Programme (ATP), designed to encourage the development of new technologies especially at the early-stage and when requiring collaboration between researchers and institutions across different sectors. Corley et al. (2006:975) citing Bozeman and Boardman, (2003) state that the last three decades in the USA could be named the *"era of inter-institutional research collaboration"* because the US science policy has moved from supporting small single investigator research projects to many investigator, grant-based, multidisciplinary research projects.

In addition, others programs have been developed across the world in order to foster collaboration between groups of countries, such as the establishment of the BRICS (Brazil, Russia, India, China and South Africa) Think Tanks Council (BTTC). Furthermore, the Canadian government has initiated the International Science and Technology Partnership Program (ISTPP) to foster bilateral agreements in R&D activities between Canada and other countries such as Germany, France, and China. Other examples to provide funding for joint research activities between countries are the International Development Research Centre (IDRC) in Canada and the Sweden International Development Cooperation Agency (SIDCA). There are also bilateral research collaboration programs, such as the joint programs between Israel and other developed countries, such as the US-Israel National Science Foundation which promotes basic research in both countries, and the German-Israel Foundation for Scientific Research and Development and the EU-Israel Cooperation Programs respectively (Arunachalam and Doss, 2000).

A few months previously, the British government announced a first-of-its-kind initiative funding program in the GCC region called the 'UK-Gulf Institutional Links', for collaborative research projects between GCC researchers and the UK. This program aims to fund research projects related to the social welfare and economics development of the GCC region in areas related to water, energy, food production, and cyber security (Tribune, 2017).

All of these strategies and funding programs involve high public and private investments in which their impacts on the economic and social life of people should be evaluated. Defining a clear evaluation system for their successfulness through different key indicators has become more evident (Stokols et al., 2008a). One important positive impact during this time has been a growth in the quantity of published co-authored papers in most scientific disciplines and across geographic regions, which may be seen as an output resulting from the increase of collaborative research activities, through different funding programs implemented across the world (Katz and Martin, 1997; Laudel, 2002; Cronin et al., 2004; Newman, 2004; Moody, 2004; Cronin, 2005; Jin and Rousseau, 2005; Wagner and Leydesdorff, 2005a; Wang et al., 2005; Jones et al., 2008; He, 2009; Savanur and Srikanth, 2010).

2.4 Historical Background of Studying Research Collaboration

According to Beaver (2001), some French chemists were the pioneers of research collaboration between 1800-1830, after which the trend of collaboration between researchers slowly developed until World War I, which was when it started to grow at an exponential rate across most disciplines. There has been a limited number of studies on research collaboration in general and international research collaboration in specific, over the last two decades a body of literature has grown, covering a variety of disciplines. Katz and Martin (1997) state that Smith (1958) has been identified as one of the pioneers in work surrounding research collaboration – especially through the use of co-authored articles – followed later by others such as de Solla Price and Beaver (1966). The published works of study research collaboration are across disciplines which include *"information science, psychology, management science, computer science, sociology, research policy, social studies of science, and philosophy as well as each discipline in which scientific collaboration occurs"* (Sonnenwald, 2007:643). Others have focused on 'hard science' disciplines like chemistry, physics, nanoscience, and others. This diversity presents considerable challenges toward understanding research collaboration across the board, and makes it difficult to review all elements in great detail.

Previous studies on research collaboration have typically followed two dimensions. The first dimension is through studying research collaboration quantitatively, using different bibliometric methods. One example of this is the use of co-authored published scientific works (e.g. reviewed articles, books, and conference papers) to measure the growth of collaboration as well as its impacts on quality, productivity, and the creating of research networks. For instance, many studies have explored research collaboration at the individual level in order to measure the productivity and output quality of individuals, as well as these same impacts on their affiliated institutions and nations (e.g. Newman, 2004; Lee and Bozeman, 2005; Frenken et al., 2005; Heinze and Kuhlmann, 2008; Jeong and Choi, 2014). Other researchers have focused on the collaboration between academic institutions and the private sector and have employed bibliometric indicators such as co-authored publications, numbers of patents, and amounts of research industry funding in order to measure the growth and scientific impact of academic-industry research collaboration (e.g. Amabile et al., 2001; Calvert and Patel, 2003; Abramo et al., 2009; Azoulay et al., 2009; Robin and Schubert, 2013).

The second dimension is the use of qualitative methods to study research collaboration, mainly as a way of gathering in-depth understandings of the underlying processes, factors, and motives of this trend. For example, researchers have used interviews and case studies to identify the factors affecting research collaboration and the different motives behind it. Others, such as Sargent and Waters (2004) and Stokols et al. (2005), have even developed models and process frameworks which can demonstrate these. Some have used the quantitative findings from bibliometric methods to locate their studies qualitatively, identifying the factors and motives behind research collaboration, or to explain a lack of collaboration (e.g. Heinze and Kuhlmann, 2008). Others have used qualitative findings extracted from smaller samples in order to generalise them for larger populations using quantitative approaches.

2.5 The Rationale of this Study

The focus of this study is on international research collaboration (primarily between PFUs) in the GCC region, and the studies which address this level of collaboration mainly emphasise the growth and the impacts of such collaboration through using bibliometric indicators such as co-published scientific works. For example, Wang et al. (2005) and He (2009) both studied Chinese international research collaboration for different periods using co-authored papers as an indicator, and both found that Chinese international research collaboration with other countries showed exponential annual growth compared to intra-Chinese levels, which showed an annual decrease. Their work did not however provide recommendations on how collaboration could be enhanced, nor did it provide the reasons behind such trends, or what factors can affect international research collaboration positively or negatively.

There is a notable lack of studies on research collaboration between public-funded institutions, at both the national and international levels, and on how institutional conditions and structures, as well as external environments facilitate or impede such collaboration (Heinze and Kuhlmann, 2008). As stated previously, Heinze and Kuhlmann*'s* (2008:888) study is among the few that deal with the role of organisational structures in collaborative research *in the field of nanoscience within the public sector in Germany*, identifying the "*governance structures that support or hinder scientists' efforts to engage in collaborative work relations across institutional boundaries"*. However, they look at inter-institutional collaborations at the national level (intra-national) rather than international collaboration between countries (in which other factors may play a significant role at this higher level of collaboration). Additionally, their study is focused on a developed country context and not on developing countries such as the GCC countries.

The main reasons behind the lack of qualitative studies on international research collaboration include its time-consuming and resource-intensive nature, as well as the difficulty in accessing and collecting data from the research institutions, especially so if they are fully PFUs (due to their organisational structures and policy, as well as political and cultural factors that may limit access). Moreover, certain institutional characteristics may influence collaborative activities at either the national or international level. Heinze and Kuhlmann (2008) state that the research systems of PFUs are characterised by a high level of institutional differentiation, and need to be very effective in order to enhance the diffusion of knowledge. Such systems must allow knowledge circulation across institutions and develop effective mechanisms that support the daily research collaborations between institutions which scientists seek to establish and maintain (Heinze and Kuhlmann, 2008).

2.6 Defining Research Collaboration and Collaborators

The existing literature covers research collaboration in various contexts and from different perspectives. This analytical diversity introduces a variety of terminologies and definitions with studies of different levels and structures of research collaboration such as between universities and industry (e.g. Manjarrés-Henríquez et al., 2009; Perkmann and Walsh, 2009; Robin and Schubert, 2013), or between universities and public services, such as schools and health services (e.g. Buys and Bursnall, 2007). Because of this diversity of studies, common definitions or exact meanings of 'research collaboration' are lacking (Hu and Racherla, 2008). Bukvova (2010) suggests that defining 'collaboration' is key to providing a working definition of 'research collaboration'. Furthermore, the context in which the collaboration occurs is very important, due to the various motives behind different levels of collaborative research activities. Similarly, different terminologies have been used by researchers for 'research collaboration' itself, such as scientific collaboration, R&D collaboration, and team science. For example, Amabile et al. (2001) studied academic-practitioner collaboration, including parties from different sectors and professions — each with its own existential purposes or driving forces. In their definition, they used differed in notable ways as an expression to convey the different purposes or as collaboration characterized by diverse interests. The table below lists some of the definitions used by researchers in their published works in relation to "research collaboration".

Table 2-1: Definitions of collaboration/research collaboration

Definition	Author
"Researchers working together to achieve the common goal of producing new scientific knowledge."	(Katz and Martin, 1997: 7)
"Individuals who differ in notable ways sharing information and working toward a particular purpose."	(Amabile et al., 2001: 419)
"An intense form of interaction, allowing for effective communication, as well as the sharing of competencies and other resources."	(Melin and Persson, 1996: 363)
"Coming together of diverse interests and people to achieve a common purpose via interactions, information sharing, and coordination of activities."	(Jassawalla and Sashittal, 1998: 239)
"Interaction taking place within a social context among two or more scientists that facilitates the sharing of meaning and completion of tasks with respect to a mutually shared, superordinate goal."	(Sonnenwald, 2007: 645-646)
"Social processes whereby human beings pool their human capital for the objective of producing knowledge."	(Bozeman et al., 2013: 4)

Source: As indicated in the table

Generally, all of these definitions share the notion that collaboration involves pooling tangible and intangible resources together in order to achieve common or shared goals and objectives. These goals are based on the context and the motives of the participants, which ideally complement one another by involving themselves in the collaborative activity. Even inside the same institution, the motives of individual collaborators may differ than those of their institution.

In a business context, companies choose to form different types of business-oriented collaborations (such as joint ventures and partnerships) in order to reduce risks and improve competitive advantages, all with the ultimate aim of generating profit. Similarly, in the academic context, institutions like universities and research centres form different types of partnerships and collaborative activities between them or with other sectors to achieve common goals. In general, the driving forces behind their partnerships follow two different directions: either for academic and teaching partnerships or R&D. The former has goals which are not much different from those related to the business context, especially when universities form partnerships to offer academic programs leading to the awarding of joint or collaborative degrees. Those universities must consider the financial and operational aspects of such partnerships, not unlike the profit motives of partnerships between business firms. Others forms of academic and teaching partnerships are the traditional student exchange programs between international universities, as well as 'study abroad' and 'dual degree' programs. The second purpose of forming partnerships between universities, research centres, and other sectors such as industry, is for R&D activities. The main objective of 'research collaboration' in this case is to increase the stock of knowledge and to apply this knowledge to improve its positive impact, such as creating new applications that innovate and generate profits (OECD, 2002), especially between universities/research centres and industry. However, it is worth stating that research activities' outcomes are unpredictable and researchers may exhaust time and money on a project and still end with very minimum outcomes.

The second part of this section relates to the term 'collaborator'. Katz and Martin (1997:7) highlight upon two extremes of research collaborators in their work. The first extreme defines a collaborator as "*anyone contributing to a piece of research*", while the second extreme defines collaborators as only *"those scientists whom contributed directly to the main research tasks over the duration of the project"*. Based on their study, they conclude that the definition of research collaborators *"lies somewhere between these two extremes"* (1997:7). They suggest some putative criteria for differentiating collaborators from other researchers that include:

> *"Those who work together on the research project throughout its duration or for a large part of it, or who make frequent or substantial contribution, those whose names or posts appear in the original research proposal, and those responsible for one or more of the main elements of the research" (Katz and Martin, 1997:7).*

While this is may be applicable for formal research collaboration, it is difficult to apply to informal collaboration, where researchers may be sporadically involved or contribute specific skills or ideas. In addition, researchers mainly select their collaborators based on their roles in the research activities, and this selection may depend on many factors, such as the type of research (applied or basic) or disciplinary focus. People who are facilitating the administration related issues such as providing logistics and raising funds for the project may also be considered as collaborators.

In general, researchers select their collaborators based on different motives or factors. For example, Laudel (2001) & (2002) classifies collaborators into six categories based on their roles in a research project. The first category involves collaboration in which a common objective is shared and tasks are divided between the researchers. The second category encompasses when one collaborator sets the goals and performs the creative labour aspect, while others perform the routine work. In the third category, a researcher seeks collaborators on the basis of gaining access to important research equipment. The fourth category involves a free discussion of ideas without focus on any specific objective or goal, whereas the fifth type deals with defining collaborators as colleagues who assist and provide advice during the publication process (trusted assessor-ship). Finally, the sixth type involves researchers including colleagues when they require specific skills, or *"transmission of know-how"* (Laudel, 2002:10).

Bozeman and Corley (2004) propose another classification of how investigators select a collaborator, where selection may be based on factors such as a researcher's reliability and work ethic (taskmasters), or language and nationalities (nationalists), on supporting junior students or colleagues (mentors), or on seeking out experienced researchers with strong reputations (followers), on preference to collaborating with researchers they have worked with before (buddies), or finally preference for those who have compatible skills (tacticians).

2.7 Motives for Research Collaboration

Many studies during last three decades have found that there is an increasing trend toward collaboration, especially internationally, between researchers and countries. The rationales or 'driving forces' behind this trend are many, and range from seeking personal advice to gaining access to resources (Katz and Martin, 1997). The main motives at the micro level of any research collaboration are to improve the quality and the quantity of knowledge production (capacity-building) through linking resources (financial and human), both nationally and internationally. At the macro level, institutions and countries collaborate with each other mainly to improve their national competitiveness, solve regional or global research problems, and create good and stable diplomatic relationships. One could assume that by nature, the micro motives can be the means to achieve the macro motives. The following sub-sections will provide a detailed discussion of the main motives found in previous studies of research collaboration. These motives are the core objective and driving force behind any research collaboration activity. To some extent, these motives define how the collaborative activity will be structured, as well as how to define the measures of success (Corley et al., 2006).

2.7.1 Access to Research Equipment (Instruments)

One of the most important reasons for research collaboration is to gain access to expensive research instruments and equipment specially intended for solving complex scientific problems (Katz and Martin, 1997; Melin, 2000; Beaver, 2001; Newman, 2001; Shinn and Joerges, 2002; Cronin et al., 2004; Lee and Bozeman, 2005; Sonnenwald, 2007; Rafols and Meyer, 2007; van Rijnsoever et al., 2008; Heinze and Kuhlmann, 2008; Yu et al., 2013c). As stated earlier, research institutions often face significant pressure from policymakers and governmental bodies to maximise the efficiency of research activities. The costs of certain scientific instruments have soared due to advancements in technology (Katz and Martin, 1997). Most funding bodies are not able to fund the requirements of individual researchers, especially when sophisticated and expensive scientific equipment such as CT scanners and advanced telescopes are required.

In addition, the growing complexity of these research instruments plays a pivotal role, as it leads to more connections across different research disciplines (Newman, 2001; Shinn and Joerges, 2002). Rafols and Meyer (2007), relying on both interviews and bibliometric data on research involving nanoscience and technology, found that the major driver for such collaborations is the need for complex research instruments, such as fluorescent microscopy or X-ray crystallography. Newman (2001) shows that the average number of international co-authored papers in energy physics is higher than biomedical sciences due to physics having more advanced and expensive instruments, which motivates researchers to collaborate internationally and share equipment. Again, this varies across disciplines, especially in terms of the use of technology in applied science versus theoretical research. Research in social sciences and humanities tend to be ‘labour intensive’, without much need of costly equipment and laboratories, while complex equipment is often required to carry out research in the physical and natural sciences (Lee and Bozeman, 2005; Yu et al., 2013c).

Some funding agencies such as the NSF and the ESF often require teams of researchers, either working within the same disciplines (intra-disciplinary) or coming from two or more disciplines (trans-disciplinary) to work together jointly in order to ensure that expensive research equipment is used more often (Sonnenwald, 2007). Access to such sophisticated scientific instruments enhances the research productivity of poorly-resourced countries. They are rich with scientists in terms of well-educated human capital, however their financial limitations lead them to collaborate with other countries by pooling their human resources with other countries’ financial resources to enhance their research productivity and solve their scientific problems.

2.7.2 Financial Motives

Most countries are facing increasing economic crises and scarcity of financial resources. Such issues and changes encourage researchers, institutions, and governments to collaborate with each other across all sectors and at all levels. For instance, governmental bodies encourage researchers to collaborate internationally believing that this will bring about cost reduction, gain access to international funding, and reduce financial risk (Beaver, 2001; Harman, 2001; Nieminen and Kaukonen, 2001; Potì and Reale, 2007; Sonnenwald, 2007; Heinze and Kuhlmann, 2008; van Rijnsoever et al., 2008).

Heinze and Kuhlmann highlight that:

> *"The expanding research capacity requires additional funding and many research questions (due to their complexity) cannot be addressed by single groups alone, [so] researchers have an incentive to build project consortia that compete collectively for third-party funds" (2008: 893).*

Financial motivations for research collaboration may be summarised into three key facts. Firstly, most funding bodies and researchers believe that collaboration can reduce the expense of research activities during the life of a project. For example, through collaboration researchers can train themselves and their students at no cost, especially when a specific technique or a sophisticated instrument is required. This is also beneficial in that it avoids the overhead costs associated with conducting separate projects.

Secondly, and because of scarcity and changes to local research funding strategies and policies, researchers are encouraged to build international networks in order to gain access to international public and private funding opportunities (Harman, 2001; Nieminen and Kaukonen, 2001; Potì and Reale, 2007). Harman (2001) argues that having different sources of funding provides a greater security and continuity in research. As part of their funding terms and conditions and in order to fund international researchers, most international funding organisations (such as research councils) require that local researchers working in local institutions should be the focal point for funded grants. Other funding organisations have special funding schemes and programs to support research collaboration at all levels, but especially international collaboration (Potì and Reale, 2007). Even for private sector businesses, collaborating with universities allows them to access public research funding, as there are many public programs to foster academic-industrial research collaboration worldwide (Sonnenwald, 2007; Lambert, 2003). Such types of research collaboration strategies build a network between sectors and researchers, both at national and international levels, which enhances and fosters future R&D activities.

Finally, research activity outcomes are unpredictable and allocating budgets for research projects with low success rates is a risky endeavour. As stated earlier, many of the socioeconomic and environmental problems faced by some countries or regions are similar, which is why funding institution provides grants for a research that has been funded by another institution in another country. Through research collaboration, institutions can work together on similar research problems by providing funding for teams of researchers from both institutions, instead of providing funding for two different teams independently. This allows research and funding institutions to reduce risk and avoid duplication of similar research activities. Hence, more projects will be funded and the risk involved will be spread around (Beaver, 2001).

2.7.3 Reduction in Transportation and ICT Costs

Reductions in transportation and communication costs are also another motive encouraging researchers to collaborate (Melin, 2000). There is evidence that research collaboration is motivated by and has increased due to a decrease in travelling and ICT costs, which affect the efficiency of collaborative research activities (Katz and Hicks, 1995; Hicks and Katz, 1996; Katz and Martin, 1997; Melin, 2000; Carillo et al., 2011; Sonnenwald et al., 2001; Sonnenwald, 2007). While many researchers find a relationship between geographical proximity and research collaboration either at national or international levels where research collaboration increases as the distance between the collaborators decrease (e.g. Katz, 1994; Liang and Zhu, 2002), researchers can now easily travel rapidly from place to place, with low transportation costs compared to the previous century. Today, researchers can travel to meet their counterparts within two days of travel, which is especially true for countries on the same continent. Cheap and frequent air flights are available between most major cities. Such developments in the transportation services have encouraged the researchers to find the best qualified colleagues around the world to collaborate with and therefore enhance the quality of research output.

Likewise, the modern communication mechanisms of ICT and the reduction in their costs are also an important driving force and component in research collaboration, and their effective use will influence the success of research projects (Sonnenwald et al., 2001; Cummings and Kiesler, 2007). Using such types of ICT can facilitate research collaboration activities, especially if such activities do not require the researchers to be collocated (Sonnenwald, 2007). In addition, many different forms of remote research collaborations have emerged as a result of the development in ICT (Bos et al., 2007). Communication costs have been rapidly decreased with the introduction of technologies like email, online messenger services, and social network media such as Facebook and Twitter. Hicks and Katz (1996) undertook a quantitative study of the science system in the UK between 1981 and 1991 and found that aside from the growth in the total number and proportion of co-authored articles, there was an increase in other kinds of communications, such as international telephone calls and international flights between researchers. Carillo et al. (2011) believe that these reductions in communication costs have enabled researchers to be more selective in choosing collaborators, partnering with researchers with similar attributes, and thus having a net positive impact on research quality and productivity. In the main declaring that *"ICT can support the migration of minds without the migration of bodies"* (Oldham, 2005, cited by Sonnenwald, 2007: 660)

2.7.4 Increasing Levels of Specialisation

Research specialisation has rapidly increased over the last two decades and researchers now require more advanced knowledge in order to make significant advances. Many experimental and applied research activities require highly specialised researchers and high-tech scientific instruments that cannot be tackled by a single researcher or a few researchers due to their complexity (Basu and Aggarwal, 2001; Beaver, 2001; Sargent and Waters, 2004; Birnholtz, 2007; Sonnenwald, 2007). Such large research problems require the pooling together of different areas of expertise. For example, large scale research projects (such as are found in molecular biology or biomedical research) require having specialists from different disciplines such as biology, medicine, statistics, technology, and administration and thus may require higher levels of collaboration that may include governments and industries.

Other large scale projects require significantly more teamwork (giant collaboration), or what is known as "big science". One example of this is the Large Hadron Collider (LHC), a huge engineering project built in Switzerland by the European

Organization for Nuclear Research (CERN), and it is the highest-energy particle collider in the world (Sonnenwald, 2007). More than ten thousand researchers and technical staff from over one hundred countries and hundreds of research institutions work together on this collaborative project (Sonnenwald, 2007).

2.7.5 The Growing Importance of Cross-Disciplinary Research

Global advances in knowledge and technology production integration, and the involvement of many stakeholders in research activities has introduced new terminologies. Sometimes two or more researchers from the same discipline work together to form an intra-disciplinary/unidisciplinary joint research activity which produces new knowledge within the same discipline (Stokols et al., 2008a). Conversely, different forms (trans-disciplinary, interdisciplinary, multidisciplinary, etc.) of 'cross-disciplinary' research collaborations which involve researchers from different disciplines working together (and in some cases integrating their different knowledge to produce a new knowledge) is an emerging practice (Stokols et al., 2003; Ramadier, 2004; Sonnenwald, 2007; Klein, 2008; Stokols et al., 2008a).

The interest as well as the investment in cross-disciplinary research activities has witnessed a growing trend over the past two decades among both public research institutions and private research agencies (Klein, 2008; Stokols et al., 2008b). Many national and international policies and financial instruments have been implemented around the world to stimulate cross-disciplinary research collaboration activities (van Rijnsoever and Hessels, 2011; Bruce et al., 2004; Stokols et al., 2005; Rafols and Meyer, 2007; Stokols et al., 2008b; Sá, 2008; Porter and Rafols, 2009). The reasons behind such interest include the complexity of current global research issues such as health, social, and environmental problems, as well as the realisation that a combination of more than one disciplinary perspective is essential to better understand and solve these complex research issues (Bruce et al., 2004; Cummings and Kiesler, 2005; Stokols et al., 2005; Birnholtz, 2007; Rafols and Meyer, 2007; Stokols et al., 2008b; Heinze and Kuhlmann, 2008; Klein, 2008; Sá, 2008; Porter and Rafols, 2009; van Rijnsoever and Hessels, 2011; Raasch et al., 2013). Rafols and Meyer (2007:634) state that since the 1990s, cross-disciplinary research has become the "*mantra of science policy".* Their assumption is based on the sharp increase in the amounts of funding and of policies aimed at promoting cross-disciplinary research activities. They believe that such activities generate a high rate of scientific breakthroughs and are the most successful way to deal with societal problems by fostering innovation and competitiveness. As an example of this, King et al. (2002) state that since physical activity patterns among individuals and aggregates are influenced by many personal and environmental issues, cross-disciplinary perspectives across different fields (such as psychology, sociology, urban planning, public policy, etc.) are required to gain a complete understanding of these phenomena.

However, some point out that one drawback to cross-disciplinary collaborations is the limitation of opportunities to publish research results in high-ranking refereed journals (which tend to be discipline specific),which may discourage this form of collaboration (Bruce et al., 2004).

2.7.6 Learning New Skills and Techniques (Technology Transfer)

Researchers also collaborate in order to gain access to the scientific and technical human capital available with others. Bozeman et al. (2013:9) conceptualise human capital as *"... the degree, field of training, experience, tacit knowledge, or network ties that an individual collaborator brings to the collaborative group".* Researchers constantly learn new research skills and improve their research capabilities through research collaboration (Melin, 2000; Beaver, 2001; Wagner et al., 2001; Bozeman and Corley, 2004; Sargent and Waters, 2004; Lee and Bozeman, 2005; Maglaughlin and Sonnenwald, 2005; Heinze and Kuhlmann, 2008). Many researchers such as Wagner et al. (2001), Cummings and Kiesler (2003), Maglaughlin and Sonnenwald (2005) and Heinze and Kuhlmann (2008) state that when working together on a research project, they learn from each other by exchanging tools and methods, especially when it is a cross-disciplinary research project where researchers utilise diverse paradigms and cross-fertilise disciplinary concepts. A biologist working with a chemist on a biochemistry research project will enhance the research skills and capacity for both of them and become acquainted with new methods and instrumentation. In cases involving students (especially postgraduates) in such research activities, this will educate them more and build different skills such as research and group working skills (Beaver, 2001). In addition to other scientific and economic objectives, many countries develop programs to enhance collaboration between universities and private sector businesses in order to train researchers and students in practical environments.

2.7.7 Enhancing Productivity, Quality and Efficiency

Many studies suggest that one of the main motives for researchers to collaborate is that through research collaboration they can enhances their research productivity and efficiency. Such belief is empirically proven by many studies which confirm that research collaboration enhances participants' productivity, quality, and efficiency (Pravdić and Oluić-Vuković, 1986; Katz and Martin, 1997; Melin, 2000; Beaver, 2001; Persson et al., 2004; Sargent and Waters, 2004; Lee and Bozeman, 2005; Frenken et al., 2005; Rigby and Edler, 2005; Birnholtz, 2007; Sooryamoorthy and Shrum, 2007). Moreover, due to being comprised of different people with different perspectives and knowledge working together, risk is minimized, which increases the chances of success and in turn leads to new directions of research activities and further future research and funding. For example, some of these studies confirm a strong relationship between collaboration and institutional productivity, where the researcher who collaborates more is the most prolific (Pravdić and Oluić-Vuković, 1986). In addition, the researchers' productivity will increase if they collaborate with highly productive researchers rather than the other way around (Pravdić and Oluić-Vuković, 1986).

Additionally, researchers believe that by collaboration, they will be able to produce better quality research, especially when they are collaborating with well-established scientists. Also, bibliometric studies indicate that the quality of papers published jointly in terms of citation rates is higher than that of single authored papers (e.g. Persson et al., 2004; Levitt and Thelwall, 2010; Onyancha and Maluleka, 2011). They argue that those papers are published in higher-impact journals, which explains frequent citations and citing for longer periods of time (Persson et al., 2004; Frenken et al., 2005; Rigby and Edler, 2005). Even in terms of level of collaboration, Frenken et al. (2005) suggest that internationally co-authored papers have higher visibility through conferences and a higher citation rate than intra-national co-authored papers. It can generally be understood then that one important instrument for facilitating knowledge production and diffusion in science and technology has been research collaboration (Hagedoorn et al., 2000; Powell et al., 2005; Singh, 2005).

2.7.8 Attracting Talents

Due to demographical trends in some regions of the world showing a decrease of graduates in science and engineering, many countries (such as those in Europe) use international research collaboration as a way to attract talent from other countries. Boekholt et al. (2009:5) state that some countries need to develop policies to improve their *"attractiveness to researchers by reducing administrative obstacles to mobility in the areas of social security entitlements, fast-tracking of work permit and visa procedures and recognition of qualifications"*. Some developed countries implement policies that build their national research capacity and quality through enhancing international research collaboration, which will enable domestic researchers' access to current knowledge, and build networks with international researchers. They may also aim to attract the best researchers from abroad due to shortages in their own countries, mainly through increasing the attractiveness of domestic systems to overseas researchers (Boekholt et al., 2009). Furthermore, to improve their products and services, businesses also collaborate in R&D with universities in order to get access to the best students and scientists for recruitment purposes, especially if the collaborating scientists are paid lower salaries compared to the offered business salaries (Lambert, 2003; Sonnenwald, 2007). Salary rates in some developing countries are very low compared to salary schemes in more advanced countries, causing these countries face difficulties in matching what is paid by developed countries and leading to a 'brain drain' (Oldham, 2005).

2.7.9 Social Reasons

Scholars offer differing opinions on the social motives behind research collaboration. While some researchers have shown that such factors motivate researchers to collaborate (e.g. Katz and Martin, 1997; Melin, 2000; Beaver, 2001; Sonnenwald, 2003b; Bozeman and Corley, 2004; Sargent and Waters, 2004; Maglaughlin and Sonnenwald, 2005; van Rijnsoever et al., 2008), others such as Price (1963) claim that social factors do not play a significant role because collaboration output arises from economical rather than social motives.

Generally though, there are social and personal motives behind collaborations in research, not the least of which include academic promotion and tenure (Sonnenwald, 2003b; Sargent and Waters, 2004; Sonnenwald, 2007; van Rijnsoever et al., 2008). For example, van Rijnsoever et al. (2008) found a correlation between the academic collaborative networks on the one hand, and professional development during the first twenty years of an academic career on the other. The networks gained from collaborative activities increase a researcher's productivity, which in turn will have a positive impact on their career development. Moreover, such positive impacts on career development may influence their future willingness to collaborate. Sonnenwald (2007) believes that individual personal goals can influence one's on-going commitment to collaboration, as it widens his or her perspective on many aspects of their work. Conversely, some collaborative research activities (such as those between academic researchers and private industry) may have a negative impact on career development, due to publishing restrictions imposed by industry (especially involving innovation and development opportunities).

Other social and personal motives include increasing scientific popularity and visibility (Heinze and Kuhlmann, 2008), recognition (Beaver, 2001), and for personal enjoyment, especially when working with old colleagues and supervisors (Katz and Martin, 1997; Melin, 2000; Beaver, 2001; Sargent and Waters, 2004; Maglaughlin and Sonnenwald, 2005) or to maintain contact with former graduate students (Oldham, 2005). Some find that research collaboration is a mechanism for getting to know people and increasing social networks (Beaver, 2001; Newman, 2001; Sargent and Waters, 2004; Newman, 2004; Woo et al., 2013; Toral et al., 2013). Researchers tend to prefer having social networks with counterparts, providing more opportunities to collaborate with them. Newman (2001) states that the social networks created by biomedical scientists help to reach any one individual within the network, through following six or less co-authorship linkages. Such networks help researchers develop ideas about new research questions, funding opportunities, and in selecting the right collaborators (Beaver, 2001; Bozeman and Boardman, 2003; Maglaughlin and Sonnenwald, 2005).

2.7.10 Political Reasons

Historically, research collaboration has had a positive political impact and many policymakers at both national and regional levels develop collaborative research initiatives and funding strategies in order to strengthen the political relationships between nations, promote understanding, and enhance world peace (Sonnenwald, 2007; Boekholt et al., 2009). One example of such initiatives is the International Arid Lands Consortium (IALC) which was established in 1990 by some research institutions from the USA, Israel, Jordan, and Egypt as an independent, non-profit body to be a catalyst for peace through research collaboration in arid lands (McGinley and Chamie, 2003). This organisation supports workshops and symposia aimed at promoting peace in the Middle East. Another example are the research programs established by the EC through the European Science Foundation in order to improve the understanding between countries in the region and enhance European political unity and integration (Banda, 2000; Oldham, 2005; Boekholt et al., 2009). In order to gain funding from these programs, the researchers have to be from at least three EU countries. A third example are the research collaboration programs between some of the Central American countries which led to closer political ties between them (Oldham, 2005).

Finally, as mentioned earlier, some governments develop bilateral collaboration programs such as the German-Israel Foundation for Scientific Research and Development, which mainly funds joint research activities between the two countries as a means of *"healing post-war wounds"* (Arunachalam and Doss, 2000:48). Others support collaboration to redirect military research into peacetime applications, such as the International Science and Technology Centre (ISTC) which provides funding for non-military research activities between the previous weapons' scientists in Russia and/or the Commonwealth of Independent States, and other researchers throughout the world (Sonnenwald, 2007).

2.8 Levels and Structures of Research Collaboration

Researchers collaborate with each other inside or outside of their disciplines, research groups, departments, institutions, and academic sectors. These different levels of collaboration can be intra-national or international. In terms of structure, these different levels can be classified as being either formal or informal. Research collaboration may sometimes begin by chance, such as at conferences, workshops, on sabbatical leaves, through mentorships, or research visits. As a result, collaborations between researchers can begin informally and are characterised by person-to-person contacts at the micro level, which gradually may lead to contracts and/or other forms of linkages at the macro level.

There is some debate regarding at which level the research collaboration should start or be enhanced. Some state that research collaboration is a purely individual level matter and it is up to the individual researcher whether to engage in such type of research activity or not (Laudel, 2001; Hu and Racherla, 2008). They consider collaboration between two researchers or more as the fundamental unit of collaboration. For example, Laudel (2001) empirically shows that most research collaboration begin face-to-face and at an individual level. Others see it as a strategic issue that needs to be addressed as an objective of each institution and at higher levels (Stokols et al., 2008b; Manjarrés-Henríquez et al., 2009). Research institutions, funding agencies, and policymakers often must facilitate this form of knowledge production, and do not leave it at the individual level due to the overall positive impacts which will be discussed later in this chapter. Also, governmental bodies and regional organisations have to provide funding, facilities, and capacities to support research collaboration as well as facilitate cross-profession collaboration between research institutions and industry. The importance of research collaboration is increasing rapidly and a number of studies have addressed this trend across many research themes (Newman, 2004; Cronin et al., 2004; Wray, 2006). The form and level of research collaboration is influenced by the professional field of the researcher, and studies suggest that the field-specific motivations for collaboration define which forms of collaboration a researcher will use (Melin, 2000; Glänzel and de Lange, 2002; Wagner, 2005).

2.8.1 Levels

As stated above, most strategies and policies primarily aim to enhance research collaboration at higher (macro) levels (such as between institutions or countries), and thereby assume that the lower (micro) levels (such as individuals and groups) will benefit as well. The table below summarises the two main levels (i.e. intra and inter) of research collaboration as outlined by Katz & Martin (1997). The most basic level of intra-research collaborations is when researchers from the same discipline or research group and research institution work together with the goal of producing new knowledge within the same discipline (intra-disciplinary). Other types of 'intra-level' research collaborations are intra-departmental, intra-institutional, intra-sector, and intra-national.

On other hand, inter-research collaboration is the second level of collaborative research activities. Such types of higher level research, which is aimed for by policymakers, includes international research collaboration, where researchers collaborate across international borders. The most targeted international research collaboration is one that includes cross-disciplinary, multi-national, and multi-institutional types. Others types of "inter-level" research collaborations are inter-departmental, inter-institutional, and inter-sector, which include cooperation across different departments, institutions, and sectors. For example, intra-departmental collaboration is when participants work together within a single department inside a research institution; while inter-departmental collaboration occurs when its participants span multiple departments or disciplines. Ponds (2009) finds in his study that most international research collaboration happens between academic institutions and not between academic institutions and other sectors such as society or industry. In some cases research collaboration involves both 'intra' and 'inter' levels of collaboration, especially when two researchers from different institutions in the same country (intra-national) collaborate with researchers from other countries (international). Katz and Martin (1997) classify these scenarios as either ‘homogeneous’, when it involves either the intra or inter, or ‘heterogeneous’ when it involves both intra and the inter collaboration.

Sonnenwald (2007) categorises scientific collaboration according to three differently focused groups, which are geographic, disciplinary, and organisational. For instance, in terms of geographic focus, researchers can either collaborate remotely (remote collaboration) in which they are not collocated but work together in research activities or are collocated at national and international levels. Also in terms of disciplinary focus, it can be intra-disciplinary (disciplinary collaboration) or inter-disciplinary. Finally, in terms of organisational focus, they can collaborate either within the same sector (e.g. university-university or industry-industry) or with another sector (e.g. university-industry or university-community).

Most collaborative activities are formed either within the public sector, the private sector, or both. An example of public sector research collaboration is when two or more public institutions or organisations work together, while private sector research collaboration is when two or more private institutions work together. Both the public and private sectors can also work jointly in R&D activities. In some cases, three different types of participants can be included in the collaboration, as seen with the Triple Helix Model which was developed to study the relationship between research institutions (public or private), government, and industry (Etzkowitz and Leydesdorff, 2000). Universities may also work with other community services providers or public organisations such as health services providers or schools in order to promote population health and enhance educational systems. Finally, universities and other research institutions work with industry or with other research centres, mainly to develop or improve their products and services. The main outcomes of such collaboration is intellectual discovery and scientific advancement (Stokols, 2006; Stokols et al., 2008b).

Generally, there is a relationship between the level of research collaboration and the motives behind forming it, especially when the collaborative parties are from different sectors. Researchers from universities may work together and have similar motives, as their ultimate aim is to generate knowledge; while on the other hand, when they work with the industry, motives may shift to generating and implementing knowledge by introducing new technologies, products, processes, and techniques that foster economic growth and generate income (Gibbons et al., 1994).

Table 2-2: Different levels of research collaboration

Level	Intra	Inter
Individual	-	Between individuals
Research group	Between individuals in the same group	Between groups in the same institute
Institute	Between individuals or groups in the same research institute	Between research institutes in the same department
Department	Between individuals or institutes in the same department	Between departments in the same school
School/College	Between individuals or department in the same school	Between schools in the same institution
Institution	Between individuals or schools in the same institution	Between institutions in the same sector
Sector	Between institutions in the same sector	Between sectors in the same country
Nation	Between sectors in the same country (intra-national)	Between countries (international)

Source: Adopted and modified from Katz & Martin (1997)

2.8.2 Structures

In terms of organisational structure, any research collaboration can be classified as either formal or informal. The ‘formal’ type may be characterized by a formal agreement such as a research contract, joint research project, consultancy agreement, or a signed memorandum-of-understanding (MoUs). This type of collaboration involves documentation, including a research plan, obligations, budget, aims and objectives, collaborators, research institutions, and the terms and conditions of a contractual agreement.

Researchers can also work together directly without involving their institution's management, which is termed as 'informal' research collaboration. This includes things such as discussing research related issues through e-mails, conferences, informal meetings, workshops, sabbaticals, research visits, and short-term research endeavours. Most of these informal research collaborations cannot be measured through bibliometric indicators (especially when there is no research output such as publications) compared to more formal ones.

Hagedoorn et al. (2000) argue that there is little to know about informal partnerships because they are difficult to track and study quantitatively and in systematic ways. Link and Bauer (1989) found that nearly 90% of US-based manufacturing firms engage in informal research partnerships with other firms. Some other examples of informal research collaborations include meetings of the senior administration of research institutions that share information about the research activities within their institutions and suggest priority research themes and topics for future research collaborations. A doctoral student who travels between research institutions to carry out their research activities is another example of informal research collaboration. Finally, meetings and communications between researchers to discuss their research activities and advise one other is another type of informal collaborative activity.

Generally, research collaboration begins informally through person-to-person contact, and from there gradually becomes more formal, leading eventually to a formal collaboration such as joint research project and contracts. In some cases the research discipline influences the type of structure used in collaborative activities. There is less formal research collaboration in the humanities and social sciences due to less need for formulated contracts and does not typically involve patients and new products (Schartinger et al., 2002). In the natural sciences where applied research is carried out, more formal research collaboration exists, especially for university-industry collaboration where knowledge creation goes beyond publication, and potentially lifesaving developments, products, services, or technologies are at stake.

2.9 Measuring the Impacts and Success of Research Collaboration

Since investment in and funding of collaborative research activities has expanded, this has driven higher demand for indications that they are effective and justifiable in terms of their research output as well as others key indicators of success. Boardman and Bozeman (2006) and Corley et al. (2006) specify that the criteria for collaborative success includes: (1) Achieving the main reasons (motives) to collaborate, (2) the avoidance of barriers via effective planning and management, and (3) meeting the planned outcomes for the key stakeholders involved in the collaboration, including social and policy goals in addition to scientific goals.

The expected output of any collaborative research activity can be multifarious, varying between informal gain of ideas and knowledge to categorised output such as co-patents or co-publications (which are measurable and quantifiable). Although some researchers consider collaboration as a form of '*collabetition*' (i.e. part collaboration, part competition), it has a positive impact for the academic participants and their institutions and national affiliations. It is a 'win-win game' in that each one will benefit from it both in the short-term (through the output in terms of publications and results), and in the long run in terms of intellectual property development and phases of implementation.

The next two sub-sections will focus upon the main quantitative and qualitative indicators of research collaboration.

2.9.1 Quantitative Impacts

The main objective of research collaboration is producing knowledge, however, the outcomes of any research are unpredictable and in some cases no knowledge may be produced. The most commonly quantifiable proxy used by researchers to measure the impact of research collaboration is the number of co-authored published research (i.e. co-authorship). Many have cited the increase in the number of multi-authored papers as evidence of an increase in research collaboration (Price, 1963; Balog, 1980; Subramanyam, 1983; Hicks and Katz, 1996; Newman, 2004; Cronin et al., 2004; Adams et al., 2005; Lee and Bozeman, 2005; Savanur and Srikanth, 2010; Yu et al., 2011; Rousseau, 2011; Gazni et al., 2012; Uddin et al., 2012; Yu et al., 2013a). For example, as stated earlier, a statistical analysis of the UK research system between 1981-1991 found a steady increase in the number as well as percentage of co-authored articles between institutions as relating to an increase in joint research activities (Hicks and Katz, 1996). However, Duque et al. (2005) found that in developing states like Kenya, Ghana, and India, there is no positive relationship between research collaboration and number of co-authored publications. This supports Bukvova (2010) assertion that not every research collaboration will necessarily produce co-authored articles, nor do all collaborators necessarily appear as co-authors in published papers.

At the international level, many studies found an increase in international co-authored published papers as an indication of increased international research collaboration (Glänzel, 2001; Wagner and Leydesdorff, 2005a; Wang et al., 2005; Jin and Rousseau, 2005; Leydesdorff and Wagner, 2008; He, 2009).

The advantage of using co-authored published papers to measure research collaboration is that it is relatively easy due to the availability and accuracy of data. Published papers are listed in many databases such as Web of Science (going back to 1963) and Scopus (going back to 1996), and can be retrieved through the free or inexpensive tools available in those databases. Subramanyam (1983) supports the notion that this is a practical and inexpensive method to quantify the impacts of research collaboration on productivity. Furthermore, in terms of the sample size, it is an easy way to get a large-enough sample to produce statistically significant results in bibliometric analysis, whose findings can then be independently verified by other investigators easily due to its availability (Subramanyam, 1983; Katz, 1993; Katz and Martin, 1997; Bozeman et al., 2013). The Scopus data base includes more than 29,500 journals and the Web of Science (WoS) data base includes more than 18,800 journals across multiple disciplines.

However, some studies criticise this method as the role and the percentage of contribution of each author is not clearly defined in multi-authored papers, along with there being other social reasons behind listing additional authors (e.g. Follette, 1992; Melin and Persson, 1996; Wray, 2006; Heinze and Kuhlmann, 2008). The common practice of making colleagues 'honorary co-authors' is a critical issue, and can potentially give the wrong impression about the true nature of collaboration (Follette, 1992). Others argue that the assumption that co-authors provide an equal contribution is not always a valid, as not all research collaboration leads to producing co-authored papers and not all co-authored papers are indicative of an output of research collaboration (Katz and Martin, 1997; Smith and Katz, 2000; Laudel, 2002; Bukvova, 2010).

As an example of this, Katz and Martin (1997), and Smith and Katz (2000), state that using collaboration and co-authorship interchangeably is not a true reflection, as co-authorship is only a partial indicator of collaboration, and argue that many problems can arise from using this type of measurement, therefore the validity of interpreting such variables needs to be assessed. For example, if two scientists work together, but decide to publish separately, or even if they worked separately and decided to publish jointly, the bibliometric data does not reveal such nuances. However, these two extreme cases can potentially offset one another's effects on using such variables in evaluating research collaboration.

Another shortcoming of using co-authorship to measure collaboration is when authors put more than one affiliation per author in their paper, especially when they are in different countries. For example, a researcher on his/her sabbatical leave (or on a visiting fellowship) publishes a paper with two affiliations—their home institution and the one where they are visiting. In this scenario, for example, Katz and Martin (1997) argue that there is no collaboration between the two institutions, although there is a paper published jointly. However, in most cases of sabbatical leaves or visiting fellowships, the permanent institution is participating either directly or indirectly in the joint research activities. Researchers being given paid leave or funded research activities during their visits are the main purpose of such visits. This scenario may also occur inside a country, especially when the researcher is working for more than one institution, such as in a school of medicine and a hospital, resulting in a published paper with two affiliations listed.

All of the above scenarios could occur at all levels of collaboration, especially when the collaboration is informal in nature. Nevertheless, the drawbacks of using the amount of published co-authored papers as a variable are minimal since they are extreme scenarios that may offset one another. In addition, scrutiny and standardization of the data used will minimise the potential errors, especially when applying this measure at higher organisational levels such as between different organisations or countries (Melin and Persson, 1996; Melin, 2000). All things considered, using this variable still provides the most ideal way and the most available source of data to measure research collaboration that can be handled statistically (Melin and Persson, 1996).

A second quantifiable measure, and in cases where there is no possibility to publish a research in term of journal articles or books or a valuable advice from an expert in the field has helped to generate knowledge and his/her contribution will appear as an acknowledgement (sub-authorship), which is why some researchers use it as another measure of collaboration (Cronin et al., 2003; Cronin et al., 2004; Cronin, 2005). An example of a real collaboration is the doctoral students' acknowledgement of their supervisors in their final thesis, who in most cases provide a major contribution to the work.

The third quantifiable indicator of research collaboration is its positive impact on productivity. Many studies provide evidence that research collaboration and linkage between different sectors boosts and enhances institutional as well as personal productivity (e.g. Liberman and Wolf, 1998; Lee and Bozeman, 2005; Gulbrandsen and Smeby, 2005; Frenken et al., 2005; Meyer, 2006; Van Looy et al., 2006; Breschi et al., 2007; Azoulay et al., 2009; He et al., 2009). These studies find that collaboration increases the institutional and the personal productivity of researchers, and that each researcher's productivity is highly influenced by the different types of links he/she has. In other words, the more collaborative links a researcher has, the more research productivity will result thereof, and conversely, less collaborative links will lead to less research productivity.

In addition to that, some studies find that highly productive researchers tend to collaborate more than less productive researchers. Frenken et al. (2005) argue that the rationale behind this is that their previous collaborative research experiences helped them to create larger networks which in turn help them to gain access to more resources and editorial boards, and thus have a higher acceptance rate for publication. Accordingly, when a researcher collaborates more with other highly productive researchers, his/her research productivity increases as a result of this positive influence – either as a co-author in a published paper or as a single author (Lee and Bozeman, 2005). Thus, collaboration among highly productive researchers is linked with increased research productivity, while collaboration among less-productive researchers is associated with less output. Some scholars who have studied collaboration between universities and industry propose that one of the most important outcomes is the increased productivity of the firms involved, especially when a new product is developed that leads to financial profitability (Barnes et al., 2002; Dietz and Bozeman, 2005; Meyer, 2006; Perkmann and Walsh, 2009; Robin and Schubert, 2013). However, there is evidence in some of the literature that collaboration with industry may negatively influence the productivity of academic researchers because of the contradictive views between both academic institutions and industry and the publication restrictions imposed by industry (e.g. Perkmann and Walsh, 2009; Bruneel et al., 2010).

The fourth quantitative variable is the volume of scientific networks created by and between researchers. It has been observed an increase of scientific networks globally between individual researchers, universities, industries, governments, and other funding organisations (Gibbons et al., 1994; Etzkowitz and Leydesdorff, 1998; Cronin, 2001; Harman, 2001; Nieminen and Kaukonen, 2001; Grossman, 2002; Newman, 2004; Wagner and Leydesdorff, 2005b; van Rijnsoever et al., 2008; Morel et al., 2009; Oliveira and Gama, 2012). Some have created a graphic, using nodes and lines, with the size of each node representing the volume of links between the collaborators, institutions, and countries (Newman, 2004; Wagner and Leydesdorff, 2005b; Hou et al., 2008a). It has been argued that networks can be seen as an important means for scientists in securing research contracts and funding (Harman, 2001; Nieminen and Kaukonen, 2001), and increases in their research productivity (Liberman and Wolf, 1998). Others see a direct relationship between one's scientific network as a researcher on the one hand, and their years of experience and academic ranking on the other hand (Bozeman and Corley, 2004; Lee and Bozeman, 2005; van Rijnsoever et al., 2008). Even in the industrial sector, networks between industry and academia are important channels for the flow of ideas and information, which helps them monitor emerging trends in science and technology — allowing them to collectively shape the direction of research and gain early access to the results.

Audretsch et al. (2002) argue that firms which have network ties with universities tend to be more productive in terms of R&D and patents. They state that it is very important to maintain such networks in order to gain access to the scientific and technical human capital of academics and students.

The fifth and final quantifiable measure as an outcome from research collaboration, specifically within joint research projects between academia and industry (university-industry collaboration), is the number of registered patents. This type of patent describes when two or more co-inventors are from two or more institutions and/or countries, or where the owners and inventors of a patent are from different institutions and/or countries. Many studies find a direct and positive correlation between university-industry collaboration and the numbers of co-patents registered (Meyer-Krahmer and Schmoch, 1998; Debackere and Veugelers, 2005; Meyer, 2006; Van Looy et al., 2006; Breschi et al., 2007; Azoulay et al., 2009; Perkmann and Walsh, 2009). Moreover, some studies use co-patents as an indicator for university-industry collaboration, and find that inventors publish more than their non-inventor colleagues (Breschi et al. 2007).

2.9.2 Qualitative Impacts

The quality of research has become one of the most important issues for policymakers and funding bodies around the world and has been addressed by many social science scholars. Its impact can be measured by the actual influence of any collaborative research output on surrounding research activities (Moed et al., 1985). Research collaboration generally has a positive impact on the quality of research output and the knowledge generated through it. Gray (1989) states that when research institutions work jointly on a problem, the quality of results often increases dramatically, due to a more comprehensive analysis and complementary resources.

The commonly used practical method of measuring the quality of research impact is the number of times an article has been cited by subsequent published works and the impact factor of the journal in which they are published (Rigby and Edler, 2005; Pečlin et al., 2012; Lancho-Barrantes et al., 2013). Many bibliometric studies have found that published papers resulting from research collaboration are published in higher-impact journals (i.e. high impact factor), and are cited more frequently and for a longer period of time compared to other published papers not resulting from collaboration (Narin et al., 1991; Laband and Tollison, 2000; Glänzel and de Lange, 2002; Sargent and Waters, 2004; Persson et al., 2004; Frenken et al., 2005; Leimu and Koricheva, 2005; Figg et al., 2006; Inzelt et al., 2009; Levitt and Thelwall, 2010; Pečlin et al., 2012; Lancho-Barrantes et al., 2013). Some scholars provide empirical evidence supporting the notion that the acceptance for publication of co-authored papers is higher than for single-authored papers (e.g. Gordon, 1980; Laband and Tollison, 2000). Even in terms of the level of collaborative research, internationally co-authored papers are cited more often than those with co-authors from the same nation (Narin and Whitlow, 1991; Glänzel, 2001; Glänzel and de Lange, 2002; Persson et al., 2004; Frenken et al., 2005; Figg et al., 2006; Inzelt et al., 2009; Jeong et al., 2011; Pečlin et al., 2012; Lancho-Barrantes et al., 2013). This is mainly due to the geographical diffusion of knowledge which will be accessible to a larger population of scientists globally.

Another qualitative advantage of research collaboration is that because of different organisations, with researchers having different perspectives and discussing and arguing about their research activity, errors are more easily detected and risk is reduced (Beaver, 2001). The more researchers there are working together on a piece of research, the more knowledge, skills, and perspectives will be brought to bear, enriching their research quality as a result. Furthermore, at occasions such as workshops and conferences, additional feedback from colleagues further improves and enhances their work (Katz and Martin, 1997).

Other qualitative impacts related to research collaboration are researchers' professional development being furthered during research activities, such as learning new educational and administrative skills and expanding their knowledge base, as well as other socio-political developments (Sonnenwald, 2003b; Cummings and Kiesler, 2003; Sargent and Waters, 2004). All of these developments no doubt have positive impacts on the quality of teaching, research, and development in the participating institutions and countries. Research collaboration also plays an important role in the training and development of postgraduate students (mainly PhD students), either by involving them in the collaborative research projects, or through co-supervision across research institutions and countries.

Finally, in addition to the qualitative indicators listed above, some studies such as Perkmann et al. (2011) and Perkmann et al. (2013) have investigated the outcomes and impacts of research collaboration between academics and industry on technology and innovation. Academics play a direct and supportive role by providing solutions to complex industrial and public problems, improving the quality and efficiency of their products and services.

2.10 Potential Problems of Research Collaboration

Although it is generally known that research collaboration is inherently a good thing, and should be encouraged at any level however, some of the researchers point out potential problems which can arise, either from collaboration itself or the indicators used to measure it. Firstly, research collaboration can be used to hide unethical conduct, especially so with international collaboration (Sonnenwald, 2007). For example, some researchers from developed countries collaborate with researchers from developing/underdeveloped countries to unethically perform clinical trials or to gain access to some sensitive areas such as prohibited natural resources and political areas (Oldham, 2005). Secondly, in some cases researchers collaborate with the objectives and intention of intellectual espionage, stealing the results of others (Beaver, 2001). Thirdly, a limitation of collaboration is the difficulty in asserting responsibility for errors, which can lead to negative impacts on the research quality and to the diffusion of epistemic and ethical responsibility (Wray, 2002; Wray, 2006). Fourth, in some cases collaboration may lead to competition between countries that diverts from its main objectives towards other more self-oriented goals, such as the competition of scientists — especially when there is a competitive advantage in one country or research institution compared to the other collaborators' country or organisation. This is potentially very risky, and can lead to a 'brain drain' for some developing countries, particularly within international research collaboration that lacks adequate funding sources.

