THE ENTREPRENEURIAL UNIVERSITY AND THE
ENTREPRENEURIAL ENVIRONMENT: ORGANIZATIONAL
ANALYSIS AND POLICY CONSIDERATIONS

A thesis submitted to The University of Manchester for the degree of
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<th>Full Form</th>
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<tr>
<td>A&amp;I</td>
<td>Academic-Industry</td>
</tr>
<tr>
<td>A-I-G</td>
<td>Academic-Industry-Government</td>
</tr>
<tr>
<td>AIAP</td>
<td>Academic Innovation Assitances Program</td>
</tr>
<tr>
<td>CIAP</td>
<td>Community Innovation Assistance Program</td>
</tr>
<tr>
<td>EIAP</td>
<td>Educational Innovation Assistance Program</td>
</tr>
<tr>
<td>ERI</td>
<td>Education, Research, and Innovation</td>
</tr>
<tr>
<td>ERIE</td>
<td>Education, Research, Innovation, and Entrepreneurship</td>
</tr>
<tr>
<td>EU-COM</td>
<td>European Commotion</td>
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<tr>
<td>FDI</td>
<td>Foreign Direct Investment</td>
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<tr>
<td>GCC</td>
<td>Gulf Cooperation Council</td>
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<tr>
<td>GERD</td>
<td>Gross Domestic Expenditure on R&amp;D</td>
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<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>GUTech</td>
<td>German University of Technology-Oman</td>
</tr>
<tr>
<td>H.M.</td>
<td>His Majesty The Sultan Qaboos</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communication Technology</td>
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<td>IIC</td>
<td>Industry Innovation Centre- Oman</td>
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<tr>
<td>IP</td>
<td>Intellectual Property</td>
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<tr>
<td>KC</td>
<td>Knowledge Creators</td>
</tr>
<tr>
<td>KF</td>
<td>Knowledge Funders</td>
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<td>KU</td>
<td>Knowledge Users</td>
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<tr>
<td>MOHE</td>
<td>Ministry of Higher Education - Oman</td>
</tr>
<tr>
<td>MONE</td>
<td>Ministry of National Economy - Oman</td>
</tr>
<tr>
<td>NERI-FPS</td>
<td>National Education, Research, Innovation – Fund &amp; Policy Spaces</td>
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<tr>
<td>N&amp;I</td>
<td>National &amp; International</td>
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<tr>
<td>NIS</td>
<td>National Innovation System</td>
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<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>NTNU</td>
<td>Norwegian University of Technology</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
</tr>
<tr>
<td>PPP</td>
<td>Public, Project, Private</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>Research &amp; Development</td>
</tr>
<tr>
<td>SCP</td>
<td>Supreme Council for Planning</td>
</tr>
<tr>
<td>STIE</td>
<td>Science, Technology, Innovation, and Entrepreneurship</td>
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<tr>
<td>STI</td>
<td>Science, Technology, Innovation</td>
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<tr>
<td>SQU</td>
<td>Sultan Qaboos University</td>
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<tr>
<td>TH</td>
<td>Triple Helix</td>
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<tr>
<td>TRC</td>
<td>The Research Council of Oman</td>
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<tr>
<td>TTO</td>
<td>Technology Transfer Office</td>
</tr>
<tr>
<td>UT</td>
<td>University of Twente</td>
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<tr>
<td>UoS</td>
<td>University of Strathclyde</td>
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<tr>
<td>U-I</td>
<td>University-Industry</td>
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Abstract

Manchester Business School Manchester Institute of Innovation Research
Sharifa H Alharthy, Doctor of Philosophy (PhD)

The Entrepreneurial University and The Entrepreneurial Environment: Organizational Analysis and Policy considerations

This thesis presents a study of the ‘Entrepreneurial University’. It develops a framework for conceptualising the entrepreneurial university by interrogating literature and secondary sources. Regardless of the increasing body of literature on the entrepreneurial university concept, it is revealed to be under-theorized. This literature starting from Clark’s initiatives up until recent publications focus on case studies which are not analytically driven. This gap in the theory of the entrepreneurial university inspired the study aim, which is to develop an analytical framework that can be used as a tool to identify ‘The Entrepreneurial University’ from any other ‘classic university.

The study argues that there are three main aspects affecting universities’ transformation toward entrepreneurial organization. These are: organization, external environment, and the interaction between organization and external environment. The first aspect investigates the entrepreneurial organizational dimensions, with a comprehensive framework of five organizational dimensions namely managerial, funding resource, mission, external collaboration, and cultural dimension. This has been developed as a ‘compass’ to characterize two ideal types of entrepreneurial university. The second and third aspects address the concepts of the entrepreneurial environment and the coherence between the entrepreneurial organization and the entrepreneurial environment where the university exists. The concept of National Education, Research and Innovation (ERI) Funding and Policy Spaces (NERI-FPS) (Nedeva et.al 2013) has been selected as the most appropriate framework for characterizing the entrepreneurial coherence, and analyzed for this purpose, where the variety of opportunities and flexible selection process are seen to be the key elements for the coherence between them. This adds a new development to the theory. Both the entrepreneurial framework and the NERI-FPS have been tested using four European case universities, from the Netherlands, Norway, Sweden, and the United Kingdom.

The framework is applied to the universities and policy environment in Oman as an example of a developing country seeking to use entrepreneurship as a solution to socio-economic problems. Using qualitative analysis of documentation and detailed interviews, the framework is shown to reveal characteristics of the universities which can be used to develop policy actions. The results reveal that Omani universities are “classic” universities. However, to shift toward an entrepreneurial approach, five scenarios are suggested for Oman, and a pathway toward fully-fledged entrepreneurial universities is illustrated.

First an online survey served as a pilot study, the results of which were then used to formulate the second stage which was semi-structured interviews with two Omani universities, and the third stage was in-depth interviews with Omani policy makers. This approach improves the internal validity of the research, and provides a rich picture of the universities and their environment.

Finally, the study provides a framework which characterises entrepreneurial universities along a number of context-neutral dimensions which could take the research forward. The novelty of using case of Oman as an empirical study added new contribution into the field. In addition, this study contributes to a better understanding of policy actions with regard to entrepreneurial transformation.
Declaration

No portion of the work referred to in the thesis 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

This thesis is dedicated to my mother, Fatima Salim Alharthy,

To my family, the Sons of Hamood Alharthy,

To my people, the future generation of Oman who are paving the path towards a better Entrepreneurial Omani Culture
Acknowledgments

Words of acknowledgement can never really convey my utmost appreciation to those generous individuals who have contributed in so many ways to this thesis.

First and foremost, I would like to convey my sincere gratitude to my mother, Fatima Salim Alharthy, for her endless love, support, and prayers. She has always been the true inspiration for my entire life’