The fifth potential problem involves time constraints. Well-established researchers that are leading a group in collaborative research will often spend a lot of time performing administrative activities which affect their productivity. Furthermore, a greater amount of time is needed for international collaborative research compared to local collaboration. Sixthly, the manner in which some researchers assign credit can be problematic (Wray, 2006). This largely occurs when co-authors that were not actually involved are listed on published works, who may have been included for social or political reasons (Cronin, 2001). Such actions underscore the criticism of using the numbers of co-authored publications as an indicator of research collaboration. Seventhly, in some cases the administrative costs of collaboration can be very high, as well as time-consuming — especially with inter-collaboration across disciplines or internationally, due to the geographical distance between the participating researchers (Nooteboom, 2000). This can have a negative effect on the productivity of collaborative researchers (Cummings and Kiesler, 2007; Stokols et al., 2008b). Finally, collaboration may be unduly affected by powerful lobbying groups which can influence research policy and funding decisions in their favour, having a negative impact on funding for single researchers or new groups of researchers (Sonnenwald, 2007).

2.11 The Factors Influencing Research Collaboration

The previous sections of this chapter provided a general overview of research collaboration and the historical background, forms, levels, motives, and the impacts/outcomes of research collaboration. During the collaborative process, from the initiation stage until the conclusion stage, many internal and external factors influence collaborative research activities. This section will address the main factors that affect successful research collaboration and will highlight the most recent published works (from 2001 onward) addressing the factors influencing research collaboration. The emphasis here is on outlining the main factors to help build a conceptual framework for the study.

There are many previous studies on collaborative research activities which highlight the factors that facilitate and/or hinder research collaboration. Researchers have used different approaches in classifying those factors based on their context of study. Some of them addressed the factors which affect collaboration in general such as Mattessich et al. (2001) and Sonnenwald (2007). Others have emphasised the factors that affect either academic research collaboration (i.e. academic-academic collaboration) such as Maglaughlin and Sonnenwald (2005), Heinze and Kuhlmann (2008) and van Rijnsoever and Hessels (2011) or cross-sector collaboration (academia-private sector) such as Amabile et al. (2001), Mora-Valentin et al. (2004) and D'Este and Patel (2007) or between academic and social organisations such as Kellett and Goldstein (1999) and Buys and Bursnall (2007).

The following sub-sections will look at the main studies addressing the factors that facilitate and/or hinder research collaboration in general, academic research collaboration, and research collaboration between publicly funded research institutions.

2.11.1 Studies on the Factors Influencing Research Collaboration in General

Mattessich et al. (2001) are among the researchers that published a comprehensive review about the factors that influence collaboration in general. They reviewed and screened more than 280 studies on "collaboration" in general, and extracted the factors influencing collaboration activities. They identified twenty factors that influenced the success of any type of collaborative activity, and classified these factors into six different categories (Table 2.3). Although their research suggests that these factors can apply to any collaborative effort (such as those between government agencies, non-profit organisations and business organisations), the twenty identified factors cover a variety of contexts, which include academic and non-academic contexts, and not all of these identified factors are related and important for research collaboration. Classifying their relevance within the different types of collaborative activities helps researchers and policymakers to address the ones most relevant to their studies and initiatives. These identified factors are not, however, classified according to which stage they correspond to. Some are more important in the initial stage (such as the purpose, vision, goals, and objectives), others are more important during the implementation stage (such as adaptability and flexibility), and some are more important during the collaboration process (such as communications and political and social climates).

Table 2-3: Factors influencing the success of collaboration in general

Group	Factors
Environment	1- History of collaboration in the community 2- Collaborative group seen as a legitimate leader in the community 3- Political and social climate
Membership characteristics	4- Mutual respect, understanding, and trust 5- Cross section of members 6- Members see collaboration through self-interest 7- Ability to compromise
Process and structure	8- Members share a stake in both process and outcome 9- Multiple layers of participation 10- Flexibility 11- Development of clear roles and policy guidelines 12- Adaptability 13- Appropriate pace of development
Communication	14- Open and frequent communication 15- Established informal relationships and communication links
Purpose	16- Concrete, attainable goals and objectives 17- Shared vision 18- Unique purpose
Resources	19- Sufficient funds, staff, materials, and time 20- Skilled leadership

Source: Author's construction based on Mattessich et al. (2001)

A few years later, after a series of published works on research collaboration, Sonnenwald (2007) published a chapter in *"Annual Review of Information Science and Technology"* (ARIST), focusing exclusively on research collaboration in general, particularly on the factors affecting the different stages of the collaborative process. She synthesized the findings of studies carried out in different contexts or settings of research collaboration. She listed four stages of the research collaboration processes, which are foundation, formulation, sustainment, and conclusion. Each of these stages frames the progressive emergence of factors affecting the collaboration process.

The first stage is the foundation stage, which emphasizes the motives behind research collaboration, as well as political climate, cultural differences, gender, communications, and personal factors such as trust, respect, and personal compatibility. The second stage is the formulation stage, which is further broken down into four categories of factors to consider during this stage. The first category is factors related to the collaboration's vision, goals, benefits, the effective distribution of resources, and the obligations and tasks of each collaborative researcher and institution. The second category involves leadership and organisational structure. The third relates to the availability of ICT within the collaborative institutions and countries. Finally, the last category in the formulation stage is the clarity of intellectual property and other legal issues in the collaboration.

The third stage of research collaboration process is the sustainment stage, and is also further broken down into three categories of factors. The first category related to this stage involves the challenges that may emerge during the project. Researchers have to expect challenges and problems that may emerge during this stage, which require more effort, flexibility, and adaptability. These challenges and other problems may arise due to a lack of well-captured data in the formulation stage, or for other unexpected reasons. Examples of these problems include changes in the collaborating institution's management and policy, unexpected social factors such as illness and deaths, size of the collaboration team, management problems, and the geographical distances. The second category of factors related to the sustainment stage is the learning process and time required to integrate the knowledge (especially in cross-disciplinary research) and sustain learning during the research process. Collaborators have to allocate extra time and contingency resources for unexpected challenges during the learning process. The third and the final category of the sustainment stage is efficient communication between collaborators, which is very important for successful projects. The collaborators have to use up-to-date ICT facilities and coordinate with each other on the progress of their project, especially when they are geographically dispersed.

The last stage of the collaborative process is the conclusion stage, which mainly focuses on the outcomes of collaborative projects such as the knowledge produced and any other related products. In this stage, the collaborators have to evaluate their scientific outcomes and measure them against their vision, goals, and objectives. New research questions and proposals can then be created and new collaborative research processes begun.

Sonnenwald (2007) addresses research collaboration comprehensively, overlapping with most of the factors identified by Mattessich et al. (2001). However, she similarly looked at the general context of research collaboration and some factors, which may affect a specific level or form, will not have any impact on the other levels and forms. For example, the type of institution (i.e. public or private) is very important in any collaborative activity. Generally, the motives of private institutions are different from those of academic research institutions due to differences in their reasons of existence, cultures, organisational systems, and procedures that may affect research collaboration within or between the two different types. In addition, collaborating with public research institutions is different from collaborating with non-public research institutions because of organisational structures and other institutional related factors. For example, the process of approving a collaborative research project or purchasing a piece of research equipment may differ from one institution to another because of the differences in their administrative and financial systems. Also, in any specific level of research collaboration, the factors which have effects on the intra-national level are different than the factors affecting international levels of collaborations. For example, Rahm et al. (2000) studied university-industry research collaboration in the USA, UK, and Japan, and found that such form of research collaboration in Japan is different from the USA and the UK, and many factors relating to educational systems, culture, economical and legal issues affecting it while there are some similarities in the USA and the UK.

A recent working paper by Bukvova (2010) includes a literature review on joint research activities. In this overview, she mentions the influencing factors and divides them into two groups based on the nature of their existence. The first group is the internal factors, including *"coordination, preparation, communication, awareness, familiarity of team members, leadership skills, personal characteristics, setting boundaries, and legitimate authorization, and support from stakeholders" (Bukvova, 2010:5-6).* These factors mainly relate to the individual researchers on a collaborative project. The second group is the external factors that influence research collaboration, which are of interest to decision-making bodies like research institutions and organisations attempting to support collaboration. Examples of this are institutional culture and availability of funding and other resources. Her review helps to familiarise researchers with the expected factors; however, how these factors could affect collaboration, or at which level or phase they could emerge has not been well clarified.

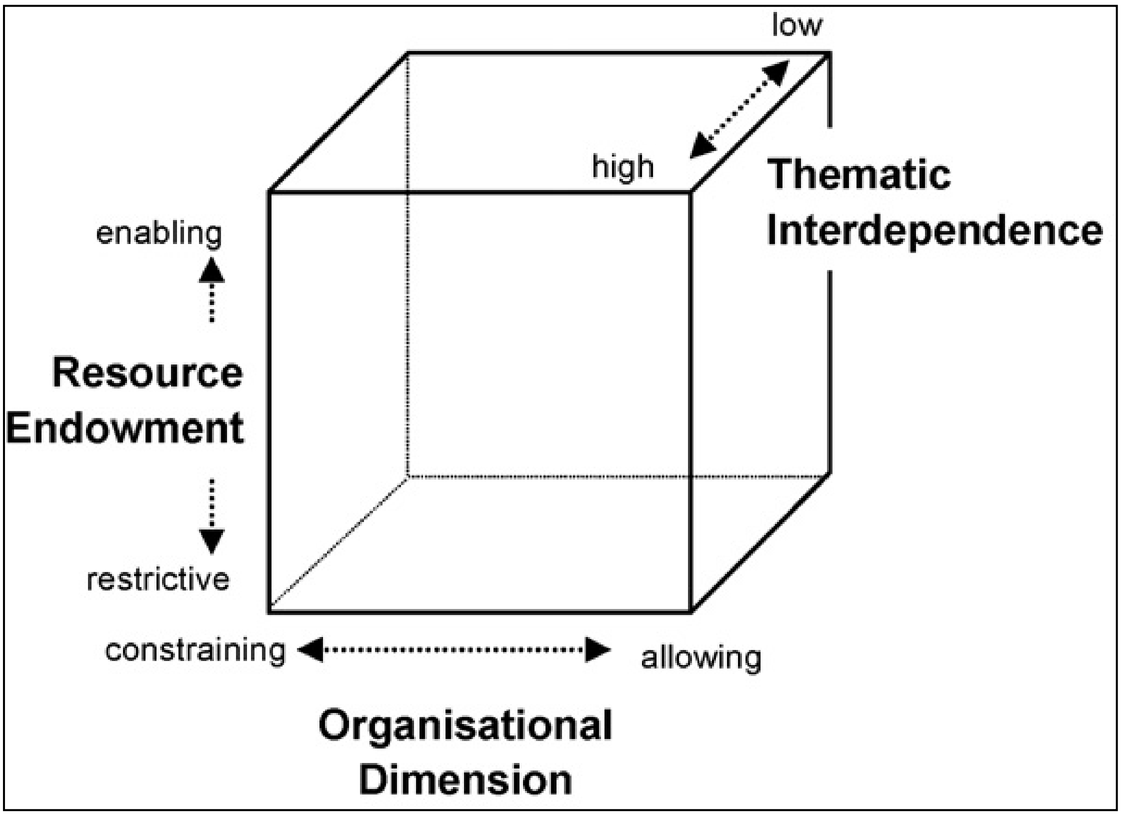
2.11.2 Studies on the Factors Affecting Research Collaboration between Academic Researchers

Previous litreature has investigated the main challenging factors that affect academic researcher collaboration. Most of the identified factors from these studies overlap with the previously highlighted research about the general factors affecting collaboration. For example and in 2005, Maglaughlin and Sonnenwald used interviews and field study data collection, to identify and analyse factors that facilitate and/or hinder interdisciplinary research collaboration in south-eastern USA within academia's natural sciences and came up with twenty factors. They classified them into four main categories: *"personal, resources, motivation, and common ground". The factors related to the personal category are, "expertise (knowledge and skills), social networks, trust, personal compatibility, and common professional traits" (2005:4).* The factors related to the resources category includes, *"funding agencies support, researchers' institution's support, literature, scientific publishing, students, and time" (2005:5)*. The factors that appear to motivate interdisciplinary collaboration are, *"learning and teaching, new discoveries, fun, and external rewards"* (2005:7). Finally, the fourth category relates to common ground, both physical and political, such as, *"physical proximity, research organisations, disciplinary bias, discipline-specific language and bridges" (2005:8-9).*

As stated earlier, most of these factors outlined by Maglaughlin and Sonnenwald overlap with those identified in the previous literature, such as in Mattessich et al. (2001). However, their research was more narrowly focused on academic research collaboration at a national level in specific academic discipline, which is natural sciences, and they identified a new factor related to this level of collaboration—namely professional traits. For instance, they stated that common professional traits are personality characteristics that would lead a scientist towards interdisciplinary research (Maglaughlin and Sonnenwald, 2005). The context of their study focused on intra-national interdisciplinary research collaboration between research institutions in south-eastern USA, in the natural sciences within academia, where other factors may affect either the international collaborations between countries or other disciplines collaborating at an international level. For example, in order to replicate their findings more generally, they would require a more quantitative approach using a different and larger population sample from different geographical regions and other disciplines.

In term of factors affecting academic collaborative research activities between the publicly funded universities, there is a limited amount of research done at both national and international level (e.g. Laudel and Gläser, 1998; Heinze and Kuhlmann, 2008; Corley et al., 2006). For example, Heinze and Kuhlmann (2008) among the most recent researchers who address such collaboration and their focus was on inter-institutional research collaboration, between public sector institutions in Germany (intra-national). They analysed research collaboration in the developing domain of nanoscience within the public research system in Germany. They have used multiple sources of data, such as co-authored research output and in-depth interviews as well as a heuristic tool called a "governance cube" (Figure 2.2). They identify governance structures that can either support or hinder collaborative work relations across institutional boundaries.

Figure 2-1: Governance dimensions of research collaboration between public sector institutions



Source: Heinze and Kuhlmann (2008)

The three dimensions of the governance cube looking at research collaboration are thematic interdependence, organisational dimension, and resource endowment. Each of these dimensions focuses on some external factors affecting the collaborative process. By implementing these three dimensions, they identify a number of institutional factors that are important in enhancing research collaboration between the institutions in the German research system.

The first dimension is thematic interdependence, and is mainly concerned with factors related to the motives and rationales behind the collaboration. These motives support the collaborator's decision-making, and increases the mutual benefits of collaboration. The second dimension is the organisational dimension, which is related to the vision, mission and objectives of the research institutions, as well as the research capacity of each institution. These organisational factors have a significant influence on collaborative decisions. Some research institutions are not ready to start research collaboration either because it is not part of their vision and objectives, or because they have limited resources. Others may only concentrate on basic research activities, rather than applied or technology-driven research activities. Another organisational dimension factor is the availability of well-qualified human resources with a record of job mobility. Heinze and Kuhlmann (2008:895) find that *"Researchers with inter-organizational career tracks, or with a record of visiting fellowships, which enable informal contacts with other research institutions."* Research leadership experience in collaborative projects is an important factor that enables collaborative research activities in achieving its objectives. Finally, effective and flexible administrative support from all levels in each organisation is a critical factor needed for successful collaboration. Mobility of researchers and interchange of resources and instruments between collaborative institutions are some examples of such flexibility.

The third and last dimension is resource endowment, which focuses on the factors related to the availability and flexibility of funding schemes for research and collaborative activities (either from the internal sources of the research institutions or third-party funding). If funding is available, this will support research processes and increase shared benefits resulting from research collaboration. Furthermore, resource flexibility appears to be important in enhancing inter-institutional research collaborations. Flexible allocation and interchange of resources between institutes support collaborative activities, because this flexibility helps increase effectiveness (Heinze and Kuhlmann, 2008). One example of resource flexibility is moving the funding of research projects from one institution to another because the main researcher has moved to it. In other words, allowing the funding to follow the lead researcher, and not be tied to the institution.

However, their study is focused mainly on the institutional factors that influence research collaboration between public research institutions at the national level. There are many interpersonal and external factors, which may affect such collaboration, such as coordination, preparation, communication skills, and other personal characteristics. Moreover, other external environment factors related to stakeholders and national policies may affect collaboration in research. Finally, they have looked at these factors at the national level, while other factors may affect higher levels of collaboration such as the international research collaboration between PFUs.

2.11.3 International Research Collaboration between Publicly Funded Universities

Most of the previously highlighted studies that address the factors influencing research collaboration mainly emphasize general factors affecting research collaboration or collaboration between academic researchers at a national level. There is a lack of studies of factors influencing research collaboration between public research institutions at an international level (Landry and Amara, 1998). Research studies at such levels of collaboration address key indicators, such as the growth of collaboration, using results for scientometrics and bibliometric techniques (e.g. Glänzel, 2001; Jin and Rousseau, 2005; Wang et al., 2005; Jappe, 2007; He, 2009) and not the factors behind/influencing collaboration.

Much of the previous work done on general collaboration or academic research collaboration may not be relevant to international research collaboration between public-funded universities, especially in developing countries such as those in the GCC. This is perhaps due in part to their context not being applicable, and that theories developed may not be as applicable in some parts of the world as others. An example of this would be theories developed in the US or UK, which may not apply to the context of developing states, such as those in the GCC.

On the other hand, there are many accepted reasons behind the lack of studies on factors influencing research collaboration between countries, and how such trends can be enhanced. First, it requires time and resources to carry out such research because researchers must visit different countries to examine their experiences and research systems. Secondly, such studies require primary data collection. An example of this data is interviewing of key players in those institutions, such as the researchers, decision-makers, and the research facilitators. In addition, it is difficult to access and collect data from these public universities because of their organisational structures. The research systems in PFUs are characterised by a high level of institutional differentiation and need to be very effective in order to enhance international knowledge flows. Such a system "…need not only to allow knowledge diffusion across institutional boundaries via career paths, but also to institutionalize effective mechanisms to support day-to-day collaborations across organizations that scientists seek to establish and maintain" (Heinze and Kuhlmann, 2008:889).

2.11.4 Summary of the Factors Affecting Collaborative Research Activities

1- Interpersonal Processes Factors

This group of factors is mainly related to the collaborators' personal characteristics, skills, and abilities to achieve the stated. The team and its members should have the skills and knowledge that are relevant to the research project. This group of factors affects collaboration from the initial phase to the completion phase. First, having previous positive experiences with collaborative activities will have positive effects on the success of the current activity, and will enhance the researchers' ability to collaborate effectively with each other by enhancing trust (Sargent and Waters, 2004; Boardman and Bozeman, 2006). Boardman and Bozeman (2006) found that principal investigators in multi-sector research collaboration had known each other for many years and worked together previously on several projects, and this relationship engendered trust among partners and helped the collaboration work well.

Second, individual collaborators who provide leadership (such as the project managers or PIs) should possess leadership skills, such as organisational and interpersonal skills necessary to carry out the role with fairness (Mattessich et al., 2001; Sonnenwald, 2003a; Bruce et al., 2004; Jones et al., 2004; Stokols et al., 2005; Sonnenwald, 2007; Gray, 2008; Stokols et al., 2008b; Heinze and Kuhlmann, 2008). Sometimes leaders must be able to access external funding and to shift initial research goals in the direction that their research is moving in (Heinze and Kuhlmann, 2008). They must also have a good reputation among the group and knowledge of the subject area.

Third, collaborators should share mutual understanding, trust, and respect for each other (Easterby-Smith and Malina, 1999; Jassawalla and Sashittal, 1998; Dirks, 1999; Mattessich et al., 2001; Bruce et al., 2004; Sargent and Waters, 2004; Maglaughlin and Sonnenwald, 2005; Corley et al., 2006; Sonnenwald, 2007; Stokols et al., 2008b; Bruneel et al., 2010). Mattessich et al. (2001) state that at the beginning of collaborative activity, collaborators have to devote energy to learning about each other and building trust between them by presenting their intentions and agendas honestly and openly (with no hidden agendas). It may take some time to develop such trust and understanding between them, and for that reason a sufficient amount of time should be allocated for this, especially if some of the collaborators are new to one another. Any previous negative experiences in collaborative activities with any research institutions, can create a poor image that can have negative effects for future collaboration—especially in terms of building trust and respect between collaborators (Sargent and Waters, 2004).

Fourth, since the ultimate aims of the collaborative activity will have positive impacts for the institution and the participating members, the collaborators should have an intrinsic interest in the research project and see and believe what will receive a direct benefit from their involvement (Mattessich et al., 2001). Fifth, as any collaborative activity may face various difficulties and obstacles to success, collaborators should be able to compromise when decisions need to be made in order to facilitate and remove those difficulties and obstacles. Also they should be administratively and technically flexible during collaborative research in order to accomplish their work by modifying their means of collaborative activity (such as the structure and research methods) as it becomes necessary (Kagan, 1990; Jassawalla and Sashittal, 1998; Mattessich et al., 2001; Bruce et al., 2004; Sargent and Waters, 2004; Corley et al., 2006). Their ability to use different methods and structures to meet the demands of the project have positive impacts on accomplishing the goals of the project. In some cases major changes are required, such as changing the research vision, adjusting goals, or switching team members. The team should be able to adapt to any major changes and accommodate these developments (Jassawalla and Sashittal, 1998; Mattessich et al., 2001).

Sixth, the communication skills that researchers have play a crucial role for the project's success due to frequent interaction, both as a collaborative group, and externally with other stakeholders. Such communication skills will help overcome any conflicts that arise (Urban and Bennett, 1999; Mattessich et al., 2001; Bruce et al., 2004; Jones et al., 2004; Sargent and Waters, 2004; Maglaughlin and Sonnenwald, 2005; Corley et al., 2006; Stokols et al., 2008b). Many scholars highlight the importance of high levels of communication, coordination, and cooperation during the collaborative process (Jassawalla and Sashittal, 1998; Amabile et al., 2001; Sargent and Waters, 2004; Corley et al., 2006; Walsh and Maloney, 2007; Cummings and Kiesler, 2007; Stokols et al., 2008b; Jeong and Choi, 2014). Amabile et al. (2001) found that effective communication and coordination (such as frequent, well-planned meetings) facilitates the functioning and success of the collaborative project, especially if the collaborative team is geographically dispersed. Each member has to communicate formally by updating his/her colleagues or PI about their progress, and discuss any issues related to the project. A lack of adequate communication will impede effective team performance (Stokols et al., 2008b). It is very important to set up a communication system at the beginning of a collaborative project, and identify the responsibilities of each member in the project (Mattessich et al., 2001). The size of a project has an impact on the communication systems, since a small group of researchers can communicate easily compared to a larger research group. In addition to formal channels of communication, collaborators should establish informal and personal connections with their counterparts, such as the setting aside of purely social time (Mattessich et al., 2001). This will help to promote understanding and camaraderie between them.

Seventh, although some researchers argue that the familiarity between team members will have a negative effect on long-term team performance (Stokols et al., 2008b), many agree that such familiarity leads to higher research productivity (Mattessich et al., 2001; Jones et al., 2004; Sargent and Waters, 2004; Stokols et al., 2008b). Eighth, the technical project-relevant skills and knowledge are key for collaborative success (Bartunek and Louis, 1996; Amabile et al., 2001; Heinze and Kuhlmann, 2008). The selection of the right collaborators here is crucial. The most appropriate collaborators must be selected, so that they complement each other and add value, in order to achieve their shared objectives. Ninth, team members have to sense that they have an equal stake in the outcomes (Jassawalla and Sashittal, 1998).

Finally, cultural differences between collaborative researchers or organisations are another factor that deserves attention (Taillieu, 1997; Amabile et al., 2001; Maglaughlin and Sonnenwald, 2005; Wagner and Leydesdorff, 2005a; Boardman and Bozeman, 2006; Stokols et al., 2008b; Ponomariov, 2008; Thomas et al., 2009; Yu et al., 2013c). This may not have a high impact if the collaborators are from the same discipline or institution, and thus share some cultural features. However, many collaborative research activities are cross-cultural in nature, especially in activities which involve different disciplines, sectors, and countries. The internal culture is unique to an academic discipline can influence collaboration, especially in cross-disciplinary research. Every discipline has its own terminology and language, which can potentially be a barrier to collaboration with researchers from other disciplines. Words may have different meanings in different disciplines, and therefore it takes time and effort to establish effective communication across disciplines (Maglaughlin and Sonnenwald, 2005). Team members should have an understanding of possible cultural differences among them, and should reach a mutual understanding in order to minimise the possible negative impacts of these differences on the project (Easterby-Smith and Malina 1999). Such differences can potentially cause conflict, which can include disagreements over group processes, roles, responsibilities or interpersonal conflict (Jehn and Mannix, 2001), underlining the importance of conflict resolution at this stage. If collaborators share similar cultural characteristics, the collaborative process will be more effective and efficient as they will share information, resolve conflicts, and coordinate more easily and their efforts will be spent conducting the research, rather than on efforts to maintain a positive group dynamic (Taillieu, 1997; Boardman and Bozeman, 2006).

2- Institutional Factors

Although many researchers underestimate the effects of institutional contexts on collaborative activities, the framework developed by Sargent and Waters (2004) captures the institutional contexts surrounding the collaboration process by addressing the different factors in which they may affect the collaboration process. The institutional environment surrounding any collaborative research activity plays a vital role and has to enhance the researchers to collaborate within and outside of their home institution. Their home institution could be classified as an internal environment surrounding collaborators. First, the collaborative organisation's mission and vision relative to other research institutions and sectors both national and internationally is very important. Many collaborative initiatives fail because such activities are either not part of their mission, or it is not a priority. Good historical collaboration with other communities at either national or international levels build trust and encourages researchers to collaborate, take new initiatives, and improve their research productivity (Mattessich et al., 2001).

Collaborative institutions must provide different types of support for the activity such as allocating time, resources, and other logistics. Resources include all human and financial requirements which are necessary to develop and sustain a collaborative project. Allocated funds must be sufficient—especially in the start-up phase—and flexible in terms of funding streams. Other resources such as human and in-kind support are essential to success. Each collaborative organisation should devote substantial staff hours to collaboration.

Also, the research culture inside the collaborative institutions can affect the research activity if it is not a priority of their staff, especially with international research collaboration. Research collaboration between universities and the private sector (cross-profession collaborations) is an example of organisational culture differences influencing the collaboration between them. Amabile et al. (2001) found that the lack of initial clarity and understanding of cultural differences between both parties leads to negative outcomes. Finally, the availability of ICT facilities is critical in collaborative research activities. Many researchers that address this issue highlighted its importance for collaborative research activity (Rinaldi, 2009; Carroll et al., 2009; Kalb et al., 2009; Söldner et al., 2009). If research institutions do not have a well-established ICT structure, this will have a negative impact on collaborative research activities (Duque et al., 2005; Söldner et al., 2009; Kalb et al., 2009). Sonnenwald (2007) states that ICT infrastructure facilitates research collaboration and opens up new windows for collaborative activities, especially when researchers are not collocated. Many applications can be used to support research collaboration such as internet, video conferencing systems, shared applications for data analysis, remote access to instruments and project management tools. If collaborative projects rely heavily on ICT, a high level of readiness in technology is needed by the research institutions (Olson and Olson, 2000). Some funding programmes have been developed to fund development projects and applications in ICT to support collaborative research activities (e.g. remote research collaboration) and synchronous access to remote research instruments (Sonnenwald et al., 2004).

3- Environmental Factors

The external environment surrounding collaborative research activities includes the different stakeholders, geographical distances, and external bodies which influence the progress and success of the activity. The political climate is an important factor which may affect initiating and sustaining any collaborative research activities. On the one hand, removing political barriers will have a positive impact and increase collaboration between countries. On the other hand, many countries use the collaboration as a means to promote political unity in the region. For instance, many programmes (such as the EU research FPs) have been implemented by the European Commission aiming to foster collaboration between EU states in order to improve relations between those countries. Even if the relationships between countries are strained, collaborative research between them can increase mutual understanding and promote world peace (McGinley and Chamie, 2003).

Sonnenwald (2007) states in his study that during the Cold War, researchers from both the US and Soviet Union established and maintained relationships that were valuable in promoting an end to their countries' long-running geopolitical conflict. Generally saying, research collaboration can be used as a promoter of peace. There are many political barriers such as implementing policies, funding schemes, and visa and travel restrictions, which may impede research collaboration.

Other national policies may affect research collaboration both nationally and internationally. As previously mentioned, the main motives behind research collaboration include gaining access to resources such as funding, research equipment and instruments, data, and other natural and social resources like biographical data and sites (Carillo et al., 2011; Bozeman and Corley, 2004; Lee and Bozeman, 2005; Potì and Reale, 2007; Rafols and Meyer, 2007; Heinze and Kuhlmann, 2008; van Rijnsoever et al., 2008; Yu et al., 2013c). Collaborative institutions, stakeholders, and governments should facilitate such access in order to enhance their research. For example, the ranking system in the UK constrains the collaboration between the universities and industry because the newer universities which are ranked lower in RAE cannot apply for funding, even if they have strong links with small and medium-sized enterprises (Smith and Katz, 2000 Cited by Sonnenwald 2007).

Finally, external culture is very important, especially the countries' cultural heritage. (Wagner and Leydesdorff (2005a)) argue that researchers in countries with historical colonial ties collaborate more in comparison to those that do not. Additionally, some research activities require collecting information, samples or data from different participants such as patients, farmers, teachers, policymakers, and other citizens. Factors such as their understanding about the importance of research activities, education and awareness levels play an important role in achieving the research objectives.

2.12 Framework for Effective Collaboration Management between PFUs in GCC Countries

Given the different concepts, levels, and structures of research collaboration, many of the previous studies in this domain build different models or frameworks to understand the mechanisms that influence collaboration, as well as how to manage, enhance, and sustain the effectiveness of such activities. Most scholars who have addressed research collaboration within the academic context have focused on either cross-professional collaboration, such as between academic and private sector (Amabile et al., 2001; Fontana et al., 2006; Philbin, 2008), or collaboration between academic researchers (Sargent and Waters, 2004). Others, such as Easterby-Smith and Malina (1999) and Stead and Harrington (2000), mainly focus on international research collaboration between academics, but without developing frameworks or models. Through working papers they outline some of the motives and factors that may affect this type of collaboration.

2.12.1 Background of Some Developed Frameworks

Bukvova (2010) notes that researchers have developed frameworks for research collaboration. For example, Sargent and Waters (2004) use a two-stage process to inductively develop a framework to understand the mechanisms that influence academic-academic research collaborations. The first stage draws on the research collaboration experiences of three distinguished researchers in order to develop a process framework, from the initiation phase through to the completion phase; highlighting the relevant factors for each phase (such as collaborator motivations, nature and scope of the project, roles and activities, as well as project outcomes). The second stage of their research seeks collaborative experiences from another eight research collaborators from different countries and at different stages in their careers. Two sets of factors emerge from their study as affecting the phases of collaboration relating to the collaborative context and the interpersonal collaborative process factors.

Their framework pertains to academic-academic research collaboration, mainly in the context of developed countries characterised by collaborative activities and well-established research infrastructure and resources. To what extent this framework is applicable to underdeveloped and developing countries requires further investigation. General theories developed by looking at one country might then be adapted to suit others. Sargent and Waters (2004) suggest that in order to understand the collaborative process, the researcher must account for the context in which the collaboration occurs, especially as national policies and cultural differences may affect such processes.

Stokols et al. (2005) have developed a conceptual framework for understanding and evaluating trans-disciplinary research collaboration in a large-scale national initiative in the USA, which aims to promote cross-disciplinary research collaboration in the science and prevention of tobacco use. They evaluate collaborative processes and outcomes between 1999 and 2004. The framework considers three areas: (1) antecedent conditions (intrapersonal, social, physical environmental, organisational, and institutional) that influence the researchers' readiness to collaborate; (2) intervening processes (behavioural, affective, interpersonal, and intellectual) that are active throughout the collaboration and that contribute to (3) research products and outcomes (novel ideas, integrative models, new training programmes, institutional changes, and innovative policies).

Similarly, Corley et al. (2006) uses an institutional framework that illuminates the relationships among the epistemic norms of the disciplines represented in the collaboration, the organisational structure of these collaborations, and the inter-institutional collaboration success. They use two case studies of large scale, multi-disciplinary research collaborations in the USA. Their findings demonstrate that such research projects need a high level of development in either the epistemic development of the disciplines involved, or the organisational structure of the collaboration.

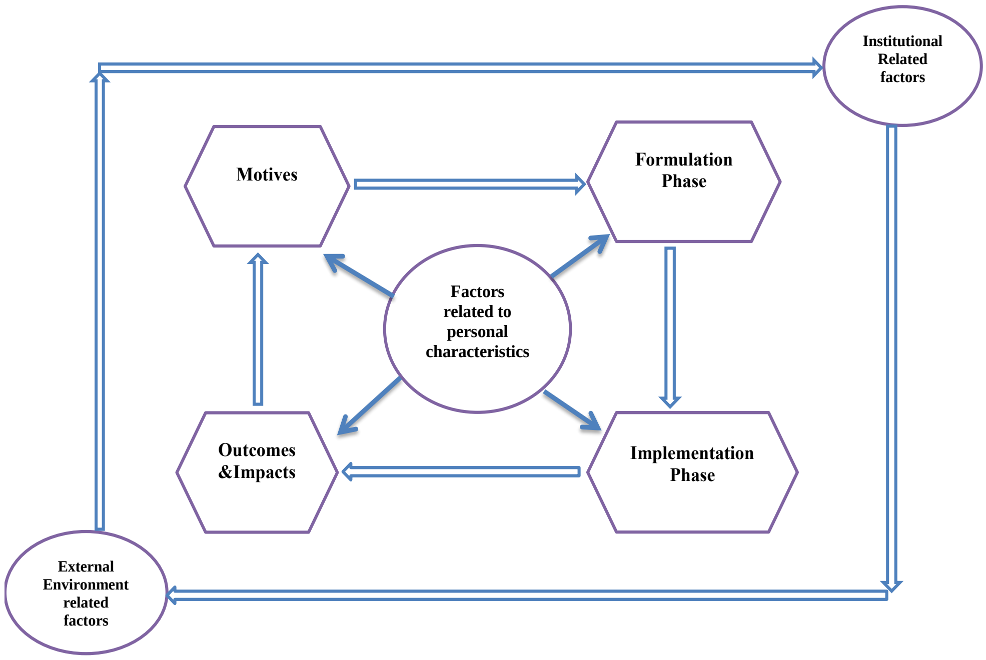
2.12.2 Framework for This Study

For the purposes of this study, the inductive framework (figure 2.2) developed by Sargent and Waters (2004) can be adapted and used. Some refinements may be required to adequately account for research collaborations between PFUs in GCC countries. The main reason for selecting this framework is its relevance to academic-academic collaboration. As stated earlier, the motives and objectives of collaboration for academics, industry, and community service institutions differ. While research collaboration between academics and industry, or between academics and community, may include different motives and objectives, the motives and objectives of collaboration between academic institutions are almost similar and share the same objectives. Secondly, the framework examines interrelationships between context, collaborative phases, and interpersonal processes. They use academics from different countries and different career stages, which seem more relevant to this study.

However, as previously stated, their framework focuses on the developed world context while the emphasis of the proposed study is on developing GCC countries. The national and institutional policies of GCC countries and universities as well as the culture are different than those in more developed countries. However, the academic faculties and some of the DMs in these countries are multi-national and from different cultures. Such differences and mixtures of culture may enrich the study. The following sub-sections detail the different elements of the proposed framework, which are collaboration phases, interpersonal related factors, institutional related factors and external related factors.

The framework suggests that academic research collaboration goes through a cycle that consists of four phases which are initiation (motives), formulation, implementation, and completion (outcomes).

Figure 2-2: Proposed conceptual framework for the study



Source: Adapted from Sargent and Waters (2004)

The first phase is the "initiation phase" which mainly focuses on the motives and the driving forces behind the collaboration (as detailed in section 2.7). The existence of one or more of these motives encourages researchers to collaborate. The second phase is the "formulation stage," where collaborators and their institutions clarify issues related to the research project, such as aims, goals, objectives, scope, duration, budget, the number of collaborators, and contract-related issues. The team and their collaborative institutions need to have a discussion, developing a clear purpose, goals, roles, and policy guidelines, in order to help the collaborators to understand their respective roles, rights, and responsibilities. The goals and the objectives should be clear to all collaborators and participants, and must be realistically attained. The evaluation process during the span of each project is very important and can be achieved through classifying the goals into short- and long- term goals and objectives. Well-defined roles and responsibilities help researchers to achieve objectives and should, to some extent, be flexible to resolve any conflicts arising during the process. In some cases, research institutions may need to adjust policies and procedures to reduce conflict.

Thereafter the “implementation phase” begins, where collaborators start implementing what they are planning to achieve from the project. Each participant will start carrying out his/her roles and obligations and must report achievements to their focal point or colleagues, or any obstacles or emerging challenges they face. In some cases, goals and roles need to be revisited if the collaboration activity does not progress well. The periodical reviews for the progress of the project play an important role in terms of evaluating what has been achieved and future plans. Financial and administrative review should also be carried out, especially for issues around communications between collaborators and budget reallocation and distributions. Sonnenwald (2003c) argues that such reviews can be carried out by external bodies such as the funding bodies or other formal or informal review teams. Conflicts between collaborators can arise in this phase and must be resolved. Also, researchers have to account for unexpected challenges, such as illnesses, deaths and family problems.

Finally, the “completion phase” relates to how collaborators rate the success of their project in terms of their achieved goals, such as the quantitative and the qualitative outcomes outlined in section 2.9. Those outcomes have a direct influence on future collaborative activities between the collaborators and basically either motivate or discourage collaborators to continue and engage in new joint research activities. Sargent and Waters (2004) classify success in research collaboration under three categories. The first category is achieving the objective outcomes, such as publications, reports and presentations. The second, the subjective outcomes, such as collaborator satisfaction with the collaborative experience, and enhancing self-efficiency and self-confidence. Finally, the learning outcomes from other collaborators, which may include new knowledge and skills learned, such as report writing skills and new data analysis techniques.

As stated earlier, two sets of factors emerge from their study which affect the phases of collaboration. The first set is the interpersonal collaborative processes, which include communication, trust, and attraction among collaborators (Sargent and Waters, 2004). The second set is a collaborative context which includes both institutional and external environment related factors, such as resources, support, and institutional and national climate in which the collaboration occurs (Sargent and Waters, 2004).

2.13 Chapter Summary and Conclusion

Enhancing effective research collaboration between institutions depends upon four elements, detailed in this chapter. First, the motives are considered as driving forces toward collaboration. Given the limitation in available resources in some countries, and with current trends in knowledge production, strategic alliances, and collaboration between research institutions, it is important to partner with others in order to utilise available resources and improve research productivity and quality. Access to complementary external resources is key in fully utilising existing resources and developing sustained competitive advantages.

The collaboration process is the second element that has to be well-organised and structured from its initial stage through to the completion stage, in order to achieve its goals. Many internal factors affect the collaboration process and can be classified as 'interpersonal factors'. These factors are mainly related to the individual collaborators' characteristics such as their personality characteristics, respect, trust, knowledge, skills and flexibility, leadership, adaptability, and collaboration experiences. In addition to internal factors, other external factors affect collaboration, such as institutional and national environments. On the one hand, collaborative institutions affect collaboration activities by providing logistics facilities, access to consumables, equipment, funding, and other human resources. On the other hand, the national environment and climate surrounding the collaborative activity also play a role and there are many issues related to this environment, such as external stakeholders' support, culture, and the political climate.

Given the discussed positive impacts and indicators of research collaboration, and based on the aims of this research, the proposed framework (figure 2.2) will be applied by performing a case study on a collaborative research initiative started in 2003 between SQU and UAEU. This case study will provide a general overview of collaboration in the region and help to identify the opportunities and challenges of research collaboration between PFUs in GCC countries. However, before presenting the case study, the next chapter will explore the GCC context, focussing on the collaboration between the PFUs, using key indicators.

CHAPTER THREE

3 BACKGROUND CONTEXT OF RESEARCH COLLABORATION IN GCC COUNTRIES

3.1 Introduction

The main aim of this chapter is to achieve the first objective of this research of exploring] the context of research in the GCC and collaboration among the PFUs using some key indicators (secondary data).

In this chapter, the researcher will address the first question: What are the key indicators of the current research activities and collaboration among PFUs in GCC countries? GCC countries have invested a substantial amount of funds in research compared to other states of their size especially developing countries and certain policies have been implemented in some of the regional countries in order to encourage their researchers to collaborate at an international level. For example, Qatar and the UAE opened a regional campus of some international universities in order to strengthen their HE systems and enhance collaboration with developed countries. However, a limited effort has been made to enhance regional collaboration and has mainly been implemented in research related activities. The intra-regional research collaboration between regional states is vital because they experience similar social, economic, environmental, and health problems that need attention, as well as the fact that this alliance will likely promote various economic and social benefits such as development growth, economic diversification, and democracy.

Pooling their resources together to solve these issues, expand their knowledge production, and enhance their research capacities is a very important strategic decision, and is aligned with the main objective of forming the cooperation council in the first place. The GCC states will be able to complement each other, given that some of them are rich in financial resources, while others are rich in human resources. This chapter will examine some quantitative data regarding GCC countries, such as their research institutions and centres, research infrastructure and funding, and research outputs and collaborative trends. Also, at the end of the chapter, some background will be presented which includes an overview of the two case study PFUs, SQU in Oman and UAEU in the UAE respectively.

3.2 Data Sources

Different official sources are used for collecting information and other research indicators about GCC countries. On the one hand, geographical, demographic, and economic information is collected from the Statistical Centre for the Cooperation Council for the Arab Countries of the Gulf (GCC-Stat). In addition, the main sources of information regarding HE institutions are either the ministries of HE in some of the member countries, the official websites of the research institutions, or other official websites such as those of local governmental authorities.

Alternatively, the key research indicators (such as total research output and collaborative activities) are extracted from the SciVal software derived from the Elsevier Company's web-based digital solution (which is called the Elsevier Research Intelligence Suite). This software is licensed and available for all researchers, academic staff, and top management at the University of Manchester. SciVal uses content from the Scopus database from 1996 onwards. The research outputs included in this software are articles, reviews, conference papers, editorials, and short surveys. The data is updated from Scopus weekly by the SciVal team. In some cases, the researcher directly used the online Scopus database for some key indicators.

3.3 The Gulf Cooperation Council (GCC)

Given the shared characteristics and comparable systems founded on the Islamic creed, belief in a shared destiny, sharing a mutual goal, and the idea that cooperation between these countries will serve the transcendent purposes of the Arab nation, the

GCC was established on the 25th of May 1981, after leaders of the member countries agreed to a cooperative framework joining the six countries which are the UAE, the Kingdom of Bahrain, KSA, the Sultanate of Oman, the State of Qatar, and the State of Kuwait to affect coordination, integration, and inter-connection among the member countries in all fields to achieve unity.

Figure 3-1: Map of the GCC countries

These countries share important common factors such as a shared religion, deep cultural ties, a strong bond of kinship amongst their citizenry, geographical proximity, and homogenous values and characteristics. The total estimated population of all GCC countries at the end of 2014 was about fifty million people, while the total area is approximately 2.4 million square kilometres, a significant percentage of which is desert, rich with oil reserves (GCC, 2016). The largest country in terms of population, area, and total Gross Domestic Product is the KSA, while the smallest is the Kingdom of Bahrain.

Table 3-1: Statistical information about GCC countries (2014)

Country	Total Area (km²)	Population (millions)	GDP (Billion US$)	GDP Per Capita (US$)
UAE	71,000	8.264	338.7	40,900
Bahrain	774	1.315	33.8	25,688
KSA	2,000,000	30.301	649.5	20.590
Oman	309,500	3.993	80.7	20,210
Qatar	11,600	2.216	173.5	100,130
Kuwait	17.800	3.767	160.9	52,480
GCC Countries	2,410,716	49.856	1,358.8	29,869

Source: Statistical Centre for the Cooperation Council for the Arab Countries of the Gulf (GCC-Stat)

After more than thirty-five years in existence, the GCC's objectives still fall short of the desired levels of its decision-makers and its citizens. Many socio-economic initiatives that had been raised and agreed upon years ago have yet to be implemented. For example, objective (4) as stated in table 3-2 below, which highlights the importance of establishing scientific research centres and collaborative research activities between the member countries, and encouraging the private sector to participate in this issue, has not been fulfilled and is of concern to this study. Given the availability of resources (human and financial), as well as the well-established academic research institutions and centres and nationals funding bodies, bibliometric evidence indicates that there is very limited research collaboration (intra-regional) occurring between the research institutions of its member countries. Most of the well-established academic research institutions in these countries are funded by their governments, with research and collaboration being one of their main objectives.

Table 3-2: The main objectives of establishing GCC

Objective 1	To affect co-ordination, integration, and inter-connection between member states in all fields in order to achieve unity between them
Objective 2	To deepen and strengthen relations, links, and areas of cooperation now prevailing between their peoples in various fields
Objective 3	To formulate similar regulations in various fields including economic and financial affairs; commerce, customs, and communications; education and culture; social and health affairs; information and tourism; legislative and administrative affairs
Objective 4	To stimulate scientific and technological progress in the fields of industry, mining, agriculture, water and animal resources, and to establish scientific research centres and collaborative research, and encourage cooperation by the private sector for the good of their peoples

Source: The GCC Charter (GCC, 2014)

3.4 The HE System in GCC Countries

The HE system in GCC states is relatively young, as the first HE institution in the region, King Saud University (a public-funded university), was founded in 1957. The HE system in each of these countries consists of academic institutions which are either PFUs or colleges governed by a council or board, or privately funded universities and colleges. The councils or boards that manage public-funded institutions are comprised of members from different backgrounds, such as academia, government, business, public life, and industry. Their roles are to oversee the institution's activities and to monitor its progress and development. They are also accountable for sanctioning academic, financial, and administrative regulations at the institution, and provide support to the officers who administer everyday procedures.

All public-funded institutions of HE in GCC countries are funded by their governments, and tuition is free of charge for the citizens in each regional country. The total number of universities (public and private) established in GCC countries as of 2016 is approximately 90 universities. In addition to these universities, there are also some specialised public and private HE colleges which offer undergraduate and postgraduate degrees in different disciplines. There are a limited number of scholarships allocated by these institutions for international students from across the world. The HE system of each of the member countries is governed by a number of different governmental regulatory structures and authorities. For example, the Ministries of HE are responsible for all public and private universities and colleges in most of the GCC countries, while there are also some specialised colleges and HE institutions governed by specific authorities (such as in Oman, where the nursing and health sciences institutes are governed by the Ministry of Health and technical colleges are governed by the Ministry of Manpower). Also in some of these countries, HE institutes fall under the authority of a HE Council, which is the chief governing body that administers HE in each respective country and is delegated with forming and carrying out HE strategies and policies (Al-Lamki, 2006).

3.5 Facts and Figures about HE and Research in GGC Countries

This section will highlight some of the key indictors regarding the regional HE system such as statistical information about the HE institutions and examples of key investment and funding opportunities for R&D activities in the region. In addition, key research indicators will be presented such as regional research output, international research collaboration indicators, and regional research collaboration indicators. These indicators will be compared with some research-intensive countries.

3.5.1 The Regional HE Institutions

Each one of the GCC countries implements different strategies in terms of establishing and developing the national HE system. For example, and on one hand, KSA focused on establishing domestic PFUs in order to provide a well-qualified labour force for the national economy. As of the 2016, there are twenty eight PFUs as well as ten other private universities. On the other hand, both Qatar and the UAE implemented a different strategy by opening the door for international universities to establish branches. In both countries, about forty branches of these international universities have been established, mainly from the USA and the UK. However, in the UAE, in addition to these international universities, there are also domestically established private universities and colleges, while there are very few in Qatar. Oman implements a different strategy where, in addition to twenty nine publicly funded HE institutions, other national private universities have been established in six different regions of the country, as well as two international universities and nineteen private specialised colleges.

Table 3-3: HE institutions in GCC countries

	Public Institutions		Private Institutions		
Country	University	College/Institute	University	College/Institute	Total
Bahrain	1	2	1	0	4
Kuwait	1	0	5	4	10
KSA	28	8	10	18	64
Oman	1	28	8	19	56
Qatar	2	1	5	4	12
UAE	2	2	26	41	71
Total	35	41	55	86	217

Source: www.mofa.gov.bh, www.mohe.gov.om, www.mohe.edu.kw, www.moe.gov.sa, www.moe.gov.ae and www.sec.gov.qa.

Given the available publicly funded HE institutions in the region however, they are unable to meet the demand of all the secondary school graduates. The current trend in the region is to enhance the private sector and international research institutions in order to utilise the facilities provided by the countries in the region, such as providing them lands and tax exemption in order to invest in this sector and produce highly-qualified graduates.

Naithani (2011:3) states that:

> *"In the last two decades development of higher education infrastructure has been primarily on account of setting up of numerous private higher education institutes in GCC countries. Universities and colleges funded by GCC governments have been unable to meet the demands of growing national as well as expatriate population"*

The key research indicators show that most of the regional HE institutions are teaching-oriented and not research-oriented. This helps to explain why only 30% of them are producing indications of research output, such as research publications. Additionally, most of the research produced in the region comes from PFUs. For example, the largest country in the region, the KSA, has twenty-eight PFUs, ten private universities, and many other specialised public and private colleges. More than 75% of its research output between 2010 and 2015 was produced by only seven public HE institutions, while the remainder was produced by other institutions, including industry.

3.5.2 Research Infrastructure and Funding

In general, the average spending on R&D in the Arab world countries including the GCC is about $10 per capita compared to $330 dollars in Malaysia and some of the other smaller EU countries, such as $575 in Ireland and $1304 in Finland (WorldBank, 2016).

One example of the current flagship investments in HE in the region and specifically in KSA is the establishment of a graduate university called the King Abdullah University of Science and Technology (KAUST) with a total investment of about US$ 20 billion (Day et al., 2010). The main aim of this university is attracting and developing the best researchers and postgraduate students from across the world in different science and technology disciplines. It is worth mentioning that all the PFUs in KSA fall under the supervision of the Ministry of HE except KAUST, which is overseen by the Ministry of Petroleum. In order to enhance research activities, the university established a funding strategy called the University Research Fund (URF)

Program in 2007 to fund academic researchers at the university through seven different funding programs.

Table 3-4: Examples of nationals' research funding bodies in GCC countries

Funding Body	Country	Funding Programs
King Abdul-Aziz City for Science and Technology (KACST)	KSA	1- Strategic Technologies of fundamental Research Support Program 2- Research Grants Programs 3- Innovative Researches Support Program
The Research Council (TRC)	Oman (2005)	1- Open Research Grant Program 2- Strategic Research Grant Program 3- Research Chair Program 4- Research Centers Program 5- Adapting towards Sustainable Development Program 6- Graduate Research Support Program (GRSP)
Qatar National Research Fund (QNRF)	Qatar (2006)	1- National Priorities Research Program 2- Undergraduate Research Experience Program 3- Biannual National Research Survey 4- Conferences and Workshops Sponsorship Program 5- Arab Expatriate Scientists - Fast Track Launch Program
Kuwait Foundation for the Advancement of Sciences (KFAS)	Kuwait (1976)	1- Supporting capacity building programs in research institutions. 2- Promoting technology transfer and best practices in applied research. 3- International Collaborative Research programs mainly with MIT 4- Research Grants programs 5- Events Sponsorships and competitions programs

Source: www.kacst.edu.sa, www.trc.gov.om, www.qnrf.org and www.kfas.org

3.5.3 Key Indicators of the Regional Research Output

It is worth mentioning that only the research produced in the English language and published in journals listed in Scopus is included in this data, while other research produced by the region in Arabic language and published in other journals is not listed. In general, most of the research produced by the region is listed in Scopus because almost all the science disciplines, as well as some of the humanities and social science disciplines, in the regional HE institutions are published in English.

In terms of research output, the GCC countries have shown a significant growth during the last decade as per the data collected from the Scopus database. As shown in Table 3.5 below, the regional share from the world total of published research grew from 0.3% to 1.1% between 2005 and 2015, while the total number of regional research output grew by 436%, more than seven times higher than the world average of 61% for the same period. The percentage of research output originating from Qatar grew by 1076%, from KSA by 683%, from the UAE by 273%, and from Oman by 214%. Such dramatic growth in research productivity is consistent with the different strategies that have been implemented by the regional countries such as the increase in budget allocated for R&D activities and funding programs, as well as the increase in the number of HE institutions. For example, the number of PFUs in KSA has been increased from eleven to twenty eight universities during this period in which they have become the dominant research producers among the countries. In Qatar, the country opened its door to many international universities to open their branches there, which has fostered national research productivity as well as the establishment of the QNRF as a national funding body. Oman expanded its HE system by opening the door to national private universities, which have been established during this period, as well as through the establishment of TRC in 2005 as a national funding body.

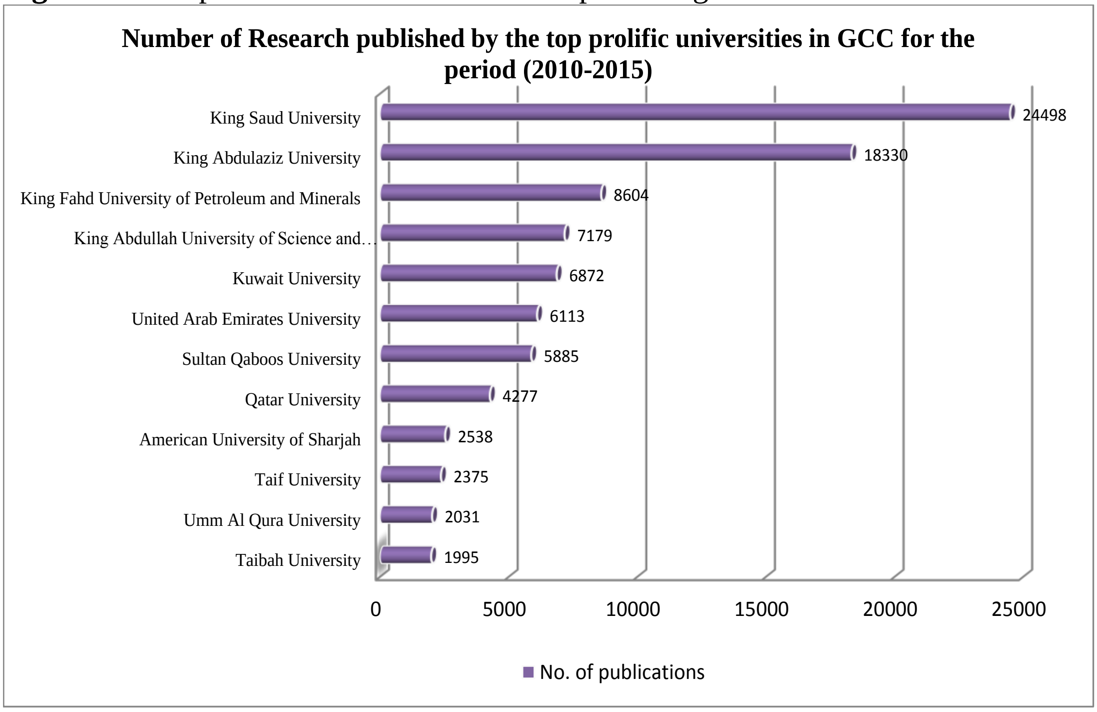
Table 3-5: Growth of published research by GCC countries compared to world publications

	2005		2015		Growth	
Region/Country	Quantity	%	Quantity	%	Quantity	%
World	1,579,821	100.0%	2,537,301	100.0%	957,480	60.6%
GCC	5,396	0.34%	28,951	1.14%	23,555	436.5%
Bahrain	240	0.02%	377	0.01%	137	57.1%
Kuwait	868	0.05%	1,471	0.06%	603	69.5%
Oman	503	0.03%	1,580	0.06%	1,077	214.1%
Qatar	265	0.02%	3,117	0.12%	2,852	1076.2%
KSA	2,400	0.15%	18,783	0.74%	16,383	682.6%
UAE	1,217	0.08%	4,543	0.18%	3,326	273.3%

Source: Scopus (2016)

In GCC countries, PFUs account for more than 77% of the total research published in Scopus during 2010-2015, when compared to other regional research institutions and industry. Figure 3.2 below shows the top twelve universities with the largest numbers of papers published during the period from 2010 to 2015. They include seven from KSA, two from the UAE, and one from each of Kuwait, Oman, and Qatar. Almost all of these universities are PFUs.

Figure 3-2: Top twelve universities in GCC producing research



Source: Scopus (2016)

3.5.4 International Research Collaboration in GCC Countries

The percentage of total domestic research output in terms of published research with one or more co-authors from another country is the key indicator for measuring international research collaboration between countries. Given the low domestic research output in terms of published research in GCC countries compared to other developed countries, an analysis of general international research collaborations for the period of 2006–2015 shows a higher level of collaboration compared to other developed, research-intensive countries (such as Canada, China, France, Germany, Italy, Japan, the UK, and the USA). For example, more than 74% of Qatar's published research during the period 2006-2015 had one or more co-authors from another country (63% for KSA, 59% for UAE, 56% for Oman, 50% for Bahrain, and

44% for Kuwait) compared to 47% in France, which is the highest percentage for international collaboration of research-intensive countries during the same period (45% for Canada, 45% for Germany, 44% for UK, 40% for Italy, 29% for USA, 24% for Japan, and 16% for China). This result supports the viewpoint that those countries with low research productivity had more international collaborations (Katz, 2000; Zitt et al., 2000). One of the key findings from the data is that the regional single-author published papers in GCC countries have decreased from 26% in 2006 to 9% in 2015, and national research collaboration has also decreased from 34% in 2006 to 20% in 2015. Both indicate an expansion in regional international research collaboration (from 41% in 2006 to 71% in 2015). On the other hand, national research collaborations in research-intensive countries are higher compared to the GCC countries, with a logical explanation for this being that researchers in large nations find partners and collaborators in their home countries more easily than researchers of those smaller nations (Schubert and Braun, 1990). In conclusion, although GCC countries achieve good international collaboration with other countries, however, collaboration with their GCC counterparties is still untapped.

Table 3-6: GCC countries' research output for the period 2006-2015

	Overall percentage (2006-2015)			
Country	International CL	National CL	Single author	Total
Bahrain	49.7	24.9	25.4	100
Kuwait	44	40.2	15.8	100
Oman	55.9	29.2	14.9	100
Qatar	74.3	17	8.7	100
KSA	63.1	22.4	14.5	100
UAE	58.6	24.9	16.5	100
Overall	61.0	24.3	14.7	100

Source: Elsevier B.V. SciVal (2016)

Table 3-7: The research output for the research-intensive countries

Country	Overall percentage (2006-2015) International CL	National CL	Single author	Total
Canada	44.5	44	11.5	100
China	15.6	79.8	4.6	100
France	47	41.3	11.7	100
Germany	45	43.7	11.3	100
Italy	40.1	51.3	8.6	100
Japan	23.9	67.6	8.5	100
UK	44.2	37.4	18.4	100
USA	28.7	54.4	16.9	100

Source: Elsevier B.V. SciVal (2016)

3.5.5 Research Collaboration between GCC Countries

An analysis of research collaboration between GCC countries reveals a lower level of collaboration than is generally true elsewhere. Although 61% of research output produced by GCC countries during 2006-2015 involved international collaboration, less than 3% of it concerns regional collaboration (research output affiliated to at least two countries from the region). For example, out of 63% of KSA research output produced with international researchers, only 2% of it includes researchers from other regional countries. Other countries are better off in term of regional collaboration such as 11% each for Oman and Qatar, 10% for Kuwait and 8% for the UAE.

At an institutional level and based on the data from SciVal software, the highest nine research institutions were selected in terms of research publications from all six GCC countries. Four of them are the highest research producers in KSA, which are King Abdul-Aziz University (KAU), King Abdullah University of Science and Technology (KAUST), King Fahd University of Petroleum and Minerals (KFUPM), and King Saud University (KSU). The remaining five universities are the highest research producers from each of the remaining countries which are Kuwait University (KUNIV) in Kuwait, SQU in Oman, UAEU in the UAE, the University of Bahrain (UoB) in Bahrain, and Qatar University (QU) in Qatar. Table 4.3 below summarises the research output and collaboration between these nine universities, as well as the percentage of their international and regional collaborations for the period 2009-2013.

Table 3-8: Collaboration between the top nine PFUs in GCC countries (2009-2013)

University	KAU	KAUST	KFUPM	KSU	KUNIV	SQU	UAEU	UoB	QU
KAU		11	13	225	10	0	4	15	4
KAUST	11		50	5	1	5	1	3	14
KFUPM	13	50		35	14	7	16	2	9
KSU	225	5	35		36	74	14	33	22
KUNIV	10	1	14	36		15	11	9	1
SQU	11	5	7	74	15		53	4	14
UAEU	4	1	16	14	11	53		2	14
UoB	15	3	2	33	9	4	2		3
QU	4	14	9	22	1	14	14	3	
Total publications	7779	3426	4278	13693	3402	2801	2995	625	1628
Total ICL	5514 (71%)	2613 (76%)	1938 (45%)	8528 (62%)	1535 (45%)	1487 (53%)	1580 (53%)	293 (47%)	1203 (74%)
Total RCL	293 (4%)	90 (3%)	146 (3%)	444 (3%)	97 (3%)	172 (6%)	115 (4%)	71 (11%)	81 (5%)

Source: Elsevier B.V. SciVal (2014). ICL: International collaboration, RCL: regional Collaboration

The table above indicates that intra-regional collaboration between the top research-producing universities in the region is quite low compared to their total international collaborations across the world. In terms of numbers of total research output, SQU and UAEU are the highest collaborators at a regional level. One logical explanation behind this is due to the availability of the SQU-UAEU funding scheme, which to some extent supports the research activities between both institutions and fosters their joint research output.

The secondary data indicates that most of the co-authored publications between the two institutions during this period include authors participating in a joint research project funded by the scheme. In terms of disciplinary focus, most of the SQU and UAEU joint publications (37 out of 54) are in medical sciences (such as Pharmacology, Toxicology, Pharmaceutics, Biochemistry, Genetics and Molecular

Biology), while the remaining publications are in environmental or agricultural sciences, engineering, and the computer sciences. The table also indicates that the intra-national collaboration between KSA universities such as KAU-KSU is higher than their intra-regional collaboration with other GCC universities. Most of these co-authored publications are in natural sciences like chemistry, physics, and astronomy. Such findings may support the argument that some research universities found their collaborators inside their own country. Generally, the analysis of the secondary data has indicated that GCC countries have not established good partnerships in R&D activities.

3.6 The Sultanate of Oman

The Sultanate of Oman is the second largest country between the six GCC countries in terms of area, and the third largest country in terms of population. It is located on the southeast coast of the Arabian Peninsula with a total area of 309,500 square kilometres and total population of approximately four million, as published by the National Centre for Statistics and Information in April 2014. It is bordered by the KSA to the west, Yemen to the southwest and UAE to the northwest, and also shares marine borders with Iran and Pakistan. The total GDP of the country in 2013 was about US$ 79 billion and the GDP per capita was US$ 21,560. Similar to other GCC countries, Oman's economy primarily depends on oil and gas, and they are the main source of income, accounting for more than 70 % of the total annual income in 2013. Administratively, the country is separated into eleven administrative governorates, which in turn divide into sixty *wilāyats* (cities).

The HE system of the sultanate are under the authority of the HE Council, which is the supreme governing body that administers HE in the country and is entrusted with the formation of HE strategies and policies (Al-Lamki, 2006). There is only one public-funded university in Oman, SQU which opened in 1986, with one under establishment (i.e. University of Oman). The university council of SQU oversees the institution's activities and monitors its progress and development, chaired by the Minister of HE. The Ministry of HE oversees most of the remaining parts of the system, which includes eight private universities, six public-funded applied science colleges, and nineteen private specialised colleges, offering undergraduate and postgraduate degrees in different disciplines.

Most of the private universities and colleges are affiliated with European, Australian, or American institutions. The HE system also includes other specialised colleges and institutes governed by state authorities, such as technology colleges (Ministry of Manpower), nursing and health science institutes (Ministry of Health), a Military Technical College (Ministry of Defence), Institute of Sharia Sciences (Ministry of *Awqāf* and Religious Affairs), and College of Banking and Financial Studies (Central Bank of Oman). Similar to other GCC countries, most of the HE institutions in the country are teaching-oriented, and the research output that does exist is produced by a few dominant institutions. More than 70% of the countries' published research output was produced by the only public-funded university (SQU), while the remaining published research output was produced by other private and public research institutions such as private universities, public colleges, private colleges, and other public and private sector organisations.

3.6.1 Sultan Qaboos University

SQU is the sole national university in Oman and it is its major research institution. SQU was opened in 1986 after His Majesty Sultan Qaboos Bin Said announced it during the tenth anniversary of Oman's National Day in 1980. It was the only public-funded university until late 2012, when His Majesty ordered the establishment of a second public-funded university called the University of Oman. As of now the second university is still in its planning phase.

In accordance with the Royal Directives of His Majesty, SQU commenced with five colleges; namely the College of Medicine, College of Engineering, College of Agriculture, College of Education, and College of Science. In 1986, the university officially opened, and its first students were enrolled. One year later, the College of Arts was established in 1987, followed by the College of Commerce and Economics which opened in 1993 (SQU, 2016). The College of Law joined the University in 2006, and finally the College of Nursing was opened in 2008 (SQU, 2016). There were 16,169 students registered at the university during the 2011/2012 academic year, of which about only 1% were international students, mostly from Arab countries. The students' population distributed equally between male and female (50% each). Total postgraduate enrolment was approximately 1162 (7% of total students), in which 5% of those were PhD students, and 95% masters level students. The total staff of the university are 3,018, of which 31% are academic staff (18% of total academic staff are female), 36% administrative staff, and 33% technical and support staff. About 49% of the academic staff are Omani nationals, with the remaining 51% being international academic staff of different nationalities.

The annual budget of SQU is government funded and approved at the beginning of each calendar year by the Ministry of Financial Affairs. The total budget for 2013 was US$ 500 million, which covers all of the operating and capital expenditures for the university and its educational hospital (SQUH). In addition to that, SQU annually generates some income from doing research and community service activities, such as external research grants (US$ 3.5 million), consultancies (US$ 5 million), short courses (US$ 1.5 million), postgraduate fees (US$ 1.2 million), and other commercial activities and services (US$ 3 million). The university uses those different sources of income to support its research activities by providing different funding schemes to academic researchers, such as the Internal Grant funding scheme (IG) and Joint Research Grants Scheme (CL) with other research institutions such as SQU-UAEU funding scheme grants.

SQU's vision is to become an outstanding centre of science and research distinguished by creativity and innovation, and a source of pride for Oman. The aim of the university is to achieve distinction in all areas of teaching, learning, research, and community service. It also strives to promote the values of scientific analysis and creative thinking, in order to participate in the creation, growth, and dissemination of knowledge, and to cooperate with national and international communities (SQU 2014). One of the main objectives of the university as per the University Law issued by Royal Decree No. 71/2006, dated the 2nd of July 2006, is to cooperate with other academic institutions (SQU, 2016:NP) through, *"International links and exchange with other academic institutions, particularly those in the Gulf Cooperation Council Countries,"* [and] *"Interaction with international academic experience in all areas of thought, science, and culture".*

This indicates that collaboration in research is one of the main objectives of SQU, and that the university has to build linkages with other research institutions across the world, and especially with other GCC research institutions.

The vice chancellor of SQU is appointed by royal decree, and he/she is responsible for the operational activities of the university and serves as the deputy chair of the university council. The university council is chaired by the Minister of HE and is comprised of members from different backgrounds, such as businessmen, lawyers, government officials, and representatives from the university's academics. The Council reviews and approves regulatory bylaws, strategies, policies, development plans, and any amendments to them. As well as this, the Council approves the appointments of the deputies to the vice chancellor and the deans of the colleges.

The council also reviews the annual budget before sending it to the Ministry of Finance for final approval. There are three deputies to the vice chancellor at the university. The first one is the Deputy Vice Chancellor for Administration and Finance Affairs, which oversee all financial and administrative related issues such as personal affairs, procurements, career development, payments, and other administrative services. The second is the Deputy Vice Chancellor for Academic Affairs and Community Services, which oversees academia-related issues and community services. All nine deans of the colleges report to him directly. The last one is the Deputy Vice Chancellor for Postgraduate Studies and Research that oversees all postgraduate and research-related activities, such as facilitating the research, financial and administrative issues, postgraduate programs, postgraduate scholarships, postgraduate international student supports, and scientific publications. There are two deans that report to the Deputy Vice Chancellor for Postgraduate Studies and Research, which are the Dean of Postgraduate Studies and the Dean of Research, as well as the other nine research centres.

3.6.2 Research at SQU

In the early years of SQU, the primary focus was on the quality of the academic programs through excellence in teaching. Research activities mainly depended on individual motivation and facilities available within the teaching environment, given that the faculty members were aware of the importance of research to their career development. Research activities at SQU were carried out by the academic staff in the nine different colleges, as well as the few research cadres which work in the nine research centres. Those research centres were established to tackle a number of strategic issues related to the country. They are the Oil and Gas Research Center (OGRC), Center of Excellence in Marine Biotechnology (CEMB), Oman Studies Research Center (OSC), Water Research Center (WRC), Remote Sensing and Geographic Information System Center (RSGISC), Humanities Research Center (HRC), Center for Environmental Studies and Research (CESAR), Earthquake Monitoring Center (EMC), and Communication and Information Research Center (CIRC). The main objective of each centre is to coordinate with other stakeholders either inside the country (such as governmental bodies and industry) or internationally (such as international research institutions), and form partnerships to carry out research activities either through the university's allocated budget, or from external grants and consultancies (SQU, 2015).

Significant research activities began at SQU in 1999, after a new scheme of funding was announced by the university. The university allocated a research budget that came from its own self-generated income to provide research grants to support their activities called Internal Grants (IG). In this case, the academic researcher must submit a research proposal, plan, and budget request through the Assistant Dean for Postgraduate and Research office (ADPSR) in their representative college to the Deanship of Research (DoR). The submitted proposals would then be forwarded to external referees who would evaluate them and send them back to the researchers through the ADPSR, to modify and resubmit to the DoR for approval. The approved proposals would be funded on an annual basis for the duration, and from the beginning of each calendar year receiving a yearly progress report and final report to be submitted at the end of the project. The average number of projects funded annually from this scheme is about seventy-five projects, with annual budget of US$ 1.3 million.

After a visit by His Majesty Sultan Qaboos to SQU in 2000, where his generous donations totalling US$1.3 million annually led to the long-term funding of multidisciplinary research projects, from 2001, that were deemed to be of strategic importance to the country. The main aim of these projects is to generate new knowledge and discoveries, and to solve socio-economic problems in Oman. Researchers can submit their proposals to the DoR through the ADPSR office in their respective college, and the awards are based solely on the merits of the project and its relevance to Oman. The submitted proposal is reviewed and evaluated internally by stakeholders inside the country (such as governmental bodies and organisations), and externally by academic reviewers who are experts in the discipline. The principal investigators also must give a presentation in front of the research board. Finally, the approval decisions are based on three review and evaluation criteria. The successful projects are completed over a period of three years, and high-quality research output is expected. A total of sixty five projects were approved in 2009, with a total budget of US$ 16 million.

In 2003, SQU started providing funding for any researcher interested in doing collaborative research with any institutions, given that the collaborative institution was willing to share the costs of the research project and fund the researchers from their side. A committee was formed by both SQU and UAEU to facilitate such a collaborative research relationship between both institutions (section 3.8).

In 2005, a royal decree was issued that established The Research Council (TRC) in Oman to lead research development and oversee research grants within the country. Accordingly, the council would be the focal point of all national policy pertaining to research and innovation, and must encourage the creating value for both society and the private sector, through research and innovation and the application of the research. In 2009, TRC started to provide funding to researchers across the country in order to enhance research capacity by awarding research reasonable sized grants for short and mid-term projects, and through the Open Research Grant Program (ORGP). In order for any researcher to submit a research proposal to TRC, their institutions should be signed up to The Research Electronic Submission System (TRESS). SQU received nine grants from TRC in 2009 with total value of US$2.3 million. The total number of grants received by SQU through the end of 2013 is seventy grants, with a total budget of US$ 21.5 million.

As a centre of expertise within the country, both the public and private sector stand to benefit from SQU facilities and research infrastructure, which provide them with research consultancy services. More than four hundred twenty consultations were provided by the university until the end of 2013, which generated more than US$41 million in income. SQU researchers also received other external grants for their research activities from national and international organisations too.

3.7 United Arab Emirates

The UAE is the third largest country out of the six GCC countries in area, and the second largest in terms of population. It is located on the south-eastern end of the Arabian Peninsula with a total area of 71,000 square kilometres and total population of about 8.3 million as published by the National Bureau of Statistics. It is bordered by Oman to the east, KSA to the south, and also shares marine borders with Iran, Qatar, and Pakistan. The total GDP of the country in 2014 was about US$339 billion and the GDP per capita was US$40,900 (GCC, 2016). Similar to Oman, the UAE economy mainly depends on oil and gas which are the dominant source of income, comprising more than 65% of total annual income in 2013, and ranked as the seventh-largest country in oil reserves. The UAE is a federation of seven emirates (Abu Dhabi, Ajman, Dubai, Fujairah, Ras Al-Khaimah, Sharjah and Um Al-Quwain) each of which is governed by a hereditary emir who jointly form the Federal Supreme Council which is the highest legislative and executive body in the country. The capital of the country is Abu Dhabi, and each one of the emirates allocates a percentage of its revenue to the UAE’s central (federal) budget. As a federal system, there are many powers and responsibilities which are not granted to the national government, and which are reserved by each emirate to exercise their own local administrative policies.

The HE system of the country is slightly different from Oman. In the UAE, the Ministry of HE and Scientific Research (MOHESR), and through a subsidiary body called the Commission for Academic Accreditation (CAA) oversees public-funded HE institutions at federal level, as well as other private institutions in the country, while the local governments at each emirate oversees the non-federal public-funded institutions which are funded by the local governments. For example, Abu Dhabi Education Council (ADEC) is the governmental body in Abu Dhabi emirate which can establish HE non-federal public-funded academic institutions (funded from the local government), as well as other educational bodies at local level only. Coordination with MOHESR is still required before establishing any HE institution in any emirate, and the ministry has licensing, accrediting, and supervisory authority to over the establishment of any private HE institutions. There are two federally funded public universities in the UAE, which are UAEU which opened in 1976, and Zayed University (ZU) which opened in 1998 with two branches, with one in Abu Dhabi and one in Dubai, as well as seventeen other branches of Higher Colleges of Technology. The HE system in the country includes many non-federal PFUs and institutions such as Khalifa University of Science, Technology and Research (KUSTAR), Emirates College for Advanced Education (ECAE), and Fatima College of Health Science in Abu Dhabi.

Similar to other GCC countries, most of these HE institutions are teaching-oriented, with very few of them focusing on research activities. However, unlike Oman and similar to KSA, about 63% of UAE research output is published by the top six institutes (UAEU 24%, American University of Sharjah 10%, Petroleum Institute of Abu Dhabi 10%, Khalifa University 7%, University of Sharjah 7%, and Masdar Institute 6%), of which most of them are publicly-funded through either federal or local governments. The remaining output is published by other public and private research institutions such as Zaid University 3% and Tawam Hospital 2%.

3.7.1 United Arab Emirates University

UAEU is the first and foremost comprehensive, national, federal university. The university opened in 1976 by the president of the UAE, Sheikh Zayed Bin Sultan Al Nahyan, and it includes nine different colleges offering undergraduate and postgraduate degree programs. They are the College Business and Economics, College of Education, College of Engineering, College of Food and Agriculture, College of Humanities and Social Sciences, College of Information Technology, College of Law, College of Medicine and Health Sciences, and Science (UAEU, 2016a) . There is also the University College, which assists and enhances the skills of newly enrolled students, such as English language and numerical literacy before transferring them to one of the nine academic colleges above. The UAEU features state-of-the art facilities, comprehensive study support and a notable, international faculty (UAEU, 2016a). There were 13,864 students registered at the University during the academic year 2014-2015, in which 20% of them were international students, mostly from Arab countries. Enrolled male students represented 20%, while female students represented 80% of the entire student population. The total postgraduate student body is 943 students (7% of total students), of which 20% of are PhD students, and 80% are masters students (UAEU, 2016b). The total staff of the university is 2,623, of which 25% are academic staff (18% of total academic staff are female), 60% administrative staff, and 15% technical and support staff. About 26% of academic staff are Emirates nationals, and the remaining 74% are international academic staff from different nationalities.

The regular annual budget of the UAEU is around US$395 million. It is provided by the UAE Federal Government. The budget is based on a funding formula for students as per their academic majors, thus the budget is regularly adjusted up and down by a few percent, as per the actual student numbers at the time of the annual university student audit conducted by the Ministry of Finance and Industry (MOFI). Beyond the regular annual budget, the University gets some additional support from 1) Graduate Programs fees, 2) Externally-funded research contracts, 3) external sponsorship of university activities, such as exhibitions, conferences, and different student activities, and 4) Specific projects supported by the Abu Dhabi government. These are in "restricted accounts" ring-fenced for the objectives of support, totalling about US$27 million in 2013. The additional support varies from year to year.

Similarly, UAEU (2015) state the university's vision on their website as, *"Leadership and excellence in higher education and scientific research at the regional and international levels"*. As part of its mission, and in addition to providing the country with quality graduates that meet international standard, it is developing research solutions for strategically important issues related to the country, and to collaborate effectively with other organisations.

Their mission indicates that collaboration is a priority for UAEU, and the university fosters collaboration with government, private businesses, and academic institutions, both nationally and internationally. The total published research output between

2009 and 2013 indicates that 32% of the output was co-authored within either the same institution or with other institutions inside the country. 53% of the total output was co-authored internationally, with researchers from institutions outside the country.

The university council is chaired by the Minister of HE and Scientific Research and, similar to SQU, is comprised of members from different backgrounds such as businessmen, lawyers, government officials, and academics. The Council reviews and approves regulatory by-laws, strategies, policies, development plans, and any amendments to them. There are four deputies to the Vice Chancellor in the university. The first One is the Deputy Vice Chancellor for Finance & Administrative Affairs, who oversees all of the financial and administrative issues, such as personal affairs, procurements affairs, career development, payments, and other administrative services. The second is the Deputy Vice Chancellor for Academic Affairs, who oversees academic related issues and community services such as continuous education. All nine Deans of the academic colleges and the Dean of the University College report to him directly, as well as the other service centres. The third deputy is the Deputy Vice Chancellor for Research and Graduate Studies, who oversees all postgraduate and research activities and related issues. There is one college reporting to this deputy, which is the College of Graduate Studies, as well as a deanship, which is the Library Deanship, in addition to six research centres and one Office for Research and Sponsored Projects. The last deputy is for Students Affairs & Enrolment, who is in charge of issues such as housing, health, financial aids, social activities, and counselling.

3.7.2 Research at UAEU

Since the establishment of the university, its faculty have engaged in many research activities that contribute to the country’s development in most areas, such as education, economics and health services. The office of the Deputy Vice Chancellor for Research and Graduate Studies is the responsible for fostering the research activities at the university both internally, with the different public and private organisations and research institutions in the country, or internationally with other international organisations and research institutions. Similar to SQU, UAEU research activities carried out by the academic staff working within the nine academic colleges and research centers. The main six research centres at the university are Zayed bin Sultan Al Nahyan Center for Health Sciences (ZCHS), National Water Center; Roadway, Transportation, and Traffic Safety Research Center (RTTSRC), Emirates University Center for Public Policy and Leadership, Khalifa Center for Genetic Engineering & Biotechnology (KCGEB), and Emirates Center for Energy and Environment Research. Recently, another two research centres have been established in the university which are Emirates Center for Happiness Research and The National Space Science and Technology Center. All of these research Centers coordinate with other stakeholders, nationally and internationally, to tackle issues related to their disciplines.

In addition to enhancing the links between the UAEU and external funding bodies, there are different types of internal research funding opportunities for both students and academic researchers in the university. On the one hand, students can apply to get funded from Summer Undergraduate Research Experiences (SURE) funding scheme by working in team under the supervision of qualified academic researcher. On the other hand, academics can apply to other different types of grants such as UAEU/SQU Joint Program, UAEU Interdisciplinary Center-based Program, UAEU Program for Advanced Research (UPAR) and UAEU Research Start-up Competition (UAEU, 2017). Similar to TRC in Oman, National Research Foundation (NRF) in UAE consider as the main national funding body which provide funding for research related activities in different areas of national priority that will have a positive socio-economic impacts to UAE nation. Researchers in UAEU can apply to other nationals' agencies and organisations such as Abu Dhabi Environmental Agency and Al Jalila Foundation Competitions which provide funding for research related activities in UAE.

3.8 SQU – UAEU Research Collaboration

The historical ties and geographic proximity of Oman and the UAE presents a model of collaboration at various levels. SQU and UAEU established a high level, joint committee in 1988 between the two countries as part of their main objectives to foster collaborative activities between the two universities in all academic and research issues, such as academic exchange program, collaborative research projects, research visits, and other student related activities, including athletic, social, educational events between the two universities. A collaborative research subcommittee was formed in 2003 to oversee collaborative research activities between them. The committee is comprised of members from the research offices of both universities, most of whom are members of the main committee.

Both universities allocate an annual budget supporting the collaborative research projects submitted for funding. The committee meets twice a year (once at each university) to discuss all issues pertaining to research collaboration. The first meeting is held in April, while the second meeting is held in October of each year. At the beginning of each calendar year, the two universities internally announce the submission date for new research and funding proposals. The location for submissions alternates between the two universities. The proposal must include two PIs, one from each university, as well as other research investigators from both universities.

In addition, the budget is to be divided equally between the two PIs, so that each university provides 50% of the requested budget. The PI of the university that received the proposal must submit it to the research office of the university. Than the university will call for a meeting in April in order to screen the proposals before they are sent to external referees. After that, the university will send the preselected proposals to external referees for scientific evaluation. The final approval for the selected proposal will be in the second meeting in October and the project will start at the beginning of the calendar year. Before activating the next year budget, the PIs will present the annual progress report. At the end of each collaborative research project, a final report is submitted to each of the two universities. Historically, the maximum budget approved since collaborative research activities between the two universities began is about one hundred and five thousand US dollars.

The total number of research projects approved through the end of 2015 was twenty-five, of which thirteen were completed, two were discontinued, and ten remain as on-going projects, most of which will complete at the end of 2015. Generally, in social science projects, both PIs and investigators will jointly develop data collection instruments, and collect data separately from each country, then analyse and interpret the results together. While in applied sciences, a PI may suggest a research question and the research sample, while another analyses the sample, due to the availability of the analysis instruments at his research institution. A third researcher interprets the results, and finally a fourth one or all of them write up the final output. The size of any collaborative project determines how tasks are allocated and shared between collaborators. Many of these funded projects address research problems related to both countries across different disciplines such as medicine, crop science, food science, education and sociology.

3.9 Chapter Summary and Conclusion

This chapter has outlined the background and some of the quantitative data on GCC countries such as their research institutions, research outputs, and collaborative trends. These data were compared with other research incentive countries in the world. After that, the context of this study was addressed by an overview about the two PFUs which are the case study. They are SQU in Oman and UAEU in the UAE. These two universities have initiated a programme of research collaboration, and there are currently some on-going collaborative research projects between them, along with other completed and few terminated projects. Some of these collaborative projects were terminated at some stages, and others completed without achieving their full objectives or extended due to unexpected challenges. As per the data, twenty-five projects were approved from 2003 to 2015, which shows either a low submission or low success rate. An in-depth investigation will be carried out to identify the challenges they have faced whilst collaborating, as well as the opportunities and the potential of joint research activities in the region. This will be achieved by interviewing the PIs and DMs from both universities in order to explore the opportunities and challenges of collaborative research activities in GCC countries.

CHAPTER FOUR

4 METHODOLOGY

4.1 Introduction

While the previous chapters have laid down the theoretical background, conceptual framework of research collaboration and presented some key indicators of research collaboration between GCC countries and mainly the PFUs, the aim of this chapter is to outline the methodology used in the study. The chapter contains four main sections. The first section presents the epistemological assumptions of this research and followed by the research methods chosen for the study. The next section covers research design, including data collection, sampling methods, and data analysis. Finally, the quality criteria in qualitative research and the ethical considerations of the study are also outlined.

With the world becoming a "global village", each researcher and research institution must take advantage of this situation to improve their productivity by utilising resources allocated for research to increase their impact on societal welfare. Countries around the world experience similar pressing problems, such as environmental, health, and socio-economic issues, especially when these countries are located in the same continent or region. There are positive empirical impacts of research collaboration (see chapter 2) in knowledge production and attempting to solve these issues. Given these positive impacts, one growing trend over the last three decades is increasing research collaboration between scientists which many policy makers encourage through different levels and structures. The increase in this trend of research collaboration between researchers (especially at international level and within the same region) is the driver behind this study. Based on some quantitative (secondary) indicators outlined in the previous chapter, there is a limited amount of collaborative research activities between GCC countries which dominated by the public-funded research institutions. This study mainly attempts to explore the opportunities and challenges of research collaborative activities between the public-funded institutions in GCC countries by interviewing key players of some collaborative research activities funded by SQU-UAEU funding scheme. The study adopts the academic collaboration framework by Sargent and Waters (2004) with some refinements.

This study aims to understand the opportunities of joint research activities in the region by collecting some in-depth information, such as the existence of the motives, as well as the outcomes/impacts of the funding scheme. In addition the study will try to identify the main factors (challenges) which affect research collaboration between PFUs in GCC countries. Apart from those factors identified from the literature, the study will try to identify other factors which may relate to the region under investigation or the specific type of universities (PFUs). The researcher will interview the key players engaged in collaborative research activities and mainly the researchers and policy-makers. In his study about research collaboration, Sonnenwald (2007:644) states that:

> *"Research methods that are used to investigate scientific collaboration include bibliometrics, interviews, observations, controlled experiments, surveys, simulations, self-reflection, social network analysis, and document analysis"*

4.2 Research Paradigms (Philosophies)

The principal aim of doing any research is to increase the stock of knowledge, using predetermined systematic ways (Saunders et al., 2011). Selecting the right method will have a positive impact on the final knowledge produced, and the researcher has the responsibility to clarify the selected research paradigm in order to ensure the quality of the research. There are various ways of conducting research studies, and each researcher may have their own beliefs and views of the surrounding environment. However, there are some "research paradigms", which can be defined as the basic set of beliefs and assumptions that guide any researcher before h/she starts the research enquiry (Guba and Lincoln, 1994; Easterby-Smith et al., 2012; Creswell, 2013) and therefore defines the world-view of the researcher (Denzin and Lincoln 2011:91).

In conducting any research, four important concepts guide the paradigmatic view of the researcher and these are:

- What knowledge is (ontology);
- How we know the knowledge (epistemology);
- What values go into it (axiology); and
- What is the process (methodology) of studying it

According to Denzin and Lincoln (2011), Ontology involves the philosophy of reality, whilst epistemology is the philosophy of knowledge, or how we come to know that reality. On the other hand, axiological assumptions answer the question of the role of values in research, and whether they can be suspended in order to acquire knowledge (value-free), or they facilitate and form what is known (value-laden) (Collis and Hussey, 2013). In the former, the researcher is independent and detached, whereas in the later he/she is part of what is studied (Collis and Hussey, 2009). The overall process of doing research, and the best practices of apprehending this reality is known as the methodological assumptions (Krauss, 2005). The researchers' assumptions about human knowledge and about the nature of realities they encounter in their research inevitably shape how they understand their research questions (Saunders et al., 2011). Johnson and Duberley (2000) state that the axiological and methodological assumptions tend to influence the ontological and epistemological assumptions.

4.2.1 Different Research Paradigms

Given the long standing and unavoidable debate by philosophers about conducting research, there are a range of different philosophies that can be used to address different research problems. The most commonly used are the positivist, constructivist/interpretivist and realist research philosophies. These philosophies are used for quantitative, qualitative or a mixed method studies. Each of these approaches has its own philosophical assumptions and methodological implications.

The positivist philosophical enquiry has been dominant for centuries. The ontological assumption of this approach is that there is a single external and objective reality (Easterby-Smith et al., 2012; Bryman, 2012); while its epistemological underpinning is that reality can be examined by an independent and neutral researcher (value-free) (Saunders et al., 2011). Knowledge is discovered or gained through measurements or observations of phenomena (Krauss, 2005; Easterby-Smith et al., 2012), which the researcher has no control over. This philosophical approach is frequently used to test theories because the researcher (positivist) begins with a theory of a phenomenon, and then goes on to test it using hypotheses. Given these assumptions, the positivist research follows a deductive, quantitative approach (Krauss, 2005; Easterby-Smith et al., 2012) and very popular with the natural sciences.

The constructivist or interpretivist approach was also developed during the last half-century. This approach assumes that views and actions of social actors forms the observed social phenomena in a continuous process, which are subjected to continuous revision (Saunders et al., 2011). So in order to understand the world in which individuals live or work, they construct many subjective meanings of their experiences/meanings, which are directed toward certain objects (Creswell, 2013). Interpretivists regard the world as a 'social construct' through which people allude meanings, interpretations, motives and intentions towards behaviours in their daily encounters (Blaikie, 2007; Easterby-Smith et al., 2012). Reality is subjective because social constructivists are not independent but part of what is being studied (value-laden). Interpretivists produce generalisations from data, which is then used to build and not to test theory. They follow an inductive approach to understand an actor's thinking and feeling in order to explain their actions (Easterby-Smith et al., 2012). They therefore rely heavily on the participants' views of situations being studied by using different techniques such as open-ended questions. Inductive reasoning forms an integral part of qualitative enquiry (Hyde 2000) and this does not prevent the researcher from using existing theory to formulate the research question to be explored (Saunders et al 2012). Inductive reasoning starts with observations and ends with proposing theories (Goddard and Melville, 2004) or simply put it involves drawing generalizable inferences out of observations (Bryman 2012: 26). According to Krauss (2005), qualitative researchers perceive quantitative approach as limited in nature because it looks at a smaller portion of reality which cannot be split without losing the importance of the entire phenomenon. To them, the best way to understand any phenomenon is to view it in its context through a qualitative approach (Krauss, 2005). From the foregoing, the ontological orientation of the interpretivists is socially constructed and its epistemology is subjective reality. Thus, the researcher values the researcher-subject relationship in knowledge creation (Denzin et al., 2006; Farquhar, 2012; Wahyuni, 2012) because it allows a critical examination of assumptions that would have been overlooked or ignored by other approaches (Jacobs and Manzi, 2000).

The third paradigm is realism, and this lies between positivism and constructivism and has elements of both paradigms. The ontological assumptions of realism are that reality exists independently of the researcher (similar to the positivists view), but rejects the assumption that the only genuine way of understanding reality is the positivistic approach (Saunders et al., 2011). On the other hand, it shares the constructivist epistemology that accounts for the different meanings people ascribe to their experiences and how their perceptions are influenced by their values and beliefs. It should be noted that not all realities are socially constructed. The influence of values and beliefs on the respondents' perceptions is the reason why it is very difficult to generalise the findings of realists (Easterby-Smith et al., 2012). Realism is 'value aware', unlike the 'value free' positivist orientation, and the constructivist is 'value laden'. The realist, therefore, has an idea about the direction to follow, but seldom has a clear idea of the results to expect (Easterby-Smith et al., 2012). This approach is most suitable for exploratory research, which studies a phenomenon in its natural setting through the lived experiences of subjects. Realists use both inductive reasoning (qualitative approach) and deductive reasoning (quantitative approach) to understand any phenomena.

4.2.2 Research Paradigm for this Study

As stated earlier, the ontological and epistemological assumptions affect the selection of research paradigms. Karataş-Özkan and Murphy (2010) argue that researchers choose their paradigms based on the purpose of the study, their philosophical assumptions about reality and how to inquire into this reality. The aims and objectives of this study is contrary to the positivist view whose epistemological assumption is that the only reliable and legitimate basis for knowledge is direct experience accumulated in the form of data. This is a social science research study that frequently encounters phenomena that are not easily observed and are consequently discounted from the positivist epistemology (Johnson and Duberley, 2000; Krauss, 2005). Examples of such phenomena in this study are the values and culture of researchers and institutions, and their perceptions about the motives, factors, and output of collaborative research. The best way to understand a phenomenon is to become immersed in it by moving into the culture or organization being studied, to have a 'lived-experience'. Cross-sector motives behind research collaborations are different from the motives behind research collaboration between academic institutions (especially public-funded institutions). The collaborator's perceptions about the factors which may affect such collaborations will vary but positivism suggests a single uniform reality which is not applicable in this study. Reality is influenced by the context of the study and participant's perceptions.

Again, while positivist researchers are independent from the world they study by being neutral, it is difficult, if not impossible, for social scientists to be independent and detached from the phenomenon. In most cases, the researcher needs to be part and parcel of the study (value-laden) to interpret the observations h/she makes (Blaikie, 2009; Easterby-Smith et al., 2012). For these reasons, positivism is deemed inappropriate for this study because the phenomenon involves real-life human experiences in organisations (Robson, 2002).

On the other hand, constructivism partly satisfies this study because it accounts for the perceptions of the participants, such as interviewees as reality. However, the participants in this study, like the principal investigators and policy makers interpretations of the factors which affect collaborative research activities between PFUs is not seen as reality in itself but one of the many views about reality. The participants' views and perceptions, which are based on their experiences, are very vital in understanding reality (Johnson and Duberley, 2000).

Between the two different philosophies lies the ideal paradigm for this research (realism). It shares the ontological assumption of positivism, which state that reality exist independently from the researcher, while rejecting the possibility of a single objective reality (Blaikie, 2009). Also, realism rejects constructivism by viewing reality as a social construction, but does accept the important role of participants' perceptions and experiences. The entities that can be used to provide explanation in realism include people, organizations, relationships and attitudes and this research amply dwells on these tenets to explain collaborations in the GCC countries (Easton, 2010). The researcher has to explore what is unknown and cross-check with what h/she has found or thought to be known (Blaikie, 2009). Further, realism also allows for flexibility in research. Given that, realism shares some assumptions of positivism and constructivism, the philosophy accepts either quantitative or qualitative methods, or both, to get reality and the researcher has to study the phenomena in-depth in order to understand it. Thus, the realist must rely on the researcher to gather further data, to give alternative explanations to the current debate, and thereby seeing the data through a different lens that eventually portrays a good understanding of the real world (Woodside et al., 2005; Easton, 2010). The study is an exploratory one where the researcher explores in-depth the phenomena by interviewing key players. In addition, the researcher's experience in the context will help to guide him (value-aware). Given the above reasons, realism is seen appropriate for this study.

Table 4-1: Research philosophies

Concept	Question	Positivism	Realism	Constructivism (Interpretivist)
Ontological	What is the nature of reality?	• Reality is objective (tangible) and singular • It is independent of social actors	• Reality is objective • Exists independent of human thoughts and beliefs or knowledge of their existence • Interpreted through social conditioning	• Reality is subjective (socially constructed) and multiple
Epistemological	What is the relationship of the research to the researcher?	• Reality can be assessed • The object is independent of researcher and the researcher is neutral all times	• Observable phenomena provide credible data and facts • Understanding patterns of behaviour by group of people	• The researcher and the research are interactive and inseparable
Axiological	What is the role of values?	• Value-free (unbiased)	• Value aware	• Value-laden (biased)
Theory	What is the role of the research to theory?	• Theory testing and theory guide research. Has a prior theoretical base	• Building theory and has a prior theoretical base	• Building theory and theory is an outcome of research. In general not based on prior theory
Strategy	What is the research strategy?	• Deductive	• Inductive	• Inductive
Methods (Data)	What is the research method?	• Quantitative	• Quantitative/ Qualitative	• Qualitative

Source: Adapted from Easterby-Smith et al. (2012), Bryman (2012), Zikmund et al. (2012) ,Saunders et al. (2011), and Johnson and Duberley (2000)

4.3 Research Methodology

The nature of a study (its objectives, research questions, theoretical background and the research contexts) guides the choice of a research methodology. In general, the selection of the right technique is highly related to the research philosophy (paradigm) selected by the researcher for his/her research. As discussed in the previous section, the selected research philosophy for this study is realism, which leans towards both qualitative and/or qualitative methodologies (Easterby-Smith et al., 2008). This study is a qualitative research as it stresses "the socially constructed nature of reality, the intimate relationship between the researcher and what is studied, and the situational constraints that shape the enquiry" (Denzin and Lincoln, 2011:8). A qualitative research method is considered appropriate for a number of reasons. First, academic contexts are rich in data, and investigating any phenomena requires deep investigation (especially if it is related to a specific organisation such as PFUs). Little is known about the phenomena under study, and most of the literature is overly general, and focused on different forms of research collaborations. To deeply explore the phenomena, the researcher has to understand the in-depth processes, including contexts, subjects' circumstance and experiences, complexities of situations, emotional circumstances of participants, values and cultures within which the study occurs, in order to explore and understand the real world from the participants' worldview.

Again the researcher intends to study the phenomenon research collaboration within the GCC countries under its natural setting (Creswell, 2013), and this can be better conducted through a qualitative enquiry that advocates that knowledge production should be flexible and sensitive to the social context within which data are generated rather than relying on rigid, remote and inferential methods (Denzin and Lincoln, 2005). Furthermore, qualitative research is preferred because the study seeks a detailed understanding of research collaborations and these details can only be obtained by talking directly to the participants and allowing them to tell their stories unencumbered (Yin, 2010). The findings of the study may be used by other researchers to test other contexts in the region with similar organisational characteristics. As it is very costly and time consuming to study other PFUs in the region at this stage (either through a quantitative approach or through doing case studies for all of them), generalising the findings could be done at a later stage.

4.4 Research Design

Saunders et al. (2011) define research design as the general plan of how the research will go about answering the research question(s). It includes the source of data collection, the ways of collecting it, how to analyses it, how to qualify it, ethical issues, and any expected obstacles, such as access, time, location and funding. Generally, through research design, the researcher translates his research questions into data, as well as providing a framework for the data collection and analysis.

4.4.1 Case Study Research Strategy

There are many approaches to conducting qualitative research and the researcher adopts a case study research design (Yin, 2013; Robson, 2002) as it facilitates in-depth investigation and understanding of a real-life contemporary phenomenon in its natural setting (Farquhar, 2012; Yin, 2013; Robson and McCartan, 2016). Robson and McCartan (2016:150) define case studies as a "strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence". In any case study research, the case to be investigated and selected by the researcher could be individual, group, institution or country (Robson, 2002). Using case study in institutional studies has become more popular because of its effectiveness in producing good quality research in real life contexts (Yin, 2013). There are three different forms of case study; single case study, double case study and multi-case study (Creswell, 2013). Using a qualitative case study in this research was the right method because it helped to collect non-numeric data, which reflect the real life of participants. Given the three different forms of case study, a single case study fits this research. The case selected for this study is SQU-UAEU funding scheme. The researcher made meaning from the collected data from academic researchers and decision makers in both universities.

4.4.2 Data Collection

There are different means for collecting data for a qualitative case study, which include interviews, documentary records, and observation. Given that it is a time consuming method that produces a large amount of data, the most widely employed method in qualitative research is interviewing (Bryman, 2012). In order to obtain an in-depth understanding of any phenomenon, the researcher is encouraged to be as close as possible to the setting. Saunders et al. (2011) define three categories of interviews. The first is the "structured interview", where the researcher asks predetermined questions in fixed order and wording. The second category is the "semi-structured interview", where the researcher has a list of themes and questions that are predetermined, but the order and the wording can be modified. In this category the researcher can add more questions during the interview, or even omit some of the predetermined questions if they are not applicable to some participants. The third category is the "unstructured interview" or in-depth interview, in which the researcher defines his general research interest and carries out the interview informally. The researcher may conduct the interviews on a "one-to-one basis" (either face-to-face or through using telephone or internet) or may use focus group discussions, where the researcher meets with group(s) of interviewees to explore an aspect of research through group discussion (Saunders et al., 2011). This study used semi-structured interviews to obtain information on institutional and national level research collaborations. This was adopted to ensure a high degree of consistency across interviews.

First, primary data was collected from researchers who have either participated or are participating in collaborative research activities between SQU and UAEU. Second, decision-makers who were/are involved in collaborative research activities between both institutions were equally interviewed. Finally, some secondary data such as final reports, progress reports and presentations and co-authored publications were obtained from the research offices, official websites and the international database Scopus to supplement and verify some of the primary data collected.

4.4.3 Sampling Methods

Sampling in research is very important, especially when conducting research for an entire population, which is mostly impossible (and true in research activities). Samples can be classified into two categories; “probability” and “non-probability” (Easterby-Smith et al., 2008; Bryman and Bell, 2011; Saunders et al., 2011). Each of these categories includes different techniques that can be used in research. In probability sampling, the researcher randomly selects some representative of the total population, using different techniques to make inferences in order to answer research question(s) or meet objectives (Saunders et al., 2011).

Probability sampling techniques are mostly associated with quantitative research strategies. The first probability sampling technique is simple random sampling. In this, the researcher selects the participant(s) randomly from the entire population, and the probability of including each participant in the sample is equivalent. The second method is selecting the participants using systematic sample technique in which the researcher selects every n^{th} unit from the total population. For example, if the total population is 1000, then the researcher is planning to include 100 participants in the study. A random start can be done between the first and the tenth inclusively. If the selected participant is the fifth, the researcher will select every fifth unit from each ten of the population. The third technique is stratified random sampling. Here the researcher divides the population into strata according to their characteristics of importance to the research. For example, in this particular study factors such as academic discipline, rank and collaborative experience are considered and then randomly selected from each stratum. The last technique of random sampling is the cluster sampling. With this technique, the population is distributed into groups (or clusters) and these are selected to represent the population. This technique is valuable if most of the variation in the population is within the groups, not between them (Saunders et al., 2011). This technique may include multi-stage cluster sampling, in which the researcher, firstly select the clusters and then selects randomly from each of the selected clusters (Easterby-Smith et al., 2012). It is worth mentioning that multi-stage cluster sampling is different from stratified sampling because in the former one participant is selected randomly from the selected clusters, while in the stratified sampling, the selection is randomly done from all the strata.

The second sampling technique is the non-probability sampling; here the researcher selects the sample for the study by using non-random techniques. There are many different techniques which can be employed in this sampling method. The first in this category is convenience sampling; where the researcher selects the participant who is most available by virtue of his/her accessibility. The second technique is using snowball sampling, in which the researcher starts his research by finding some participants from the target population, then asking them to nominate other participants that have similar characteristics, or are suitable for the study. The third technique is using a judgment sampling approach, where the researcher selects the participants based on his/her own opinion. The fourth technique is using quota sampling, in which the researcher establishes quotas for the number of participants with certain characteristics, and then selects whomever from each group non-randomly. Other non-probability sampling techniques are self-selection samples and expert samples.

4.4.4 Sampling Methods for this Study

In probability sample techniques, the researcher selects the sample randomly, which has to be a significant representation of the population to produce significant results. This category is mainly used when testing hypothesis in quantitative research. On the other hand, the qualitative approach aims to understand the phenomenon in-depth as well as build a theory. The researcher selects the most suitable participants, interviews them, and extracts the required information from each participant. Generally, the number of participants in a qualitative approach is small (Gerring, 2006), and not statistically significant. In this study, the researcher identified the participants using non-probability sampling techniques. The researcher used the judgement sampling approach where he selected cases based on his own opinion. The most suitable participants in this research were those individuals who had experience in regional joint-research activities between the two universities, especially formal research collaboration(s). In selecting the participants, the researcher first obtained the list of PIs and committee members involved in joint research projects funded by the SQU-UAEU through the webpage of the SQU-UAEU Committee. Additionally, the research offices in both universities were used to elicit information on the decision-makers involved in these research activities. After that the potential PIs were grouped into the two institutions (SQU and UAEU) in order to have two different populations. Each of these groups included PIs from different academic disciplines, ranks and collaborative experience and decision makers. Participants were then selected randomly from each group and interviewed.

4.4.5 Pilot Study and Interview Questions

The researcher used a two-stage process to design effective interview questions. First, the researcher pre-designed the interview questions following the themes that emerged from the extensive review of literature (detailed in chapter two). This was followed by the second stage, where the researcher conducted a pilot interview with two expert researchers. Both of them had experience in collaborative research activities. The first respondent had worked as a PI and investigator in collaborative research activities, as well as holding a managerial position (Assistant Dean for Postgraduate Studies and Research) in one of the selected universities. The second respondent also holds a similar position in the other university, with experience in collaborative research. This follows Doyle (2004) suggestion that to identify and capture all the important topics in a study, it is essential to interview people who can present the big picture and provide a valuable input for the proposed research. Prior to the pilot interviews, the two participants were given the list of topics to be covered in the interview as well as the research questions. As a result of these interviews, some modifications were made to the proposed interview guides to reflect all the relevant themes of the study. Additionally, the pilot study gave the researcher the opportunity to practice the interview process efficiently. In most cases, the questions were asked according to the flow of the interview discussion. This process confirmed that semi-structured interviews would be the most efficient method of conducting this kind of research as the researcher gets the freedom to ask questions depending on the flow of the discussion without constraints.

4.4.6 The Participants

The aim of qualitative research is to collect rich information. The total number of participants in this study was thirty-one, involving collaborative researchers (PIs) and decision makers from the two selected universities. The PIs were those who have some experience of research collaboration between the two selected universities across all disciplines. They were asked questions related to their experiences in collaborative research activities such as their motives, outcomes, process, and factors affecting their collaborations. The opinions of the decision makers such as Deans/Assistant Deans of colleges/schools or DVCs for research and postgraduate studies were also elicited on the importance of research collaboration in general and between PFUs in the region. Questions related to their university research strategies and specifically on research collaboration were asked. To strengthen the empirical evidence, results from the literature search and the case study were used to develop a detailed conceptual framework in order to understand research collaboration.

The research participants were classified into three different distribution groups which are:

- **Disciplines focus:** Applied Science disciplines (AS), Basic Science disciplines (BS) and Humanities and Social Science disciplines (HSS).
- **Academic rankings:** Full Professor (FP), Associate Professor (AP) and Lecturer (LC).
- **Collaboration experience:** less than 3 years, between 3 to 6 years and between 6 to 9 years.

It is worth mentioning that the above distribution groups have been used by many researchers in research policy and management, especially in collaborative research activities (e.g. Bozeman and Corley, 2004; Al Hosni, 2010; Bozeman and Gaughan, 2011). In addition, most of the collaborative research activities between the two institutions were from AS disciplines. Tables (4.2) and (4.3) summarise the different participants for this study.

Table 4-2: Categories of respondents (Academic PIs)

Participant Code	Academic Rank	Discipline	Collaboration Experience
PI:1	LC	AS	< 3 years
PI:2	LC	HSS	< 3 years
PI:3	FP	AS	6-9 years
PI:4	LC	AS	< 3 years
PI:5	AP	AS	3-6 years
PI:6	FP	HSS	< 3 years
PI:7	LC	AS	< 3 years
PI:8	LC	AS	< 3 years
PI:9	AP	BS	< 3 years
PI:10	FP	AS	3-6 years
PI:11	LC	AS	6-9 years
PI:12	AP	AS	3-6 years
PI:13	AP	HSS	3-6 years
PI:14	LC	HSS	< 3 years
PI:15	FP	AS	3-6 years
PI:16	AP	AS	3-6 years
PI:17	FP	AS	3-6 years
PI:18	FP	AS	6-9 years
PI:19	FP	AS	3-6 years
PI:20	LC	AS	3-6 years
PI:21	LC	AS	< 3 years
PI:22	FP	BS	< 3 years
PI:23	LC	AS	3-6 years

Source: Author’s construct, 2015

Table 4-3: Categories of respondents (Decision Makers)

Participant Code	Position	University
DM:1	DVC	SQU
DM:2	Director	SQU
DM:3	Dean	SQU
DM:4	Assistant Dean	UAEU
DM:5	Director	UAEU
DM:6	Head of Section	SQU
DM:7	Academic Advisor	SQU
DM:8	Head of Section	UAEU

Source: Author's construct, 2015

As stated earlier, the total number of respondents in this study was 31, comprising 17 from SQU and 14 from UAEU. All respondents were either involved in on-going collaborative research or have been involved in one between both universities. Almost 71% (N=23) were academic researchers who have participated as PIs in collaborative research projects funded by the SQU-UAEU funding scheme between the two institutions while the remaining 29% (N=8) were decision makers (5 from SQU and 3 from UAEU). In terms of collaborative research experiences in this particular funding scheme, 43.5% of the PIs have experience of less than 3 years, 43.5% have three to six years' experience and 13% have six to nine years' experience. It is worth mentioning that the PIs included in the study possess no less than two years of experience in collaborative activities funded by the scheme. The majority of the PIs participating in this research were from Applied Science (AS) disciplines (74%), while the remaining 26% from Basic Sciences (BS) and Humanities & Social Sciences (HSS) disciplines (9% and 17% respectively). The reason behind such big difference is because the majority of applicants, in terms of submitted proposals for funding from the scheme and thereafter the approved projects, were from AS disciplines. Finally, in terms of the academic ranking of the academic participants, 35% were full professors (FP), 22% associate professors (AP) and 43% were assistant professors (LC).

4.4.7 Ethical Issues and Interviews Process

Before going into the field to conduct interviews, ethical clearance was sought and obtained from the University of Manchester’s Research Risk and Ethics Committee (UREC) through the School of Environment Education and Development Ethics Advisory Group. This process is in line with research protocols (Creswell, 2013) and included a justification that the research was worthy and the methods appropriate. Having obtained this, the researcher proceeded into the field to conduct interviews. The interviews took place in SQU in Oman and UAEU during the summer of 2015. Prior to this, formal authorisation was also sought and obtained in the two institutions to facilitate access to prospective research participants. Consequently, the researcher contacted potential respondents via e-mail (which are publicly available) and introduced the research project to them. Participants were briefed about the research and why they were being invited to take part. They were however assured that their participation was entirely voluntary and they could opt out at any time. Those who agreed to take part in the study were sent a second e-mail, which included the Participant Information Sheet (PIS) and the Consent Form (CF) to confirm their willingness. For the purpose of convenience, participants had the prerogative to determine when and where the interviews were to be conducted. Reminders were finally sent to participants one week before the scheduled interview through their emails as well as SMS and phone calls. Before the interviews took place, the researcher obtained the signed CF from all the participants and also assured them of the confidentiality and anonymity of their responses. All interviews took place in the offices of the respondents with the exception of two respondents who chose to be interviewed outside of their offices. With the exception of a few interviews, the majority were tape-recorded.

4.4.8 Data Analysis

The voice recorded interviews were downloaded to the researcher’s computer and transcribed using a word processor. The transcripts were read many times and relevant data was underlined and subsequently categorised into research themes, subthemes and related information. The interviews were then analysed using an iterative coding process. The first step was open coding to identify the various factors, followed by axial coding to the factors and identify relationships among them (Bryman, 2012). The coding helped in illuminating themes and trends across the interviews to garner greater understanding and insight into the phenomena under investigation.

4.5 Research Quality

There are different perspectives on which research quality can be tested in qualitative research and what constitutes quality has been discussed variedly including validity, reliability and generalizability. Validity measures the extent of how the number of participants is sufficient to generalise the findings to the context of study. Reliability (or consistency) in qualitative research is the extent to which the research process yields stable and consistent results in different trails. Generalizability refers to what extent the findings would be the same if taken from other samples selected from the population (Creswell and Miller, 2000). To ensure qualitative research meets quality standards, Tracy (2010) developed "big-tent" approach for qualitative quality which include: (a) worthy topic, (b) rich rigor, (c) sincerity, (d) credibility, (e) resonance, (f) significant contribution, (g) ethics, and (h) meaningful coherence (Tracy, 2010:839). She goes on to elaborate that these qualities serve as a pedagogical tool to promote dialogue among researchers as well as encourage viability and credibility in qualitative research (Tracy, 2012). Elsewhere, others have proposed triangulation, structural corroboration and referential adequacy as assurances for quality assurance (Eisner, 1997). In other jurisdictions, some qualitative scholars have suggested that in doing qualitative research, one should check whether the topic is appropriate (Silverman, 2013) and the questions worthy of investigation (Creswell, 2013). The researcher followed these underlying principles to ensure that the research topic was worthy and the appropriate philosophical and methodological orientations and techniques were adopted first, subjecting the research topic and methodology to the University of Manchester Ethics and Fieldwork Review Committees for approval, which was subsequently granted. Further, the study relied upon the top management of the sampled organisations, who are experts in their own rights and have extensive collaborative experience through several years of work, as well as keeping a constant interface with them and the data to ensure that the findings are accurate.

4.5.1 Validity

Checking the validity of any research is no longer the preserve of quantitative researchers. There have been thriving and vibrant literatures which have examined validity within the qualitative research paradigm (Kidder and Judd, 1986; LeCompte and Goetz 1982; Yin 2009). In checking the validity of the research, they identified the following criteria; construct validity, internal validity, external validity and reliability (Yin 2009:40). As qualitative studies tries to interpret and make meaning through human interactions, the process contributes to the construction of social reality and in assessing the validity of the process, Altheide and Johnson (2010: 593) suggest the researcher considers *"the place of evidence in an interaction process between the researcher, the subject matter, the intended effect or utility, and the audience for which the project will be evaluated and assessed".* This suggestion was heeded to and consequently the researcher explained to participants the aim of the study at the beginning of each interview, and encouraged them to give as much accurate information as possible. The context of the study to some extent helped the trustworthiness of the data, because most of the participants including some of the decision makers were academic researchers who fully understood the importance of the research information. As researchers, they are most probably involved in the same scenario of collecting data, and fully understanding the importance of accurate information for the study outcomes. In addition, the researcher tried to use different strategies to ensure the validity such as repeating the questions in different ways. Finally, the study included participants from different disciplines backgrounds and academic ranking. Most of the decision-makers were also holding academic positions and involved in researcher activities. Before the interviews commenced, the respondents were assured of confidentiality, anonymity and safety of all respondents and their organisations. This was ensured through anonymizing all respondents and their organisations by the use of codes and identifiers. Data collected was also protected from external parties and stored in private and protected storage devices.

4.5.2 Reliability

Reliability is no longer a concept limited to only quantitative research but extends to qualitative research as well. It means ‘the degree of consistency with which instances are assigned to the same category by different observes or by the same observers on different occasions’ (Hammersley, 1992:67). To ensure reliability, qualitative researchers ‘use variety of techniques (interviews, participation, documents) to record their observations consistently’ (Neuman, 2003:184). The researcher ensured reliability in this study by selecting four interviews randomly and re-analysed them using two different strategies (intra-rater) and in both cases, similar results were found. Again, to ensure the reproducibility of the procedures and results, two of the interviews were given to an independent researcher and expert in management and collaborative research (inter-rater). Though the expert did not arrive at the same conclusion with one of the interviews, the level of consistency was very high. This indicates that the ‘reliability can be improved by comparing the analysis of the same data by several observers’ (Neuman, 2003:288).

4.6 Chapter Summary and Conclusion

This chapter outlined the study's methodology. It presented the philosophical orientation of the study and the rationale for adopting a qualitative approach. The study adopted the realist paradigm, which enabled the researcher to explore in-depth a social phenomenon, by interviewing key players in order to gather further information, to give an alternative explanation to the debate on research collaboration among PFUs in GCC countries. This is anticipated to help build a theory which may be used by other researchers for studying similar universities, either in the region or in similar universities in other developing countries. The context of the study, as well as the research questions, supported the use of a qualitative approach. The chapter discussed the data collection methods, including in-depth interviews as well as secondary sources of data, sampling and participant selection, pilot studies, the interview process, and data analysis, as well as ethical clearance. Finally, the research quality related issues were presented at the end of the chapter to address issues pertaining to the validity and reliability of data collection and analysis. The chapter was therefore useful in providing the philosophical and methodological bases for the research; this is in tandem with the qualitative research evaluation criteria suggesting that, the choice of appropriate methodology is important to ensuring research quality and robustness. The next chapter discusses the findings of this research.

CHAPTER FIVE

5. FINDINGS: THE MOTIVES AND IMPACT OF THE SQU-UAEU FUNDING SCHEME

5.1 Introduction

To remind the reader, the main aim of this study is to explore, understand, and analyse the opportunities and challenges of research collaboration among PFUs in GCC countries.

The previous chapter provided the justification behind the chosen qualitative research approach as well as the ways of collecting data, selecting samples, and analysing the collected information and data. The chapter clearly stated that in order to achieve the above aim and answer the main objectives of this study, the researcher has to be as close as possible to the context and explore it in depth by interviewing some of the experienced principle investigators (PIs) and decision makers (DMs) in the research collaboration between the two selected universities. Their accumulated experiences and knowledge will help gain a fuller understanding of the phenomena under investigation.

Based on the findings of the literature review and the research questions listed in the first chapter, the researcher listed the main topics to be addressed in the interviews, which are:

- The motives behind their involvement in research collaboration between SQU and UAEU;
- The impacts/outcomes of the research collaboration funded by the SQU-UAEU funding scheme;
- The factors/challenges affecting the collaborative projects between SQU-UAEU researchers;
- The potential of research collaboration between PFUs in GCC countries;

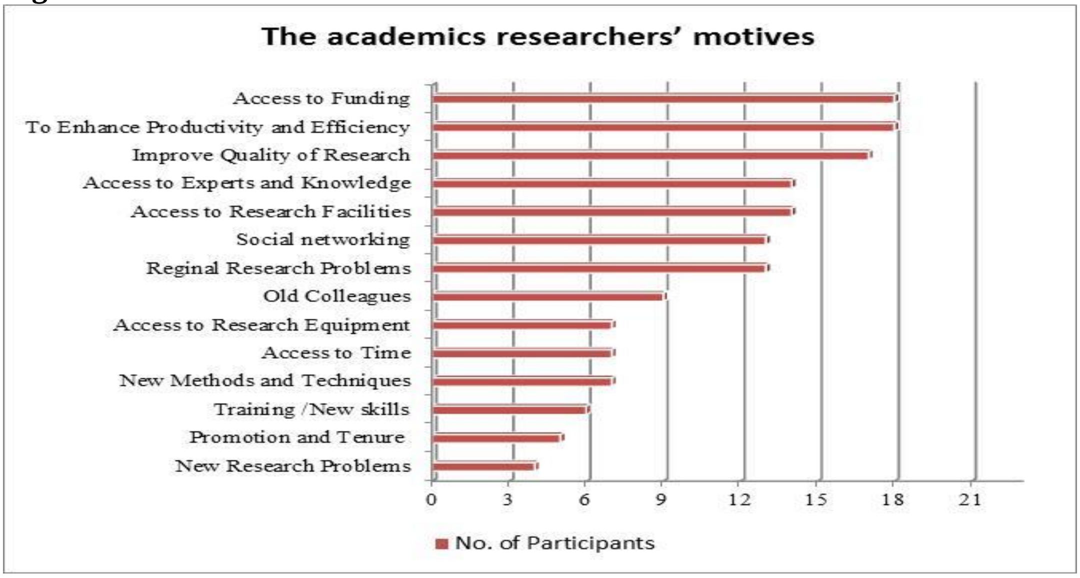
While the next chapter will address the findings of the last two topics to achieve the objectives three and four, this chapter will address the findings of the first two topics to achieve objective two of this research. It presents the findings of the participants' motives and the outcomes/impacts of collaborative research activities between the two selected universities. The researcher asked the participants questions about their motives to initiate and participate in joint research activities funded by the SQU-UAEU scheme. In addition, questions related to what they have achieved and the benefits gained from such participations. The findings are supported with distribution analysis of each category (theme) as well as the sub-categories.

5.2 Academics' Motives for Research Collaboration

This section and the next will both present the motives of academic researchers and institutions for research collaboration between the two universities.

Generally, the motives extracted from the academic participants' interviews are not much different to those found in the literature. However, the findings show that academic disciplines, academic ranking, and collaborative experience all have an impact on an academic's motivation to participate in a joint funded project. The academic participants indicated that their main motivations behind their participation in the collaborative research scheme between SQU and UAEU were to gain access to resources such as funding and research facilities, improve research quality and productivity, and to address regional research problems as well as create a strong academic network. Figure 5.1 below summarises and ranks the different types of motives behind academic participation in collaboration.

Figure 5-1: The main academic motivations for research collaboration



Source: Author's construct, 2017

The academic participants (18 out of 23) ranked *'Access to funding'* and to *'improve productivity and efficiency'* as the leading motivations behind their participation in the joint research activities funded the SQU-UAEU funding scheme. Both motives have been addressed by academic participants from all disciplinary backgrounds, but chiefly LC (Lecturers) and AP (Associate professors) academic researchers, who face difficulties in gaining funds from other available funding sources compared to other senior researchers and believe that collaboration in research funded by the scheme will help them to enhance their research productivity and efficiency, which is considered very important for their career development and promotion.

Conversely, the third main motive mentioned (i.e. *'quality of research'*) was referred to more by FP academic researchers who have already reached their top academic ranking and consider producing good quality research as their main priority. The fourth and the fifth motives, *'Access to research facilities'* and *'Access to expertise and knowledge'*, were each referred to by 14 out of 23 academic participants, with the former referred to more by FPs and APs from AS disciplines and the latter referred to more by LC academic researchers from all disciplines.

The sixth and the seventh motives behind participation are to address a *'Regional research problem'* and build up *'Social/academic networking'*, which were referred to by 13 out of 23 participants. On the one hand, tackling a regional research problem was primarily noted by AP and FP academic researchers from both HSS and AS disciplines with more than 3 years of regional collaboration experience. On the other hand, building social/academic networks was mainly referred to by LC and AP academics from AS and BS disciplines. The eighth main motive highlighted by the academic participants (9 out of 23) was working with *'Old colleagues and supervisors'*. In addition to other motives, some researchers and mainly AP and FP from both AS and HSS disciplines preferred to work with their old colleagues or mentors where there is a well-established relationship and an established trust between them that helps to achieve the research objectives and minimize the difficulties in the joint research.

Only 7 out of 23 academic participants addressed *'New methods and techniques'*, or getting access to *'time'* and *'research equipment'* as motivations to participate in the funding scheme. While learning new methods and techniques was addressed mainly by LCs from AS disciplines with less than 3 years of regional collaboration experience, getting access to time was mentioned by FP and AP academic researchers from AS disciplines and mainly those who are in administrative job positions. Finally, getting access to research equipment was mentioned mainly by academic researchers from AS disciplines in projects which confirmed the findings of other researchers.

The last three motivations mentioned by very few of the academic participants were '*Training', 'Promotion and tenure'*, and *'New research problems'*. These motives were addressed by 6, 5, and 4 out of 23 academic participants respectively.

5.3 Categories of Motives from Academic Respondents

The fourteen main motives highlighted above which have been addressed by the academic participants can be grouped into the following four categories (themes):

1- Access to economic resources, which includes access to funding, research equipment, research facilities, and time;
2- Access to scientific and technical human capital, including access to expertise and knowledge, regional research problems, new methods and techniques, training and new skills, and new research problems;

3- Enhancing productivity, efficiency, and quality of research;
4- Social motives, which include social networking, old colleagues/supervisors, and promotion and tenure.

Table 5.1 shows the ranking of the academic participants' main motivations (category wise) to collaborate in research activities funded by the SQU-UAEU funding scheme.

Table 5-1: The categories for motivations of the academic participants

Categories	No. of Statements	Rank
Access to economic resources	46	1
Access to scientific and technical human capital	44	2
Enhancing productivity, efficiency, and quality	35	3
Social and personal motives	27	4
Total	**152**	

Source: Author's construct, 2017

As the table shows, *'Access to economic resources'* ranked as the first main category behind academic researchers working jointly in projects funded by the SQU-UAEU funding scheme, with 46 out of 152 statements. By a small variance, the second main category behind academic researchers' involvement in the funding scheme is getting *'Access to scientific and technical human capital'* with a total of 44 statements. The third category is *'Enhancing productivity, quality and efficiency'* with a total of 35 statements, and the final category is *'Social motives'* with a total of 27 statements. The next four sub-sections present the distribution of the four categories of motives and quotes from the interviews transcripts.

5.3.1 Category One: Access to Economic Resources

This category includes four different motives for collaboration in the program mentioned by the academic participants (Table 5.2). It is ranked as the primary main motive behind their involvement in the SQU-UAEU funding scheme. The total numbers of statements in this category were 46 which are equivalent to 30% of the total statements extracted from all academic participants' interviews.

Table 5-2: Distribution of motives in the category 'Access to economic resources'

Category (1): Access to economic resources	**Nature of science**			**Academic ranking**			**Collaboration experience**			**Total**
	AS (17)	BS (2)	HSS (4)	FP (8)	AP (5)	LC (10)	<3 (10)	3-6 (10)	6-9 (3)	
Access to funding	12	2	4	4	5	9	9	8	1	**18**
Access to facilities	12	0	2	6	2	6	6	5	3	**14**
Access to time	6	1	0	3	2	2	3	3	1	**7**
Access to equipment	5	2	0	2	3	2	2	4	1	**7**
Total	**35**	**5**	**6**	**15**	**12**	**19**	**20**	**20**	**6**	**46**

Source: Author's construct, 2017

5.3.1.1 Motive 1: Access to Funding

The academic interviewees stated that they considered '*getting access to funding'* as the main motive behind their participation in the funding scheme. They used the scheme as a funding source because they face difficulties in gaining funds from other internal funding sources in both institutions.

> *"Also the other part was actually the funding. It's [an] opportunity for funding" (PI, 4).*

Researchers utilised the funding scheme as an alternative funding source, either due to a lack of sufficient funds being allocated by internally funded grants, or because of high competition in funded research activities, especially where there is a limited amount of budget allocated for the colleges/academic departments, regardless of the size.

> *"There is a very high competition in the college in getting funding from internal grants funded by the university. This program was a good opportunity for me to get funded" (PI, 9).*

> *"It is one of the research funding grants available in the [name of the university]. There is a cap for internal grants. So funding is one of the main reasons" (PI, 22).*

Finally, one of the researchers stated that "buying research equipment requires a good investment of money", where such funding provides him with the opportunity to buy some sophisticated research instruments and improve the research capacity of his academic department.

> *"With this funding, my college administration agreed to contribute partially to the purchase of one of the most important instruments in my department" (PI,12).*

This motive ranked first in the category of **"Access to economic resources"** and overall motives in which it was mentioned 18 times (78%) and mainly addressed by LC and AP academic participants from all academic disciplines. Getting access to financial resources such as funding was highlighted in previous studies about research collaboration. Examples of these studies are Potì and Reale (2007), Sonnenwald (2007), and Heinze and Kuhlmann (2008).

5.3.1.2 Motive 2: Access to Research Facilities

There are a variety of facilities which are used for research activities. Examples of these facilities which were spoken of by the academic participants are animal experiment houses, research labs, national data, national sites, software, chemicals, and research instruments. Researchers found this joint program as a means to gain '*Access to research facilities'* which are available in both institutions. It seems that each university has some unique facilities which are not available in the other.

> *"Another reason is the facility they are having. The module I am using required an [name of the facility]. This is available with them" (PI,1).*

Other researchers employed this funding scheme as a means to gain access to national data to carry out a comparative study and learn from neighbouring countries' experiences.

> *"We aimed to compare two countries in this regards … I collected data from [name of the organisations] in Oman and he collected data from [name of the organisations] in UAE" (PI, 14).*

This motive ranked as the second main motive in the category and the fourth overall motive being extracted 14 times (61%) and mainly mentioned as a motive by FP academic participants from AS disciplines (86%). This finding is also in line with that of other researchers, regarding access to facilities is considered as one of the main motives behind collaboration (e.g. Wray, 2002; Oldham, 2005).

5.3.1.3 Motive 3: Access to Time

Academic participants with administrative jobs such as DVCs and deans claim that collaboration with their counter-parties helps them to gain access to time for research and compensate for some of the time limitations imposed on them. It is clearly understood that administrative work takes up a very substantial amount of the academic researchers' time. Administrative load was mentioned by the academic participants as one of the factors hindering research activities in general.

> *"In my case, definitely my collaborator has more time for research because he does not have an administrative role … That is also an important part of it … It's always better to collaborate with somebody who has time for research than [someone] who is loaded with administrative works" (PI, 10).*

> *"Many administrative works [have had to be undertaken] especially in the last three years … Time for research becomes very limited … So I think working together will help to complement each other's resources such as time and research facilities" (PI, 9).*

This motive was referred to by seven academic participants (30%), mainly senior researchers from AS disciplines, and ranked as the third in the category (tenth overall). Most of these academic participants are or were holding an administrative position in their institutions. Very little previous research has addressed the motive of getting access to time as one of the main motivations to collaborate, however, researchers such as Finholt et al. (2002) and Maglaughlin and Sonnenwald (2005) consider time as an important resource for collaboration and researchers have to allocate enough time in order to succeed in the joint research activities.

5.3.1.4 Motive 4: Access to Research Equipment

Getting *'Access to research equipment'* or instruments is the fourth main motive behind research collaboration in the category **"Access to economic resources".** The nature of applied science research in most cases requires using some scientific equipment which is often expensive and may not be available in every research institution. Among the academic participants it was found that this funding scheme was the best opportunity to get linked to their counterparty in the other university and utilise or access research equipment/instruments available to them during their joint research.

> *"My colleagues at the department told me that they have the analytical equipment needed for analysing the samples ... Our proposed research requires such instruments ... It was a good opportunity to know what facilities they have" (PI, 23).*

In addition, others stated that they are able to continue collaborating and using the facilities and equipment available with their collaborators for other research activities after completing the joint project.

> *"[At] the same time they have analytical equipment which we do not have ... Until now we continue collaboration and use their facilities" (PI, 3).*

Getting access to research equipment was mentioned by seven academic participants (30%) from AS and BS disciplines (71% and 29% respectively), and ranked as the fourth in the category **"Access to economic resources"** and eleventh overall. As a motive to collaborate, access to research equipment has been extensively highlighted by scholars such as Cronin et al. (2004), Sorenson and Fleming (2004), Heinze and Kuhlmann (2008), and van Rijnsoever and Hessels (2011).

5.3.2 Category Two: Access to Scientific and Technical Human Capital

This category includes five different motives for collaborating in scheme-funded research projects mentioned by the academic participants (Table 5.3). This category is ranked as the second main category behind involvement in the SQU-UAEU funding scheme, with 44 statements out of a total of 151 extracted statements.

Table 5-3: Distribution of motives in the category 'Access to scientific and technical human capital'

Category (2): Access to scientific and technical human capital	**Nature of science**			**Academic ranking**			**Collaboration experience**			**Total**
	AS (17)	BS (2)	HSS (4)	FP (8)	AP (5)	LC (10)	<3 (10)	3-6 (10)	6-9 (3)	
Access to expertise and knowledge	10	1	3	4	4	6	7	6	1	**14**
Regional research problem	9	0	4	5	3	5	3	7	3	**13**
New methods and techniques	6	0	1	1	1	5	4	2	1	**7**
Training	5	1	0	0	2	4	4	2	0	**6**
New research problems	2	0	2	0	2	2	1	3	0	**4**
Total	**32**	**2**	**10**	**10**	**12**	**22**	**19**	**20**	**5**	**44**

Source: Author's construct, 2017

5.3.2.1 Motive 5: Access to Experts and Knowledge

The researchers can get access to others' expertise and knowledge, either formally through direct contact and joint research activities or informally by sharing ideas and experiences during a conference or a workshop. As indicated by some academic participants, *'Access to experts and knowledge'* was one of their main motives to engage in joint research projects funded by the scheme. Researchers collaborate to complement each other's knowledge as no single person has all the needed knowledge to carry out and produce a good quality of research unless it is a very basic research project.

> *"I knew his method will complement my method and he knew that my method will complement what he is doing ... He has in his group software experts. A computer*

package which we do not have here and we do not have [an] expert in running this package" (PI, 3).

For example, most of the applied research activities require different people to work together in order to achieve an outstanding outcome, especially when it includes more than one discipline (i.e. cross-disciplinary). As stated in the literature review, most of the advancement in knowledge production comes as an output of the integration of different scientific fields.

> *"... Our proposals are multi-disciplinary ... Simple example is statistics analysis ... We need different people to do different things ... So getting access to expertise is one of our main motives" (PI, 1).*

In some cases a researcher is new to the proposed research topic and they approach researchers in the other institution to learn from their experiences. They collaborate with them in order to gain access to their experiences and start digging from the point where the other has already reached. Therefore acquiring new knowledge, or even extending it, is one of the motives behind working together in research activities.

> *"... Also the main motive was to interact with their researchers ... they had already done some research in this topic and they have substantial information and data ... We learned from their research experiences in this topic ..." (PI, 12).*

This motive ranked as the highest motive (fifth overall) in the **"Access to scientific and technical human capital"** category and was mentioned by 14 academic participants (61%), mainly LCs from AS and HSS disciplines. Researchers such as Bozeman and Corley (2004), Sonnenwald (2007), and Birnholtz (2007) consider getting access to experts and knowledge as one of the main motivations to collaboration.

5.3.2.2 Motive 6: Regional Research Problems

As stated earlier, the GCC region shares similar research problems which need to be tackled by the scientific community. Similar socio-economic, environmental, and medical issues are spread across the region. These research problems may arise either because of culture or the geographical location of the region.

> *"There are some issues which you need to know. For example, among GCC countries and this is a region where you need to know. Issues related to the culture, to the population, diseases which occur ..." (PI, 11).*

Many of the participating academics find such funding schemes to be an opportunity to tackle '*Regional research problems'* by collaborating with their colleagues in the other university, to maximise the impact of research, and utilise the allocated resources instead of investigating the same problems separately.

> *"We have a problem in the quality of services provided by [name of the organisations] and similar problems in [name of the regional country] ..." (PI, 6).*

> *"This is a common problem in both [name of the organisations], in both countries ... The international studies such as [name of the study] find that this is an issue in all the GCC countries participating in the studies" (PI, 2).*

This motive was mentioned by 57% (13 out of 23) of the academic participants, specifically by FPs from AS and HSS and ranked as the second highest in the category **'Access to scientific and technical human capital'.** Although limited research has emphasized upon the importance of research collaboration to solve regional research problems, many scholars consider collaboration as the best way to tackle global problems (e.g. Cummings and Kiesler, 2005; Raasch et al., 2013).

5.3.2.3 Motive 7: New Methods and Techniques

30% of the academic participants, consisting primarily of researchers who are in the early stages of their academic career, posited learning *'New research methods and techniques'* as a primary motive to participate in research collaboration between the two universities. This motive ranked third highest in the **'Access to scientific and technical human capital'** category. While some of them came from the same disciplinary background and tried to use new methods and techniques in order to produce high quality results in their research:

> *"We tried to use new methods and different techniques to produce economic value products (add value) such as [name of the product] and medical products ... What we achieved is considered one of the best outputs in this type of research ... It is the first product produced by using [name of the regional resources]" (PI, 12).*

Others came from different disciplines and worked together in cross-disciplinary projects:

> *"Our project is interdisciplinary research. He is from another discipline background and I am from another ... New idea for both of us. We will use both different backgrounds to introduce new methods" (PI, 7).*

This motive was referred to by 30% (7 out of 23) of the academic participants, predominantly LCs from AS disciplines, and ranked as the third highest motive in the category **'Access to scientific and technical human capital'.** Previous studies such as Wagner et al., (2001), Sargent and Waters (2004), and Heinze and Kuhlmann (2008) consider learning new methods or techniques as one of the motives behind engagement in collaborative research activities.

5.3.2.4 Motive 8: Training

Training is the fourth motive in this category, where some researchers found it to be a good opportunity for them and their participating RAs and postgraduate students to be trained in using different facilities in the collaborative institutions. The facilities which are available in one institution may not be available in another, and even if it is available, there is no trained person who knows how to use them, especially when the skilled technician is no longer in post. By doing joint research activities, the academic participants can acquire the knowledge on how to use such facilities.

> *"… I also found this project as an opportunity to train my student and technician. I have sent the technician to be trained in their animal house facility for two months. They have a good animal house" (PI, 4).*

Another participant argued that getting access to free training from a professional in using some sophisticated research equipment is one of his main motives for engaging in a collaborative project. Before purchasing any scientific equipment, it is essential to have well-trained technicians on how to use such equipment:

> *"They have one [piece of equipment] which we used to carry out our experiments in the joint project. In addition to that, it was my plan to train our department superintendent on using this equipment … The College agreed to purchase it next semester so we can use it in our future research activities" (PI, 9).*

The opportunity to get access to training was mentioned by 6 academic participants who are mainly in their early academic career from AS disciplines. This motive ranked as the fourth most popular in the category **'Access to scientific and technical human capital'**. Few researchers (e.g. Beaver, 2001; Sonnenwald, 2007) consider training as a motive for collaborating in research.

5.3.2.5 Motive 9: New Research Problems

Some academic participants stated that their participation in collaborative research activities between the two universities was mainly to tackle '*new research problems'* which were never addressed by researchers in the region before. One academic participant claimed that their joint research is new and only a limited amount of the literature available had addressed it in similar contexts.

> *"Frankly speaking the research topic we did was new and we were aiming to look at the [research problem] … The topic is never done in the region and even in the Arabic World, and even comparative between two countries … The literature for the Arabic world is poor in this regard" (PI, 13).*

Other researchers claimed that, as an output of their joint research activities, new research problems arose and they agreed to tackle them by submitting a new research proposal to be funded jointly from the scheme.

> *"We were happy about the findings and the outputs of our first joint project. New research problems arose during the first project … We submitted a new proposal for the second phase and got funded again" (PI, 5).*

The "New research problems" category was mentioned by 4 academic participants (17%) and ranked as the last motive in the second category **"Access to scientific and technical human capital"**. All of them are in their early or mid-academic career from both AS and HSS disciplines. This finding supports the previous literature that tackling new research problems is considered as one of the motivations to collaborate in research Bozeman and Boardman (2003) and Maglaughlin and Sonnenwald (2005).

5.3.3 Category Three: Enhancing Productivity, Efficiency, and Quality

This category includes two different motives mentioned by the academic participants (Table 5.4) for engaging in joint research activities between the two universities. This category is ranked as the third highest category of motives with 35 extracted statements out of 152.

Table 5-4: Distribution of motives in the category, 'Enhancing productivity, efficiency, and quality'

Category (3): Enhancing productivity, efficiency, and quality	**Nature of science**			**Academic ranking**			**Collaboration experience**			**Total**
	AS (17)	BS (2)	HSS (4)	FP (8)	AP (5)	LC (10)	<3 (10)	3-6 (10)	6-9 (3)	
Enhance the productivity and efficiency	13	2	3	3	5	10	9	8	1	**18**
Improve quality of research	12	2	3	8	4	5	7	7	3	**17**
Total	**25**	**4**	**6**	**11**	**9**	**15**	**16**	**15**	**4**	**35**

Source: Author's construct, 2017

5.3.3.1 Motive 10: To Enhance Productivity and Efficiency

The academic participants indicated that *'Enhancing the research productivity and efficiency'* is one of the motives which most of the academic researchers intended to satisfy when collaborating with others. Although this motive is highly linked with another addressed motive, which is for career development and academic promotion (motive 13), however, very few of the academic participants mentioned them together. Most of the academic researchers aim to get promoted academically and this cannot be achieved unless they produce a high quantity of research output such as published peer-reviewed articles, books, and chapters.

> *"Improve the quality of our findings and [a] high possibility to publish more and in turn faster [develop our] academic career" (PI, 7).*

This motive was addressed in two different ways. Some participants stated that complementing the available facilities in each university is one way of improving the productivity and the efficiency. Given the limited resources available to them as individual researchers, they have a strong belief that they will be able to complement each other's abilities and utilize available resources at both universities.

> *"We can fully utilize the different facilities available in the universities in a more efficient way. They have good facilities and we also have ... By this we can produce more" (PI, 17).*

> *"We decided to collaborate together ... [it is a] faster and effective way to do research instead of doing things separately" (PI, 21).*

Others think that collaboration will help them to produce more research, especially if their collaborators are productive researchers.

> *"... I feel that collaborating with active researchers usually produces an excellent research in terms of quality and quantity, as well because you have different expertise and this pushes research forward" (PI, 22).*

> *"Although he is relatively young, he has a very good number of publications ... Very dynamic researcher" (PI, 16).*

This motive extracted 18 times (78%) and ranked as the first motive in the category **"Enhancing productivity, efficiency and quality"** and the second in overall motives. This motive was highlighted by academic researchers in their early or mid-academic careers from all disciplines. This finding is in line with the previous studies which consider collaboration as a means to enhance academics' research productivity and efficiency (e.g. Sargent and Waters, 2004; Lee and Bozeman, 2005; Sooryamoorthy and Shrum, 2007).

5.3.3.2 Motive 11: Improve Quality of Research

It is scientifically confirmed that research collaboration in general has a positive impact on the quality of knowledge production. Many academic participants indicated that they decided to develop a joint research proposal and submit it for funding as a way to get connected to well-established researchers in the collaborating institution in order to gain knowledge and *'Improve research quality'*.

> *"Also publication wise, we think that working with them will help us to produce excellent and more research" (PI, 12).*

> *"It is win-win and we complement each other. The impact and the quality will not be the same. So this is why people collaborate" (PI, 19).*

The findings from the interviews indicate that some of the academic participants developed this motivation through practical experiences. Firstly, most of their personal co-authored published papers are better in quality and cited more often than their single-authored papers. This encouraged them to work with others, believing that joint research activities will produce a better quality of research.

> *"I published many research [papers] but the best ones [were those] produced jointly with my colleagues in the university as well with others outside. This is always one of the reasons behind working with any one such as [name of the collaborator]" (PI, 6).*

> *"… But in my case I found it is better to work with others and mainly outside the country. Previously I was publishing alone … very low citations … even the very few with my colleagues in the university are not cited as much as recent publications such as from this project" (PI, 12).*

In addition, some believed that their collaborators will help to improve the quality of the research produced. They built this assumption based on the reason that the single-authored papers published by their collaborators are highly cited, which means working with them will influence the quality of their joint research output.

> *"He is an excellent scientist ... When looking to his research ... I mean his own research, he got high citations ... [this] all encouraged me to work with him" (PI, 19).*

> *"Not only this. But also [name of the collaborator] is a very good scientist when you look in Scopus" (PI, 16).*

This motive was extracted from 17 academic participants (74%) and ranked as the second highest motive in the category **"Enhancing productivity, efficiency and quality"** and third overall. This motive was primarily highlighted by FP academic researchers across all disciplines. This motive is identified by many researchers as one of the reasons for academic researchers to collaborate in research such as Sargent and Waters (2004), Persson et al. (2004), Oh et al. (2010) and Onyancha and Maluleka (2011).

5.3.4 Category Four: Social and Personal Motives

Scholars have different opinions on the social factors of research collaboration. On the one hand, researchers such as Melin (2000), Bozeman and Corley (2004), and van Rijnsoever et al. (2008) have shown that such factors motivate researchers to collaborate. Others such as Price (1963) claim that social factors do not play a significant role as collaboration output arises from economic and not social motives. However, this study is in line with those who support the notation that collaboration in research is a socio-cognitive practice.

In this study, three different social and personal motives (Table 5.5) have been extracted and grouped under a new category, **'Social and personal motives'**, which motivate the academic participants to collaborate under the funding scheme. This category is ranked as the fourth main category of motives behind involvement in the SQU-UAEU funding scheme.

Table 5-5: Distribution of motives in the category 'Social and personal motives'

Category (4): Social and personal motives	Nature of science			Academic ranking			Collaboration experience			Total
	AS (17)	BS (2)	HSS (4)	FP (8)	AP (5)	LC (10)	<3 (10)	3-6 (10)	6-9 (3)	
Social networking	11	2	0	2	4	7	6	5	2	**13**
Old colleagues	6	0	3	6	2	1	2	6	1	**9**
Promotion and tenure	2	0	3	0	1	4	3	2	0	**5**
Total	**19**	**2**	**6**	**8**	**7**	**12**	**11**	**13**	**3**	**27**

Source: Author's construct, 2017

5.3.4.1 Motive 12: Social Networking

The academic participants ranked the motive *'social networking'* or expanding academic social networks as the primary motive under Category Four, **'Social and personal motives'**. They believe that this funding scheme will increase their academic social networks, which will in turn increase their visibility and help to facilitate their gain of access to many technical and economic resources. On one hand, some of them (mainly LCs and APs from all disciplines) stated that working with others helped them to become more visible and recognised as researchers in their field.

> *"Another reason is to get connected with others. Every year, I have new colleagues in the region and also internationally. This is why we collaborate in academia. Mainly to learn from each other and get connected" (PI, 20).*

> *"Also to get connected to a good group of academics and experts in my field. This is why we collaborate. Always I like working with others" (PI, 4).*

On the other hand, such academic networks will open to them a window for attaining access to different economic resources for research, such as funding opportunities available across the world as well other social benefits such as new job opportunities.

> *"My intention was to get connected with them and others. I have another project with them and other colleagues from UK. That project came about mainly because of our previous joint project"* (PI, 11).

> *"I achieved my main objectives or motives to collaborate with them. One was to create a social network with other researchers and it is achieved ... For example, I got an email from one known researcher in my field from the UK asking me to participate in a global research project about [the topic]" (PI, 12).*

In general, formal and informal social academic networks and interactions between researchers are essential in order to make advancements in knowledge production and solve research problems. Researchers will get access to up-to-date knowledge, research problems, and the different resources needed to carry out research. Previous studies such as those of Maglaughlin and Sonnenwald (2005), van Rijnsoever and Hessels (2011) and Woo et al. (2013) highlighted this social motive which is considered one of the main reasons to develop programs to promote collaboration. This motive was extracted 13 times (57%), mainly from the AS and BS academic disciplines with researchers in their early or mid-academic careers and less collaboration experience. It is ranked as the highest motive in the category of **"Social and personal motives"** and seventh overall.

5.3.4.2 Motive 13: Old Colleagues

In addition to other motives, nine of the academic participants (39%) clearly stated that they decided to develop proposals for funding from this scheme because they knew somebody working in the university. It is quite common for academic researchers to continue working with their *'Old colleagues'*. For example, fresh PhD academic researchers continue to work with their previous academic supervisors (mentors) or with their PhD colleagues.

> *"I know [name of the collaborator] because he was my PhD student. I know his capabilities. It was an opportunity to work together again ... I contacted him and agreed to develop a proposal to be funded from the scheme" (PI, 6).*

Additionally, academic researchers continue working with their old academic colleagues especially if they successfully worked with each other previously in joint research activities.

> *"Number one, as a continuation of our previous collaboration … and also we want further collaborations … We are collaborating in different projects … so it's part of wider collaborative activities ..." (PI, 15).*

In both scenarios, such as continuation in collaboration with old colleagues is highly influenced by the previous joint research experiences. The more successful the previous collaborative experience, the greater the motivation to collaborate and work together again.

> *"He was working with us and we collaborated together before and produce good research. This encourages me to works with him again" (PI, 10).*

Generally, this indicates that researchers prefer to collaborate with people they have worked with before, either as colleagues or as academic supervisors/students. The common mutual interests and the trust built between them influences the output and the positive impacts of their joint research activities.

Working with *'Old colleagues'* ranked as the second motive in this category with 9 extracted statements from AS and HSS academic disciplines across all academic rankings. Scholars such as Sargent and Waters (2004) and Maglaughlin and Sonnenwald (2005) also addressed working with old colleagues as one of the main motives behind academics collaboration. Researchers prefer to collaborate with others already worked with such as previous colleagues or students.

5.3.4.3 Motive 14: Promotion and Tenure

The most important output from scientific research is publications and it is obviously well known that the academic promotion mainly depend on research publications as well other academic related activities such as teaching and community services. Although limited number of academic participants explicitly mentioned it as a motive, getting *'Promotion and tenure'* is one of the reasons behind doing research in general and of course collaborating with others in knowledge production. Some researchers stated that they decided to collaborate because their collaborators are high research producers and they believed they will have a positive impact on their future academic career. In general, academic participants linked to the academic career development, with the improvement of productivity and the quality of research produced from joint research activities:

> *"Improve the quality of our findings and [a] high possibility to publish more and in turn faster [develop our] academic career" (PI, 7).*

> *"This is very common if you want to produce a good number of articles ... More research means better experiences and academic career progress" (PI, 13).*

One of the interesting finding as addressed by one senior researcher that in some universities co-authored paper weighted more than single authored paper when comes to promotion decisions, especially when the two papers have similar citation rates.

> *"In academic promotion, co-authored papers weighted more ... This is based on my experience in promotion committee" (PI, 23).*

Five academic participants (22%) mentioned this motive as one of their main reasons for collaboration and mainly LC. It is ranked as the third one in the category related to **"Social and personal motives"**. Among the scholars who highlighted social motives for collaboration, such as academic promotion and career development, are Sargent and Waters (2004) and van Rijnsoever et al. (2008).

5.4 Institutional motives as perceived by decision makers

While the previous section presents in detail the motivations of the academic researchers to participate in the joint research projects funded by the SQU-UAEU funding scheme, this section will summarise the institutional motives (i.e. SQU and UAEU) as perceived by the DMs in both universities. The table 5.6 below summarise these motives.

Table 5-6: The main institutional motives as highlighted by the DMs

No.	Motive
1	An institutional objective
2	Historical ties and the diplomatic relationship
3	Improve the efficiency and quality of the research for both universities
4	Reducing the risk of doing research
5	Tackling regional research problems
6	Link researchers and create international networks
7	Sharing resources and research facilities

Source: Author's construct, 2017

Most of the DMs stated that it is part of their institutional objectives to collaborate with other institutions nationally and internationally. They develop policies to create links with counterparties through signing formal agreements, such as MoUs, to establish official partnerships.

> *"It's is one of our institutional aims. That's why we try to get connected with other institutions through different means such as signing MoUs" (DM, 5).*

> *"In order to achieve the objective of collaboration, we have signed agreements and exchange visits"* (DM, 3).

However, some of them maintained that, based on their experiences, few fruitful joint research activities have emerged between the regional research institutions. Two of them stated that this funding scheme is the only successful initiative in the region in terms of formal research collaboration.

> *"Well I think in the region and as a formal scheme … I do not think there is any … To my personal knowledge, this scheme is the only successful formal collaboration in the region in terms of research…" (DM,7).*

> *"I have never heard about similar joint research funding schemes in the region" (DM, 6).*

Next, although some of them stated that the strong historical ties and the diplomatic relationship between both countries at higher levels play a vital role in encouraging and motivating both universities to collaborate in many academic related aspects.

> *"There is a cooperation committee at a strategic level between the two countries … They share the same backgrounds and cultural aspects ... Both universities agreed to work jointly in many academic aspects such as teaching and research collaboration" (DM, 8).*

> *"Actually, this committee is a subcommittee from a main SQU-UAEU committee… We do collaborate in other academia-related issues. I think the strong relation between the two nations encouraged both universities to work together in such research activities" (DM, 2).*

However, one of them clearly indicated that such a relation also exists with/between other GCC countries:

> *"The strong tight [bond] between the two countries could be a reason, but in general GCC countries have a good relationship between them, which could be a reason to promote joint research between them" (DM, 1).*

Moreover, the DMs participating in this study have a strong belief that such collaboration will have a positive impact at a national level and will improve the efficiency and quality of the research for both universities. This motivates them to increase the funding and encourage researchers to participate

> *"I am an academic and I know that such collaboration will enhance the research … Will produce good research … This will have a positive impacts on both universities … Both countries will benefits"* (DM, 4).

For example, one of the DMs compares the outputs of the joint research projects and internally funded projects and stated that in many cases collaborative projects are better in term of the published works.

> *"Based on my experience as a [name of the position] sometimes they published more compared to the internally funded projects"* (DM, 4).

Next, the DMs addressed the issue of reducing the risk of doing research where funding both groups jointly is better than funding two groups separately.

> *"Also funding projects with 50% of the needed budget. Research outcomes are unpredictable and sharing resources actually minimising the risk of doing research".* (DM, 6)

Moreover, some of the participating DMs addressed the issue of tackling regional research problems, especially those faced by both participating countries. It is worth mentioning that because both countries share geographical borders and very strong social linkage between their citizens, many shared socioeconomic and health research issues arise related to both countries.

> *"We are in the same region and many issues or I can say research problems are in both countries. I will give you one example, the problem of [name of the regional disease] which is also in [regional country]."* (DM, 3).

> *"I know many research problems in the region which are tackled by different institutions. Why not working together and maximise the productivity of the resources."* (DM, 7).

In addition to that, the DMs believed that such joint research projects could be considered as an opportunity and starting point of departure to link researchers from both universities and other international research institutions and universities.

> *"This is the best way to link academic researchers regionally and internationally" (DM, 1).*

> *"Also one of the most important aims is to link the researchers. Joint funded project is a starting point. They will continue collaborating, sharing facilities, sharing data, and resources" (DM, 5).*

Such academic network and linkage will improve the researchers mobility, which will have positive impacts in creating links with colleagues in the former institutions and attract them to work jointly in research related activities.

> *"Some of them [i.e. researchers] moved from SQU to UAEU and some moved from UAEU to SQU … This is a good trend … strong networking will be created" (*DM, 5).

Finally, similar to the academic researchers' motives, sharing resources and research facilities in terms of capital equipment and other research related materials was also considered as one of the institutional motives behind such funding schemes. DMs highlighted the advantages of using each institutions available resources, such as research instruments and facilities.

> *"Sometimes, it is very expensive to fund a project especially when it is requiring research equipment. This is one of our objectives for having this funding scheme. Researchers can use the available facilities in both universities."* (DM, 6).

> *"Maximise the utilisation of research facilities"* (DM, 5).

To summarise the findings of the institutional motives behind the funding scheme, DMs stated that the long lasting historical and cultural ties, improvement of the personal and national research productivity and quality, reducing risks, tackling regional research problems, creating strong academics networks, and sharing resources and facilities are the main motives behind initiating the funding scheme between the two universities.

5.5 Summary of the Motives

The previous sections addressed both academic researchers and the institutional motives behind initiating and participation in collaborative research activities funded jointly by the two universities. In regard to academic researchers' motives, an analysis of the findings of the interviews uncovered fourteen motives behind their participation, in which they are grouped into four main categories. These categories consist of motives related to **"Getting access to economic resources"**, motives related to getting **"Access to scientific and technical human capital"**, **"Enhancing quality, productivity, and efficiency"** and **"Social related motives"**.

Generally, the case study confirms the findings of previous literature, in that research collaborations between the academic researchers is driven by economic or human-resource needs. However, the study also found that such driving forces are influenced by factors such as the academic disciplines, academic ranking, and collaboration experience of the academic participants. As the academic participants become more experienced in joint research activities, the motives behind new involvement become more focused. Junior researchers' motivation to collaborate is primarily for gaining access to funding, creating social networks, improving productivity and efficiency, and gaining access to experts and knowledge; while FP researchers' motivations are to tackle regional research problems, mentor junior researchers and colleagues, and to improve the quality of the research. Finally, AP researchers' motivations lie between the two academic rankings. Their main motives are to gain access to funding and improve both their productivity and the quality of their research.

In terms of academic disciplines, AS researchers collaborated mainly in order to access funding and research facilities, solve regional research problems, and improve the quality of their research, while the HSS discipline researchers also gave similar reasons for involvement. Finally, although the BS disciplines were underrepresented in this study, the reasons behind their involvement in the funding scheme were to get funded and create social networking within their respective disciplines.

To conclude, although it is clearly understood that individual researchers are the primary driving force behind collaboration, at a higher level decisions makers also present certain institutional motives behind introducing the funding scheme too, such as the existence of a strong political relationship between the countries, improvement of the institutional research quality and productivity, reducing the risks involved in research, and creating scientific networks and sharing research facilities. Initiating the funding scheme has opened the door for researchers to collaborate and get connected with both regional and international academic networks.

5.6 The Outcomes and the Impacts

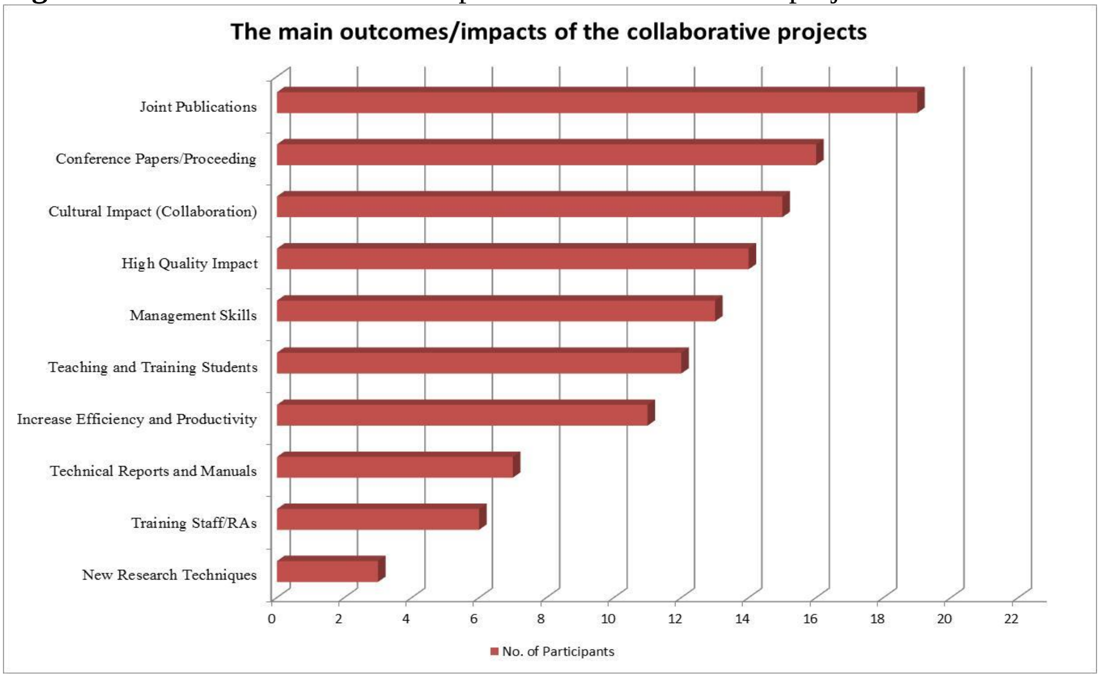
While the previous sections addressed the findings regarding the motives behind academic participants' involvement in collaborative research activities funded by the SQU-UAEU funding scheme and summarised the main institutional motives, the subsequent sections will look at the outcomes and the impacts of the funding scheme as perceived by the academic researchers. It is worth noting that the joint research activities between the two institutions were “knowledge-focused research” and not “property-focused research”. Most of the research projects funded by the scheme produce intangible outcomes and contribute to scientific knowledge and produce technical and scientific publications rather than tangible outcomes, such as patents or developed products. Thus far, there is only one project with an opportunity to have a patent registered in which, so far, no final decision has been made by the IP registry office in the GCC.

The academic participants were asked whether they have achieved their planned objectives and what the outcomes of their joint research activities were. In addition, the academic participants were asked about the impacts of the collaborative research activity outcomes on the surrounding research activities in their fields. Similar to the academic motives, the different outcomes and impacts can be grouped into three different categories, based on the relationship between them.

For triangulation purposes, the researcher collected the progress reports and final reports of the joint research projects funded by the scheme from the research offices of both institutions, as well as the website of the SQU-UAEU Joint Committee. In addition, cross-checking has taken place through searching electronic databases such as SCOPUS for the outcomes of the joint published research for validity. The citations of these publications were also collected to validate the qualitative impact as per the academic participants’ indications.

Many of the academic participants mixed up between the motives and outcomes as are often interrelated. The planned outcomes of the research to some extent also motivates the researchers to collaborate. Generally, the academic participants indicated that the outcomes of their participation in the collaborative research scheme between SQU and UAEU ranked from the most productive objective outcomes such as new knowledge production in the form of joint publications and conference papers, to learning outcomes such as new research techniques, training staff/RA, and teaching or training graduate students. In addition, some of them addressed the qualitative impacts of their collaborative research output either in terms of high numbers of citations or the impact factor of the journals where they published their research outputs. The figure 5-2 below summarises and ranks the ten different types of outcomes/impacts of the collaborative research activities funded by the SQU-UAEU funding scheme.

Figure 5-2: The main outcomes/impacts of the collaborative projects



Source: Author's construct, 2017

The results, as shown in Figure 5.2, indicate that 19 out of 23 academic participants ranked *'Joint publications'* as the first main outcome of the collaborative research activities funded by the SQU-UAEU funding scheme. Joint publications mainly include journal articles as well as chapters, books, and dissertations. This finding was expected as the main productive output of any academic research activity is the publishing of articles in peer-reviewed journals as academic career ranking mainly depends on published research as well as other criteria such as teaching and community services. Secondly, *'conference papers'* or *'conference proceeding'* is ranked as the second outcome of collaboration and was addressed by 16 academic interviewees. This outcome is no less important than the first; however, generally researchers initially publish their preliminary findings in the form of a conference presentation or proceeding before formulating it fully in an article or paper. Attending an international conference is a way of getting positive feedback from colleagues, as well as to expand a network and make your research more visible.

The third main outcome/impact of the funding scheme as pointed out by the academic participants (15 out of 23) was *“Culture impacts (Collaboration)”*. They mentioned that such funding schemes helped to increase the institution’s cultural awareness of the importance of collaboration in research. Next, the academic researchers pointed out to the impact of the funding scheme on the *‘quality of research’* produced. Out of the 23 academic participants, 14 highlighted that they were able to produce a good quality research and published them in high impact journals. Such finding validated by cross-checking the collected data from SCOPUS database and confirmed what they have argued. After that, 13 out of 23 academic participants highlighted the *‘Collaboration management skills’* learned as an output of their collaborative projects. The academic researchers learn many administrative skills, such as how to manage the research project, project accounting skills, and human management skills

The sixth outcome from the projects funded by the scheme as addressed by 12 out of 23 academic participants is the *‘teaching and training’* provided for students. They emphasised the impact of the joint projects on the research related skills learned by the students, mainly at graduate level. The impacts of the joint research activities between the two universities on academics researchers *‘efficiency and productivity’* also ranked seventh in the main output/impact as pointed out by 11 academic participants. Researchers argues that such joint research activities produce more knowledge in terms of published papers and even some of them claimed that such publications are cited highly by others.

The academic participants addressed the issue of providing a *‘technical report’* or *‘manual’* to the main stakeholders as the eight outcome from their joint activities. This outcome was addressed by 7 participants, mainly by those researchers aiming to solve critical regional problems that directly impact society. They have to disseminate a reports or manual to the main stakeholders, such as governmental bodies and other stakeholders. Finally others *‘learning outcomes’* were mentioned by some academic participants such as *‘training staff/RA’* and *‘new research techniques’* (highlighted by 6 and 3 out of 23 academic participants respectively).

5.7 Categories of Outcomes/Impacts of the Funding Scheme

As mentioned in the literature review chapter, Sargent and Waters (2004) classified success in research collaboration into three categories. The ten different outcomes and impacts from the funding scheme are categorised into these three main categories as follows:-

1- Objective outcomes, which include joint publications, conference papers, technical reports and manuals.
2- Subjective outcomes, which include increased efficiency and productivity, qualitative impact and management skills.
3- Learning outcomes, which include new research techniques, training staff/RA and teaching, training graduate students and institutional cultural impact.

The table 5.7 shows the ranking of the academic participants' main outcomes/impacts (Category wise) of collaborating in SQU-UAEU funding scheme.

Table 5-7: The categories for Outcomes/Impacts of collaborative projects

Categories	No. of Statements	Rank
Objective outcomes	42	1
Subjective outcomes	38	2
Learning outcomes	36	3
Total	**116**	

Source: Author's construct, 2017

The academic participants pointed out that the key outcomes from their participation in this funding scheme were publishing a number of joint articles and presenting their findings in international conferences. They ranked such *'objective outcomes'* as the main ones with about 36% (42 out of 116) of total statements. Secondly, the *'subjective outcomes',* such as the impact of the joint research activity on their research productivity and efficiency, quality and collaborative management skills learned, were ranked the second set of main outcomes with about 33% (38 out of 116) of the total statements. The funding scheme helps them enhance their research productivity and enables them to produce good quality articles and learn some collaboration management skills. Finally, *'learning outcomes'* are considered as the third main category with about 31% (36 out of 116) of the total statements related to the outcomes/impacts of the funding scheme. This category includes learning new research techniques, training staff/RA and teaching and training students.

The next three sub-sections will present the distribution of the different categories of outcomes/impacts and quotes from the interviews transcripts.

5.7.1 Category One: Objective Outcomes

The first category of outcomes/impacts of collaborative projects funded by the scheme includes three different outcomes. They are *"Joint publications", "Conference papers/proceedings"* and *"Technical reports and manuals"*. It is worth saying that these outcomes are the key quantitative indicators for successful collaborative research. Such outcomes mentioned by the academic participants in 42 statements.

Table 5-8: Distribution of outcomes in the category 'Objective Outcomes'

Category (1): Objective outcomes	**Nature of science**			**Academic ranking**			**Collaboration experience**			**Total**
	AS (17)	BS (2)	HSS (4)	FP (8)	AP (5)	LC (10)	<3 (10)	3-6 (10)	6-9 (3)	
Joint publications	15	1	3	7	5	7	6	10	3	**19**
Conference papers/Proceedings	12	1	3	7	4	5	4	9	3	**16**
Technical reports and manuals	4	0	3	1	3	3	2	5	0	**7**
Total	**31**	**2**	**9**	**15**	**12**	**15**	**12**	**24**	**6**	**42**

Source: Author's construct, 2017

5.7.1.1 Outcome One: Joint Publications

The main reason for conducting research in an academic context is to expand the knowledge by publishing the output in referred journals or books. Researchers consider publishing papers in good journals as an indicator of successful collaboration.

> *"We were able to publish two articles through this project. This is always an objective to be achieved in academic research". (PI, 9)*

> *"We published from the project… as you can see from the final report in good journals…" (PI, 13)*

> *"Her dissertation was an output from this research". (PI, 12)*

Joint publications highlighted by 19 out of 23 academic participants and ranked as the first outcome from the joint funded projects and considered as the main one for all academics across all classification groups. This finding is consistent with previous studies that consider co-authored papers as the most quantifiable output from joint research activities (e.g. Jin and Rousseau, 2005; Wagner and Leydesdorff, 2005a; Wang et al., 2005; Leydesdorff and Wagner, 2008; He, 2009; Jeong et al., 2013).

5.7.1.2 Outcomes Two: Conference Papers/Proceeding

Publishing the findings or the preliminary results of the collaborative research projects in a conference is the second main outcome mentioned by the academic participants. This includes presenting the research outcomes in the conference or as a proceeding in conference proceeding.

> *"Generally, we published some papers in good journals and also presented the findings in both regional and international conferences". (PI, 12)*

> *"In addition to the published articles, we attended conference and presented our results". (PI, 5)*

Diffusing the findings in a conference mentioned by 16 out of 23 academic participants and ranked as the second outcome both in this category and in general. Similar to the joint publications, this outcome was highlighted by academic participants from all groups. As a separate output, presenting a paper in a conference was overlooked by previous studies as a separate outcome from research collaboration. This outcome is considered by researchers as a part of co-authorship outputs.

5.7.1.3 Outcome Three: Technical Reports and Manuals

Some of the collaborative funded projects funded by the scheme were tackling some problems related to both countries and in some cases, stakeholders asked them to submit a technical/final report to be used to improve their services or possibly implementing their findings. In addition, others stated that funding institutions require them to submit technical reports and consider such reports as an important outcome from their collaborative research activity.

> *"We also sent the final report to [name of the ministry] to help them to improve the services provided by [name of the organisations]…The report includes some recommended policies which will help them to improve services". (PI, 14)*

> *"The final report submitted to both universities is also considered an output".(PI, 6)*

Producing technical reports and manual are considered as outputs from the funded projects by 7 academic participants and ranked as the third in this category and the eighth in general. This outcome is highlighted by those who were tackling regional research problem from AS and HSS disciplines. Similar to the previous finding, a few scholars consider both technical reports and manuals produced from collaborative research as one of the main outcomes of joint research activities.

5.7.2 Category Two: Subjective Outcomes

This second category of the outcomes/impacts of the collaborative projects funded by the scheme is "subjective outcomes" which includes three different outcomes.

They are *"High quality impact", "Management skills", and "Increase efficiency and productivity"*.

Table 5-9: Distribution of outcomes in the category 'Subjective outcomes'

Category (2): Subjective outcomes	**Nature of science**			**Academic ranking**			**Collaboration experience**			**Total**
	AS (17)	BS (2)	HSS (4)	FP (8)	AP (5)	LC (10)	<3 (10)	3-6 (10)	6-9 (3)	
High quality impact	11	1	2	8	4	2	3	9	2	**14**
Collaboration management skills	8	2	3	4	3	6	8	4	1	**13**
Increase efficiency and productivity	10	0	1	3	2	6	3	6	2	**11**
Total	**29**	**3**	**6**	**15**	**9**	**14**	**14**	**19**	**5**	**38**

Source: Author's construct, 2017

5.7.2.1 Outcome Four: High Quality Impact

The first important outcome/impact in the second category "Subjective outcomes" is the quality of the knowledge produced by the collaborators from funded projects. Many academic participants and mainly FP researchers stated that by sharing different experiences and opinions, the quality of the knowledge produced as an output of the SQU-UAEU funding scheme was better, compared to their individual researcher publications.

> *"We published seven papers in very good journals…I would say the two main papers are heavily cited. And we kept publishing together". (PI, 3)*

> *"One important thing we published many papers in good international journals". (PI, 15)*

In general, clash of opinions, a cross-fertilisation of thoughts that may in turn generate new insights or perspectives that individuals working on their own would not have grasped.

> *"…published good quality papers because we combined good researchers, we produced good research". (PI, 6)*

> *"This is obvious when researching together…better results...from the citations you can identify which is better". (PI, 17)*

This impact ranked as the first subjective outcome and fourth in overall. 14 academic participants out of 23 addressed this outcome and mainly FP researchers (All of them) as well as most APs. Such remarkable findings may indicate that senior researchers are in favour of producing a better quality of research compare to junior researchers who care more about enhancing their productivity in order to produce more researcher papers during specific time period. The impact of collaborative research activities have been extensively highlighted by many scholars, such as Rigby and Edler (2005), Pečlin et al. (2012) and Lancho-Barrantes et al. (2013).

5.7.2.2 Outcome Five: Management Skills

Some academic participants highlighted the difficulties of managing the joint research activities, especially when it included more than one institution or country.

> *"…We faced many administrative problems because of two separate institutions involved…we managed to finish it and achieve the objectives". (PI, 22)*

> *"It was not an easy project…Two groups of researchers…Two different institutions involved from two countries… a lot of management skills needed especially when there is no electronic system". (PI, 11)*

However, working in a group of researchers as a PI or even as an investigator is a good experience. Some academic participants stated that being the PI in a collaborative research project is a good opportunity for learning different skills like managing projects, funds and people. Such skills help them build their managerial knowledge and learn the different procedures that apply to research institutions.

> *"At least now I am able to take a similar project with less administrative difficulties…I learned how to manage such type of project". (PI, 2)*

"One of the most important outputs is the practical experience learned from the project. As stated earlier, I faced difficulties in the first year and mainly in managing and administrating the project, but after that I got used to the different procedures". (PI, 14)

"…Managing similar project was difficult at first compared to the second one, which was easier. We learned from our previous experiences…" (PI, 5)

The management skills learned by the participants through collaboration were noted by 13 out of 23 researchers and considered as the second main impact in the category and the fifth in general. The findings showed that this impacted junior researchers with less collaboration experience (less than 3 years) more, in that their participation in joint projects helped them to gain some managerial and administrative experience. The more experienced researchers in collaborative project had already developed managerial skills. The research related management skills as an outcome from joint research activities has been addressed by a number of scholars such as Cummings and Kiesler (2003) and Sonnenwald (2007).

5.7.2.3 Outcome Six: Increase Efficiency and Productivity

As stated earlier that one of the main reasons for academic researchers in doing research is to produce knowledge. Researchers are motivated to collaborate in order to produce a good amount of research with less time and allocated resources. The academic participants claimed that working together in joint research projects helps them improve their research productivity and become more efficient.

"If you look at the final report, you can see that the project is successful and mainly in regards of knowledge production. I would say that working alone without my collaborator will not lead even to 50% of what we achieved… very productive project". (PI, 5)

"…Basically, I spent less time and produced more research". (PI, 4)

"…For me it was a very productive project. We have four papers published, mainly from the work done in [name of the university]". (PI, 10)

The positive impact of the funding scheme on the researchers' productivity and efficiency was noted by 11 out of 23 academic participants and was highlighted by academics from AS and HSS disciplines in their early academic career. This finding is in line with those of many scholars (e.g. Frenken et al., 2005; Gulbrandsen and Smeby, 2005; Lee and Bozeman, 2005; Van Looy et al., 2006; Breschi et al., 2007; He et al., 2009; Azoulay et al., 2009).

5.7.3 Category Three: learning Outcomes

The third category of the outcomes/impacts of the collaborative projects funded by the scheme includes four different learning outcomes. They are *"Cultural impacts", "Teaching and training students", "Training staff/RA"* and *"New research techniques"*.

Table 5-10: Distribution of outcomes in the category 'Learning Outcomes'

Category (3): Learning outcomes	**Nature of science**			**Academic ranking**			**Collaboration experience**			**Total**
	AS (17)	BS (2)	HSS (4)	FP (8)	AP (5)	LC (10)	<3 (10)	3-6 (10)	6-9 (3)	
Cultural impacts (Collaboration)	11	1	3	6	3	6	6	7	2	**15**
Teaching and training students	10	0	2	5	2	5	3	7	2	**12**
Training staff/RA	5	1	0	1	2	3	2	2	2	**6**
New research techniques	3	0	0	0	1	2	1	2	0	**3**
Total	**29**	**2**	**5**	**12**	**8**	**16**	**12**	**18**	**6**	**36**

Source: Author's construct, 2017

5.7.3.1 Outcome Seven: Cultural Impact (Collaboration)

Ranking the impact of the funding scheme on the organisational culture in terms of promoting collaboration as one of the main impact was unexpected. Initiating a funded scheme helps academic researchers at both universities to create a link between them and enlighten them about the importance of joint research activities. The participating researchers witnessed a growth in number of joint research activities between researchers at both universities.

> *"I think many of the team members as well others in both universities got aware about the importance of doing joint research. My colleagues in the previous project worked with some researchers from SQU in research activities". (PI, 6)*

> *"At least it was an experience and a link created…and my colleagues in the college started doing joint research with them, such as [name of the academic researcher]". (PI, 2)*

One participant stated that the funding scheme not only linked them regionally with the collaborating institution, but they also started collaborating with others at an international level.

> *"We just finished another project together last year. After we finished the SQU - UAEU project and then started a new one with colleagues from the UK". (PI, 20)*

15 out of 23 academic participants ranked the impact of the funding scheme on the institutional research culture and collaboration as the first in this category and the third overall. Academics from all disciplines and academic ranking noted this impact. The previous literature overlooked the impact of research collaboration activities on the institutional research culture and how implemented collaboration policies such as this formal funding imitative improves the collaboration culture in academia.

5.7.3.2 Outcome Eight: Teaching and Training Students

The findings of this study show that some academic participants stated that their students benefited from their involvement in collaborative research activities. They received training and learned research related skills by carrying out tasks assigned to them. Tasks include collecting data from the fields, analysing samples, participating in fieldwork and administrative tasks.

> *"Also it was a good opportunity to send my student to analyse the collected samples… He learned from this project some research skills". (PI, 20)*

> *"My student trained with them and they will send their staff next semester". (PI, 1)*

> *"The project involves some undergraduate students and they collected most of the data. They learned some research related skills and got trained". (PI, 6)*

Moreover, some researchers believe that their graduate students have benefited from collaborative project because they implemented methods learned from the joint project. One of them highlighted that such learning has a positive impact on their masters' dissertation.

> *"My student finished his degree from the project where he learned a lot during his involvement with us… his research quality was excellent". (PI, 17)*

The impact of the funding scheme on developing the students' research skills was noted by 12 out of 23 participants and ranked as second in the "learning outcomes" category and sixth overall. This impact was emphasised by academic researchers from both AS and HSS disciplines, from all academic ranking. The inclusion of students from all degree levels in academic research activities is considered as an important strategy to enhance their research skills and build their knowledge to enable them to carry out their own future research, especially for those interested in a career in academia or research. Previous scholars have pointed out the positive impacts of collaboration on student research, learning and knowledge. They have highlighted the importance of involving graduate level students in research activities and collaboration in order to teach and train them in research skills (Beaver, 2001; Maglaughlin and Sonnenwald, 2005; Cummings and Kiesler, 2007).

5.7.3.3 Outcome Nine: Training Staff/RAs

It is worth noting that it is costly to train both academic and technical staff for training programs such as how to use specialised scientific equipment or new research techniques and methods. Some researchers claim that this funding scheme provides them the opportunities to access training programmes either for themselves or for their RAs and technical staff.

> *"Also the projects involved some training programmes which were new to us. We had learnt how to use a specific analytical technique in one of the instruments". (PI, 23)*

In some cases where an institution lacked scientific equipment, the researchers decided to send their RAs or technical staff to analyse samples at the collaborating institution. In this way the staff are trained on how to use the equipment and build on their knowledge.

> *"As I mentioned before, probably one of the advantages from this project is the free training for technical staff in using equipment... You know, training them outside will cost a lot". (PI, 9)*

The training gained from the collaborative research activities was addressed by 6 out of 23 academic participants, mainly from AS disciplines. The impact was ranked as the third in this category and ninth overall. In addition to training students, some scholars such as Beaver (2001), Maglaughlin and Sonnenwald (2005) and Klein (2008) consider the free training provided for technical support staff, RAs and the participating researchers as an important outcome of joint research activities.

5.7.3.4 Outcome Ten: New Research Techniques

It is quite common that researchers use more than one technique, especially when they are from different disciplines. Inter-disciplinary research has become a norm and many research problems across the world have been resolved by using new techniques as a result of multidisciplinary projects.

> *"Another important thing is the new knowledge we gained. We applied new techniques to address the study and we were able to produce some good results...". (PI, 12)*

> *"...Learned new methods or techniques and this is considered a positive advantage of the joint project". (PI, 23)*

This outcome was addressed by 3 out of 23 academic participants and mainly LCs and APs from the AS disciplines and is considered as the last outcomes/impacts in this category and in general. Similarly, some previous studies have addressed the new techniques learned as an output of collaboration (Wagner et al., 2001; Cummings and Kiesler, 2003; Sonnenwald, 2007).

5.8 Summary of the Outcomes

The previous two sections addressed the outcomes / impacts of the collaborative research projects funded by the SQU-UAEU funding scheme. The findings from the interviews extracted ten main outcomes/impacts which were grouped into three main categories. The first category was **"objective outcomes",** which included joint publications, conference papers, technical reports and manuals. The second category was **"Subjective outcomes",** which included increased efficiency, enhanced quality and management skills. Finally, the third category was **"Learning outcomes",** which included new research techniques, training staff/RA and teaching and training students.

Research collaboration between universities is practicable and sustainable only if the objectives of collaboration are satisfactory to both sides. Almost all the academic participants claimed that they have achieved most of what was planned initially in the submitted proposal for funding, except in two cases, where one of the PIs highlighted some difficulties faced relating to the hidden agenda of his counterparty, while another PI faced difficulties with external stakeholders approval and supports. Furthermore, many of the participants addressed the issue of delays in achieving their objectives and requested time extensions in order to achieve their planned outcomes. The delays were mainly due to organisational, stakeholder and national related factors and challenges which will be looked at in the next chapter.

5.9 Chapter Summary and Conclusion

This chapter aimed to analyse the findings with regards to addressing the second objective of this study by answering the second and third research questions. The findings showed that both institutional and academic researchers' motives do not differ from those found in the literature; however, DMs mainly look at collaboration from a macro level perspective, while researchers look at it from both micro level and key personal interests perspectives. On the one hand, the DMs highlighted the different institutional level motives behind initiating this funding scheme between the two universities which can be summarised as historical and cultural ties, improving institutional and national research productivity and quality, reducing risk, tackling regional research problems, creating strong academic networks, and sharing resources and facilities. Previous studies have addressed these motives as institutional, national and regional factors behind development of policies and strategies to enhance research collaboration (e.g. Arunachalam and Doss, 2000; McGinley and Chamie, 2003; Almendral et al., 2007; Sonnenwald, 2007; Boekholt et al., 2009; Jeong et al., 2013).

One the other hand, and in regard to academic researchers' motives, an analysis of the findings of the interviews uncovered fourteen motives behind their participation, which can be grouped into four main categories. Generally, the case study confirms the findings of previous literature, in that research collaborations between the academic researchers is driven by economic or human-resource needs. Examples of the these motives are getting access to funding (e.g. Potì and Reale, 2007; Heinze and Kuhlmann, 2008), enhance academics' research productivity and efficiency (e.g. Lee and Bozeman, 2005; Sooryamoorthy and Shrum, 2007), improve research quality (e.g. Sargent and Waters, 2004; Onyancha and Maluleka (2011) and getting access to experts and knowledge (e.g. Bozeman and Corley, 2004; Sonnenwald, 2007).

Moreover, the findings from the interviews extracted ten main outcomes/impacts of the joint funded scheme which were grouped into three main categories. The main outcome from the joint research activities funded by the scheme is the joint publications either in terms of peer reviewed papers, conference presentation and technical reports. This finding is consistent with previous studies that consider co-authored papers as the most quantifiable output from joint research activities (e.g. Jin and Rousseau, 2005; Wagner and Leydesdorff, 2005a; Wang et al., 2005; Leydesdorff and Wagner, 2008; He, 2009; Jeong et al., 2013). In addition, the positive impact of collaborative research activities on research quality and productivity have also been extensively highlighted by many scholars, such as Rigby and Edler (2005), Pečlin et al. (2012) and Lancho-Barrantes et al. (2013). Other outcomes/impacts highlighted by the academic participants are the management skills learned, positive impacts on institutional research culture, training and new research techniques.

The next chapter presents the findings of the factors/challenges affecting the success of collaborative research activities between the two PFUs. In addition, the chapter presents the perceptions of the participants about the potentials for research collaboration between the countries in the region.

CHAPTER SIX

6. FINDINGS: DYNAMICS AND CHALLENGES OF RESEARCH COLLABORATION BETWEEN PFUs IN GCC

6.1 Introduction

The previous chapter answered the second and third research questions of this study by presenting the findings of academic researchers, institutional motives to collaborate, and the outcomes/impacts of collaborative research activities between the two universities. This chapter will answer the fourth and fifth research questions which are:

- What are the factors affecting collaborative research activities between SQU and UAEU?
- What are the potentials of research collaboration between PFUs in GCC countries?

The chapter will present the findings of the academic participants' experience of the factors that influence the effectiveness of the joint research activities between the two institutions. Based on the themes of the factors that emerged from the literature review, the participants were asked questions about the process of their joint research projects and what obstacles or difficulties they faced during the different stages of a joint research project. Additionally, questions about the availability of institutional, national, and external stakeholder support (if any) were asked.

The findings of the previous chapter showed that the academic participants are well motivated to collaborate and most of them were able to achieved their planned objectives; however, similar to any international joint work activities such as joint ventures in the business sector, the success of joint research activities is influenced by a variety of factors, either related to the participants' interpersonal process or to external environmental (contextual) factors such as the institutional, national, and external stakeholder support. It is worth mentioning that collaboration between two institutions with the same organisational context (e.g. university-university collaboration) or other research institutions is much easier and faces less obstacles than collaboration between two different entities (e.g. academic-industry), because to some extent in the former situation both institutions share a similar mission, vision, objectives, culture, and structure, while in the latter collaboration there are differences in missions, objectives, and culture, which are considered as major barrier in collaboration. Sargent and Waters (2004:317) state, *"Our evidence suggests that in understating the collaborative process one must account for the context in which the collaboration occurs…".* Although some of the identified factors are not seen as major issues by some of the participating researchers because they were able to handle and resolved them naturally during their joint research project, it is very important to address them in this research in order to improve the success of research collaboration activities in the region.

Following a similar structure to the previous chapter, this chapter will highlight the different factors by grouping them into four categories and present the distribution analysis of each category as well as sub-categories.

6.2 Factors Influencing Research Collaboration

The analysis of the data confirms some factors previously identified in different types of research collaboration. However, some new factors have emerged from this study which relate to the contexts under investigation. The researcher extracted twenty major factors affecting the joint research activities between the two institutions (table 6.1).

Table 6-1: The main factors (challenges) as mentioned by the academic participants

Factors	Category	No. of Statements	Rank
Administrative problems	IPS	20	1
Purchasing problems	IPS	18	2
Graduate programmes and RA	NPS	17	3
Logistics support	ESS	16	4
National research culture	NPS	15	5
Data collection support	ESS	15	6
Mutual interests	PC	14	7
Funding problems	IPS	14	8
Institutional flexibility	IPS	14	9
Research infrastructure	IPS	14	10
Incentives	IPS	14	11
Trust and no hidden agenda	PC	12	12
Access to national data and sites	NPS	12	13
Personal time allocation and commitments	PC	10	14
Collaborative research policy and priorities	IPS	9	15
Institutional research culture	IPS	9	16
Flexibility and adaptability	PC	8	17
National collaborative research policies	NPS	8	18
Output implementation support	ESS	8	19
Communication skills	PC	6	20

Source: Author's construct, 2017; **PC:** Refers to factors related to Personal Characteristics, **IPS:** Refers to factors related to Institutional Policies and Support, **ESS:** Refers to factors related to External Stakeholders Support and **NPS:** Refers to factors related to National Policies and Support

Firstly, both institutional "administrative and purchasing problems" are the main challenges as pointed out by 87% and 78% of the academic participants respectively. The academic participants claimed that it takes a lot of pre- and post-approval processing time from the joint research activities funded by the scheme.

Secondly, 74% of academics participating in this study highlighted the weakness of postgraduate programmes across the region. They believe that such programmes, mainly at the PhD level, help to promote collaboration and strengthen the regional academic network. Thirdly, 70% of the researchers face some difficulties related to external stakeholders' logistics support, such as governmental bodies that control the importing and exporting of needed facilities and materials for the research. Both the lack of national research culture and data collection support from external stakeholders are considered as two more major challenges, faced by 65% of the academic participants. They face difficulties in collecting the required data for their research activities, due to the lack of research culture in the region.

After that, 61% of the academic participants addressed the issues of personal mutual interests, institutional funding problems, institutional flexibility, lack of research infrastructure, and lack of incentives as the next few obstacles. For example, they stated that although the budget allocation for research in general in both institutions improved during the last decade, issues related to budgeting and financing, such as cutting the proposed budget, delaying the releasing of the approved budget and the movement of the budget between budgeted years and items, all of which having a very negative effect on the progress of joint research activities.

The academic participants also mentioned the issue of the lack of financial incentives as one of the factors affecting the collaboration between the academics from both institutions. They claimed that joint research activities require more time and effort, especially at the international level where more coordination and communication is required. Some of the academic participants, mainly from AS disciplines, prefer to collaborate with the private sector by signing a contract for research. They highlight the financial incentives received when they collaborate with industry, compared to academic research collaboration.

Other challenges highlighted by the academic participants are either related to collaborators such as trust, flexibility, time allocation, and communication skills, or related to the institutions, such as collaboration priorities and institutional culture, or related to national policies, such as getting access to national data. The next two sections will categorise and present these challenges in details.

6.3 Categories of Factors from Academic Respondents

This section will present the four different categories of factors influencing research collaboration activities between the two institutions. They are grouped by their relationships:

- Factors related to Personal Characteristics which include: mutual interests, trust, personal flexibility, communications skills, and time allocation and commitments
- Factors related to Institutional Policies and Support which include: collaboration policies, budget related issues, purchasing related issues, research administration related issues, infrastructure related issues, institutional culture, and collaborative research incentives
- Factors related to External Stakeholders Support which include: data collection support, logistics support, and output implementation support
- Factors related to National (governmental) Policies and Support which include: national collaborative research policies, national research culture, access for national data, and developing graduate programmes and RAs

The table below summarise these main categories by presenting the number of extracted statements mentioned by the academic participants in each of them.

Table 6-2: The categories of the factors affecting collaboration between academic researchers from both universities

Categories	No. of Statements	Rank
Personal Characteristics	50	3
Institutional Policies and Support	112	1
External Stakeholders Support	39	4
National Policies and Support	52	2
Total	**253**	

Source: Author’s construct, 2017

The category of factors related to **‘Institutional policies and support’** is ranked as the first main category of the factors (112 out of 253 statements) affecting collaborative research projects funded by the SQU-UAEU funding scheme. These factors mainly relate to the bureaucracy in both administrative and financial procedures as well as the limitations in financial support and incentives provided for researchers, which need to be tackled by the DMs in both institutions. The second category ranked by the academic participants is the factors related to **“National policies and support”**, mentioned in 52 out of 253 statements. These factors include the limitations in national research policies and culture as well as some logistics support, such as to gaining access to national data and sites.

Next, some collaborators’ **“Personal characteristics”** which affect the joint research activities may influence the progress of the research project negatively. This category ranked third, with 50 out of 253 statements. Examples of these barriers are lack of mutual interest, trust, communication, no hidden agenda, clear roles, and ability to compromise. Finally, factors related to **“External stakeholders support”** are considered as the last category of factors (39 out of 253 statements) which influence joint research activities between the two institutions. Most research activities require support from external bodies where the data collection and research outcomes may be implemented or will have an impact. Examples of this support include getting access to clinical data from hospitals, students and staff from schools and universities, governmental and private sites controlled by different bodies, and other non-published data from the different local and international organisations. The next four sub-sections present the distribution of the different categories of factors affecting collaboration between academic researchers, as well as quotes from the interviews transcripts.

6.3.1 Category One: Factors Related to Personal Characteristics

The analysis of the interviews showed some key factors related to the team member characteristics and behaviour, which may affect joint research activities. In general, the success of joint research activities is mainly attributed to the harmony of the group members and how each one of them perceived the joint project; however, it is important to develop strategies and a friendly environment to encourage them to collaborate. Generally, these factors are very important in the initial stage of the collaboration process. The analysis of the interviews identified fifty statements classified into five main factors related to **“Personal characteristics”** which impacts the process and the success of joint research projects. Table 6.3 below summarises these different personal related.

Table 6-3: Distribution of factors (challenges) in the category ‘Personal Characteristics’

Category (1: Personal characteristics	**Nature of science**			**Academic ranking**			**Collaboration experience**			**Total**
	AS (17)	BS (2)	HSS (4)	FP (8)	AP (5)	LC (10)	<3 (10)	3-6 (10)	6-9 (3)	
Mutual interests	9	2	3	4	4	6	6	6	2	**14**
Trust and no hidden agenda	9	0	3	3	2	7	5	6	1	**12**
Flexibility and adaptability	6	0	2	1	1	6	4	3	1	**8**
Personal time allocation and commitments	8	1	1	3	3	4	3	5	2	**10**
Communication skills	4	0	2	2	1	3	3	2	1	**6**
Total	**36**	**3**	**11**	**13**	**11**	**26**	**21**	**22**	**7**	**50**

Source: Author’s construct, 2017

6.3.1.1 Factor One: Mutual Interests

The participants highlight the importance of having mutual interests between the collaborators. Each member of the collaborative group expects to gain from their participation and unless there is a common shared interests, working together will not be fruitful, and many problems will arise from the initial stage of the collaboration.

> *"The common interest is very important. We will not do the project unless we shared the same interest…." (PI, 9)*

> *"I think having a common interests between the two academics or groups and population is very important … We have common interests since he was here." (PI, 10)*

Researchers can find collaborators with similar research interests through different means. For example, past successful experience or the opportunities of working together previously help a lot in the progress of any future work. One academic participant attributes the success of their joint project to the fact that they had worked together before and such experience helped to share their research interests:

> *"I knew him before… he was working with us in the department for a few years. We have published together…" (PI, 10)*

If there is no chance to work together and know each other, researchers can discuss their research interests informally while attending international/regional conferences, seminars, and sabbatical leaves, or by email and other communication means.

> *"I met him in a regional conference in Dubai and discussed our research interests…We agreed to start working together." (PI, 22)*

> *"I can say the start point was when I did my sabbatical in their department." (PI, 8)*

Some of the academic participants of the successful joint research projects funded by this scheme attributed it to having mutual interests between their collaborative groups.

> *"If both of us agreed on everything, sharing similar interests and our team is homogeneous, this leads us to achieve the objectives. This is exactly what happened." (PI, 14)*

The importance of having a personal 'mutual interest' between the collaborators was addressed by 14 out of 23 academic participants across all classification groups and ranked as first in the category of factors related to **"Personal characteristics"**. Having mutual research interests in collaborative research activities was highlighted by many researchers such as Maglaughlin and Sonnenwald (2005), Stokols et al. (2008b), and Bruneel et al. (2010).

6.3.1.2 Factor Two: Trust and No Hidden Agenda

As explained in the previous section that researchers will not work together unless they share similar research interests and such factors play an important role in the success of joint research activities. In addition to establishing a mutual research interest among collaborators, some of the academic participants highlight the importance of building trust between them. Researchers have to present positive and honest intentions in order to develop/build trust. Mutual trust is one of the most important factors that affects the performance of the collaborators and plays a vital role from the initial stage until the completion stage and results dissemination. By building interpersonal trust, collaborators will allocate their efforts and knowledge towards the joint project objectives.

> *"Very simple, we trusted each other and this is very important in joint research. We have objectives to be achieved and worked together toward achieving them." (PI, 6)*

Building trust could be achieved through different means, such as through establishing a personal relationship between the researchers or based on previous joint collaborations.

> *"We trust each other…We work together not only in this project but also in many other research and academic activities." (PI, 13)*

> *"He is very active and honest… I worked with him before in internal funded project when I was there." (PI, 17)*

If the previous relationship does not exist, some academic participants recommend that collaborators have face-to-face informal meetings at the beginning of the joint research in order to build trust. They have to present their intentions very honestly and openly.

"... For example, initial physical meetings are important to socialise the researchers and make them know each other. This is the best way to build trust between the participants." (PI, 12)

"The first meeting was in SQU and was three months after getting the approval. It was very important and informal. That meeting helped a lot to know and learn about each other and build the confidence to start the project." (PI, 20)

Although in some cases mutual interest is established, clear personal and characteristics information about a collaborator is not available, and this may lead to failure if the collaborator hides a personal agenda or interests.

"I agree that we are sharing similar research interests but it is not easy to understand the personal values and why they want to work with you… after you worked with them you will be able to understand." (PI, 2)

Generally, this factor was addressed by 12 out of 23 academic researchers and ranked second in the category of factors related to **"Personal characteristics"**. The finding of building trust between collaborators is an important factor in joint research activities, as is the importance of previous experience highlighted by some scholars in previous research on collaboration (e.g. Mattessich et al., 2001; Sargent and Waters, 2004; Boardman and Bozeman, 2006).

6.3.1.3 Factor Three: Personal Time Allocation and Commitments

Along with research related activities, the academic researchers have other teaching and administrative duties. Given the different commitments that academics have, it is very important to plan well and allocate enough time for research, especially in international joint research projects. Unlike regular internal research grants or intra-national joint research collaboration, international joint research activities require more time and effort because of geographical distances between the collaborators.

"Unless you have enough time, doing joint research is very difficult compared to other types of research project. I prefer to get internal grant instead of applying for joint grant… It is a headache." (PI, 9)

The team members of the joint research project should keep this in mind; otherwise, unaccomplished tasks by any participating researcher will affect the progress of the entire project. For example, and as highlighted by one academic participant who faced difficulty in finishing the project in time and in turn has to apply for an extension because of new research commitments of one of the key team members.

> *"We face difficulties in accomplishing the project on time because of two tasks. One team member was not able to finish them. He was busy with many things... always delaying... One year after he committed himself in this project, he got [name of the grant] funded by the university." (PI, 12)*

Moreover, in addition to more research related commitments, assigning new administrative roles or teaching loads can affect the research activities of the academic researchers.

> *"In my case, my collaborator has more time for research than me… No new administrative role assigned for him…." (PI, 10)*

This factor was addressed by 10 out of 23 academic participants and ranked third in the category of factors related to **"Personal characteristics"**. As stated earlier, research collaboration in general, and mainly at an international level, requires more time and effort, and both researchers and collaborative research institutions have to consider such activities before assigning new roles or commitments to team members. This finding is in line with what other researchers found in their research about collaboration such as Jeong et al. (2013) and Shin and Jung (2014).

6.3.1.4 Factor Four: Flexibility and Adaptability

How will the research progress when the outcomes are unpredicted and the researchers have to accept unexpected results? Sometimes collaborators have to change their methodological frameworks or the research objectives and plans. In addition, they need to understand that different views and conflicts between them are good in order to improve their knowledge and outcomes of the research. Some of the participating academic researchers addressed the issue of being flexible in any joint research activities as a major influencing factor.

> *"… Also he is very flexible. This is one of the main reasons behind the success of the research." (PI, 23)*

> *"… We agreed and decided to limit the number of regions from [country] because we found some difficulties in collecting data. Such flexibility is considered very important in collaboration." (PI, 11)*

It is very important for the collaborators in collaborative research activities to work closely in order to achieve what is planned or even, in some cases, to accept the changes if needed.

> *"We decided to modify some of our objectives as per our initial results and everyone agreed on the change. This helps to complete our project without delay." (PI, 14)*

If the collaborators are very rigid and do not accept changes, this either leads to difficulties in achieving what was planned or low quality of outputs.

> *"Flexibility of the team members is very important. I think if we were agreed in the first joint project to change the scope of the research, we will be able to achieve better results but we had different views." (PI, 5)*

Generally, as highlighted by one academic participant, collaborating members and institutions should remain open to the different ways of managing and achieving the planned objectives. Additionally, they should have the ability to sustain if any major changes happen, such as changing the goals, the team leader, and investigators of the collaborative project.

> *"He resigned [the PI]… I think they cancelled his contract… I could not locate who will be the PI from their side… I called him and he said he had left the project to the college and they will decide… everything collapsed…what is plan B?" (PI, 2)*

The flexibility and adaptability of the team members was addressed by 8 out of 23 academic participants and ranked fourth in the category of factors related to **"Personal characteristics"**. The importance of being flexible and accepting any modifications in joint research projects was presented by many research collaboration scholars, such as Mattessich et al. (2001), Sargent and Waters (2004), and Corley et al. (2006).

6.3.1.5 Factor Five: Communication Skills

Given the importance of well-established communication system between joint research activities, and mainly for distance-separated collaborators such as at inter-institutional and international levels, some of the interviewed academic participants addressed the importance of having good communication skills for all collaborators, especially the PIs of each joint research project. The PI has to update all researchers involved in the project about progress, obstacles, achievements, and changes in the research plan. Although face-to-face meetings are encouraged, new technology plays a vital role in fast and economical communication.

> *"Another important thing is good communication skills… Although it is important to have face-to-face meetings, but given the national border restrictions as well as limitation of budget to travel we use other means of communications such as emails… it is very important to communicate and update each other." (PI, 3)*

> *"As a project leader you have to communicate." (PI, 13)*

One academic participant pointed out to the impact of weak communications between collaborators and stated that their project was terminated because of many reasons, but one of them was weak communications between collaborators, especially the project leaders.

> *"The project terminated because the PI from [name of the institution] did not update us about the progress from their side… additionally, he resigned and did not inform us whether a new project leader has been assigned from their side or not." (PI, 2)*

In order to enhance the success of the collaborative project, collaborators and PIs have to set up a communication strategy at the beginning of the joint research project and nominate key responsible members for communication between the teams.

> *"I think having good experiences and skills in similar activities are important for success… for example, updating the team about the progress and any new outcomes is important. I am participating in one project funded by [name of funding body]. Every Friday I get updates through e-mail. I did the same for my joint project (SQU-UAEU) and this helps in resolving any problem and get feedback from the team members." (PI, 4)*

The factor 'communication skills' was addressed by 6 out of 23 academic participants and ranked as the last factor in the category of factors related to **"Personal characteristics"**. This is in line with the previous findings on the importance of communications and regular updates about the progress of the joint research projects between collaborators, especially PIs (e.g. Cummings and Kiesler, 2003; Jones et al., 2004; Sargent and Waters, 2004; Sonnenwald, 2007; Stokols et al., 2008b).

6.3.2 Category Two: Factors Related to Institutional Policies and Support

Collaborative research activities are not isolated from the surrounding institutional environment including the administration offices, academic departments, and colleges in which the researchers interact with them during their joint research projects. Firstly, although the participants noted that it is one of the main institutional objectives to collaborate in research regionally and internationally, academic participants emphasised the importance of developing clear institutional policies to enhancing joint research projects with other national and international institutions such as regional research institutions. Additionally, as public research institutions, the administrative and finance related issues such as releasing the budgets, reallocating the budget, spending processes such as travelling and purchasing equipment, and other administrative procedures are regulated by the governmental roles and regulations. The academic participants highlighted different challenges related to administering and financing their joint projects and they pointed out the importance of adapting and implementing very user friendly and flexible procedures in order to enhance research activities in general and joint research activities in specific. Such adaptation needs to be coordinated with external stakeholders such as regulatory bodies and public authorities. The findings of the analysis of the interviews identify one hundred and twelve statements classified into eight different factors related to **"Institutional policy and support"** which affect the joint research project process, summarised in Table 6.4.

Table 6-4: Distribution of factors (challenges) in the category 'Institutional policies and support'

Category (2): Institutional policies and support	Nature of science			Academic ranking			Collaboration experience			Total
	AS (17)	BS (2)	HSS (4)	FP (8)	AP (5)	LC (10)	<3 (10)	3-6 (10)	6-9 (3)	
Administrative problems	14	2	4	6	4	10	10	7	3	**20**
Purchasing problems	16	2	0	7	4	7	6	9	3	**18**
Institutional flexibility	10	1	3	5	2	7	7	5	2	**14**
Funding problems	9	1	4	2	5	7	7	5	2	**14**
Research infrastructure	12	1	1	5	3	6	4	8	2	**14**
Incentives	10	0	4	2	3	9	7	5	2	**14**
Institutional research culture	5	0	4	3	1	5	6	1	2	**9**
Collaborative research policy and priorities	7	0	2	4	1	4	3	5	1	**9**
Total	**83**	**7**	**22**	**34**	**23**	**55**	**50**	**45**	**17**	**112**

Source: Author's construct, 2017

6.3.2.1 Factor Six: Administrative Process Problems

Working in any research project requires a substantial amount of internal logistics support to carry out the administrative works related to the pre- and post-approval process. On one hand, the academic participants claimed that it takes months from the time of submitting the proposed joint research project to getting the funding decision. Such a long administrative time of approval process discourages researchers from doing joint research activities.

> *"The approval process is also lengthy… Its take about 10 months from submitting the proposal to getting the final approval." (PI, 5)*

> *"I feel that there are other problems related to administration… For example, in order to get funded, you have to wait a very long time from the date you submit till get approval." (PI, 11)*

Such delays in making funding decisions may force researchers to apply to different grants or sources of funding because they do not have any idea if they will be funded or not.

> *"We had to wait long time. I was expecting that I will not be funded… I already committed myself with my colleagues in another strategic project." (PI, 15)*

On the other hand, post-approval administrative process is another issue addressed by the academic participants. The administrative delays in processing the requests of collaborative research activities such as hiring RAs, field work visit approvals, and processing purchasing requests. Such lengthy processes had a negative impact on the progress of the projects.

> *"... I lost my RA. Mainly because it took me too long to process his contract… I think some internal administrative procedures need to be looked at." (PI, 1)*

The academic participants claim that such delays in processing the administrative requests related to research will have negative impacts on general research activities and collaborative research, such as a decrease in the number of applicants for funding from the joint research scheme, or reducing the amount of international collaboration.

> *"...I think this bureaucracy in the procedures will have a negative impact on research activities in the university... for example, researchers may hesitate to apply again for funding from this scheme or even working with other from outside the country." (PI, 1)*
>
> *"It needs improvements… Currently some academics prefer to collaborate locally or informally with other international colleagues… Avoiding the administrative procedures." (PI, 13)*

Some of the academic researchers claimed that one reason for all these administrative delays was due to the fact that universities follow public systems in terms of both purchasing and other administrative related procedures.

> *"One logical explanation for such delays is the university follows the same system which is followed by other public institutions such as ministries…" (PI, 5)*
>
> *"I think the main problem is that the university is bound by the governmental procedures and this should be looked at if they want people to do research."* (PI, 4)

The problems related to 'Administrative processes' were addressed by 20 out of 23 academic participants and ranked as the main factor affecting joint research activities under the category of factors related to **"Institutional policies and support".** The importance of institutions being user-friendly as well as flexible administrative systems are highlighted in the literature by researchers such as Heinze and Kuhlmann (2008), Sargent and Waters (2004) , and Knobel et al. (2013). In this study, many of the academic participants address this factor together with the next one, which is related to 'purchasing problems'.

6.3.2.2 Factor Seven: Purchasing Problems

Unlike most of the administrative process challenges, which can be tackled and sorted out internally at the institutional level by top management and administrative staff, purchasing equipment and many other research related materials is considered by researchers as a *"very frustrating"* (PI, 1) and needs to be addressed internally with coordination with external stakeholders, such as the regulatory bodies and public authorities. The academic participants complained about the procurement systems in both institutions where they follow and implement the public sector financial systems in both countries.

> *"Well our project got delayed because it takes one year to get the equipment from the supplier. One reason could be because they use public sector purchasing system." (PI, 12)*

First of all, many of the academic participants stated that the purchasing process is a very lengthy procedure and researchers have to wait a very long time in order to get their requested equipment or other research facilities and instruments, such as chemicals, software, and consumables.

> *"I ordered the chemicals and I did not receive them because it was stuck with the Ministry of Environment for approval and payment… It was there in procurement for almost two months and then they made the payment...I planned such that chemicals will arrive in one month and I will do my experiments but it arrived late. So I could not complete all my experiments as they were planned." (PI, 7)*

> *"Many internal and external approvals are needed… for example, one month to get quotations… Months to get delivered." (PI, 23)*

Even after receiving the requested equipment, clearing and installing them by institutional technical staff takes time as well.

> *"... Maybe because of the suppliers but what about the waiting time to be install by technical department." (PI, 9)*

Issues related to 'Purchasing problems' were addressed by 18 out of 23 academic participants and ranked as the second main factor in the category factors related to **"Institutional policies and support".** Similar to the previous factor, researchers such as Sargent and Waters (2004) and Knobel et al. (2013) also highlight the importance of institutional logistics support, such as acquiring equipment and materials for collaborative research activities.

6.3.2.3 Factor Eight: Institutional Flexibility

Being flexible is not only important at the individual level; institutions such as funding bodies have to be flexible too. Research activities affected by some unexpected internal and external challenges may require changes in objectives, budgets, and administrative issues. Institutions who aim to conduct and enhance joint research activities should be able to facilitate and adapt to such changes. During the joint projects funded by the scheme, the academic participants addressed some institutionally challenging issues which required some flexibility from the funding institutions. One of the examples highlighted by an academic participant is flexibility to transfer the remaining budget from one year to the next because of un-expected delays.

> *"It is very important for the funding organisations to be flexible. I asked to transfer funds between years and got rejected. Sometimes you cannot finish what was planned initially. So we have to adjust in the budget and transfer it to the next year." (PI, 6)*

Another example mentioned by the participants is flexibility to transfer budgets from item to item. The proposed budget for any research activity is estimated and not accurate. For example, most of the scientific research equipment, chemicals, and regents used in research and teaching related activities in the region are imported from overseas and the researchers estimate the costs of these items based on the exchange rate at the time of submitting the proposal. However, exchange rates fluctuate based on the market supply and demand and, in case of increasing the price of a currency, the researcher has to transfer the deficit from another item. Some academic participants claim that they face similar scenarios and face difficulties in transferring the budget.

> *"One example I faced was the increase of the price in budgeted chemicals. It is out of my hands because exchange rates changed. They have to consider such external force… It is out of our control." (PI, 15)*

> *"Another issue: also I am not allowed to transfer from one item to another. Like from capital equipment to chemicals." (PI, 4)*

The lack of 'Institutional flexibility' was addressed by 14 out of 23 academic participants and ranked as the third main factor in the category factors related to **"Institutional policies and support".** This finding is confirmed by other researchers such as Heinze and Kuhlmann (2008) and Sargent and Waters (2004).

6.3.2.4 Factor Nine: Funding Problems

As stated in the previous chapter, getting access to funding is considered as a main academic motive to perform joint research projects funded by the scheme. Many of the participants stated that this funding scheme is the only one available in the region which funds joint research activities. However, some of them stated that the amount of funding they got is not sufficient for their proposed research project. In many cases they got less than what they were budgeted for in the submitted proposals.

> *"What we got is about 65% of what we proposed." (PI, 4)*

> *"… Not only in this, in most of the grants, we got less than what we asked for." (PI, 16)*

Such cuts in proposed budgets force the researchers to reduce the scope of their planned research and reduce the objectives or try to utilise other funding sources available to them.

> *"In addition to data collection difficulties, cutting the funding also forced us to decrease the number of regions… we covered only one region from each country." (PI, 11)*

> *"…I sent to him chemicals from here… I adjusted the budget from another source… our budget was limited." (PI, 8)*

Moreover, some participants complained about the funding system of the SQU-UAEU funding scheme, where each university has to allocate 50% of the approved budget for the project to its academic staff, regardless of the actual requirements of the research group in each university.

> *"We are doing 70% of the work. They are doing 30% of the work. We need 70% of the budget and they need 30% of the budget. They said NO." (PI, 1)*

In addition to these issues, some academic participants raised the issue of the restrictions in the amount of budget allocated for hiring RAs, attending conferences, and research visits.

> *"The PI has no flexibility in allocating budgets in some items, such as hiring RAs or consultants. We have restrictions." (PI, 6)*

> *"If we have the flexibility to move the resources between items, many problems will be sorted out. I faced problems in getting the good RAs because of the budget". (PI, 20)*

Similar to the previous factor, the problems related to 'Funding' were addressed by 14 out of 23 academic participants and ranked as the fourth factor in the category factors related to **"Institutional policies and support"**. The importance of providing sufficient funds for collaborative activities and flexibility in moving them between categorised items was highlighted by Corley et al. (2006), Sonnenwald (2007) and Defazio et al. (2009).

6.3.2.5 Factor Ten: Research Infrastructure

Weak research infrastructure in any institution can hinder, and even prevent research activities in general. It is quite common in many developing countries where their

HE institutions and research organisations are not well-equipped with research facilities and resources. As explained earlier, most GCC universities were established as teaching-oriented and not research-oriented institutions, where most of the research facilities were not priorities. However, some academic participants admit the availability of state-of-the-art scientific equipment and facilities in many regional research institutions, especially PFUs.

> *"Last ten years witness a surge growth in regional research investments. In KSA and Qatar for example, they have a good research infrastructure and facilities." (PI, 6)*

> *"One important thing is we can utilise the facilities, which available in other research institutions. I mean in the region… there are excellent facilities and infrastructure… equipment and labs in some of them which may not be available with us or even with our colleagues at [name of the collaborative university]." (PI, 17)*

However, some of them addressed the limitations in research facilities and infrastructure in their universities. They highlight the importance of having research labs and scientific equipment considered essential to perform good research.

> *"We do not have lab spaces… I have to go early morning to my colleagues asking to borrow their lab spaces for my PhD students or for me in order to do our experiments." (PI, 1)*

> *"Our research equipment is very old… Everybody using it." (PI, 9)*

In addition, some technology-mediated communications are important especially for joint research related issues, which do not require frequent and face-to-face meetings. The availability of different communications facilities and infrastructure such as free telephone lines, video conferencing, audio conferencing, and electronic joint research systems are important to speed up the progress and exchange updates about the research project. Geographically separated researchers mainly depend on the existence of these communication tools in order to communicate with their teams. Many participants complained about the means of communications, where cheap or freely used programmes are blocked in some countries.

> *"Collaborative research mainly about performs assigned research tasks and communication between researchers to get updates and plan well is essential. We*

have some restrictions and the universities have to facilitate for researchers by providing them with a means of communications." (PI, 3)

For example, we do not have video conferencing facilities and we cannot call them because our telephone lines are for local calls only. (PI, 13)

The limitations in the institutional 'research infrastructure' were addressed by 14 out of 23 academic participants and ranked as the fifth factor in the category factors related to **"Institutional policies and support"**. The previous literature highlighted the importance of having well-established research infrastructure and facilities in any research institutions, and are considered one of the factors that drive researchers to do research and collaborate with others (e.g. Amabile et al., 2001; Jones et al., 2004; Maglaughlin and Sonnenwald, 2005; Sonnenwald, 2007). In addition, international researchers are encouraged to collaborate with research institutions with good research facilities (Jones et al., 2004).

6.3.2.6 Factor Eleven: Incentives

Both the working environment and job satisfaction are very important components to motivate academics to produce high quality and innovative research. The academic participants found that it is challenging to be involved in joint research activities, especially with international researchers, compared to individual research or intra-institutional research collaboration. International research collaboration requires more time and effort while weighted by the universities equally compared to other research activities. A pay-for-performance strategy is commonly used by research organisations and each institution has to work on different reward systems, which tie the different incentives to research performance.

Firstly, in order to improve the culture of collaboration in research, the academic participants raised the issue of un-availability of reward systems to be involved in collaborative research activities, mainly at the international level. For this reason, some researchers prefer to work with their colleagues inside the university.

"Some academic will prefer to have an internal grant even with their colleagues in the department/college... what motivates them to do international collaboration even

with GCC researchers? Nothing… at this stage we need this institution to provide incentives. We are building the capacity now." (PI, 21)

The academic participants mentioned some tangible and intangible incentives such as financial rewards, reduced teaching load, and peer recognition, as well as considering such levels of collaboration in promotion criteria.

> *"They need some incentives to collaborate… Reward systems are important… different incentives such as financial rewards or at least reduced teaching load." (PI, 12)*

> *"It is not always financial but could be to consider them in the number of teaching hours." (PI, 6)*

One of them highlighted that even when comes to academic promotion, both single author and co-authored published papers were weighted equally. He was a member in the academic promotion committee and claimed that the promotion committee will not value such international joint research more than doing research alone or at a national level.

> *"I suggest that publishing alone or with others should be weighted differently in terms of academic promotion." (PI, 14)*

The factor 'Incentives' was addressed by 14 out of 23 academic participants and ranked as the sixth factor in the category factors related to **"Institutional policies and support"**. This finding is in line with previous literature where some organisations and research institutions implemented different incentive strategies to promote research and collaboration (e.g. Fuyuno and Cyranoski, 2006; RAE, 2008; Franzoni et al., 2011; Cao et al., 2013).

6.3.2.7 Factor Twelve: Institutional Research Culture

Some participants believe that institutional culture is a very important factor which may hinder collaboration in general. As mentioned earlier in this chapter, most if not all of the HE institutions in the region were established as teaching-oriented universities. The academic staff were assigned teaching related activities and they had no time allocated for research related activities. After forming well-established teaching systems and supplying the local/regional labour market with well-educated undergraduates, they moved toward their second main objective, which is research. Although funding was the first important element toward research, such radical changes require modification in the internal working environment of each institution. The research institutions play a vital role to change the institutional culture by enlightening all staff, especially academics, about the importance of research and joint collaboration activities with other parties at national and international levels. One participant stated that research culture has to be installed in each institution and policymakers have to implement policy to force citizens' researchers to produce research and collaborate.

> *"There is also the problem of research culture. You are doing your research in the UK and you can see day and the night people in the university talking only about research. The research culture is there. I am talking about institution research culture, at national level also… The top administration has to adapt and enforce people to do research, particularly nationals." (PI, 1)*

Similarly, another addressed the issue of research culture at the institutional level by highlighting the lack of policy prompting research and collaboration such as implementing enforcement rules and procedures for nationals to produce research and collaborate.

> *"… One reason may relate to enforcement system to produce research. If they have life time contract [nationals] why they bother themselves by research and collaboration." (PI, 3)*

> *"They have to take the lead… They are familiar with the country more. I worked in more than 10 projects and none of them leaded by [name of the regional nationality]… This is cultural issue." (PI, 13)*

Such adaptation towards research culture and collaboration has to start from intra-departmental and intra-institutional levels. One participant highlighted intra-institutional collaboration by saying that:

> *"Even at institutional level… I mean between the researchers inside the university, both joint research and even research itself is not part of their priority…" (PI, 14)*

For example, one participant tried to work with his colleagues inside the university and found difficulties. Such experiences may show that intra-institutional research (e.g. between departments or colleges) collaboration is very weak.

> *"I face difficulty to work with others inside the university… It is not part of their priority. This is a cultural issue." (PI, 8)*

The factor "Institutional research culture" was addressed by 9 out of 23 academic participants and ranked as the seventh factor in the category factors related to **"Institutional policies and support"**. Many studies address the influences of institutional culture on the success of research collaboration activities (e.g. Birnholtz, 2007; Ponomariov, 2008; Yu et al., 2013c).

6.3.2.8 Factor Thirteen: Collaborative Research Policies and Priorities

The academic participants indicated that their universities encourage and support them to collaborate internationally with others in all academic aspects, including research.

> *"We are encouraged to collaborate with others at all levels nationally or internationally." (PI, 3)*

> *"During the departmental meetings, we are always recommended to collaborate and produce research with well reputed researchers across the world." (PI, 15)*

However, some of them argued that there is no clear institutional collaborative research policy, nor regional research collaboration priorities, to be followed by researchers. It is essential for the universities to develop clear institutional research policies for collaborative research activities, especially with their counterparts in the region.

> *"Not everyone knows collaboration in research is also supported especially for the regional-related issues. Having clear written policies to be followed by all researchers in the universities will be better." (PI, 6)*

> *"Some of my colleagues do not know about the importance of collaboration, at least with others in the region. The universities have to play a role in this regards… For example policies and awareness activities are essential." (PI, 19)*

In addition to collaborative research policies, some of the academic participants addressed the issue of the lack of institutional research priorities, mainly with regional institutions. The regional collaborative research priorities should be clear to all researchers. Some of them claimed that their research proposals were rejected because the research problems were not major priorities for both Oman and UAE. The committee selected the proposals which addressed issues related to both countries, but some researchers did not know this criteria.

> *"I think providing the researchers' information about the main research priorities in the region is very important. So submitted research proposal are aligned with the funding criteria." (PI, 23)*

> *"I submitted a proposal before and got rejected… although it was a good topic, it was not of interests for both countries." (I, 16)*

The factor 'collaboration research policy and priorities' was addressed by 9 out of 23 academic participants as the last main factor in the category factors related to **"Institutional policies and support"**. Limited amounts of research highlight the importance of having clear institutional policies and priorities for collaboration.

6.3.3 Category Three: Factors Related To External Stakeholders Support

Real world collaborative research mainly aims to address and solve problems faced by nations, organisations, and people. However, in order to tackle these problems, researchers require full support from the main parties (i.e. stakeholders) involved in these problems. The academic participants in this study outline some major challenges faced by them related to external stakeholders, such as getting access to different sites to collect data for collaborative research related activities, as well as some other logistics support, such as facilitating the process of purchasing materials and research equipment from outside the region. Generally, the category of

‘Stakeholders’ support’ factors includes three main factors summarised in table 6.5 below, namely: data collection support, logistics support, and findings implementation support.

Table 6-5: Distribution of factors (challenges) in the category ‘External stakeholders’ support’

Category (3): External Stakeholders support	**Nature of science**			**Academic ranking**			**Collaboration experience**			**Total**
	AS (17)	BS (2)	HSS (4)	FP (8)	AP (5)	LC (10)	<3 (10)	3-6 (10)	6-9 (3)	
Logistics support	15	1	0	4	4	8	6	8	2	**16**
Data collection support	11	0	4	6	3	6	5	7	3	**15**
Output implementation support	5	0	3	1	3	4	2	5	1	**8**
Total	**31**	**1**	**7**	**11**	**10**	**18**	**13**	**20**	**6**	**39**

Source: Author’s construct, 2017

6.3.3.1 Factor Fourteen: Other Logistics Support

Apart from data collection support, one of the most important supports needed for any research is logistical support from other external bodies, such as governmental bodies that control the importing and exporting required facilities and materials for the research. However, the academic participants highlighted that they faced many difficulties in order to get approval to purchase research related chemicals and reagents. The researchers had to get approval each time an order had been placed.

> *“You can’t imagine how frustrating it is to fill a booklet by listing each item and many other details… we are doing research in public university… this is not the right way.” (PI, 1)*

One academic researcher suggested that such approval could be granted for the universities once a year and they can purchase anytime during the year. They do not need to apply for it in each purchase request.

> *“List all chemicals and get approval once.” (PI, 9)*

In addition they highlight on the delays in post-purchase clearance and receiving imported equipment or research materials from official bodies, such as ports authorities. For example, one researcher stated that:

> *"It takes a long process in order to get my equipment. The staff from procurement department at the university has to fill forms and go to the ports to clear them. It may take weeks to finalise and receive them." (PI, 4)*

Others stated that it is worse if there are chemicals or other research materials, like animal samples that need to be collected as soon as possible, otherwise they will expire.

> *"The college received many expired chemicals because they are out-dated or stored in a bad environment in the ports... This is mainly because of long clearance processes." (PI, 15)*

This indicates that priority and fast logistics trucks are needed for any research related facilities and materials.

> *"When I say strictly use for research, it means strictly use for research. In Europe and America this is already worked out… why do we need to get approval if it is for research?" (PI, 1)*

The limitation in external stakeholders' logistics support was addressed by 16 out of 23 academic participants and ranked as the first most important factor in the category of factors related to **"External stakeholders' support"**. Some previous studies address the importance of different logistics support provided by external stakeholders (e.g. Mattessich et al., 2001; Bruce et al., 2004; Sonnenwald, 2007; Martinelli et al., 2008).

6.3.3.2 Factor Fifteen: Data Collection Support

Apart from external stakeholders' logistics support, researchers face difficulties in terms of data collection support. The researchers will not be able to tackle and investigate any research problems that require data collection unless they have an access to such data and are able to collect it easily, without restrictions. For example, investigating health related issues mainly requires collection of data such as biological samples from the hospitals or patients. Some participants claimed that full support for data collection from such external bodies or 'stakeholders' is very limited or not up to the desired level.

> *"What we wanted from [name of the ministry] was the ethical approval to collect samples and took nearly two and half year. Simply they do want to collaborate… there are some people who think they should do the research and not others." (PI, 11)*

Such limitations in getting access to national data, especially for joint research activities where another country involved in the project, may relate to national policies factors where there is no clear official guidance and policies for the governmental and private organisations to support any research activities in the country.

> *"Open access policy for national data does not exist… This is one reason for weak support from them." (PI, 17)*

> *"When they got to know that another country was involved in the project, they started hesitating to provide data for the project." (PI, 20)*

Researchers were forced in some cases to pay for people in order to get access for data, which will have a negative effect on the budget of the project, as such items may not initially be proposed in the requested budget.

> *"They ask me to pay for them in order to go to archives and provide me with the needed data and it was not budgeted… They have to do it after office hours." (PI, 4)*

In some cases PIs have to include facilitators as part of their research teams to help them with collecting data or hire them as an RA for the data collection period.

> *"We have to hire their staff as RAs in order to get data collected." (PI, 2)*

The challenge of getting access to data was addressed by 15 out of 23 academic participants and ranked as the second most important factor in the category of factors related to **"External stakeholders' support"**. Similar to the previous factor, some scholars highlight the importance of getting access to data needed for research and consider it as one of the impeding factors for research and collaboration (e.g. Bruce et al., 2004; Sonnenwald, 2007; Martinelli et al., 2008; Bammer, 2008).

6.3.3.3 Factor Sixteen: Output Implementation Support

Given the potential of implementing the findings of some of the joint research activities funded by the scheme, the researchers again in some cases have to have access to sites such as farms, national resources, plants and other private and governmental organisations.

> *"We started testing our produce in [name of the university] campus." (PI, 23)*

Generally, external stakeholders use research results to improve and/or develop new products, services and production processes. There is no use of doing any real world applied or social science research, unless the main stakeholders in the countries are aware of their role in testing or implementing the findings. The academic participants claimed they faced some difficulties to pilot their findings. For example, one PI argued that they published their findings; however, they tried to implement some strategies/findings in the real world and faced difficulties because of public sector organisations' resistance.

> *"Well, after getting all the ethical related approval, I asked the [name of the ministry] to test the results for two months in a sample of [group of people] and they refused." (PI, 13)*

> *"For example, there is a resistant to implement the findings… basically the [group of people] refuse and we did not have any support from the ministry." (PI, 20)*

However, other participants claimed that involving stakeholders from the initial stage of the project is essential in order to get access to data and thereafter, the possibility of implementing the findings.

> *"In reality, the stakeholders are important in term of being involved from the initial stage… otherwise you will have your results lying in the shelves without being utilise." (PI, 11)*

Lack of output implementation support was addressed by 8 out of 23 academic participants and ranked third in the category of factors related to **"External stakeholders' support"**. However, this has not been highlighted in literature about collaboration in research.

6.3.4 Category Four: Factors Related to National Collaborative Research Policies and Support

In addition to the factors related to institutional and external stakeholders' support, which challenges regional collaboration between PFUs, the academic participants highlighted some challenges related to the national level. It is important for each country to have clear national level collaborative research policies and objectives that all research institutions and researchers must adhere to. Clear objectives will have a positive impact on the performance of the researchers in terms of selecting the right joint research activities and tackling strategic problems faced by the country and region. Table 6.6 below summarises the main factors related to national collaborative research policies and support.

Table 6-6: Distribution of factors (challenges) in the category 'National R&D policies and support'

Category (4): National R&D policies and support	**Nature of science**			**Academic ranking**			**Collaboration experience**			**Total**
	AS (17)	BS (2)	HSS (4)	FP (8)	AP (5)	LC (10)	<3 (10)	3-6 (10)	6-9 (3)	
Graduate programmes and RAs	12	1	4	5	4	8	8	7	2	**17**
National research culture	10	1	4	4	4	7	7	6	2	**15**
Access to national data and sites	8	0	4	3	2	7	6	4	2	**12**
National collaborative research policies	6	0	2	2	1	5	5	2	1	**8**
Total	**35**	**3**	**14**	**14**	**11**	**27**	**27**	**19**	**6**	**52**

Source: Author's construct, 2017

6.3.4.1 Factor Seventeen: Graduate Programmes and RAs

Although two of the academic participants stated that the weakness in postgraduate programmes in the region is both institutional and national problem, many of the academic participants who raised this issue stated that this is a national level issue and needs to be tackled by each country in the region. Universities in developed countries use graduate and PhD students to carry out the majority of the research activities. The academic participants stated that most of the research tasks like collecting the data, analysing the samples, and carrying out the lab experiments are done by PhD researchers and RAs.

> *"Research depends on strong postgraduate programmes… mainly PhD level… in this level we have very weak programmes… very few and limited number of graduates… limited local scholarship from the government." (PI, 12)*

> *"Across the country and even in the region, we do not have research students. You are in the UK and you see how their graduate programmes are… many programmes and a lot of students… big competition. Most of the research is done by PhD students and postdoc researchers." (PI, 17)*

> *"Our PhD programmes are weak and many of the researchers in the developed world depend on their research students to carry out the main tasks in their research activities." (PI, 14)*

Some academic participants highlighted the importance of attracting both regional and international students to their programmes by providing them with scholarships and both funding and logistics support.

> *"No attractive scholarships for the current programmes… Promoting the postgraduate research programmes for both national and international students is very important… give scholarships and funding." (PI, 9)*

> *"Learning from other developed countries in this regards. Example, in addition to scholarships, provides them with logistics support such as accommodation and health care." (PI, 3)*

Another issue raised by academic researchers, which may closely relate to postgraduate students, is the un-availability of well-trained RAs with permanent job schemes. Most of the participating academic researchers, mainly from AS, claimed that it is not easy to get RAs locally because most of the graduate students prefer to get permanent jobs and RA jobs in universities are temporary.

> *"They can get a lifetime job easily in the industry or even in the public sector. Why they should work in a temporary job such as RA… Me and my colleagues in the college face difficulties to recruit RAs." (PI, 15)*

Even when you can get them locally, some participants emphasised the problem of resignations. Although PIs spend resources in order to train RAs in using some sophisticated research equipment or to collect and analyse data, some of them resign in the middle of the research project, especially when they get a permanent job or a better offer.

> *"I spent a lot of money training him outside the country for six months. He was supposed to work with me for the next three years till I finish my project… He got a job in the beginning of the second year. I cannot stop him from getting that job because he worked for me on a short-term contract." (PI, 20)*

> *"The recruitment systems in both universities do not support us. RAs resigned from both side because it is a temporary job." (PI, 4)*

Finally, the limited resources allocated for hiring RA staff is another restriction for getting well-trained RAs, especially internationally. Although it is highly encouraged to hire local RAs in order to build up national research capacity, academic participants try to get people from the international market if it is not available locally; however, getting RAs from outside the country is difficult because of the limited funds allocated for them as well as other national level restrictions, such as visa processing and security clearance.

> *"If it is not available in the country, I can hire a skilful one from outside but also difficult because of limited salary allowed. It is not attractive. Also there are restrictions from the government." (PI, 2)*

The limitation in well-structured postgraduate programmes and the availability of RAs are considered as some of the challenges faced by the academic researchers participating in projects funded by the scheme. This factor was highlighted by 17 out of 23 academic participants and ranked first one in the category of factors related to **"National collaborative research policies and support"**. The role of postgraduate programmes, and the availability of RAs in promoting collaboration and research in general, is extensively highlighted in previous literature (e.g. Rushton and Meltzer, 1981; Jordan et al., 1988; Jordan et al., 1989; Dundar and Lewis, 1998).

6.3.4.2 Factor Eighteen: National Research Culture

The research institutions in each country cannot work in isolation from the surrounding environment. Many major players involved in collaborative research activities and those who provide technical and logistics support, such as governmental bodies and the private sector, are considered as essential.

> *"Not only researchers but even policymakers… If you talk to some ministers about your research, they will not be bothered because they are busy with building the schools or hospitals or roads… the country has to work on many things." (PI, 1)*

The academic participants face many difficulties related to the support needed from stakeholders as highlighted earlier. Some of them stated that this is a national level issue and policymakers in each country have to implement strategies and play roles to improve national awareness about the importance of research and collaboration. Given that the GCC region consists of developing countries which mainly focus at this level in developing the welfare of their citizens, the importance of research should be clearly addressed to all people.

> *"I think the research culture in the country and the region in general... Research is not part of their priorities… the countries have to increase the awareness." (PI, 10)*

> *"Not everyone agreed with the importance of research… I mean our culture is different than western countries cultures." (PI, 5)*

The national research culture and the awareness of the importance of research for the country and the people will help researchers to tackle the different problems more efficiently, as well as getting full support from different levels of people. This factor was highlighted by 15 out of 23 academic participants and ranked second in the category of factors related to **"National collaborative research policies and**

support". Although many researchers have demonstrated the importance of research collaboration, few have paid close attention to the national research culture.

6.3.4.3 Factor Nineteen: Access to National Data and Sites

Though getting access to data and sites has been addressed as one of the challenges related to stakeholders' support, some researchers consider it as a country level issue and thus it needs to be addressed by policymakers at a national level. It is essential for the collaborative research activities, especially those which tackle a bilateral/regional (multilateral) research problem, to get access to national data and sites. Researchers from different countries need to be robust and compare national data in order to produce a good quality of research and solve research problems. As stated earlier, the academic participants of the SQU-UAEU funded projects face some difficulties in collecting and getting access to data for their research, and the lack of national level policies of free access to data for research purposes forces some researchers, in some cases, to include people from the stakeholders, such as from ministries, in order to facilitate the data collection process.

> *"We have to have one person in our research team from [name of the ministry]. His role is to facilitate the data collection process. He made our life easier." (PI, 6)*

> *"We are forced to add some staff from the ministry, otherwise our life will be difficult and we will not be able to collect data." (PI, 13)*

One way is by appointing them as research assistants to collect the data for the project.

> *"The data collection done by my research assistants… they are from the ministry. They were our students and we paid for them from the project. This is the easiest way to collect data otherwise it will be difficult." (PI, 13)*

Researchers highlight the importance of implementing national policies related to access to national data for research related activities that allow researchers to gain free access.

"The government should implement the free access to data (Free Public Access to the Data) and it is not owned by a certain institution. As long as I am using it for research, I should get access to them. It is not yours or his." (PI, 4)

"I mean to some extent, the free access to data is not available. Some national level data such as real statistics about a specific disease or any health related issue..." (PI, 11)

Such open access to national data policies could be implemented where any researcher working in the region in any research institutions can get access freely for research related purposes.

"The countries should encourage collaboration by developing policies. For example, as a researcher I should get access for data freely without restrictions." (PI, 16)

Free access to national data and sites was addressed by 12 out of 23 academic participants and ranked third in the category of factors related to **"National collaborative research policies and support"**. Getting access to national data and sites was also highlighted by some researchers, such as Bruce et al. (2004), Sonnenwald (2007), and Bammer (2008).

6.3.4.4 Factor Twenty: National Collaborative Research Policies

In addition to the lack of policies related to the institutional level, the academic participants addressed the lack of having national level policies and funding for international collaborative research activities, especially for region related research problems. Such policies are considered as important in order to solve regional research problems and improve the national and regional competitiveness and excellence in research.

"It is not only inside the universities, but also for each country in the region. I mean it is better to develop national policies, which help the researchers to guide them. For example, what regional issues to be tackled and where to get funded." (PI, 6)

"Each national research council has to enhance research collaboration in the region." (PI, 2)

The academic participants suggested that the national research council in each country with coordination with the research institutions and centres have to develop such policies. They need to outline the main collaborative research priorities.

> *"What are the national or regional research problems to be tackled? The national body in-charge of research related activities have to work out these issues and set up policies and priorities…" (PI, 20)*

The limitation in the national level collaborative research policies was addressed by 8 out of 23 academic participants and was ranked as the fourth challenge in the category of factors related to **"National collaborative research policies and support"**. Limited studies highlight this issue and the importance of having regional policies to promote collaboration.

6.3.5 Summary of the Factors Affecting Research Collaboration

The previous sub-sections present the findings of factors (challenges) which affect joint research activities funded by the SQU-UAEU funding scheme. These factors were grouped into four main categories, which are **“Personal related factors”**, **“Institutional related factors”**, **“External stakeholders’ support related factors”**, and **“National level related factors”**. There is a relationship between the discipline of the research activities and the existence of these challenges. For example, AS joint research projects which require more logistics support from both institutions and external stakeholders face more difficulties in order to purchase the required chemicals and equipment or logistics support to collect samples from the sites. While BS joint research projects that do not require such support face limited difficulties. In addition, the more experience the researchers have in collaborative research activities in the region, the less difficulties they will face due to accumulated experience, helping to overcome these challenges.

6.4 The Potential of Research Collaboration between PFUs in GCC Countries

The findings of the participants' interviews support the key secondary data indicators in which both indicate the limited amount of collaborative research activities between regional HE research institutions. However, the researcher asked the interviewees to determine the possibilities, if any, available in the region to produce more knowledge and research through collaborative research activities, similar to what other international countries. Table 6.7 below summarises the different potentials as highlighted by the participants.

Table 6-7: The potential of research collaboration between PFUs in GCC countries

Potential	No. of Statements	Rank
Availability of research institutions	29	1
Availability of research centres	26	2
Regional research facilities	25	3
Availability of funding (national level)	23	4
Common ground and research problems	23	5
Regional research infrastructure	17	6
Political ties	16	7

Source: Author's construct, 2017

The first important potential in the region addressed by the participants is the availability of research institutions, especially PFUs. Almost 94% of the participants (29 out of 31) highlight the importance of the available HE research institutions.

> *"There are many HE research institutions. KSA has more than 25 public and many other privates… Other countries in the region also have… These numbers of research institutions can improve their research by collaboration regionally and internationally." (DM, 6)*

> *"In terms of number of universities, there are many either governmental or privates but in term of research productivity very limited." (DM, 5)*

In addition to these HE institutions, there are a substantial number of research centres either attached to those universities or as independent bodies. The availability of research centres in the region was mentioned by 26 out of 31 participants (84%). On one hand, most PFUs include a research centre in disciplines of high importance to the country.

> *"The research centres are also available in most of these universities." (PI, 2)*

> *"…our research centre is important for the country because we perform research in economically important sector… I know others centres in the region doing similar research." (PI, 16)*

Other research centres are available either as independent bodies or attached to other public organisations, such as ministries and public authorities.

> *"We have also some independent research centres and others attached to other governmental bodies such as ministries." (PI, 9)*

However, some participants stated that a number of the research centres, mainly those attached to the universities, do not physically exist, and some of them have low productivity.

> *"Formally, we have nine research centres but seven of them are functioning and few produce research." (DM, 8)*

> *"We collaborate nationally with [name of the research centre]… In the university they need some resources because some of them are not doing well." (PI, 15)*

They argued that the main reason behind such issues is because the researchers working in these centres are academic staff in the colleges and allocate limited time to the centres' research activities.

> *"We tried to collaborate with one of the research centres in [name of the regional country] because we do not have enough time to do much. I am the director of the centre and one of the researchers, but most of my time is spent teaching in the college… even my research team have the same problem." (PI, 16)*

> *"Two of our research centres are not active and the ones which are active require more full time human capital." (DM, 6)*

Although research facilities were one of the institutional challenges faced by the academic participants, the participants admit the availability of some research facilities in some of the regional PFUs, who produce research outputs. Such facilities are considered as potential for joint research activities in the region. 25 out of 31 participants (81%) addressed the availability of research facilities in the region which could be better utilised by greater coordination and collaboration between the research institutions in the region.

> *"Many of public universities in the region are well established and have excellent research facilities." (PI, 9)*

> *"It always the most of the research productive institutions and centres in the region are the ones which have a good research facilities." (DM, 4)*

For example, one DM highlights the availability of very expensive research facilities in one of the regional public universities, which are not fully operated by their researchers.

> *"We were planning to invest millions in purchasing a [name of the research facility]… and one of the supplier informed us that the [name of the regional university] in [name of the regional country] purchased one from them… We contacted the university to get more information about the supplier and they informed us that they are happy to work together and utilise their facility instead of investing in new one." (DM, 6)*

Such big investment could be more productive if these universities work jointly with other universities and even charge some usage fees to cover the maintenance costs.

> *"We are ready to share the operating costs of any capital equipment and the consumables such as chemicals and regents but administrative and collaboration systems is not there." (PI, 12)*

Other DMs highlight the large investments in R&D activities in one of the regional countries during the last decade; however, as per the key research indicators, there is still very low productivity in terms of research published.

"Example is [name of the regional country] which allocates big investment in R&D activities and acquire many research facilities but still productivity is very low…" (DM, 3)

The fourth main regional potential, mentioned by 23 out of 32 of the participants, is the availability of funding at national levels. Most GCC universities and countries in the region provide different types of funding schemes to their researchers for research related activities.

On one hand, and at the institutional level, the participants admit to having different internal funding schemes. In both institutions (i.e. SQU and UAEU) the researches can get funded for different types of research related activities.

"We have different funding schemes. Along with this joint research funding scheme we can get internal grant and strategic grant. There is a competition in getting strategic grants because of limited budget for all the university but for internal grant is much easier." (PI, 3)

"In our university I can apply for at least four of the available institutional funding schemes..." (PI, 20)

On the other hand, at the regional level, all GCC countries have funding bodies, such as The Research Council (TRC) in Oman and Qatar Foundation (QF) in Qatar, which allocate budgets for research related activities.

"We are having [name of funding body] which provides us with different types of research grants… my colleagues in [name of the regional country] also have a grant from [name of funding body]…." (PI, 13)

"As I stated at country level I got funded from the [name of the funding body] with local collaborators from [name of the regional university]." (PI, 4)

"Based on my information UAE has National Research Foundation (NRF), Qatar has Qatar Foundation, Oman has also TRC… I think all of them have a central funding body." (DM, 7)

However, most of the participants claimed that they never heard about any one of these funding bodies allocating budgets or funding for joint research activities or allocating funds for regional collaborative research.

> *"This is the only formal joint funding scheme [SQU-UAEU]. I do not think that there is another one in the region." (PI, 9)*

> *"To some extent funding is there but joint funding or we can say there is a lack of regional research funding strategies. (PI, 12)*

Also few of them claimed that limited amounts of funds are available from the private sector to support research activities, mainly at the implementation stage.

> *"I think also private companies have to play their roles similar to developed countries." (DM, 5)*

> *"Private sector contributes little in term of funding… We need to have a policy to enhance their participation." (DM, 2)*

Fifth, GCC countries share common ground and face similar research problems. Similarly, 23 out of 32 participants highlighted the advantage of having such similarities and how the collaboration could be a means to solve regional research problems.

> *"As I said earlier, the researchers in the region have some advantages. They can work in similar research problems which related to the region as a whole." (DM, 5)*

> *"We speak the same language and have common characteristics… Research problems as well... We have advantages which may not available for others." (PI, 2)*

One participant stated that European countries do not have similar ground, however they collaborate more in all the aspects.

> *"If you look at Europe, they do not speak the same language… Not always facing the same problems but they have strong collaboration in research." (PI, 20)*

The sixth main regional potential for joint regional research is the availability of research infrastructure, which 17 out of 32 participants highlighted the importance of having. Some claim that such infrastructure is available in many HE research institutions.

> *"In addition to funding, I think one good thing in this region is the improvement in research related infrastructures... The last two decades witnessed good improvements." (PI, 20)*

"Well in term of research, the most important things and mainly for applied science disciplines are the labs and capital infrastructure which is available in the many institutions in the region... This is one of the advantages..." (PI, 18)

Others acknowledged the availability of having the basic means of communications infrastructures, such as good, cheap flights, and well maintained roads between GCC countries.

"... But in term of roads and flights… it is available and not expensive to travel… I can reach my collaborator in [name of the regional institution] within three hours of driving." (PI, 13)

However, as stated earlier, some participants highlighted restrictions for free communication facilities, such as Skype, and slowness in networks.

"Apart from these ICT restrictions, flights from one city to another are not difficult…" (PI, 2)

Other infrastructure was addressed by some participants as available potentials for joint research collaboration between researchers in the region, such as libraries and sophisticated research equipment.

"Many of the universities in the region are occupied by libraries and they are members in many of the online databases." (DM, 3)

"For example, [name of the regional institution] has well occupied research vessel and we can work jointly with them instead of buying one." (DM, 6)

Lastly, 16 out of 32 participants highlighted the importance of strong political ties between GCC countries. They consider it as an advantage which rarely occurs across the globe. Some argued that there are strong relations between international joint research activities and political ties between the countries.

You know if the relationship between any two countries is not good, of course there will be limited joint activities in all aspects… This is not the situation between GCC countries. (PI, 17)

"I think the good political ties between the regional countries are considered as a plus and we can start collaboration in research." (DM, 5)

One participant also argued that joint research activities help to improve the relations between countries.

> *"Even to improve and strength the relationship between nations, joint R&D activities could be used as a means." (PI, 14)*

In conclusion, the potentials highlighted by the participants could be used as a base to develop different regional collaborative research policies and strategies in order to enhance researchers' interactions, produce a better quality of research, and utilise existing regional R&D resources and capital investments.

6.5 Chapter Summary and Conclusion

This chapter aimed to analyse the findings with a view to addressing the third and fourth objectives of this study by answering the third and fourth research questions. The chapter presented the findings on the challenges faced by the academic participants which influenced the effectiveness of joint research activities between the two institutions. Based on the emerging themes, the researcher extracted twenty main factors affecting joint research projects funded by the SQU-UAEU funding scheme.

Firstly, and at the personal level, the academic researchers should share mutual research interests and build trust between them. Moreover, they need to be flexible and accept any adaption in the research plan as well as allocating sufficient time to achieve the required tasks in order to achieve the research objectives. Many scholars highlighted on the main characteristics of good collaborators such as having mutual research interests (Maglaughlin and Sonnenwald, 2005; Stokols et al., 2008b), trust and not hidden agenda (e.g. Sargent and Waters, 2004; Boardman and Bozeman, 2006), time allocation and commitments (e.g. Jeong et al., 2013; Shin and Jung, 2014), flexibility and adaptability (Sargent and Waters, 2004; Corley et al., 2006) and having good communication skills. (e.g. Cummings and Kiesler, 2003; Sargent and Waters, 2004; Sonnenwald, 2007; Stokols et al., 2008b).

Secondly, and at the institutional level, the academic participants highlighted some challenges related to their research institutions. They emphasised the need to develop a very friendly and clear collaboration policies and strategies as well as flexible administrative and financial research systems. Moreover, and in order to promote collaboration in research and change the institutional research culture, the academic participants raised the issue of un-availability of both tangible and intangible incentives. These challenges were highlighted in the extensive review of literature on collaboration and examples of scholars who highlighted these assertions include Amabile et al. (2001), Sargent and Waters (2004), Sonnenwald (2007), Heinze and Kuhlmann (2008), Franzoni et al. (2011) and Cao et al. (2013).

Thirdly, they addressed the issue of lack of support from external stakeholders such as public organisations and authorities. Examples of the challenges related to this category is getting access to different sites to collect data, as well as logistics support, such as facilitating the process of purchasing materials and research equipment from outside the region. Researchers such as Mattessich et al. (2001), Bruce et al. (2004), Sonnenwald (2007) and Martinelli et al. (2008) highlighted on the importance of different logistics support provided by external stakeholders such as data collection and the flexibility in port authorities assisting them to acquire research equipment and regents.

Finally, the academic participants highlighted some challenges related to the national level which prevented them from collaborative research activities. These challenges included weak postgraduate programs, lack of RAs, national research culture, access to national data and sites and lack of national level policies and strategies for collaboration. Many of these factors have been considered as challenging issues needed to be tackled by decision makers at both institutional and national levels (e.g. Rushton and Meltzer, 1981; Jordan et al., 1988; Jordan et al., 1989; Dundar and Lewis, 1998; Bruce et al., 2004; Bammer, 2008). However, although the academic participants highlighted different challenges faced by them during their collaborative research activities, they considered the availability of well-established research institutions and research centres, substantial investments in research facilities and infrastructure, availability of funding and common grounds, and strong political ties, as the main advantages of the countries in the region. Such advantages should be considered as existing potentials which should be utilised. The next chapter discusses and analyses the study's findings.

CHAPTER SEVEN

7 DISCUSSION AND KEY ANALYSIS OF RESEARCH FINDINGS

7.1 Introduction

This chapter mainly aims to discuss the study's findings presented in chapter five and six. The chapter will highlight the answers of the main research questions outlined in the introduction. Sections 7.3 and 7.4 will highlight the second objective (RQ 2 & RQ 3) of this research by discussing the findings concerning the motives, outcomes and impacts of the collaborative research projects funded by the SQU-UAEU funding scheme. Before discussing the hurdles/impediments affecting regional research collaborative activities funded by the SQU-UAEU funding scheme (RQ 4), section 7.5 will address the fourth objective (RQ 5) of this research by discussing the main opportunities of research collaboration among PFUs in the region. After that, section 7.6 will discuss the findings of the hurdles/impediments affecting regional research collaborative activities funded by the SQU-UAEU funding scheme); section 7.7 will discuss the main challenges of research collaboration among PFUs in the region. Finally, section 7.8 will summarises the chapter.

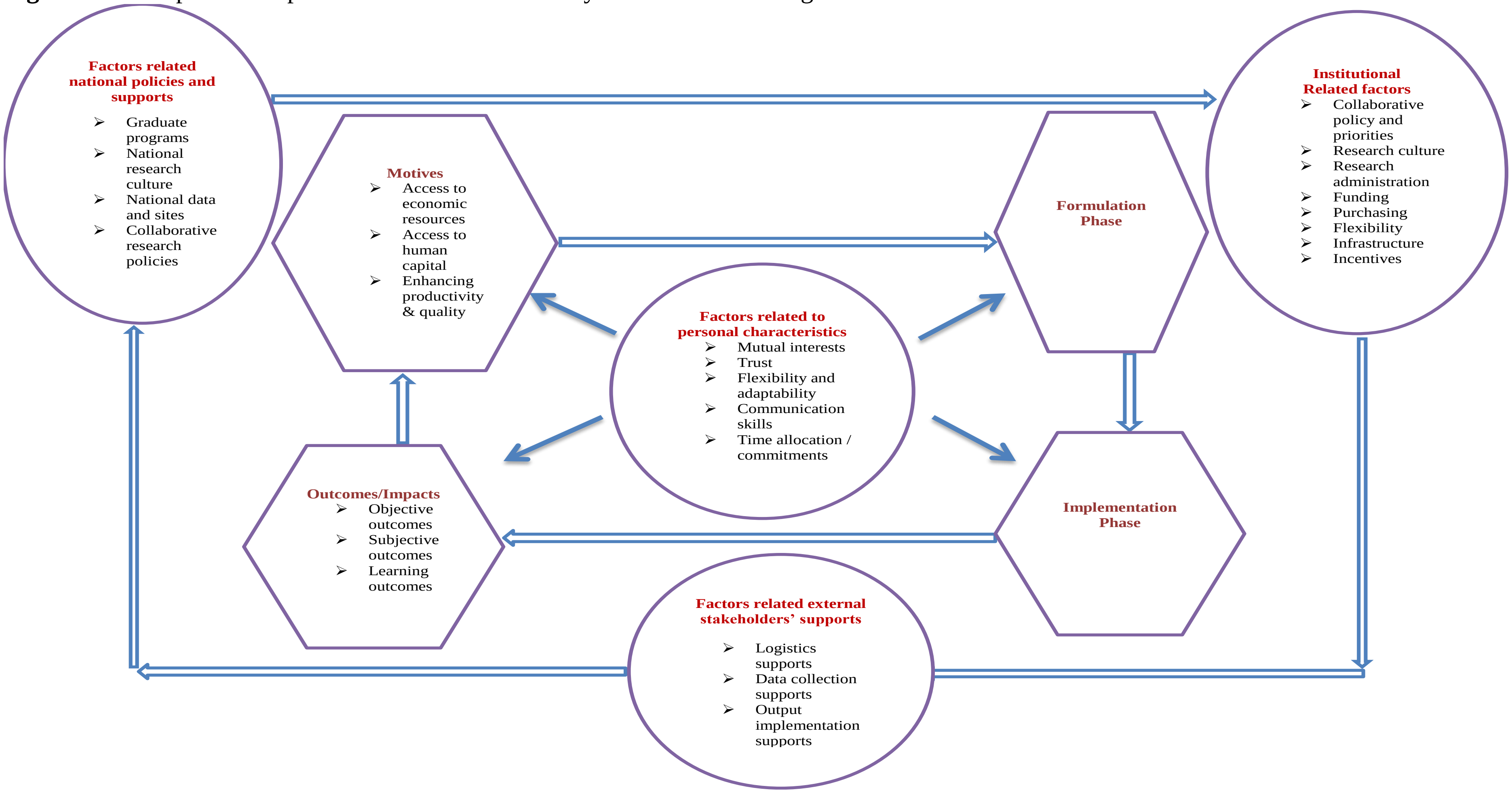
7.2 Adapted Framework for This Study Based on the Findings

As stated earlier in chapter 2 (section 2.12) that the inductive framework (figure 2.2) developed by Sargent and Waters (2004) was adopted in this study. The findings of this study however, indicated the need for some refinements (see figure 7.1 below) to adequately account for research collaborations between PFUs in GCC countries. Although the main motives and objectives of collaboration between academic researchers and institutions across the globe are almost similar and share the same objectives; however, the national and institutional policies of GCC countries and universities as well as the culture are different than those in developed countries.

The findings of this study confirm what other researchers found such as Sargent and Waters (2004) and Sonnenwald (2007) that research collaboration goes through a cycle consisting of different phases which are initiation (motives), formulation, implementation, and completion (outcomes).

Firstly, getting access to the different human and economic resources were considered the driving forces behind initiating the collaborative research activities between the academics researchers from both SQU and UAEU (section 5.2). The existence of one or more of these motives encourages researchers to collaborate. Next, before the commencement of the collaborative research project, the collaborators and their collaborative institutions need to clarify issues related to the research project, such as the aims, goals, objectives, scope, duration, budget as well as allocating the different project related tasks in order to help the collaborators to understand their respective roles, rights, and responsibilities. As stated earlier, the well-defined roles and responsibilities help researchers to achieve their objectives, it should, to some extent, be flexible to resolve any conflicts arising during the process. Such flexibility need to be from different levels such as researchers and research institutions. The final stage of any collaborative activity is the completion stage which mainly relates to measuring the success such as achieving the goals. The findings of the study as stated in section 5.6 indicate three different types of outcomes/impacts of the collaborative research projects between both SQU and UAEU researchers. They are objective outcomes, which include joint publications, conference papers, technical reports, and manuals. Next are the subjective outcomes, which include increased efficiency and productivity, qualitative impact and management skills. This is followed by the learning outcomes, which include new research techniques, training staff/RA and teaching, training graduate students and institutional cultural impact. These outcomes have a direct influence on future collaborative activities by either motivating collaborators to continue to engage in new joint research activities or discouraging them altogether.

Figure 7-1: Adapted conceptual framework for the study based on the findings



Source: Adapted from Sargent and Waters (2004) and based on the study's findings

Four sets of factors emerged from this study which affected the phases of research collaboration between academic researchers from both universities and similar to what was earlier presented by Sargent and Waters (2004). The first set was the personal characteristics related factors which included mutual interests, trust, personal flexibility and communications skills, as well as time allocation, commitment and interpersonal collaborative processes. The second set of factors were related to Institutional Policies and Support which included collaboration policies, budget related issues, purchasing related issues, research administration related issues, infrastructure related issues, institutional culture, and collaborative research incentives. Next was the External Stakeholders Support considered the third main set of factors which affected collaboration and included data collection support, logistics support, and output implementation support. Finally, the last set of factors which affected collaboration in the region was the national level environment such as national collaborative research policies, national research culture, access to national data and developing graduate programmes and RAs as well as other national research related policies and support.

7.3 What are the Motives behind Research Collaborative Activities between SQU and UAEU?

The findings of this research as presented in chapter five showed that both institutional and academic researchers motives do not differ from those found in the literature, however the decision makers (DMs) mainly look at collaboration from a macro level perspective, while researchers look at it from a micro level and from personal key interests. In addition, the findings show that the academic researchers' disciplines, academic ranking and collaborative experiences impact on the motivations of academics to work together.

In addition to considering collaboration in research as one of their institutional objectives, the DMs highlighted the different institutional level motives behind initiating this funding scheme between the two universities which can be summarised as historical and cultural ties, improving institutional and national research productivity and quality, reducing risk, tackling regional research problems, creating strong academic networks, and sharing resources and facilities. Previous scholars have addressed these motives as the institutional, national and regional factors behind development of policies and strategies to enhance research collaboration (e.g. Arunachalam and Doss, 2000; McGinley and Chamie, 2003; Almendral et al., 2007; Sonnenwald, 2007; Boekholt et al., 2009; Jeong et al., 2013). For example, Boekholt et al. (2009) researched the main drivers behind international research collaboration, especially between EU countries, and they stated that the main macro level drivers are to produce a good amount of research with high quality impact by linking human and financial resources of two or more countries. Moreover, they highlighted other non-science objectives to be achieved by the collaborators, such as improving national and regional competitiveness in research, addressing global research problems and improving the diplomatic relationship between countries. McGinley and Chamie (2003:6) stated in their paper titled *Peace Building Through Scientific Collaboration* that, in addition to solving common research problems between countries, international collaboration programmes and organisations helped to promote *"peaceful interactions among different countries in the process."*

That said, 78% of the academic researchers indicated that getting access to funding and to improve research productivity and efficiency are considered the main two motives to collaborate in joint research projects between researchers from the two universities. Firstly, research collaboration at an international level in order to get funding, highlighted by many scholars such as Harman (2001), Potì and Reale (2007) and Heinze and Kuhlmann (2008). Some researchers such as Jeong et al. (2013) found a positive relationship between the availability of funding and cross-border research collaboration. More funding available for joint research activities leads to more collaboration and co-authorship of publications. Although this funding scheme is one of the main funding sources available for researchers, and has helped to improve collaboration and research productivity, the findings of this study indicates that junior researchers in the region, mainly from applied sciences (AS) disciplines, face some difficulties in getting funding for their research activities from other internal sources at both institutional and national levels, and utilise this funding scheme as a new source of research funding. This is also true for all researchers from basic sciences (BS) and humanity and social sciences (HSS) disciplines, across all academic rankings. One explanation for such finding as noted by some of the participants is that there is high level of competition at both institutional and national levels for research funding in both countries as well as a limited budget allocated for HSS disciplines. Moreover, some researchers stated that there is no budget allocated for research activities for junior researchers such as new PhD academics or newly appointed academic staff. In general, limitations and scarcity of local funding encourages researchers to create international networks in order to get access to international funding sources (Harman, 2001; Potì and Reale, 2007).

The motive of enhancing research productivity and efficiency is considered the second driving force encouraging academic researchers to collaborate through this funding scheme. Similarly, 78% of the academic participants, mainly lecturer (LC) and associate professor (AP) academics, believe that joint research projects produce more research and thereafter they can publish more compared with working separately in research related activities. The objective of the two groups of researchers, especially those who are in their early academic career (i.e. LC) is to get promoted. So they work harder to produce more research compared with senior researchers, such as full professors (FP), who have already reached the top academic ranking. Researchers such as van Rijnsoever et al. (2008) found a positive relationship between collaboration in research and career development and promotion.

However, this does not mean that all academics researchers who are open to collaboration and have increased their research productivity are looking for promotion. Some are motivated to produce more research publications in order to secure a job in a better place, or to increase their visibility and recognition in order to get funded from other international organisations. Enhancing research productivity and efficiency as a motive to collaborate has been addressed by many researchers such as Beaver (2001), Sargent and Waters (2004), Lee and Bozeman (2005), Rigby and Edler (2005) and Sooryamoorthy and Shrum (2007). Moreover, some of them found a positive relationship between collaboration at all levels and researchers' productivity and efficiency (e.g. Lee and Bozeman, 2005; Frenken et al., 2005; Rigby and Edler, 2005; Birnholtz, 2007). Collaborative researchers tend to be more productive and also collaborate more often than less productive researchers.

The third main motive highlighted by 74% of the academic researchers was to improve the quality of their research activities. This motive was identified by many scholars and some of them have found a positive correlation between the quality of research and collaboration. Examples of these studies include Beaver (2001), Sargent and Waters (2004), Persson et al. (2004),Oh et al. (2010) and Onyancha and Maluleka (2011). However, unlike increasing productivity levels, this motive was shared by 100% of FPs and 80% of APs, who are more concerned with improving the quality of research production in comparison to junior researchers. As stated earlier, FP academic researchers have already reached the highest academic ranking and therefore producing good quality of research is a higher priority for them. In addition to getting promoted, both APs and FPs require both numerous and quality publications.

The fourth and fifth main motives highlighted by 61% of the academic participants were gaining access to research facilities, and expertise and knowledge, respectively. On one hand, getting access to research facilities is addressed more by AS disciplines, across all academic rankings, where the research activities in these disciplines requires having some research facilities such as experimental labs and national data which may not be available locally. Availability of these facilities in collaborative institutions motivates them to work with their researchers. This also aligns with what other researchers found such as Katz and Martin (1997), Wray (2002) and Oldham (2005). They indicate that researchers, mainly at the international level, collaborate on research activities in order to gain access to research facilities such as national data, sites, reagents, and samples.

Similarly, getting access to knowledge and expertise is the fifth main motive behind research collaboration, addressed more by LC and AP academic researchers with low collaboration experience who are in need of getting in touch with well-established scientists and experts in order to learn from their accumulated research experiences and knowledge. The literature on collaboration in research considers joint research activities at all levels a means for mainly junior researchers to learn from other well-established scientists and experts in their field (Katz and Martin, 1997; Bozeman and Corley, 2004; Birnholtz, 2007; Bozeman et al., 2015).

Solving regional research problems and creating social and academic networks are ranked as the sixth and seventh main motives (each mentioned by 57% of the academic participants) behind academic research collaboration through the funding scheme. Although limited research (e.g. Davidson Frame and Carpenter, 1979) highlighted the importance of collaboration at a regional level in solving national or regional research problems, some of them addressed the importance of collaborative research activities at an international level in tackling global issues, such as health related diseases and climate changes (e.g. Cummings and Kiesler, 2005; Porter and Rafols, 2009; Raasch et al., 2013). All researchers from the HSS disciplines who participated in this study were aiming to tackle regional issues related to educational and social studies, which are faced by both countries.

In addition, more than 50% (9 out of 17) of the AS researchers, mainly senior academics, were aiming to address regional research problems in health and environmental sciences. This finding indicates that in addition to other global research problems, which could be tackled by researchers across the world, there are some regional-specific issues that need to be tackled jointly by researchers in each region, such as GCC countries. No BS researcher highlighted this motive, perhaps because such research involves common truths of universal interests.

Researchers from both AS and BS disciplines (13 out of 19), especially those in their early or mid-academic career (11 out of 15), consider this funding scheme an opportunity to create social/scientific networks, which will help them to promote their academic career and get access to international findings and research facilities. In addition, new academic researchers are in need of building their social academic networks in order to improve their visibility and recognition, while other senior researchers already have their well-established academic network. This finding is in line with literature where many of the previous studies highlighted the importance of collaboration in research in order to link scientists and create academic network. Example of these studies are Newman (2004), Maglaughlin and Sonnenwald (2005), van Rijnsoever and Hessels (2011) and Woo et al. (2013). Katz (1993:23) stated that *"As social isolation can lead to psychological despondency, so professional isolation may lead to intellectual despondency."* However, a limited number of studies consider this motive to be only for academics in their early or mid-academic career.

The eighth main motive noted by 39% of the academics participants is already having a contact at the collaborative university such as an old colleagues or supervisor/student, which motivates them to work together through the SQU-UAEU funding scheme. Such well-established relationship and built trust encourages them to collaborate and such good relationships help achieve the research objectives and minimize the difficulties in the joint research. This motive was highlighted by all academic rankings from both AS and HSS, while none of the BS academics addressed it as a motive. Previous studies on collaboration note that this is an advantage that motivates some researchers to work with each other. Some examples of these studies are Beaver (2001), Sargent and Waters (2004), and Maglaughlin and Sonnenwald (2005). They state that researchers prefer to collaborate with former colleagues and collaborators, with their past experiences influencing their future joint work.

In addition to these motives, 30% of the academic participants also mentioned learning new methods and techniques, and getting access to time and research equipment, as important motivating factors in collaborating on joint projects funded by the scheme. Firstly, learning new research methods and techniques was mainly addressed by the LC from AS disciplines. This group of researchers consider collaboration in research as one means of learning new research skills and techniques especially by interacting with well-established researchers. Moreover, the research techniques and methods in AS disciplines developed faster than in other disciplines. Previous scholars consider this as one of the motives for involvement in collaborative research activities, especially in cross-disciplinary collaborative research activities (e.g. Melin, 2000; Beaver, 2001; Wagner et al., 2001; Sargent and Waters, 2004; Heinze and Kuhlmann, 2008).

Secondly, some FP and AP academics from AS disciplines, mainly those in administrative roles, used joint research activities as a means to get access to more time for research in order to produce joint research activities. A very limited amount of research highlights getting access to time as one of the main motivations to collaborate, however writers such as Finholt et al. (2002) and Maglaughlin and

Sonnenwald (2005) emphasised time as an important resource for collaboration. Others addressed the issue of imbalance between the administrative, teaching, and research load, which have negative impacts on the research productivity of researchers in general and specifically on collaboration (e.g. Iqbal and Mahmood, 2011). Given the importance of producing research for academics, especially those looking for promotion, or when it is a requirement of their contract, more administrative and teaching loads lead to limited time allocated for research, and therefore researchers have to either use their grants for teaching to buy-out or pay for others to carry out some of the main research tasks. Generally, collaboration helps to combine resources, which includes time needed to perform research (Maglaughlin and Sonnenwald, 2005).

Finally, getting access to research equipment is highlighted extensively by scholars as one of the key motivations to collaborate in research, and mainly between AS researchers where scientific equipment is needed (e.g. Newman, 2001; Cronin et al., 2004; Lee and Bozeman, 2005; Heinze and Kuhlmann, 2008; Yu et al., 2013c; van Rijnsoever and Hessels, 2011). Investment of research capital on equipment motivates researchers and policymakers at all levels to collaborate with others in order to maximize the productivity of R&D activities and increase the efficiency of utilising expensive research equipment. Confirming the findings of other researchers is the reason behind more collaboration in AS disciplines requiring hi-tech research equipment, which is very expensive and not every researcher or institution has an access to them (van Rijnsoever et al., 2008; Sonnenwald, 2007).

The last three motivating factors mentioned by the participating academics are to get training, promotion and tenure, and new research problems. Firstly, getting access to free training, mentioned by 26% of the academics researchers mainly from AS disciplines with LC academic ranking, mainly focused on using sophisticated research equipment to aid them in carrying out the joint research project and any future research activities. Melin (2000), Beaver (2001), and Sonnenwald (2007) are among the few scholars who have addressed getting access to free training as one of the motives to collaborate in research with others. Next, although the main objective of any academic researcher producing research is to get academic promotion, only 22% of the academic participants, mainly junior researchers, consider this funding scheme as a fast-track promotion and career development opportunity by producing more research. Researchers such as Sargent and Waters (2004), Sonnenwald (2007), and van Rijnsoever et al. (2008) also suggested social motives for collaboration such as academic promotion and career development and have found a positive correlation between academic research collaboration and professional career development and argue that unlike science-industry collaboration, research collaboration between researchers (science-science) is mainly for development of an academic career.

Finally, 17% (mainly from AS and HSS) of the academics mentioned tackling a new research problem as one of their main motivations to collaborate in joint research activities funded by the scheme. Bozeman and Boardman (2003) and Maglaughlin and Sonnenwald (2005) highlight this motive as one of the driving forces behind collaboration in research, emphasising the importance of collaboration and international scientific networks for researchers in order to develop new research ideas and get access to new research questions.

To summarise, the main motivating factors for academics to participate in collaborative research projects funded by the SQU-UAEU scheme are influenced somewhat by three different classifications groups; disciplines, academic ranking and collaboration experiences. For example, the findings of the distribution analysis of the motives indicate that the academic ranking influences the average numbers of motives of each participant to collaborate. The average number of motives to collaborate for academic researchers with FP ranking are lower (3/FP) than the average number of motives for LC (5/LC). This indicator suggest that LC participants are highly motivated to collaborate, especially in order to get access to funding, knowledge, and improve their research productivity when sometimes they find it difficult to compete with other senior researchers locally at the institutional level. In addition, the study indicates that there is a relationship between the collaboration experience and the number of motives behind the collaboration. Researchers with less than three years experiences are more optimistic about collaborations that fulfil a number of motives compared to more experienced researchers. Experienced collaborators are more focused in what motivates them.

7.4 What are the Outcomes and Impacts of Collaborative Research Activities between SQU and UAEU?

The aim of this question was to highlight the main outcomes and impacts of the joint projects funded by the scheme. Such findings will help to measure the success of the initiative. It is worth noting that most of the joint research activities funded by the scheme between the two universities were “knowledge-focused research” and not “property-focused research”. The funded projects produced intangible outcomes, contributed to scientific knowledge and produced technical, and scientific publications, and not tangible outcomes such as patents or develop products. Only one of the funded projects led to a patent registration for which no final decision has been made yet by the IP registry office in GCC. Another project may potentially lead to the development of a product with economic value.

Generally, the participants indicated that the outcomes of their participation in research collaboration schemes between SQU and UAEU ranked from the main fruitful objective outcomes such as new knowledge production in the form of joint publications and conference papers, to learning outcomes such as new research techniques, training staff/RA, and teaching and training graduate students. In addition, some of them address the qualitative impacts of their collaborative research outputs, either in terms of high citations, or the impact factors of the journals where they published their joint research outputs.

As noted in the literature review, many studies considered co-authored papers as the main outcome from joint research activities and used as the most efficient way to measure collaboration (e.g. Katz, 1993; Glänzel, 2001; Jin and Rousseau, 2005; Wagner and Leydesdorff, 2005a; Wang et al., 2005; Leydesdorff and Wagner, 2008; He, 2009; Jeong et al., 2013). Such indicators were used by the researchers to measure the impact of policies and strategies to enhance research collaboration. Co-authored papers are also considered as the main output from this funding scheme and almost 83% of the academic participants from all academic disciplines and academic rankings consider it as their main outcome.

The second main outcome as highlighted by the academic participants was conference publications, which was highlighted by 65% of the participants across all academic disciplines and rankings (mainly with AP & FP ranking). Such findings may be consistent with the motives of the researchers where senior researchers collaborate to produce better quality research and use conferences as a means to get feedback from other researchers and improve their output quality, compared with junior researchers who collaborate to produce more research in the form of journal articles. Prior studies which have addressed the important of co-publications in measuring research collaboration consider presenting in conferences as part of co-authorship outputs. Some of them such as Katz and Martin (1997) highlight the importance of collaboration in enhancing the visibility of outputs by presenting them at conferences. More researchers collaborating together will increase the network of contacts as each of them will present the findings within their own academic networks. This may even increase the possibility of publication in good journals (Katz and Martin, 1997).

Thirdly, an unexpected finding was that academic researchers ranked the impact of this funding scheme on the organisational culture in terms of increasing the awareness of the importance of collaboration as one of the main impacts. This was noted by 65% of them and across all academics rankings and disciplines (but mainly from AS and HSS). There is a relatively small body of literature that has emphasised the impact of research collaboration activities on the institutional research culture and how the implemented collaboration policies and strategies, such as this formal funding scheme, improve the collaboration culture in academia. However, many studies address the influences of both institutional and national culture on the success of research collaboration activities (e.g. Birnholtz, 2007; Ponomariov, 2008; Yu et al., 2013c). Others such as Sonnenwald (2007) address the importance of collaboration in improving cross-cultural understanding when the collaborators are from different cultures and countries.

It was not a surprise to consider the impact of joint research projects on the quality of research produced as one of the outcomes of this funding scheme, as previous studies have looked at the qualitative impact of research collaboration (e.g. Rigby and Edler, 2005; Pečlin et al., 2012; Lancho-Barrantes et al., 2013). Using the citations rate and the impact factors of the journal in which the research is published are considered as the two main proxies to measure such qualitative impacts of academic research collaboration (Persson et al., 2004; Sargent and Waters, 2004; Frenken et al., 2005; Rigby and Edler, 2005; Leimu and Koricheva, 2005; Figg et al., 2006; Inzelt et al., 2009; Rigby, 2009; Levitt and Thelwall, 2010; Pečlin et al., 2012; Lancho-Barrantes et al., 2013). Although 61% of the academic researchers, mainly senior researchers from AS disciplines, address the qualitative impact of their outcomes, other participants stated that they published their research and it took time to measure the quality of their published research as it depends on the number of citations.

> *Such quality could be evaluated after few years because it depends on many factors such as number of citations. (PI, 12)*

The researcher validates such findings by collecting secondary data about joint publications as an output from the funding scheme. A sample of 23 journal articles published jointly between the collaborative researchers were collected and analysed and it was found that the citations of many of these papers are higher than the 10-index and H-index of each of the participated researchers. For example, one of the PIs start publishing in the early 1990s and his overall average citations was 7 and both his H-index and 10-index are 18 and 48 receptively. Three of his six highly cited papers (one in 2006, cited 54 times, one in 2009, cited 49 times and one in 2012, cited 32 times) were published as an output of the projects funded by the scheme. This is also true for his collaborator in which his overall average of citations was 11 and both his H-index and 10-index are 16 and 25 receptively. Both researchers published together seven articles which are cited more than their overall average citations and four of them are higher than both of their H-index and 10-index. Almost 80% of the selected samples of journal articles have been cited more than the average citations of each of the participating PIs. This indicates that this funding scheme helped the researchers to produce a good quality of research

Next, the academic participants ranked the general management related skills gained and skills related to joint projects as the fifth main outcome/impact (addressed by 57% of them) of this funding scheme. This impact was mainly highlighted by researchers in their early academic career with less collaboration experiences.

Cummings and Kiesler (2003) and Sonnenwald (2007) suggest that during the collaboration process, the collaborators and the principle investigators (PIs) learn many administrative related skills such as how to manage the research project, project accounting skills, and human management skills. Sonnenwald (2007) also adds that administrative systems undergo modification as a result of joint research activities. The skills developed through collaboration with more than one institution and/or country, will help improve and develop friendly administrative procedures for the future collaborations (Sonnenwald, 2007).

The positive impact on teaching and training research students involved in joint projects was noted by 52% of the participants (mainly senior researchers from AS and HSS disciplines). The researchers emphasised the different skills learned by students, such as data collection, samples analysis, and administrative skills. Researchers such as Beaver (2001), Maglaughlin and Sonnenwald (2005), Sonnenwald (2007), and Cummings and Kiesler (2007) point out the importance of general research and collaboration to teach and train students as facilitators of research collaboration through performing background research and experiments. Such knowledge helps improve their employability over others who lack such skills. For example, Sonnenwald (2007) states that students could complete their study from a joint project either by working on part of the project or under the joint supervision of the collaborators. Some of the students from AS disciplines produce their Masters dissertations as an output of the funded project by using collected data. Moreover, students could be used to facilitate collaboration by performing tasks such as literature reviews, conducting experiments and acting as a bridge between collaborators (Maglaughlin and Sonnenwald, 2005).

78% of the academics consider enhancing their research productivity and efficiency as one of their main motives to collaborate, only 48% of them (mainly LC from AS and HSS academic disciplines) stated that such funding schemes have an impact on their research productivity and they are able to produce research more than if they were doing it alone. Such differences may be due to the fact that some of them are still working in their research projects and did not publish their results till the interviews date. The positive impact of research collaboration on the researchers' productivity and efficiency has been broadly studied by many researchers and at all levels (e.g. Liberman and Wolf, 1998; Frenken et al., 2005; Gulbrandsen and Smeby, 2005; Lee and Bozeman, 2005; Meyer, 2006; Van Looy et al., 2006; Breschi et al., 2007; He et al., 2009; Azoulay et al., 2009).

Similar to the qualitative impact, the researcher validates the findings of the academic interviews by collecting some secondary data about the impact of the scheme on researchers' productivity and found that some researchers produce a good number of journal articles from the funded projects especially in the last year of the project and the year after. For example, one PI was able to produce more than 10 journal articles and 12 conference papers while another produced 4 journal articles. In general, their annual research productivity increased in the final year of the project and the year following than in the previous years (before or in the first two years of the project).

The last three outcomes and impacts highlighted by the academic participants are producing technical reports and manuals, training staff/RA and new research techniques (noted by 30%, 26% and 13% respectively). Although limited numbers of studies consider both technical reports and manuals produced by collaborative research projects as one of the main important outcomes, this study indicates that some of the researchers who address real life problems produce some reports and manuals especially to be used by the end-users and direct stakeholders. This output was highlighted by HSS and AS (75% and 24% respectively) researchers who were tackling regional research problems. Secondly, previous studies consider collaboration as one of the important and effective ways of training in order to transfer knowledge to staff, such as RAs and technicians, as well as the researchers themselves (Beaver, 2001; Maglaughlin and Sonnenwald, 2005; Klein, 2008). Training staff and RAs were also highlighted by researchers from AS and BS disciplines, where the research team learn how to use sophisticated research equipment and analytical instruments. Finally, 3 out of 17 of AS academics, mainly in their early academic career addressed the new research techniques learned from their participation in joint research activities funded by the scheme. Wagner et al. (2001), Cummings and Kiesler (2003), Maglaughlin and Sonnenwald (2005) and Heinze and Kuhlmann (2008) draw attention to the development of these new research techniques as an output of collaboration, as it is quite common for interdisciplinary research activities to use new methods/techniques to tackle research problems.

7.5 The Opportunities of Research Collaboration in the Region

The key research findings of the motives, impacts, and research question five, on the potentials for research collaboration between PFUs in GCC countries, as well as the secondary data presented in chapter three, all confirm that there are opportunities to enhance joint research activities between PFUs in the GCC region. Research institutions and the researchers are highly motivated to collaborate in order to utilise the existing human and economic resources available in the region in order to enhance productivity and quality of research, which will have a positive impact on the social welfare of the people. The next set of sub-sections will present and discuss the key opportunities available in the region.

7.5.1 Opportunity One: The Priorities and the Existence of the Motivations to Collaborate

The majority of the participating PIs/DMs in this research consider collaboration in research as one of their personal/institutional priorities; *"it is very important for me to collaborate with others"* (PI, 3). However, although some of them have some international links and informal joint research activities, most of them consider national level as the most common form of formal collaboration in their institutions. In addition to environmental and cultural related factors, issues such as availability of regional funding and administrative challenges will be discussed in the next section to consider the main obstacles to collaborating with other regions and nations.

The participants highlighted the main reasons to consider research collaboration as one of their main priorities. Firstly, the importance of such activities is increasing especially as most of the recent international and regional research problems across all academic disciplines are very complex and require researchers to work jointly;

"these days' real life problems are very complex" (PI, 9). In addition, the academics participants stated that producing good quality research efficiently requires them to collaborate with each other, *"most of the times, working together in a research problem produce better results"* (PI, 12). Similar findings are noted by a number of scholars across disciplines such as Sonnenwald (2007), Leydesdorff and Wagner (2008), and Stokols et al. (2008b).

The case study also confirms some arguments and findings of scholars such as Bozeman and Corley (2004) and Bozeman et al. (2015), in terms of selecting collaborators. In general, the participators selected their collaborators based on some criteria such as old student, old supervisor and colleague, quality of publications, home institutions, and previous workplace. However, some of them connected through their colleagues in the university or by searching online for the right collaborators. One of the most important findings identified about selecting collaborators is the impact of researchers' mobility to identify the collaborators. The national researchers (GCC nationals) have low mobility and such issues affect the type of collaborators they have compared to the non-nationals researchers (expatriates). The researchers' who are from international countries such as the UK, USA, and other parts of the world have more international collaboration than the GCC nationals, because they have been working across many research institutions and create a strong network compared with others.

One of the main reasons for low mobility amongst GCC nationals' as noted by some participants is that the GCC nationals' continue working in their initial research institution, which in many cases is the one that provided them scholarships for postgraduate studies. They are either forced by law to work with them for years or they are satisfied with what they earn and there is no better financial incentive for them to move nationally, regionally or internationally, *"I do not have any reason to move from institution to another… I am satisfied with what I am getting and happy with my current job" (PI, 2).* Issues related to research culture and un-availability of attractive regional and national mobility systems are considered separate challenges by the academic participants.

In addition to the availability of both personal and institutional collaborative research priorities, either at regional or international level as confirmed by the participants, some regional research institutions tried to develop similar initiatives (i.e. SQU-UAEU funding scheme) to collaborate using different strategies, such as funding regional research activities, signing regional MoUs, or sending letters of intent. However, as part of this funding scheme, they are unable to locate any other regional funding opportunities for joint research activities. Even in terms of the signed MoUs, there is no effective result regarding research collaboration or academic related aspects, such as student and academic exchanges.

Such findings, validated by collecting some qualitative secondary data about visions, missions, and objectives of some of the other PFUs in the region, found that most of them and mainly regional research intensive universities that collaborate in research is one of their main priorities, especially at regional level. For example, Qatar University (QU) states in its mission that the *"…university community has diverse and committed faculty who teach and conduct research, which addresses relevant local and regional challenges, advances knowledge, and contributes actively to the needs and aspirations of society" (QU, 2016). Similarly,* King Abdullah University of Science and Technology (KAUST) highlighted the importance of collaboration as part of its main mission by promoting *"…collaborative research integrated with graduate education. We are a catalyst for innovation, economic development and social prosperity in Saudi Arabia and the world"* (KAUST, 2017). Finally, University of Bahrain (UoB) developed a strategic plan for 2016-2021 and noted in its strategy pillar three, relating to research with national and regional impact, *"The University can use its existing capability and strategic positioning in the region to focus its research on these significant regional priorities through international collaboration and regional stakeholders"* (UoB, 2017). Such examples confirm the findings that PFUs in the region consider collaboration in research, mainly at a regional level, as one of their priorities in maximising the utilisation of existing resources and solving regional research problems.

In addition to collaboration in research being one of their priorities, the participating researchers found that the existence of motivations to collaborate are a very important factor and play a vital role in successful joint research activities. This finding is supported by many scholars who postulate the importance of motivation in any joint research activities (e.g.Amabile et al., 2001; Raasch et al., 2013;

Teirlinck and Spithoven, 2013). It has also been noted that both researchers and their institutions are ready to engage in any regional research collaborative activities.

The PIs indicated that their participation in the joint funded activities was mainly in order to utilise existing opportunities, such as access to financial and human resources capital and solving some regional research problems. Other motives are access to additional research facilities, learn new methods and techniques, new research problems, promotion and tenure, and working with old colleagues and students.

The DMs claimed that their institutions launched such a funding scheme for many reasons. Firstly, collaboration in research is part of their main institutional objectives and is often addressed in official documents by the institutions in the region. These motives have been confirmed earlier through quotes from some of the PFUs websites. Secondly, some DMs highlighted that the strong historical ties and the diplomatic relationship between both countries at higher levels play a vital role in encouraging and motivating both universities to collaborate. Some of them stated that such strong relationship is also available between other countries in the region; *"I mentioned earlier, strong political relation is one reason… I think this is true with other countries in the region…"* (DM, 1) Finally, the DMs listed some other main institutional motivations to collaborate either through this funding scheme or regionally in general: to solve the regional research problems and enhance national and regional research productivity. Other motives include utilising available resources, reducing the risk of doing research, and creating a regional research network.

In conclusion, both academic researchers and their institutions have different motives to collaborate regionally or even at international level and such motives are considered as an opportunity and driving force in developing strategies to enhance regional research collaboration.

7.5.2 Opportunity Two: Availability of research Institutions and Funding Bodies

The availability of well-established research institutions and funding bodies in any country or region are considered as some of the main important opportunities to enhance joint research activities, especially when each one of them complement the other in terms of research facilities and resources needed to carry out the research activities. Firstly, GCC countries have more than two hundred HE institutions including universities, colleges, and research centres (Table 3.2) in which 37% of them are publicly funded. However, many of them were established very recently (within the last ten years) and concentrate on teaching and producing undergraduates degrees and it will take them longer to start producing a good amount of research activities.

For example, in KSA the number of PFUs increased from eight in 2000 to twenty-eight in 2015 in which 17 universities were established between 2005 and 2015. In addition there are many research centres attached to the regional PFUs; there are about 75 research centres attached to KSA universities (Alshayea, 2013). In Oman, SQU alone has 9 research centres attached to it while in UAE there are 6 research centres attached to UAEU. As stated earlier in chapter three, almost all of the research published by GCC countries, produced by 30% of the GCC HE institutions, mainly the PFUs. The reason behind this is that either some of them were established to be teaching oriented, or because they are at an early stage of establishment and research activities will be one of their future objectives.

Generally, research and collaboration are considered part of the main objectives of HE institutions, however, GCC institutions, similar to any other Arab World HE institutions, are focused on teaching and underestimate R&D activities and, unlike in developed countries, research institutions struggle to achieve their core objectives and produce high quality research (Bargouthi et al., 2007). The availability of a good number of regional HE institutions and governmental support encourages both researchers and policymakers to develop joint research activities in order to utilise the available research facilities and enhance their research quality and productivity.

Additionally, there is exponential growth in foreign HE institutions (see chapter 3) because some of regional governments' policies promoting the establishment of local campuses of international HE institutions. Countries such as Qatar and UAE opened their doors to international HE institutions to establish their branches. More than fifty international institutions currently operate in the region and contribute to both teaching and research related activities (McGlennon, 2006). For example, seven of the nine branches of international institutions established in Qatar are USA universities (i.e. Virginia Commonwealth University, Weill Cornell Medical College, Texas A&M University, Carnegie Mellon University, Georgetown School of Foreign Service, and North-Western University), which play an important role in Qatar international research collaboration, mainly with US-based research institutions. In 2015, 88% of the research outputs produced by Qatar and listed in Scopus were published with international research institutions and almost 30% with USA research institutions. Research collaboration between the two countries increased twenty-fold from 2004 and 2015 (Scopus, 2016). In general, these branches of international institutions can be used as bridges to connect regional institutions (i.e. public and private) to other international research institutions in their home countries.

Finally, similar to many other countries globally, each of the GCC countries has a national funding body to develop national research related policies and strategies and provide funding to academic researchers working in local research institutions (table 3.4). Additionally, some of these national bodies provide funds to improve the national research capacity by acquiring expensive research facilities and instruments. Examples of these bodies are KACST in KSA, QF in Qatar, TRC in Oman and NRF in UAE. Some of the regional countries create a special education zone to promote HE, such as Knowledge Village in UAE and Knowledge City in Qatar (Mukerji and Jammel, 2008).

All of these available research institutions and funding bodies, as well as the existence of the positive governmental strategies to attract international HE institutions to set up their branches in the region, provide the potential for positive strategies for joint research activities between them at both national and regional level. The policymakers have solid grounds to develop policies for regional collaborative activities.

7.5.3 Opportunity Three: Availability of Regional Research Infrastructure

In addition to the well-established HE institutions and national funding bodies, another main important input factor for any research activity is the availability of research infrastructure. The availability of research infrastructure was highlighted by many studies regarding enhancing research collaboration between countries (e.g. Kraut et al., 1987; Jones et al., 2004). The factors affecting joint research activities funded by the scheme, as presented in chapter six, were that almost 61% of the academic participants addressed the issue of lack of infrastructure at an institutional level. However, some of them generally pointed out that research infrastructure in the region has improved over the last decade.

Firstly, the improvements in quality and reduction in cost of communications such as using information technology and flight connections between countries are an important infrastructure to enhance research collaborations. The communication facilities between the GCC countries such as roads, flights, telephone lines, and internet facilities are much better than in the early 2000s. However, some participants highlighted the importance of investing more in this sector and reducing communication restrictions, such as blocking free communications software such as Skype, which researchers found to be cheap, useful, and an effective means of communication with each other and to get updates on joint research activities. In addition, others noted the difficulties in moving between countries for non- GCC nationals because of visa restrictions.

Secondly, although there are considerable differences between each institution’s infrastructure, many of the public HE institutions in the region have dedicated libraries for different research related facilities, such as books and computer labs, and are linked to different databases, such as periodical journals and online database software. Also some of them invest heavily in research infrastructure, like purchasing oceanographic research vessels and big laboratory equipment. However, some participants raised issues with the research infrastructure, such as lacking lab space in their institutions or investment in state-of-the-art scientific equipment and technology: *"our research equipment is very old"* (PI, 9).

A few years ago, KAUST, as a graduate institution, invested around US$20 billion in research infrastructure and started to attract postgraduate students from across the world (McGlennon, 2006; Day et al., 2010). Qatar also invested around US$133 billion in research infrastructure and projects to transform the country into a knowledge–based economy (McGlennon, 2006; Day et al., 2010). In general, the region invests substantial amounts of funds in building the national research infrastructure, however, all of these facilities are at the national level and are not fully utilised. Key indicators showed that there is a mismatch between what has been invested and the national research productivity. The availability of such national level research infrastructure opens the door to developing regional collaboration initiatives in order to fully utilise such investment and improve the national and regional research productivity and quality, which will in turn improve socio-economic regional welfare.

7.5.4 Opportunity Four: Availability of Funding and Human Resource Development Programmes

In addition to the well-established HE institutions and national funding bodies, another important input factor for any research activity is the availability of resources. The term resource includes both economical and human resources. The participating researchers highlighted the important of availability of resources in any collaborative research activities and research in general. Most of the GCC countries allocate budgets for R&D activities in general as well as developed policies to improve the R&D human resource capital, however, only limited research has been produced so far compared with the regional R&D investment.

Some of the participants pointed out those GCC countries, to some extent, allocate sufficient amounts of funding for research related activities compared with previous decades: *"most of them [GCC countries] allocate budgets for research..."* (DM, 6). There are different R&D funding sources and research grants in each country as well as in some of the research institutions. For example, apart from TRC national funding schemes in Oman, SQU has three main funds from the university, as well as others sources nationally from both the public and private sector. Similarly in UAEU, some researchers highlighted the improvements in funding sources in the country and listed some of them that are available to the academic researchers in the university as well as other national sources: *"in our university I can apply for at least four of the available institutional funding schemes… Also we have [name of the national body] as well as private sector companies"* (PI, 20).

Some other DMs and PIs stated that this is also the case in other GCC countries, *"other regional countries also have funding such as Qatar allocated big investment in research and also the same in KSA"* (DM, 1). The collected secondary data also confirms what was highlighted by the participants in terms of funding. For example, QNRF which is the national funding body in Qatar, allocates different funding schemes, such as the National Priorities Research Programme (NPRP) and Biannual National Research Survey (BNRS) programme. In KSA, KAUST offer different funding schemes such as Science and Engineering Engagement and Development Funds (SEED) and the Competitive Research Grants (CRG) programme. However, all of these funding opportunities are at national levels and it's not open to regional researchers to apply.

Generally, the spending in R&D in the region is modest compared to other developed and (some) rapidly developing countries. It is sufficient compared with the total number of human resource capital in R&D (i.e. researchers). In KSA, the total funds allocated for R&D activities is around 0.3% of the country's GDP and aims to reach 2% by the end of 2025 (Alshayea, 2013). Similarly, Qatar aims to spend around 3% (equivalent to US$1.5 billion) of its GDP on R&D by 2015 (Day et al., 2010). In Oman, the spending in R&D increased from 0.21% in 2014 to 0.25% in 2015 (TRC, 2017).

However, many of participants suggest three different issues related to R&D funding in the region. Firstly, some of them noted the issue of research productivity compared to funding allocations. Although the countries in the region allocate a modest budget for R&D activities, the regional research productivity is very low: *"Research output is limited compare to our budgets… this is the case in many Arab world countries. Let me ask one question, how much [name of the regional country] producing and how much allocating?"* (DM, 5). Such issues can be resolved by developing collaboration between the countries.

Secondly, some of them highlighted the point that the source of most of the allocated funds are from the public sector and it is important to enhancing the private sector to participate in the regional R&D activities. This issue was also addressed by the United Nations (UN) in its report about Arab human development, published in 2002 (UNDP, 2002).

Finally, the most important issue related to this research is that apart from the SQU-UAEU joint funding scheme, the participants highlighted the limitation of having regional funding schemes. None of the regional funding bodies allocate a budget for regional joint research activities, where researchers from more than one regional country could be funded jointly, unless researchers from outside the country participate in any funded research project, as long as the leading team is from the country which that funding body belongs to. The SQU-UAEU funding scheme is the only one available in the region as some participates claimed.

In conclusion, the availability of different funding sources in each of the regional countries, as well as limited regional research productivity, guide us to develop strategies to enhance collaboration in research at regional level by pooling some of the available financial resources into a regional pool, which will have a positive impact on research efficiency and productivity as well as quality.

The economy in GCC countries depends on oil and they have to transform their economies into knowledge-based economies. Such economies mainly depend on skilled human resource capital, mainly academic researchers. Developing a skilled research related workforce and building up the regional human resources capacity is one of the important elements in enhancing the regional research productivity and collaboration. OCED (2001:18) defined human resources as the *"Knowledge, skills, competences and attributes that facilitate the creation of personal, social and economic well-being"*, which is very important for research activities. Although, GCC countries have a sufficient number of research institutions and researchers working in them with a strong research reputation in their fields, GCC countries suffer to some extent from the shortage in skilled manpower, mainly researchers and research support staff (Achoui, 2009), which forced them to invest heavily during the last decade in human resource development (HRD) programmes, which is essential at this stage in order to enhance regional knowledge production.

For example, in KSA which is the largest country in the region, there are only 23 researchers per 100,000 in the population, compared to almost 500 researchers in some developed countries like the UK and USA (Alshayea, 2013). However, the last decade witnessed improvements in HRD policies in KSA by developing scholarship programmes to increase the research capacity by sending students abroad to do their postgraduate degrees. The total number of scholarships increased from almost 12,000 in 2003 to more than 140,000 in 2011 in which 24% of them are at Masters level and 5% at PhD level, mainly studying in the UK and USA (Alshayea, 2013). Other countries also initiated HRD programmes such as Oman where the National Programme for Postgraduate Studies, which mainly aims to develops the national human resources across the academic fields to become good researchers. The government provides nationals with scholarships to do their HE studies in top ranked universities across the world, mainly in the UK, USA, and Canada (MOHE, 2016).

Moreover, although the academic participants addressed the issue of the weakness in postgraduate programmes, some of the HE institutions started to offer research postgraduate programmes and offer scholarships for the high academic achievers from the national and regional students: *"We have some masters and PhD scholarships for the top graduated students from the university and even from inside and outside the country"* (DM, 1). However it is very limited in term of programme diversity and enrolment capacity.

Given the importance of human resources for research innovation, key objectives of human resource policies have been to raise the level of knowledge and skills of the labour force. Particular policy objectives have included meeting the need for skills for innovation by enlarging the supply of the highly skilled workforce and by facilitating its mobility in order to optimise the use of human resources, to facilitate the cross-fertilisation of ideas and learning, and to address structural mismatches of demand for and supply of skills (OECD, 2001).

7.5.5 Opportunity Five: Common Socio-economic Ground and Political Environment

Some key findings of researchers such as co-authored publications trend show that strong diplomacy and historical ties between countries influence the geographical direction of international collaboration (Boekholt et al., 2009), however, this is not true when looking at GCC countries. Although they have a similar socio-culture, ethnicity and strong historical ties and political ground, their research collaborative activities are very limited. Boekholt et al. (2009) state that one of the strategic motives (drivers) behind involving the countries, mainly in the European region, into international research collaboration is to create good and stable diplomatic relationships and strengthen historical ties between them. For this, the EU as stated earlier, developed strategies and funding programmes to enhance and achieve such objectives.

The positive advantage of strong ties and a common political environment in the GCC is under-utilised by the countries in the region. Unlike EU countries, GCC countries share a common language (Arabic), and English is the second main spoken language in all the countries in the region. While English is the mode of learning and teaching in most of the AS and BS disciplines in the regional HE institutions, the Arabic language is used in some of the HSS disciplines. This makes it easier for both policymakers and academic researchers in the region to communicate and develop strategies and research activities.

In addition, GCC countries face many similar research problems such as socio-economic, political and environmental challenges. For example, almost all of them depend on scarce resources in their economy, which are oil and natural gas. Although many country level efforts have been implemented to diversify the national economy and reduce the high dependency on oil, the results and changes have been limited (Saif, 2009). Developing regional strategies and working together may lead to better results and produce more effective impacts on such issues. For instance, working together on joint R&D activities and strategies to enhance other sectors, such as renewable energy, industry and tourism, is essential at this stage. This is especially the case after the dramatic decline in the oil prices (from $105 in June 2014 to $44 in September in 2016) in the last two years (i.e. 2015 and 2016),following more than 12 years of oil price booms, which has had a negative impact on the development strategies of these countries. Other joint research activities related to develop policy and strategies to solve regional research problems in oil production, agriculture, education, and other social science issues. For examples, enhancing oil recovery, desalination, educational reform, and unemployment research related problems could be developed by researchers from different institutions in the region.

Finally, some scholars such as Sonnenwald (2007) highlighted the importance of joint collaborative research activities to develop a strong understanding and enhance political relations between countries, even if they are strained. GCC countries share similar political characteristics and have a strong political relationship. The main objective of establishing the GCC is to coordinate and strengthen the political relationship between the member countries (Al-Issa, 2005; Abraham, 2015). Given the existence of strong cooperation in political and internal region security related issues, GCC countries need to enhance and develop regional strategic research activities in political related issues. Such activities could not be done unless there are joint research activities funded by the region.

7.5.6 Opportunity Six: The Positive Impacts of SQU-UAEU Funding Scheme as a Good Experience

The findings from the interviews as well as the secondary data shows that there is a positive impact of the SQU-UAEU funding scheme. Similar to what other scholars pointed out, the participants noted both the quantitative and qualitative indicators as an output of their joint research projects funded by the scheme. As stated earlier, the main quantitative output of academic research collaboration is the increase in co-authored papers between the researchers and institutions (Katz and Martin, 1997;

Wang et al., 2005; Lee and Bozeman, 2005; Leydesdorff and Wagner, 2008; Jones et al., 2008; Mattsson et al., 2008; He, 2009; Savanur and Srikanth, 2010; Carillo et al., 2011). This was also the main quantitative output addressed by the participants when the joint research production between the two countries increased by more than 14 times. In addition, the participants present some other quantitative indicators, such as the number of students involved in the projects and the technical reports and manual. Finally, the funding scheme has positive impacts on improving the research quality and productivity of both the researchers and institutions. Some of the participating academic researchers point out the high citation rate of some of their joint publications *"…I would say the two main papers are heavily cited"* (PI, 3).

In addition to these quantitative and qualitative impacts, the participants pointed out how the funding scheme plays an important role in terms of improving the culture awareness of the importance of collaboration. The number of proposals submitted for funding from the scheme increased compared to the early years of launching it. The investigators in some of the previously funded projects from the scheme had become PIs in recently funded projects. This impact is underestimated in the previous collaboration literature, especially in the context of western countries. This may be due to the fact that the research culture in these countries is different than that of the GCC. They have better awareness of the importance of joint research activities, especially at the international level.

Generally, although the number of funded projects and volume of funds allocated are not at desirable levels, the findings of this research confirmed that this funding scheme has had the following positive impacts:

1. A link created between the participating researchers which helps them get access to each other's research institutions' facilities during or after completing the collaborative projects, and especially for analysing samples during their routine research activities.
2. Many researchers such as junior academics found it difficult to get access for funding in their individual research institutions. This funding scheme helped them get access for funding and build a research infrastructure which they can use for future research.

3. Producing both good numbers of published articles and conference papers from some of these projects works in favour of the participating researchers, and their research productivity improves because they would be unable to produce such a volume of output independently.
4. The most highly cited papers of some participants were produced as an output from funded projects.
5. The completed projects help to build the research and administrative related capacities of both the researchers and their graduate students who were involved with them (especially postgraduates).
6. The research institutions utilise the budgets allocated. Funding two groups of researchers jointly is better than funding each of them separately, especially when capital equipment or expensive instruments and software is needed to carry out the projects.

7.6 What are the Factors Affecting Research Collaborative Activities between SQU and UAEU?

This research question aims to identify the main challenges faced by the researchers in their collaborative research projects funded by the scheme. Most of the factors identified in this research have been highlighted previously in different contexts and studies on research collaboration. However, a few factors have been identified from this research that may relate more to the context under investigation than others. Examples of these factors are institutional research, culture and bureaucracy in administrative and purchasing related issues. While Sargent and Waters (2004) classified the factors affecting the collaboration process into three different categories, which are interpersonal process factors, institutional factors and environmental factors. As stated earlier. the findings of the thematic analysis of this study grouped these factors into four categories, which are factors related to 'Personal characteristics', 'Institutional policies and supports', 'External Stakeholders supports' and factors related to 'National R&D policies and supports'. The following sub-sections will discuss the findings of these four categories. Then section 7.7 will summarise these factors by presenting the main challenges of research collaboration between PFUs in the GCC.

7.6.1 Factors Related to Personal Characteristics

The participants focused more on the different obstacles faced in their joint research activities, mainly relating to institutional and external environments, and underestimated the personal factors which hinder collaborative research activities. They assume that such factors could be sorted out with more experience and build trust between them. In general, the findings of this research as presented in chapter six showed that collaborative team members' characteristics have an influence on the progress of any collaborative research activities, and the success of any joint research project is often attributed to the harmony within the group and how each of them perceived the research project. In addition to having the technical project-relevant skills and knowledge about how to achieve the project objectives and tackle research problems, the academic participants, mainly from AS and HSS disciplines, highlighted five main important factors, that are considered as the main personal characteristics which affect the progress of their research projects. These factors include sharing mutual interests, trust and no hidden agenda, personal flexibility and adaptability, communication skills and time allocation and commitment. The average number of factors per academic participant in this category was 2, while the average of statements per factor was 10 statements.

The most highlighted factors were the importance of shared mutual interest and trust between the collaborators (61% and 52% of the academics participants respectively). In general, most of the researchers, mainly LC and AP from AS and HSS disciplines, with less collaboration experience, highlighted the importance of having mutual interest between researchers and also noted the importance of building trust between them. Unless they share similar research interests and trust each other, working jointly will not succeed and they will face many difficulties. For example, one of the academics researchers stated that, *"We will not do the project unless we shared the same interest…"* (PI, 9). Previous studies of research collaboration, such as Maglaughlin and Sonnenwald (2005), Stokols et al. (2008b) and Bruneel et al. (2010), have shown that the mutual research interests of collaborators is considered an important factor which affects collaborative research activities and can influence future joint research activities. Moreover, the participants stated that such mutual interest and trust can be built either on previous collaborative experiences and successful research activities or through informal meetings during conferences and other scientific and social events. Such means helped the researchers to discuss their research backgrounds and develop a common research interest and build trust between them, and therefore have joint research activities. One of the academic researchers stated that the success of their project was attributed to the common interest previously built between the researchers.

> *I think our success is mainly due to having similar research interests…what we achieved in previous research activities together helped to collaborate more*. (PI, 10)

Previous research supports this findings such as what produced by Sargent and Waters (2004) and Boardman and Bozeman (2006), who stressed the importance of previous successful collaboration experience on building trust and common interest between researchers. Any previous bad experience in any collaborative activities between researchers can create a bad impression and will discourage future collaboration (Sargent and Waters, 2004). Moreover, researchers have to present positive and honest intentions in order to develop trust between them and put their efforts and knowledge towards the joint project objectives.

Additionally, the importance of allocating personal time and commitment for the joint research projects was also raised by 43% of the academic participants from all academic disciplines and rankings, but mainly by AS disciplines. They argue that more time is needed for joint research projects, especially if the collaborators are geographically separated. Any delay from one side will have a negative impact on the progress of the entire project and this may force the project leaders to apply for time extensions. The scholars of research collaboration such as Mattessich et al. (2001) Sonnenwald et al. (2004) and Cummings and Kiesler (2007) stressed the importance of having time allocated for such activities and the researchers have to commit themselves in order to accomplish the assigned tasks. Furthermore, new commitments or assigning new administrative roles to members of the research team should be avoided. The resource allocation theory implies that any resources allocated for a task will decrease as resources allocated to other tasks increase (Porter et al., 2010).

Next, the findings of this research showed that collaborators have to be flexible and adaptable in order to achieve the research objectives. This factor was highlighted by

35% of the academic participants, mainly by LC in both AS and HSS. Unlike BS research, AS and HSS research progress and outcomes are unpredictable. Collaborators should have the ability to accept such results which may lead them to change part(s) of the research activity. Any resistance or rigidity in the collaborators will lead to difficulties or at least will affect the quality of research produced. Similarly, the importance of having flexible team members in a joint research project was also addressed by many scholars (e.g. Kagan, 1990; Mattessich et al., 2001; Bruce et al., 2004; Sargent and Waters, 2004; Corley et al., 2006).

Finally, 26% of the participants, mainly AS and HSS, also reported that communication skills, especially in the project leaders (i.e. PIs) is an important personal factor. The PIs have to update the researchers on progress, obstacles, achievements and suggested changes in the research plan. They have to use different communication means, such as face-to-face meetings, and utilise ICT available in both universities. One project was terminated by the funding scheme because of a lack of communications between the PIs. These findings support the previous research on the importance of communication and regular updates between collaborators to promote and increase the success rate of joint research activities (Olson and Olson, 2000; Mattessich et al., 2001; Cummings and Kiesler, 2003; Hara et al., 2003; Jones et al., 2004; Sargent and Waters, 2004; Maglaughlin and Sonnenwald, 2005; Sonnenwald, 2007; Stokols et al., 2008b). Effective communication and coordination between researchers facilitates the functioning and success of the collaborative project, especially if the collaborative team is geographically dispersed (Amabile et al., 2001). For instance, Hara et al. (2003) demonstrated the importance of regular communication between researchers using different ICT, such as online web pages and videoconferencing, in order to update collaborators on the joint research activities.

In conclusion, all of these personal factors were highlighted by AS and HSS researchers in different academic rankings and collaboration experiences. However, it seems that having more collaboration experiences could overcome these challenges, because as researchers collaborate more, they develop the required skills, build trust and come to share research interests. Researchers have to commit themselves to the assigned tasks and accept any unexpected results. Scientific events, such as social gathering, regional conferences and seminars, could be used to break the ice and hold informal communications between researchers and raise awareness of each other's research interests and experiences.

7.6.2 Factors Related to Institutional Policies and Supports

The factors related to the institutional contexts surrounding collaboration were considered by the participating academics as the main factors hindering collaborative research activities. The analysis of the findings showed that there are eight different factors grouped under the category of "Institutional policies and support". These factors are collaborative research policy and priorities, institutional research culture, administrative problems, funding problems, purchasing problems, institutional flexibility, research infrastructure and Incentives. The average number of factors addressed per academic participant in this category was 5 while the average statements per factor were 14 statements.

The main two factors that have been raised by most of the academic participants are the absence of user-friendly administrative and purchasing systems in which many related problems hinders collaborative research activities between the two universities. While 87% of the academic participants stated that pre- and post-approval administrative related processes were considered as part of their main challenges, 78% of them mentioned other purchasing related difficulties such as acquiring materials and purchasing research equipment and consumables as the main challenges they have faced. While project administrative problems faced by all group of researchers, especially those with less than three years of collaboration experiences and in their early academic careers. None of the HSS researchers mentioned issues related to purchasing and this may be due to the fact that the most important resource needed for research activities in these disciplines is human resources, which does not require big purchases like research equipment or materials. In general, the logical explanation for such delays, as highlighted by some researchers, is the fact that both universities follow the public sector system in both countries and such systems are developed for other public bodies such as civil service ministries, which may not suitable for research institutions. As one of the academic participants stated that *"The university is bounded by the governmental laws and this should be looked at if they want people to do research"* (PI, 4). The research institutions in the region need to develop user-friendly research administrative systems that give the researchers more room for managing their projects and acquiring the required materials and research related staff.

In addition to the previous two impeding factors, 61% of the researchers faced difficulties in terms of institutional flexibility such as transferring budgets between items and budgeted years. Such problems were highlighted by participants from all classification groups, but mainly from AS and HSS disciplines. Such internal institutional logistics support needs to be more user-friendly and flexible in order to enhance collaboration, and the policymakers in PFUs have to work internally and with other external bodies to develop a system which encourages researchers to perform research activities.

Previous research focused on public research institutions, such as Heinze and Kuhlmann (2008) and Sargent and Waters (2004), highlighted the importance of institutional logistics support by having friendly and flexible administrative and purchasing systems for research activities, which encourage researchers to do research and collaborate with others regionally and internationally. For example, Alshayea (2013) notes the negative impact of public bureaucracy regulations on the performance and efficiency of many of the research institutions and centres in KSA. Administrative bureaucracy is considered as a key obstacle undermining the development of strong collaboration (Knobel et al., 2013).

The academic researchers admit the importance of such funding scheme and have recognised the un-availability of similar joint funding between regional HE institutions or countries, however, 61% of them also pointed out funding related procedures. One example relates to the fact that each institution has to allocate 50% of the approved budget for the project for its researchers. They mentioned that the tasks to be achieved by each group of researchers are different and therefore the required budget is also different.

> *"We are doing 70% of the work. They are doing 30% of the work. We need 70% of the budget and they need 30% of the budget. They said NO."(PI, 1)*

Others raised the issue of budget-cuts in which the approved budgets are less than the proposed one. Such practice forces researchers to change the research plan and objectives based on the approved budget. Moreover, the internal regulations in both universities do not allow the PIs of the project to transfer allocated budgets between the collaborating institutions. Funding related issues were raised more by LCs and APs from both AS and HSS disciplines. Such research activities require more budget and flexibility in term of budget allocation and movement, since the entire proposed budget is estimated, especially when it involves purchasing consumables and equipment from overseas. The importance of availability of funding and the flexibility of budget allocation has been noted in the literature, such as Beaver (2001), Maglaughlin and Sonnenwald (2005), Corley et al. (2006), Sonnenwald (2007), and Defazio et al. (2009).

Another institutional challenge reported by 61% of the academic participants was the weakness in research infrastructure. This was mainly addressed by researchers from AS disciplines across all academic ranking and experience. While some of them acknowledge the availability of excellent research infrastructure in some institutions in the region, especially those who worked in some of them, they noted that weakness in their institutional infrastructure discouraged researchers from doing research and collaboration. Examples of these infrastructure related challenges are un-availability of well-established research labs, state-of-the-art scientific equipment and free communications facilities. This finding is in line with others who have studied research collaboration (Amabile et al., 2001; Mattessich et al., 2001; Jones et al., 2004; Maglaughlin and Sonnenwald, 2005; Sonnenwald, 2007). For instance, Jones et al. (2004) stated that the poor infrastructure in some developing countries, such as electricity, poor roads and ICT facilities, makes communication between researchers difficult and hinders collaboration. The policymakers in the region need to provide funding to improve the research infrastructure in research institutions and develop systems to utilise existing infrastructure.

Another key finding relating to institutional challenges is the un-availability of incentive systems in both universities for joint research activities, which was also raised by 61% of the academic researchers, mainly LCs and APs (60% and 90% respectively), from both AS and HSS (59% and 100% respectively). The joint research activities require more time and effort to promote, the research institutions have to work in some pay-for-performance strategies to incentivise collaboration for researchers. Examples of incentives highlighted by them include financial rewards, reduced teaching load, and peer recognition, as well as considering such collaboration as promotional criteria. Previous research such as Cao et al. (2013) notes the importance of incentive systems to encourage researchers to collaborate. Many governments and research institutions implement incentive strategies in order to enhance research productivity and quality (see for example, Fuyuno and Cyranoski, 2006; RAE, 2008; Franzoni et al., 2011).

The last two institutional challenges, highlighted by 39% of the participants, are the institutional research policies and priorities and the research culture. Both issues were highlighted by academic researchers from AS and HSS disciplines, however, researchers from HSS focused more on the institutional research culture, which suggests that they are more concerned with other academic activities such as teaching and less on research. In general, the academic participants indicated that their research institutions encourage them to collaborate at all levels; however, they stated that there are no clear institutional collaborative research policies and regional research priorities to be followed by the researchers. They suggest that research institutions in the region should have clear policies to be followed by its researchers, as well as clear regional collaborative research priorities. Moreover, different strategies need to be implemented to instil a research culture in all research institutions in order to promote research across all disciplines (Oldham, 2005; EC, 2012).

In conclusion, the institutional factors that need to be tackled in the region, considered by the participants, in order to promote research and collaboration have been highlighted more by researchers from AS disciplines, which show that this group of research requires more flexibility and user-friendly research systems. Moreover, researchers with more collaborative research experiences face less institutional difficulties, because they learned how to manage their research projects as well as the institutional processes of administrative and financial procedures.

7.6.3 Factors Related to External Stakeholders Supports

Apart from institutional (internal) support, collaborative research related activities require logistics support from external stakeholders. The findings as presented in chapter six show that the participating researchers faced difficulties in their joint research activities in relation to external stakeholder support. They highlighted three main challenges; data collection support, other logistics support and implementation support. The average number of factors addressed per academic participant in this category was 2, while the average number of statements per factor, was 13 statements. However, in some cases these challenges interrelated with national level challenges. For example, researchers stated that the lack of access to data and national sites are both considered as stakeholder related challenges, as well as national level issues because of the lack of national policies supporting the free access to data for research purposes.

Firstly, logistics support needed from external bodies, such as governmental authorities, in order to approve the purchases of chemicals and clearing the imported reagents, materials and equipment, for joint research projects, from the port authorities. About 70% of the participants, mainly LCs and APs (80% of each group), from AS and BS (88% and 50% respectively), addressed the issue, while none of the HSS researchers noted this problem because they do not require much logistics support from external stakeholders; however, they require other support such as data collection and implementation support. The participants classified two types of logistics support. Firstly, some governmental bodies implement regulations in which importing any chemicals to the country needs approval from them by following a lengthy process. Researchers from AS argue that in order to enhance research activities in the region such regulations need to be lifted for research institutions because they require these chemicals for research and teaching purposes. Secondly, some researchers pointed out the delays in receiving requested chemicals, reagents, materials and equipment, due to the bureaucracy in port authorities through the implementation of lengthy administrative and clearance approval processes.

Secondly, researchers in many cases need to collect data from different governmental bodies and private sector organisations, as well as from other bodies such as those that control national sites, natural and social resources. About 65% of the academic participants from both AS and HSS (65% and 100% respectively) academic disciplines, across all academic ranking and collaboration experiences, pointed out some data collection difficulties when accessing such data as one of their main challenges. Such difficulties may appear more often when the research project involves another country because of national policies. Given these difficulties, they highlighted some alternative means by which they can collect data, such as hiring people from these organisations as facilitators to collect data. In such cases, they have to provide financial incentives which may have not been budgeted in the initial proposal submitted. The participants noted the importance of having national policies force the different organisations and bodies to provide data for research related activities in order to promote research.

Finally, the last challenge pointed out by 35% of the participated researchers related to this category is the difficulty of piloting and implementing the findings of their joint research projects. Similar to the data collection problem, this issue was raised by AS and HSS academics (29% and 75% respectively). They argue that the findings of some of the joint research projects could be implemented and the stakeholders have the potential to use it in order to improve and/or develop new products, services and production processes. However, in some cases they face resistance from the top management in these organisations to pilot and implement these findings.

In conclusion, stakeholder support has been highlighted in the literature by many scholars, especially in developing countries where there is some resistance from the top management in some organisations, as well as limitations in their knowledge of socio-economic impacts of implanting some research findings (Mattessich et al., 2001; Bruce et al., 2004; Maglaughlin and Sonnenwald, 2005; Bammer, 2008; Martinelli et al., 2008).

7.6.4 Factors Related to National Research Policies and Supports

National level policies and support for research collaboration are considered as the last group of factors which have an impact on joint research activities funded by the scheme. The academic participants highlighted four main challenges related to this category which are: the lack of graduate programmes and RAs, national research culture, access to national data, and sites and national collaborative research policies. The average number of factors addressed per academic participant in this category was 2, while the average number of statements per factor was 13 statements.

The first national level issue in the region, addressed by 74% of the academic participants, was the lack of postgraduate programmes and PhD research students. The researchers consider these programmes as the source of getting support staff for their research and it is commonly know that PhD students carry out the main research tasks such as collecting and analysing the data. Moreover, the academic participants consider such programmes as the means to attract high quality regional and international students, which will expand the regional research network and will have a positive impact on future collaboration. They recommend providing scholarships and different logistics support for both regional and international students in order to attract them and build the regional research capacity.

Such findings are supported by previous scholars who highlighted the importance of postgraduate programmes for research activities in which they found a positive relation between postgraduate programmes and research productivity (e.g. Rushton and Meltzer, 1981; Jordan et al., 1988; Jordan et al., 1989; Dundar and Lewis, 1998). Others support the view of hiring postgraduate students as RAs for research activities. For instance, Dundar and Lewis (1998) found a positive relationship between the postgraduate students as RAs and research productivity.

In addition to postgraduate programmes, the academic participants addressed the lack of well-trained support staff for research. There are three main reasons noted by the participants on this issue. The first is related to hiring staff on a temporary basis (fixed term contract) whilst they are searching for a permanent jobs in the local market. The second is related to financial incentives such as salary package being comparatively lower than the market, as well as being at the same level for both high and low demand graduates. The last reason behind un-availability of technical support staff related to the imposed restrictions in hiring RAs internationally, where researchers can get cheaper well-trained technical staff with very low turnover.

The second national level issue as addressed by the participants is national culture and how the policymakers and other parties in each country perceive the research activities. They argue that there is little attention from these players toward research and they suggest some awareness programmes about the importance of research and instructions to different organisations to support research activities and provide the researchers with their logistical needs. They believe that such programmes will help researchers tackle different problems smoothly, as well as get full support from different levels of people. Although many researchers have demonstrated the importance of research collaboration, few of them have paid close attention to the national research culture (e.g. Thomas et al., 2009; Yu et al., 2013c).

The third factor that influences regional collaboration between researchers is related to difficulties to get access to national data and sites. As addressed in the previous sub-section related to stakeholders support, the researchers found some difficulties in getting support to collect research data from different national bodies such as ministries and other private sector bodies. They consider this issue also as a national level problem which needs to be addressed by legalising authorities in each of the regional countries.

Finally, in addition to institutional level policy for collaborative research activities, the participants also addressed the lack of national level policies to promote collaboration, especially for regional related research problems. An example of these policies is free access national data for research related activities. In many cases researchers need to collect data from different regional countries in order to compare and produce better quality research as well as to sort out the regional research problems. In addition some researchers address the importance of having national research priorities especially for regional collaborative research. They suggested that national research councils/bodies in each country, coordinating with the national research institutions and centres, can play a role in developing such national research policies and priorities (Luukkonen et al., 1992; Oldham, 2005; EC, 2012).

7.7 The Challenges of Research Collaboration in the Region

While the previous section discussed the findings of the factors affecting the joint research activities funded by SQU-UAEU funding scheme, this section will briefly summarise these factors into eight main challenges faced by researchers that need to be addressed by policymakers at both institutional and national levels in both countries, as well as other regional countries in order to promote regional collaboration and utilise both economic and human resources available in the region for regional research related activities, which can bring economic and social benefits to all GCC countries.

7.7.1 Challenge One: Bureaucracy in Administrative and Financial Procedures

The research activities always require a lot of institutional support from the different administrative offices such as recruiting RAs and purchasing equipment and research related materials. As clearly stated earlier, the academic participants highlighted the difficulties and the lengthy administrative processes such as in hiring RAs, consultants and getting administrative approval to conduct fieldwork trips in order to collect data. In addition, complex administrative procedure delays, and in some cases, restricted participation in scientific conferences are also factors (Alshayea, 2013). In general, the participants complain about different approval layers before getting the final approval, which causes delays in the progress of joint research project. In addition, the public research institutions in the region follow the governmental procedures in terms of procurement of materials and research equipment. Such procedures may suit other governmental bodies, such as ministries, where the needed materials are not urgent compared to research related activities, which require fast processes. Other issues highlighted by the academic participants related to institutional flexibility in terms of getting access to and managing research budgets, such as transferring items between financial years, getting petty cash for urgent needs. The participants stated that all of these lengthy administrative and financial related processes and restrictions have negative impacts on the research activities and may cause a decrease in the number of proposals submitted for funding from any funding scheme, such as internally funded grants and the SQU-UAEU funding scheme. The currently deployed research management systems need enhancing through ICT and making them more flexible and user-friendly.

Other external factors related to stakeholder support, as noted in the previous chapter, effect purchasing processes, such as getting approval from governmental agencies and customs authorities in order to get required research materials, such as chemicals and equipment. Moreover, other lengthy processes related to post-purchase clearance and collecting the requested materials from official authorities such as ports.

Alshayea (2013:49) stated in his research about KSA that *"Saudi universities have 75 research centres, but they suffer from a predominance of bureaucratic regulations that limit the effectiveness how university functions perform and weaken regulatory and structural frameworks."* All of these bureaucratic procedures create hurdles that limit the production of research and joint collaborative activities.

7.7.2 Challenge Two: Lack of Regional Funding

The academic participants acknowledge the availability of institutional and national level funding programmes in most GCC countries. In addition, they consider the SQU-UAEU initiative as an important source of funding available to them, especially to tackle regional issues faced by both Oman and the UAE. This funding scheme has helped researchers in both institutions to produce research and access the different research facilities available in both universities, as well as other benefits achieved through collaboration. However, the participants noted the issue of the lack of other regional funding schemes, similar to this initiative, for collaboration between two or more regional research institutions which any researcher from any HE research institution can apply to. They do believe that such regional level funding is essential to promote collaboration in the region. They highlighted many regional research related issues which need to be tackled jointly by all the GCC member countries as well as other benefits which could be achieved through regional funding at both national and regional levels. In addition to providing funding for joint research grants, regional funding could help to build regional research capacity.

For example, the participants highlighted the lack of research facilities, such as labs and equipment in their universities, as well as in other regional HE institutions. Having a regional funding scheme could be a source to develop the research capacities of these institutions. In addition, the researchers complain about the weaknesses in regional ICT facilities, such as internet and e-learning facilities. They stated that regional funding could be utilised to acquire these facilities, as well as develop regional level programmes to enhance the regional ICT and scientific networking events such as regional conferences, workshops, and seminars. Finally, they pointed out to the importance of regional funding in terms of providing postgraduate scholarships for both regional and international students.

7.7.3 Challenge Three: Lack of Postgraduate Programs and RAs Staff

The second major challenge addressed by the participants was the lack of research students and RAs staff. On the one hand, the region has a limited number of postgraduate programmes offering research degrees for both regional and international students. The research findings clearly highlight the weakness in the quantity of regional postgraduate programmes and research students, mainly at the PhD level. Some of the regional universities have postgraduate programmes; however, only a limited number of students are enrolled in them: *“We have more than 25 PhD programmes and about 70 Master degree programmes but few PhD students enrolled”* (DM, 4). It is very important to have postgraduate research programmes to enhance research activities, which the participating researchers consider as a mean of gaining skilled support staff. Such programmes help enhance students’ mobility by attracting international students, as well as regional students, which will have a positive impact on regional research activities and collaboration. The possibilities of regional joint research activities are higher when students from one of the regional countries study their degrees in another regional country. An example of this is when students continue collaborating with their mentors or with their peers from the same institution. International mobility of students could be considered as a one way of enhancing joint research activities in the region.

As stated earlier, researchers such as Dundar and Lewis (1998) found a positive relationship between the postgraduate students as research assistants and institutional research productivity. Others found that there is a strong relation between graduate programmes in each academic department/institution and researcher productivity. Institutions with a good size graduate programme produces more research (e.g. Rushton and Meltzer, 1981; Jordan et al., 1988; Jordan et al., 1989; Dundar and Lewis, 1998).

In addition to developing different postgraduate programmes, some participants emphasised the limited number of scholarships for mainly international, postgraduate students, as well as other difficulties faced by existing students in terms of logistical support such as housing, visa requirements, and other benefits which hinders the international students from studying in the region.

Most of the academic participants, mainly from the AS and BS disciplines, highlighted the lack of availability of well-trained support staff in the region for the research activities. The participants consider this issue as a serious problem which needs to be tackled by policymakers in the regional countries, because it has a negative impact on research activities in general: *"Finding an RA in the country is not easy especially in science… This is not only for collaboration but for research in general"* (PI, 11). One explanation for this issue is the weakness of postgraduate programmes, as explained in the previous section, as researchers consider PhD and other postgraduate students as the best support staff for carrying out research experiments and collecting data, though the other reasons highlighted by the academic participants are as follows.

Firstly, the participants emphasised the limitation of institutional incentives for fresh graduate students to get involved in research activities, such as not being able to hire them on a permanent basis, similar to other permanent academic and administrative roles. The current system implemented in some of the regional countries includes hiring RAs staff on a temporary basis, which discourages recent graduates from pursuing such opportunities. Only graduates who are unable to get a permanent job in the market will accept working as RAs until they find a secured one. One participant claimed that they considered such a job as a bridge to get a permanent job, because they would receive training and technical skills that would help them to get an offer from other public and private organisations: *"…Because it is a temporary work, they consider it as a mean to get permanent job. As I said we lost two RAs whom I trained them for three months…They left us at the middle of the project" (PI, 4).*

Secondly, and in addition to temporary jobs, some participants addressed the issue of low salary packages for RAs and that both high and low demand graduates are paid a similar package. In the region, in both public and private sector, fresh graduate student from AS and most of the BS disciplines are in high demand, while apart from some business specialisations, the graduate students from HSS face difficulties in getting permanent jobs, especially in the private sector: *"They got appointed one semester before finishing their programme…in Oil companies and of course some ministries"* (PI, 7). This results in a limited number of available fresh graduate from AS and BS in the market who are willing to work as RAs and in most cases, they are low academic achievers. In addition to providing permanent jobs, the participants suggest matching the market in term of salaries and other allowances.

Finally, the restrictions on hiring international RAs are another challenging issue. Many of the participants claim that they are not allowed to hire RAs from outside the country unless those specialities are not available locally. Some of them noted that because of the limitations of the available budget in their research grants for RAs, they find it easier, and in most cases cheaper, to get technical staff from abroad, especially from low income countries where there are a high supply of skilled research assistants and post-doctorate candidates.

> *…With that budget, of course I was not be able to get from local market… I may able to get from [name of the country} or…but also there was a restriction…I am not allowed to hire from outside unless I advertise locally … wait and then send a request with justifications. (PI, 9)*

They suggest that each research institution has to consider such financial limitation in their project funding and should allow the researchers the freedom to hire the most qualified RAs.

In general, the GCC countries have to develop a national programme to produce and train research support staff and RAs. The participants believed that such programmes have to provide training opportunities for local graduate students who are willing to work as RAs in the research institutions. Oldham (2005) addressed this issue and agreed on the need to have some research related training opportunities for national staff, mainly in developing countries.

7.7.4 Challenge Four: Research Culture and Engagement

Hanover Research (2014:5) defines the culture of research as a *"system that places great value on conducting and communicating scholarly research."* This system consists of the environment that surrounds the research activities such as the institution, country and region. As explained in the previous chapter, the researchers are always influenced by factors at both institutional as well as other external stakeholder and national levels.

For the institutional research culture, the academic participants highlighted some issues related to the motivation of academics in performing research activities. Firstly, engaging nationals in research activities is one of the challenges faced by regional research institutions. One participant claimed, *"Many of our research activities done by expatriates and our national researchers are less productive in research. I have collected some data about this issue few years ago and I found the same in some other countries in the region"* (DM, 7). This claim was also echoed by other academic participants too. One logical explanation for this issue is that the recruitment process in public institutions plays an important role in the low research productivity of national researchers (i.e. GCC countries citizens). The recruitment system for nationals is totally different from that of expatriates, where the nationals get lifetime contract (tenured post) until retirement, regardless of their research performance. Expatriates get two years renewable contracts (non-tenured post) and the renewal mainly depends on the performance in research productivity. This discrimination allows some nationals to produce little or no research compared to others: *"I am non- [name of the regional nationality] and I have to publish otherwise my contract will be terminated" (PI, 3).* Some participants claimed that this practice may influence the productivity of the other researchers or increase the academic turnover of the non-national researchers.

Secondly, and as noted by the particpants, in the joint research activities funded by the scheme, most of PIs were international academic researchers from outside the GCC countries. This may indicate that national citizens have limited or unclear view about the importance of research collaboration. Some of the particpants stressed the hesititiation of local researchers to lead research activities. There are some national investigators involved in joint research activities, however, very few of them are ready to take the lead in new proposed research.

Generally, many researchers found that the research culture of any academic department/institution is one of the important factors determining the research performance of each researcher (Dundar and Lewis, 1998). Improving the institutional research climate and attracting researchers to participate in research activities in a positive environment at a university is a practice that can enhance research productivity.

Other external factors related to the national research culture and the engagement and the supports of the main stakeholders addressed by the participants include obstacles related to stakeholders' logistical support, either during the research execution or at the implementation stage. Examples of these obstacles include getting access to the data and sites. There is no open access to national data and there is limited support in collecting data from external stakeholders, such as governmental bodies and companies. Such dilemmas force the researchers to terminate their research projects or spend money on non-budgeted items to hire support staff from these organisations to facilitate data collection. They noted that knowing somebody, such as ex-student or colleague, in some public or private organisation is considered essential for collecting data and that such links play an important role in many successful joint research projects funded by the scheme. In addition to data collection, the academic participants faced high resistance from some of the governmental bodies, such public organisations and schools, when it's come to the implementation or at least piloting of the findings or in adopting new strategies. In some cases, such government bodies' support initiating such research activities and help the researchers to some extent in collecting data however, when it’s come to testing or implementing such findings, they will refuse to do so. In general, there is no use of doing real life research projects unless such findings are implemented and tested to verify their impacts and validity.

In conclusion, the research culture at both institutional and national levels is considered a challenging issue in the region and policies have to be implemented at all levels in order to promote research and instil research culture in each of the regional countries. Collaboration is one way to promote research culture where well-established and experienced researchers can work with junior and less experienced ones to provide them with skills and knowledge, as well as enlighten them about the importance of collaboration for them and their institutions. Moreover, policymakers have to develop strategies to encourage external bodies to support research at all levels by providing the researchers with both logistics and technical support needed to carry out their research activities.

7.7.5 Challenge Five: Recognition of Collaboration and Research Incentives

One of the challenges in the region, and probably in many developing countries, is the recognition of collaboration and the incetive to do research. Some participants raised the issue of limited recognition of research collaboration, in which such activity weighted equally with other research and academic activities when its come to academic promotion. The research published jointly with other regional and international collegues weighted equally to that which is published individually or with others at both instiutional and national level. Some of them raised the lack of both financial and in-kind incentives for the researchers and the academic departments to promote research and collaboration in the region. The particpants addressed two different types of incentives; at the personal level, such as salary supplement or teaching buy-out, and at departmental/instiutional level, such as improving the research infrastructure and facilities.

This issue has been highlighted by scholars and many governments and institutions across the world. Many developed countries have implemented reward systems to enhance and produce high quality research (e.g. Fuyuno and Cyranoski, 2006; RAE, 2008; Franzoni et al., 2011; ULAKBIM, 2016).

7.7.6 Challenge Six: Lack of Regional System for Researchers Mobility

The mobility of highly skilled human resources, such as researchers, is considered as one of the priorities of developed countries such as EU countries (Commission, 2003; Morano-Foadi, 2005; Ackers, 2005). Ackers (2005) identifies different forms of academic mobility such as joint research projects, special mobility programmes, academic exchange and time-limited work under fixed-term contracts. Policymakers and researchers investigated this issue and identified some factors impeding researchers from international mobility, such as the availability of national and regional systems (e.g. Morano-Foadi, 2005; Ackers, 2005; Ivancheva and Gourova, 2011; Lawson and Shibayama, 2013).

For example, the USA is considered as the most attractive place for academic researchers from all over the world, especially European scientists, and this an cause a brain drain in EU countries, which forces policymakers in the EU to develop attractive strategies to attract and retain them in the region and move within EU countries (Ivancheva and Gourova, 2011). In 2001, in order to build the research capacity and maximise the benefits of their researchers through networking and mobility, the EU developed a mobility strategy which aims to use the circulation of researchers for the benefit of the European economy and society as a whole. The EC developed a joint initiative with other European countries members, called the EURAXESS Service Centres, which mainly aim to create a favourable environment for researchers to move freely in the region, by providing them valuable information related to jobs, study and grants, as well as other administrative and legal support on moving from one country to another in the region (Vitae, 2016). Many improvements have been made in legislative, regulatory and administrative terms relating to researchers' mobility (European Commission, 2003). Ivancheva and Gourova (2011:186) state that *"... at the European level, mobility becomes a fundamental factor for advancements in research and an indispensable element of the career trajectory of researchers in all disciplines."*

Unfortunately, the GCC region lacks well-developed system for researchers' mobility internationally and among regional public research institutions (Naithani, 2011). Many participants emphasised the importance of having a flexible and friendly system that allows them to move between the countries in the region or even to other countries across the world.

> *One of the important issue need to be tackle by high authorities in the region is allowing researchers to move easily across the nationals borders in the region. This will have positive impacts on individual and national level. This is how network created and joint research projects initiated. (PI, 13)*

For example, there is no networked system that would offer regional based employment centred academic and professional programmes, mainly for the GCC nationals (Mukerji and Jammel, 2008). Some of the participants stated, *"We are in the early stages of research and we have to build up the culture and train our researchers by learning from other established researchers in the region and internationally"* (PI, 12). The research activities in the region are relatively new and many of the national researchers are juniors in which they need to get linked and create a strong network and learn from other well established researchers in the region and across the world.

Many scholars agree on researchers' mobility strategy, such as Beatty and Chan (1984) who found that visiting researchers from Chinese universities to the USA universities have positively influenced both teaching and research performance of their home country universities. Also in Israel, Arunachalam and Doss (2000) highlighted the positive impact on international collaboration of generous grants given to Israeli researchers for traveling and spending sabbatical leave from one to two years in the best research institutions abroad before starting their academic career.

Others highlighted the unavailability of formal systems allowing them to carry out or participate in any regional research activity outside their home country for the period of the research project, especially when the host institution has state-of-the-art research facilities and again without losing the existence privileges. Finally, and as highlighted by some academic participants, there is no flexible and attractive system which allows researchers to recruit international scientists as consultants or visiting researchers for their research projects. They argue that such well-known scientists are essential in many cases in order to enhance the research quality and they will have impact on the final findings. Although it is permitted to hire such personnel, the restrictions, in terms of the budget allocation or in terms of time length of stay, make it difficult.

7.7.7 Challenge Seven: Research, Teaching Load and Administrative Duties

In most universities across the world, academic positions imply three types of responsibilities, namely teaching, conducting research and administrative duties. With regards to the teaching load allocation, it is somewhat fixed for the same academy ranking in each academic department/school and it can be reduced if the person has some administrative duties. The teaching load and the quality of teaching is not a crucial issue for academic promotion (Hattie and Marsh, 1996; García-Gallego et al., 2012). However, for research, it is linked highly to the academic promotion criteria and, unless in the top academic careers, academic researchers have to produce a minimum amount of research in term of publications in order to be promoted (Hattie and Marsh, 1996; García-Gallego et al., 2012).

Firstly, one key issue addressed by the participants is that there is no institutional consideration for highly productive researchers and their teaching loads. Regardless of their research productivity, each academic researcher has to perform the same amount of teaching.

> *Active researchers or inactive ones are the same. Some do not care about their academic promotion because they get annual increments automatically… Policy to enhance research and collaboration is important. For example, linking time allocated for research with teaching loads or with administrative duties. (PI, 1)*

Some scholars have found a negative relation between teaching load and productivity in research (e.g. Hammond et al., 2004; Iqbal and Mahmood, 2011). For example, Hammond et al. (2004) argued that the researchers with both high motivation and ability to do research should be taken into consideration when distributing teaching loads. In addition, Jeong et al. (2013) found a negative relationship between researchers' teaching load and his/her involvement in international research collaboration. The reason behind this is that collaboration across borders requires more time and effort, and with more teaching, researchers will have limited time allocated for research related activities, which they prefer to allocate for local research activities instead.

Secondly, research collaboration requires more time and commitment compared with other research activities, especially when it includes international collaborators (Jeong et al., 2013). The participants believe that research institutions in each country should consider such commitments and link it to teaching and administrative duties of the researcher, *"International joint research require more coordination and commitments compare to internal grants because of geographical distances"* (PI, 16).

Finally, some participants addressed the issue of assigning new administrative roles to researchers who have international collaborative projects or any other big strategic research grants or research contracts. However, accepting administrative and leadership positions tend to be voluntary within the academic world. In addition, granting new research projects for researchers who already have grants and research commitments consider this as a challenging issue because allocating new research tasks will lead to less time allocated for existing research commitments, such as joint research projects. These issues affect their performance or contributions in existing research commitments (Jeong et al., 2013).

In general, the teaching loads, inequality and assigning more administrative duties to the researchers are factors which affect job satisfaction and are considered a potential determinants of turnover, absenteeism, and job performance (Oshagbemi, 1996; Bentley et al., 2013; Shin and Jung, 2014).

7.8 Chapter Summary and Conclusion

This chapter discussed the findings of this research and positioned them within the existing literature, to "explore, understand, and analyse the opportunities and challenges of research collaboration among the PFUs in GCC countries." Using the SQU-UAEU funding scheme as a case study, the researcher interviewed twenty three Principle Investigators (PI) and eight Decision Makers (DM) from both universities in order to collect in-depth data about their experiences in regional collaborative research activities.

The findings of this research confirm that the region has the opportunities to develop regional strategies and policies to enhance collaborative research activities, especially between the PFUs. However, the participants highlighted some key challenges faced during their collaborations which need to be tackled by policymakers in their regions.

The next chapter will recommend some strategies and policies (i.e. objective 5) to remove these challenges and enhance the research collaboration between the PFUs in the region. In addition, the chapter will include both the theoretical and practical contributions as well as the limitations of this study.

CHAPTER EIGHT

8 RECOMMENDATIONS AND CONCLUSION

The previous chapter discussed the main study's findings and highlighted the main aim of this research, which was to "explore, understand, and analyse the opportunities and challenges of research collaboration among the PFUs in GCC countries". This chapter answer's the last question (RQ: 6) of this study by presenting some recommended strategies and policies to enhance research collaboration between the PFUs in the region. In addition, the theoretical and practical contributions of the study as well as the limitations are also presented towards the end of the chapter.

8.1 The Aim of the Study

The main aim of this research was to "explore, understand, and analyse the opportunities and challenges of research collaboration among the PFUs in GCC countries". The participants pointed out the key opportunities or advantages available to enhance regional collaborative activities. These opportunities included the existence of both individual and institutional motivations to collaborate regionally and internationally. They considered such research activities as part of their main priorities, and this is clearly evident in the main objectives of establishing GCC (i.e. objective 4 in the GCC Charter), as well as in the main objectives of many of the region's HE institutions. The existence of these motives encouraged collaborative research activities and proved that each research institution could complement the other in terms of providing different research facilities, economic resources, and human and technical research capital. Moreover, the last decade has witnessed substantial regional investments in establishing HE research institutions and centres, as well as the enlargement of human resources development programmes and the allocation of various national levels funding for R&D activities. In general, the main opportunities highlighted by the participants included:

availability of research institutions and funding bodies; research infrastructures; availability of both human and financial resources; and the benefit of having a common socio-economic ground and political environment.

On the other hand, the participants also highlighted the main challenges, which both national and regional policymakers would have to explore. Although the GCC countries are developing countries, they are endowed with some natural resources which have to be utilised in developing strong R&D strategies and policies to enhance collaborative research activities in order to solve regional research problems, improve the regional R&D efficiency and quality, and produce a tangible impact on their societies. Based on the findings of this study, the main challenges addressed by the participants are: a lack of regional system for researchers' mobility; weak postgraduate programmes, research culture and engagement; lack of technical support staff; bureaucratic bottlenecks in administrative procedures; imbalance between research and teaching loads and administrative duties; and lack of recognition for collaboration and research incentives.

Table 8.1 summarises the main opportunities and challenges of research collaboration among PFUs in GCC countries. The next section will recommend some strategies and policies to utilise the available opportunities, address the challenges, and enhance research collaboration between the PFUs in the region.

Table 8-1: Summary of the main opportunities and challenges

Opportunities	Challenges
- The priorities and the existence of the motivations to collaborate	- Bureaucracy in administrative and financial procedures
- Availability of research institutions and national funding bodies	- Lack of regional funding
- Availability of research infrastructure	- Lack of postgraduate programmes and RAs staff
- Availability of funding and human resource development programmes	- Research culture and engagement
- Common socio-economic ground and political environment	- Lack of recognition of collaboration and research incentives
- The positive impacts of collaboration and SQU-UAEU funding scheme	- Lack of regional system for researchers mobility

Source: Author's construct, 2017

8.2 Recommended Strategies and Policies to Enhance Regional Research Collaboration

8.2.1 Introduction

As a regional body, the participants pointed out that GCC should be strengthened. Collaboration in R&D activities is considered one of the weakest areas which need to be strengthened due to the positive socio-economic impact and development of the GCC region. They reached this conclusion based on the fact that GCC countries faced many regional research problems and challenges which require unifying research efforts and combining available resources to solve them and produce better research. Moreover, they emphasised some of the different successful international programmes implemented in developed countries and regions to promote international and regional collaborations. In order to accomplish this, and given the opportunities addressed in the previous chapter, the policymakers in the GCC need to develop a long-term sustainable collaborative research strategy to utilise the available regional research resources and maximise the impact of R&D activities in the day-to-day life of their citizens and improve the regional socio-economic environment. Such strategies will help researchers to share knowledge, skills, and resources, and contribute positively to the research capacity and knowledge production of all collaborating countries. It seems, from the contextual background presented in chapter three, that in addition to the Secretariat General of the GCC, the ministries of HE and the national funding bodies in the region are the main regional bodies responsible for implementing these recommended policies and strategies. They have to work jointly to accomplish the main area of the fourth main objective of the GCC Charter:

> *"Stimulate scientific and technological progress in the fields of industry, mining, agriculture, water and animal resources, establish scientific research centers and collaborative research, and encourage cooperation by the private sector for the good of their peoples" (GCC, 2015).*

In addition, this research highlighted some challenges faced by the academic researchers, which indicate that some reforms and policies are needed to foster regional research partnerships. These reforms will not only impact on regional research collaboration, but will also influence the research related activities in each of the regional countries. The following sub-section will address the recommended strategies and policies to enhance collaboration between, GCC countries, summarised in table 8.2 below.

Table 8-2: The recommended strategies and policies to build and enhance the collaborative research between the PFUs in the GCC region

No.	Strategy / Policy	Way forward (Proposed)
Recommendation 1	Learning from others' experiences	- Visiting international bodies and programmes such as EC and ERC to learn from their experiences
Recommendation 2	Regional research council and centres of excellence	- Creating a regional administrative body in GCC to promote regional research collaboration - Create a regional funding body (e.g. The GCC Research Council) - Create centres of excellence in disciplines of very high importance to the region
Recommendation 3	Regional research priorities	- Combine top-down regional priorities with bottom-up national priorities - Regularly update the regional priorities
Recommendation 4	Regional funding schemes and incentives system	- Fund regional collaboration of any research related activity - Funding schemes for research aimed at tackling issues of strategic importance for the region, or at least for two countries in the region - Start-up funding schemes for new faculty members - Funding researchers for research visits and conference attendance - Funding for building the regional research capacities of any public research institution - Provide PhD scholarships for students from across the world and

No.	Strategy / Policy	Way forward (Proposed)
		mainly GCC nationals - Funding regional scientific activities - Engaging the private sector in funding joint research activities which has tangible potential - Initiate both financial and in-kind incentives for the researchers and regional research institutions to promote research and collaboration
Recommendation 5	Flexible administrative and financial research system	- detach any public HE institutions from governmental administrative and financial laws - provide the PI with more flexibility to manage his/her grant without restrictions - Provide fast-track clearance in the custom authorities for any items imported for research related activities - Remove the imposed restrictions for any imported chemicals and regents for research related activities
Recommendation 6	Improve regional research culture and collaboration	- Encourage national academics to lead research activities and provide them with the required training and workshops programmes - Develop a policy which links the research productivity and employment contract - Initiate awareness programmes about the importance of research and

No.	Strategy / Policy	Way forward (Proposed)
		collaboration
Recommendation 7	Researchers' mobility and postgraduate programmes	- Adapt generous sabbatical programmes - Develop a flexible system which allows researchers to hire well-known, productive international scientists for their joint research projects - Remove regional border restrictions for researchers and technical support staff working in HE research institutions in order to move easily between regional countries. - Develop postgraduate programmes and provide scholarships
Recommendation 8	Develop ICT and Networking	- Improve regional ICT infrastructure by investing more resources - Enhance regional scientific and social events to increase the links between researchers - Invest in creating a regional e-learning system
Recommendation 9	Regional Evaluation system	- Develop an evaluation system to measure the outcomes and impacts of the proposed funding programmes and strategies - Develop an evaluation system to evaluate the regional funding body and the its impacts

Source: Author's construct, 2017

8.2.2 Recommendation 1: Learning from Others' Experiences

There are many initiatives implemented across the world to foster international research collaboration between countries as indicated in chapter two (see section 2.2). Some initiatives aimed to foster regional R&D collaborations (i.e. with countries in the same region), such as the EC Research framework programmes implemented by the EU since 1984 in order to support and encourage research collaboration between EU countries. Although EU countries share many similarities, there are still cultural, economic, and linguistic differences between them. For example, there are 24 official languages that the EU has to deal with when communicating with its national governments, private sector, citizens and other organisations. Despite this linguistic difference, which may have a negative impact on communication between academic researchers and research institutions in the region, the Framework Programmes have worked well for the last 30 years and the budget allocated has been increased from €2.75 billion in the first Framework Programme (1984-1988), to €51 billion in the seventh Framework Programme (2007-2013). In 2014, the seventh Framework Programme was replaced by a new funding Framework Programme called "Horizon 2020", where the total budget allocated for this programme is about €80 billion from 2014 till 2020. The EC evaluated the seventh Framework Programme and found that apart from other socio-economic impacts, funded projects published approximately 170,000 joint publications and 1,700 patent applications (European Commission, 2016). Moreover, Narin et al. (1991) indicate that although EC countries are heavily affected by linguistics, historical and cultural issues, the papers published by research collaborators affiliated with institutions from more than one EC country were cited two times higher than single authored papers. The EC Framework Programmes targeted certain fields and found that co-authorship increased in these fields because of these programmes. In conclusion, these programmes contributed positively by closing the distance between EU countries, helping to pool regional resources together, and enhancing R&D collaborative activities between EU member states (Hoekman et al., 2010a).

Another programme set up to foster collaboration between a group of countries was the establishment of BRICS (i.e. Brazil, Russia, India, China and South Africa)

Think Tanks Council (BTTC) in March 2013, which aimed to enhance collaboration between academic research institutions in these five countries (Rensburg et al., 2015). Although this initiative is relatively new, the GCC can visit the BTTC and learn from their experiences. Some countries develop partnership programmes to enhance research collaboration at both national and international levels, such as STCs, IUCRCs, and ATP in the USA. These funding bodies have further experience which GCC can learn from.

It is worth noting that a few months before finalising this thesis the British government announced a funding programme in the GCC region for collaborative research projects between GCC researchers and the UK. This programme aims to fund research projects related to the social welfare and economic development of the GCC region and mainly focuses on issues such as water, energy, food production, and cyber security.

In conclusion, some of these initiatives provide examples that the GCC can learn from their experiences to develop strategies and policies to enhance regional research collaboration. Although it is too early to evaluate the impact of the BRICS initiative, given its three-year history, the most appropriate experience for the region are the Framework Programmes implemented by the EU since 1984. Though the EU region contains many developed countries, such as the UK, Germany and France that have strategies and policies which may not suite the GCC region at this stage, the policymakers in the region have the opportunity to learn from their experiences in terms of initiating and developing collaborative R&D strategies and policies. The policymakers in the EC and European Research Council (ERC) could help the GCC to initiate regional programmes and provide some support.

8.2.3 Recommendation 2: Regional Research Council and Centres of Excellence

Creating a regional administrative body (e.g. Directorate of R&D activities) under the Secretariat General of the GCC is also suggested at this stage. This Directorate could develop regional strategies and policies by coordinating with the national bodies responsible for R&D, such as ministries of HE and national research councils and organisations, to enhance regional research collaboration and competitiveness in research. Attached to this Directorate, a regional funding body (e.g. The GCC Research Council) is recommended to provide funding for collaborative R&D activities, especially for fields considered strategically important for each member country. This funding body could be made up of experts from each member country, and their roles would be to oversee the funding body, implement regional research policies and strategies, and provide funding. Their roles could be to monitor and evaluate the programme, as well as coordinate with other national funding bodies in their respective member countries to ensure regional alignment.

In addition to their current financial contributions to the operational expenses of the GCC Secretariat General, each member country could be encouraged to contribute extra funds for the proposed regional funding body, in order to support the proposed R&D funding schemes, similar to the current practice of EU countries. These extra funds could be calculated as a percentage of each country's GDP, where the countries with higher GDP allocate funds compared to low income countries. For example, EU countries have been encouraged to invest 3% of their GDP in R&D by the end of 2020.

As highlighted by some participants, the proposed regional research council could be supported by different centres of excellence, or independent bodies attached to the proposed administrative body, to carry out research activities in disciplines of very high importance to the region such as renewable energy research centres and regional genetics research centres. The Secretariat General could devote a special budgets for the operational costs of each of these centres, while their research related activities could be funded by the regional research council based on proposals submitted for funding or through securing external funding from both regional public and private sectors and international funding bodies. In addition to locating these centres of excellence in the region, one suggested strategy is to locate some of them in developed countries such as the UK, USA, Canada, and Germany, where regional researchers can develop their research capabilities by working jointly with well-established researchers in these countries and get access to the available facilities and resources in their universities. These centres could aim to address global challenges faced by both regions such as infectious diseases and climate change. This strategy is aligned with what the EU implemented in 1998 when they launched the EU Centres of Excellence (EUCE) programme to strengthen cooperation in both teaching and research between EU countries and other countries such as Canada, Japan and the USA (European Commission, 2015).

8.2.4 Recommendation 3: Regional Research Priorities

Given that all GCC nations are developing countries and R&D activities are relatively new compared to other advanced countries, it will be very important to enhance collaboration between researchers in all disciplines. However, it would be of strategic use to emphasise on important areas relevant to the GCC countries. As stated earlier, GCC countries share similar socio-economic research problems, such as water scarcity, desertification, agriculture, and health-related problems, as well as dependency on scarce resources in their economies like oil and gas. However, there are no regional collaborative research policies and priorities in such areas.

In 2002, as an outcome of regional publicly-funded HE institutions meeting in KSA, researchers from KACST and coordinated by GCC, conducted research on the research priorities for GCC countries. They identified approximately 150 important subjects which were considered high priority in terms of regional joint research activities (Abdul Qadir et al., 2002). These subjects were grouped into fourteen disciplines, which are: Sociology, Economics, Constructions and Planning, Environment, Education, Biotechnology, Health, Energy, Agriculture, Water Resources, Human Resources, Oil and Gas, Transport and Safety, and Industry (Abdul Qadir et al., 2002). This indicates that there are many regional issues that need to be tackled jointly between the researchers, and the region is in need of strategies that prioritise regional R&D activities. For example, one academic participant highlighted agriculture related diseases that spread across the region and caused a decline in the regional production of different fruits and vegetables such as limes, mangos, and palm trees. Some of these regional agricultural issues have been tackled by the regional countries separately. Many other regional and global issues require more coordination and cooperation between the regional countries and other countries across the world. As stated earlier, one strategy to tackle these issues is by establishing centres of excellence which will contribute to solving the regional research problems, as well as participating in solving other global issues, and will enhance regional research capacity.

In general, some interview participants suggested that policymakers in the region should combine top-down regional level priorities with bottom-up national level priorities in order to overcome these challenges. The objectives and expected outcomes of regional activities and programmes should be consistent with national and regional strategies and the jointly funded research projects should also reflect the regional R&D priorities. It is further recommended that national R&D strategies should emphasise the importance of research collaboration between universities in the region. However, the regional priorities should also consider research activities aimed at developing national R&D activities of each member country. The regional research priorities and the regional comparative advantages need to be aligned together, and funds mainly allocated to R&D activities on strategic basis or areas of critical importance to the nations in the region. In short, the research suggests periodic evaluation of regional research priorities in order to address emerging issues.

8.2.5 Recommendation 4: Regional Funding Schemes and Incentives System

It is further suggested that the regional research council should initiate regional funding schemes and incentive systems for researchers working in HE institutions. The funding schemes should aim at providing funds, linking the researchers in the region, and giving them and their respective academic institutions access to human and scientific capital as well as economic resources in order to foster regional research collaborative activities. While other incentive programmes could be designed to promote research and produce high quantity and quality publications, which will have a positive impact on the nations. In general, these funding schemes and incentive systems would contribute to the regional research capacity by allocating funds which have positive impact on regional competitiveness and research productivity.

One example of research funding schemes is providing researchers with the opportunities to submit proposals and get funded for any research related activity based on pre-determined submission schedules and criteria. In this type of funding scheme, the PI should include researchers from at least two institutions from two different countries in the region, and the budget should be limited to a specified amount. Another example is providing a funding scheme for research proposals aiming to tackle an issue of strategic importance for the region or at least two countries in the region. In order to get funded from this scheme, the PI should also include researchers from more than two countries in the region, including those facing the research problem. The budget of this type of funding could however be larger. Finally, the council could support some research activities for issues related to one country in the region if the national funding body in the country is willing to partially support them.

Apart from the proposed research funding schemes, other suggested funding schemes/programmes include:

- Start-up funding scheme for new faculty members (newcomers) joining the regional institutions, either as new PhD graduate academic researchers or having joined recently in the institution as researchers. The duration could be limited to one year with a limited budget without submitting a research proposal and a requirement for at least one senior researcher from the region to participate with them.
- Funding the researchers for research visits, mainly during summer, to international research institutions. Funding should cover living expenses as well as any research related expenses.
- Funding for building the regional research capacities of any public research institution such as constructing research labs, or purchasing research facilities and equipment should be considered. The institutions may cover part of the cost or secure partial external funding.
- Should provide PhD scholarships to students to study across the world, but mainly GCC nationals.

- Funding regional scientific activities such as conferences, workshops, brainstorming meetings, and social gathering for regional researchers.
- Funding the attendance of, and presenting in, conferences for researchers and postgraduate students, especially for those in receipt of grants from the regional funding body or for works including researchers from more than one regional country.

It is worth mentioning in this regard that some people have highlighted the importance of engaging the private sector in funding joint research activities, and mainly those types of projects which relate to their sector and have the possibility of tangibly impacting on their productivity. The regional research council could introduce a funding scheme where the researchers could tackle an issue related to the private sector in one or more of the regional countries. In such a scenario, the PI has to secure external funding to cover part of the required budget from the private sector.

On the other hand, research incentives are considered amongst the most important strategies implemented by both national governments and research institutions across the world in order to promote research and produce high quantity and quality of publications (e.g. Fuyuno and Cyranoski, 2006; RAE, 2008; Franzoni et al., 2011; ULAKBIM, 2016). Although some researchers' claim that the salary package in the region is attractive compare to other countries, *"We are happy with what we get in term of salary" (PI, 1),* many participants argued that providing different types of incentives for researchers and the academic departments is considered a successful strategy. The first advantage is that such a strategy would encourage staff to work harder in research related activities such as collaborative research and producing more research (Cao et al., 2013). In addition, the incentive strategy makes the institution, as well as the national and regional environment, very attractive to existing active staff to stay and also encouraging prospective staff to join the regional institutions. Finally, working in joint research projects, mainly at an international level, requires more coordination and administrative duties and such incentives are considered as recognition of the significant efforts involved in running such projects *"I spent more time in this project compare to others, I did. Combine and analyse the results... arrange the meetings with the colleagues/collaborators…"*

(PI, 13). Examples of suggested incentives are financial incentives for researchers, such as salary supplements or teaching buy-outs, and other departmental/institutional incentives, such as improving the research infrastructure and facilities. Also, researchers suggest reducing the teaching load for active researchers as one policy which could be implemented, as well as considering the weight of joint published research more than other research outputs.

It's worth mentioning that some GCC countries recently started to implement incentives for researchers. For example, TRC and SQU in Oman implemented financial incentive systems for publishing articles in high-ranked international journals. Such strategies will positively impact on future national research productivity and quality (TRC, 2016; SQU, 2017).

8.2.6 Recommendation 5: Flexible Administrative and Financial Research System

Excessive bureaucracy is considered one of the main obstacles undermining the development of strong collaboration (Knobel et al., 2013). The lengthy processes of some administrative and financial practices in HE institutions in the region, such as grant management and various layers of processes for purchasing, recruitment, and grant awards, lead to frustration and wasted resources. As stated earlier, the main reason of such issues is that PFUs follow governmental administrative and financial systems (i.e. laws) mainly developed for public service bodies such as ministries and public authorities. Such systems may not suite HE institutions where research is a dynamic process and requires more flexibility and speed in order to utilise the available resources in a more efficient way. The joint research project is bounded by timeframes and milestones, and any delay in acquiring facilities or administrative issues will cause unnecessary delays in the entire project. Other obstacles also relate to external stakeholders' support, such as customs authorities and ministries. Approval to buy some chemicals and scientific equipment and then clearing them through customs is another dilemma in the region. The researchers found it a very frustrating practice which has a negative impact on regional R&D activities.

The study suggests that, in order to encourage and cultivate collaboration, policymakers should consider eliminating both administrative and financial barriers. For example, in order to reduce the bureaucracy in regional HE systems, policymakers and national governments need to revisit such systems and detach the HE institutions from public administrative and financial laws and systems. More flexible and effective administrative processes could be implemented by giving the institutions the authorisation to develop their own internal systems in order to promote national and regional R&D activities. In addition, given that research activities are unpredictable processes and the proposed budget in the early stage based on estimated processes, more institutional decentralisation of both administrative and financial processes is needed. Examples of decentralised processes are providing the PIs with the freedom to manage their grants and transfers between budgeted items and financial years, as well as recruiting the human resources needed for the project, such as hiring consultants and RAs freely. Such freedom will allow the PIs to attract, and provide incentives for, the best international researchers and freshly graduated students. Moreover, in the case of the approved budget given by the funding body being less than requested in the initial proposal, the funding body needs to discuss with PIs before approving final budgets, as approving a budget less than that proposed may affect the quality of the project and, in some cases, force researchers to change the plan and the research objectives to match the approved budget, which will consequently affect the quality of the research. Finally, it is suggested that senior management in the research institutions and policy makers in the region should coordinate with other public service authorities to foster the process of research related requests, such as providing fast track clearance through the customs authorities for imported items related to HE institutions or purchased for research related activities, as well as remove the restrictions on imported chemicals and regents.

8.2.7 Recommendation 6: Improve Regional Research Culture and Collaboration

The regional culture of collaboration in research has to evolve. In general, the region at both national and institutional levels requires a well-defined research culture development strategy to improve regional research culture and align it with other institutional and national level plans. These plans should be supported by significant amount of resources for training and promoting collaborative research in the region, as well as research in general. Also, it is suggested that academic researchers and mainly nationals with low research productivity and weak collaboration should be trained in different aspects, such as grant/proposal writing, data analyses, and research management, as well as being enlightened about the importance of collaborative research activity for the region. Some researchers are highly motivated to collaborate, but have limited ability and need training in technical areas such as grant writing and communications; while others have low motivation to collaborate but are well skilled in managing collaborative research related activities, and require more motivation, such as information about the importance of collaboration and the positive impact of such activities on their academic career and their institution's reputation. In general, improving research culture plans will take years to be implemented in order to be established in the region, and need to be regularly evaluated to ensure positive impact. Marchant (2009) observes it may take up to ten years in each institution to establish a research culture.

Some academic participants argued that one strategy to enhance institutional research culture and collaboration is to establish a start-up funding scheme for new faculty members joining the institution, either as a new PhD graduate academic researcher or having joined recently as a researcher. In addition, others stated that new PhD academics require a skills development programme and have to be enrolled in a research group in their institution in order to start doing research and learn about the importance of research and collaboration. They noted the importance of intra-institutional collaboration such as collegiality in order to enhance research productivity and collaboration at all levels, and suggested some policies to enhance joint research activities such as mentoring programmes where the well-established researcher shares his/her knowledge and experience in collaborative research activities with those who are new to the academic filed. These suggestions align with those of other studies examining the importance of such programmes in enhancing research productivity (Hammond et al., 2004; Cheetham, 2007; Marchant, 2009). Others highlighted the importance of network facilitation and time allocation for joint research, as well as providing new researchers with incentives and recognition for their research achievements.

One important issue raised by some academic participants is that the HE institutions in the region need to improve the remuneration system in order to provide the researchers with a stable environment which allows them to concentrate on their research related activities. For example, such reinforcement systems could aim to force the national researchers to produce research similar to what is implemented to non-national researchers as well as provide the international researchers with high research productivity with tenure jobs (lifelong contracts) which will encourage them to produce more and reduce the instability of their jobs. One way to implement this is by introducing different academic careers such as teaching only, research only, and teaching and research, with each one of these academic careers having its own appointment, promotional criteria and system. In addition, introducing permanent jobs for RAs and providing them with financial incentives to work in such positions is essential to promoting research and collaboration in the region. Such strategies will improve the capacity of research and well-skilled RAs with permanent jobs will help to promote research. Many participants highlighted the unavailability of skilled RAs due to market demands and weak postgraduate programmes, usually considered as a source of RAs in developed countries.

In addition, balancing the teaching load and administrative duties with research is an important issue which needs to be addressed by policymakers in the region's HE institutions. As stated earlier, one suggested policy is to introduce a research cadre scheme where the person allocates all his time for research related activities. Another policy is to reduce the teaching load, especially for active researchers, and provide incentive programmes for them. In addition, assigning administrative duties for active researchers will have a negative impact on their research productivity and may affect their collaboration activities. Researchers suggest not assigning any administrative duties for researchers holding large grants, such as those working on strategically important or collaborative projects.

Finally, the national level research culture, such as external stakeholder bodies, also needs to be developed using different means, such as media, scientific activities and events about the importance of research for the GCC nations, and their support, such as logistics and data collection, are essentials for researchers in order to achieve their research objectives. The participants suggested implementing open access to national data policy for research related activities and each HE research institution having easy access to the required data. In addition, the researchers should get full support to collect data from any other national site and governmental body, as long as there are supporting documents stating that the collected data is mainly for research and there is a confidential agreement. In addition to presenting and publishing the findings at scientific events and in journals, policymakers in each country need to look into the potential of implementing some of the real life research activities' findings, especially those which will have a positive impact on the society and economy of the region. Each research institution needs to send technical reports to the main stakeholders to utilise the findings and the recommendations of these projects.

In conclusion, in order to improve the research culture in the region the policymakers should implement the following:

- Encourage national academics to lead research activities and provide them with the required training and workshops to manage the research grants and reports writing.
- Develop policies which link the research productivity and employment contracts for both national and non-national academics.
- Develop policies and programmes to improve the awareness of the people in the region about the importance of research collaboration.
- Balance teaching and research load for academics and develop incentive programmes.
- Implement open access to national data, especially for the researchers working in research institutions in the region, as well as awareness programmes for external bodies and citizens about the importance of research for them and their nations.

8.2.8 Recommendation 7: Researchers' Mobility and Postgraduate Programmes

As highlighted earlier, another issue faced by the academics in the region is the lack of a well-developed system for researcher mobility. Developing a system to stimulate the mobility of both researchers and students within GCC countries is further recommended. This system will allow both national and international researchers, and other skilled individuals working in HE research institutions in the region, to move freely without restrictions.

In order to enhance researchers' mobility, one suggested strategy is to adapt generous sabbatical programmes which allow researchers (mainly national) to work in any regional or international institution without losing existing benefits in terms of salaries and pension-related privileges. This strategy will allow them to gain knowledge and get trained in research activities as well as create strong regional and international networks with well-established researchers and colleagues. Also, this strategy will provide access to up-to-date research facilities and increase confidence to lead research and collaborative activities.

Other participants suggested implementing a flexible system which allows the researchers to hire well-known productive scientists for their joint research projects from regional and international research institutions as visiting consultants or researchers, as they assume this will have positive impacts on the quality of research output. They also believe that it will boost and enhance the productivity of the participating investigators as well as promote other international joint research collaboration. These suggestions are in line with what other researchers believe, such as Stephens Balakrishnan et al. (2013).

Finally, the academic participants addressed the issue of moving the researchers from one country to another within the region. Non-national scientists need to be granted a visa if they want to travel to any country in the region for research related activities. Such policies discourage researchers from visiting each other and reduce the efficiency of joint research activities. In order to promote collaboration, one suggested policy is to allow all regional academics and technical support staff working in HE research institutions, when their main purpose of travel is for R&D activities, to travel around the region without restrictions.

With that said the HE institutions in the region need to develop strong graduate programmes which foster the enrolment of both regional and international students. Some participants claimed that the region is rich with unique environments and researchable issues, such as genetic diseases and renewable energy resources. One strategy could be allocating the graduate level programmes based on the nature of each country in which resources and efforts will be centralised. For example, a country rich in environmental resources can concentrate on postgraduate programmes related to environmental science such as biological and environmental studies, while a country rich in non-renewable energy such as oil and gas could concentrate in those fields. This strategy will make the postgraduate programmes much stronger and students will be able to learn easily from existing resources and facilities.

In addition to promoting regional graduate programmes, HE institutions need to increase postgraduate scholarships, mainly for high achievers in undergraduate degrees, as well as for both regional and international students. Such scholarship programmes require more logistics support such as housing, visa requirements, and other benefits in order to attract international students. These students could be utilised as teaching assistants and for RA jobs, helping to solve the lack of availability of RAs in the region as highlighted by academic researchers.

In conclusion, the GCC region has the potential to be an attractive destination for learning mobility for both international researchers and students, especially when the region concentrates on unique or priority research areas related to the region.

8.2.9 Recommendation 8: Develop ICT and Networking

New ICT, in particular high-speed internet and videoconferencing, is considered to be one of the most important and largest distribution platforms of R&D activities in the world. The findings of this research align with what other researchers have demonstrated, such as Duque et al. (2005) and Sonnenwald (2007), where the availability of ICT is considered a fundamental element of research collaboration, especially for geographically dispersed research collaborations, both national or international. Researchers need to communicate and coordinate with each other regularly and many researchers show that ICT is considered the best means, especially for remote collaboration where researchers cannot meet physically (Star, 1995; Melin, 2000). Given its positive impact on joint R&D activities, many developed countries such as the USA and UK invest heavily in research programmes to develop ICT in order to meet the needs of international research collaboration (Sonnenwald et al., 2004). Future advancement in ICT will play a radical role in R&D activities, forging virtual contacts between scientists who are separated geographically, resulting in solving complex research problems through remote collaboration (Basu and Aggarwal, 2001).

The academic participants addressed many issues related to ICT readiness in the region such as weakness of internet, unavailability of videoconferencing systems and blocking some online communication networks. Although the GCC region witnessed an improvement in terms of ICT infrastructure, policymakers should develop further policies and also invest substantial amount of funds to increase the rate of improvement to enhance both regional and international collaboration. Such well-developed infrastructure will help to facilitate and increase regional research activities and help researchers to get up-to-date published research, as well as regionally or internationally available funding opportunities, research instruments, and research related activities. Also, it will help link regional researchers in order to share applications software to integrate data and analysis, get remote access to research instruments and joint preparation of research papers, develop research instruments such as questionnaires and interviews, manage joint funded grants, and schedule meetings and milestones.

Another important issue addressed by some of the academic participants is a lack of regional scientific network enhancement activities, such as hosting regional conferences and workshops, sponsoring academic researchers to attend international conferences, and hosting regular meetings between research institutions in the region at various academic discipline levels, and regional retreat activities. Regional policymakers need to enhance regional scientific networks through these activities.

Researchers such as Knobel et al. (2013:406) stated that in addition to culture affinity and existence of resources, *"Collaboration is occurring more naturally as a result of increased opportunities for interactions with foreign colleagues in workshops, conferences and symposia"*. Melin (2000) found that many researchers started their collaboration through conferences. For example, the Social Science and Humanities Research Council of Canada's (SSHRC) allocates funding for scientific network activities such as workshops, seminars, and planning meetings for Canadian researchers, in order to enhance joint research activities and collaboration in R&D (USASK, 2008). As mentioned, policymakers in the GCC region, as well as the proposed regional funding body and national ministries of HE, need to provide funding for such activities in order to enhance interaction between scientists, increase the possibility of the development of joint research proposals, and foster collaboration. Regional conferences help to facilitate contact among researchers, discuss the cutting edge of the field, and creating working relationships between researchers (Melin, 2000).

Finally, the academic participants highlighted the importance of having wider access to scientific information, such as journals and publications, by providing open/online sources and electronic learning systems (e-learning). This requires more coordination between the national funding bodies and ministries of HE in order to unite their efforts and create a regional e-learning system and network. Such access will help researchers to get access to a wide range of up-to date published works, and carry out literature reviews in more efficient ways without visiting libraries. At a national level, Oman is currently working on developing a national project called the Oman Virtual Science Library (OVSL), which aims at creating a national network to provide access to electronic databases, international journals, e-books, and other electronic scientific resources for researchers in Oman. Such an example could be used as regional learning experience after launching the project.

8.2.10 Recommendation 9: Regional Evaluation System

Finally, the GCC should develop a system to evaluate the performance and programmes of both the regional administrative body and regional funding body.

Stokols et al. (2008a) points out the importance of defining a clear evaluation system for the successfulness of any programme through different key indicators. Such an evaluation could be done by an independent body or a group of expert consultants. It is essential to evaluate all proposed regional R&D collaborative activities and ascertain whether the main objectives of the developed strategies and policies have been achieved or not, and the challenges faced by key players such as researchers and stakeholders involved in these activities. There are many R&D indicators which could be used to evaluate any collaborative research programme, such as co-authored papers, co-patents, publications/unit of spending, and publications/researches. Evaluating the internal systems of the funding body and improvements in the external environment are also essential in order to reduce the obstacles of delivering research and evaluating implemented strategies and policies. Examples of indicators are the average turnaround of a proposal, the number of submitted proposals, and overall success rate. All of this data can be collected from both proposed bodies and other main stakeholders, such as researchers and the management of the HE institutions in each country, as well as other internally generated data.

8.3 Contributions of the Study

8.3.1 Theoretical Contributions of the Study

This thesis addressed a very diverse topic which has been studied by many researchers across many disciplines, and from different angles, during the last two decades. In order to increase reader understanding, the researcher attempted to synthesize key literature on research collaboration in different contexts. Firstly, the thesis identified the main motives behind the involvement of the academic researchers in joint research activities. Although what motivates academic researchers to collaborate at all levels is similar across contexts, the findings of this research suggest that the researcher's academic discipline, academic ranking, and collaboration experience play an important role in these motivations. Moreover, the thesis goes further to explores the factors that affect regional research collaboration in developing countries, such as the GCC.

Additionally, the thesis refines the importance of policies and strategies to promote regional collaboration, especially between regional PFUs. The thesis suggests that developing a regional funding body, allocating resources, developing ICT, creating researchers' mobility programmes, removing administrative bureaucracy, and enhancing academic motivations all play a significant role in regional and international collaboration.

This thesis contributes to public policy literature and research collaboration between HE institutions in a developing world context, i.e. the GCC region. There are limited studies that address regional research collaboration between GCC countries, and this research makes some theoretical contribution to the context of the GCC, and the opportunities and challenges which affect academic collaboration between researchers from PFUs in the region.

8.3.2 Practical Contributions of the Study

The research examined some recent secondary data and a fieldwork case study in order to investigate collaborative research activities between public universities in GCC counties. The collected secondary data indicates that there is a limited amount of collaboration between these universities and between the countries in the region. The case selected by the researcher, and perhaps the only convenient one, is the SQU-UAEU joint funding scheme. The researcher interviewed key players participating in this funding scheme to identify the core opportunities and challenges of research collaboration between PFUs in the region. Based on the identified findings of this research, the researcher suggested some strategies and policies to enhance the joint research activities between countries and PFUs. Practically, this study will help policymakers in the region to enhance research activities in general, and specifically the joint research activities, by the following:

- The study identified some opportunities for collaborative research activities, which regional policymakers need to utilise more efficiently to maximise their impact on the development of the region.
- The study identified some challenges which hinder research related activities, especially joint research activities in the region. Regional policymakers must give some attention to these challenges and remove the associated obstacles to enhance research, especially regional and international joint research activities.
- The study also provides policymakers in the region with some suggested strategies and policies to enhance regional collaborative research activities, which will have a positive impact on regional R&D competitiveness and improve both national and regional research productivity and quality.

8.4 Limitations of the Study

To the best of his ability, the researcher tried to address the main research questions by collecting the most valuable information from the right participants in order to achieve the main aims and objectives of the research. In general, the researcher found little qualitative research on international research collaboration between countries and PFUs in the GCC or developing countries in general. This issue forced the researcher to collect a lot of data, which made the analysis and interpretation of the data very time-consuming. As stated earlier, some of the main reasons behind such limitations of the study are the fact that they require more financial resources and time, as well as difficulties in getting access to participants and data. In order to collect rich data, the researcher must collect it from different countries and institutions, which in many cases requires financial support and time; the researcher in this study faced these same constraints in term of funding and time limitations. The researcher had to travel between Oman and UAEU on many occasions because it was very difficult to continuously interview all of the participants from one country and then move to another country, especially when it involves DMs that change their interview schedule at the last minute due to unexpected commitments.

In addition, another limitation is the lack of implemented strategies and policies, such as a regional formal funding body or organisation to fund and promote collaboration between HE institutions in the region, or even across the 'Arab World' or Middle East. For example, many studies such as Hoekman et al. (2010b), Boekholt et al. (2009), and Arnold et al. (2011) were carried out in Europe to evaluate EU funding programmes, such as the Framework Programmes, making them available for researchers who are willing to tackle collaboration in the region. Such a study considers sources of secondary data and applicable literature, which can be used for the European context.

Secondly, although all GCC countries share almost similar HE systems and national rules and regulations, including more than two institutions from more than two countries in this research would improve its truthfulness and generalizability. However, in order to collect rich data, the researcher had to interview the right participants who are involved in joint regional research activities, which are very limited. The SQU-UAEU funding scheme is the only formal joint funding scheme in the region which aims to enhance collaborative research activities between two PFUs in the region, and it is not possible to include participants who do not have any experience on the phenomenon under investigation.

Finally, although all participants are either academic researchers or decision-makers in HE institutions, in which most of them also worked or are working as academics and understand the importance of research, the researcher faced some hesitation from a few of them, especially those in managerial positions, to give as much information as possible. However, off-record strategy was employed in such scenarios and it yielded results by helping to collect rich data.

8.5 Need for Further Research

This qualitative research produced some key findings which highlighted some new researchable issues related to research and collaboration in the region. Firstly, more research is required to investigate the trends and trajectories of collaboration across all academic careers life and disciplines. The secondary data collected gave some key indications about international collaboration between GCC countries and others across the world. Secondly, investigating the impact of the nature of universities (i.e. public or private) on both personal and institutional research productivity could be further investigated by researchers. Third, it is worth studying the impact of teaching loads and course levels (fewer and smaller courses and advanced-level courses) on personal research productivity and collaboration. Fourth, almost all participants were males, and this opens the door to investigate the impact of contextual factors such as culture and equality in female academic careers, research productivity, and collaboration. Fifth, the impact of regional challenges such as institutional and national factors faced by academic researchers in general research and collaborative research activities. Finally, investigating the correlation between motives, factors, and impacts is another issue which could be tackled by researchers.

8.6 Chapter Summary and Conclusion

This chapter concluded the study by presenting some recommended strategies and policies to enhance research collaboration between PFUs in GCC countries. The main recommendations are to establish a regional level body to foster research collaboration through different programmes, and funding schemes such as joint research grants, centres of excellence, graduate scholarships, and incentive systems, as well as other regional scientific events, which help to promote research in the region, such as regional conferences and seminars. Moreover, GCC countries have to develop regional collaborative research priorities and improve both institutional and national level research culture. In addition, they have to consider removing both administrative and financial barriers by detaching HE institutions from the bureaucratic administrative and financial laws and systems. More flexible and effective administrative processes have to be implemented by giving the institutions the authorisation to develop their own internal systems in order to promote national and regional R&D activities. Finally, the chapter includes both the theoretical and practical contributions of the study. Finally, the limitations of this study were also presented, as well as proposed future research in the region.

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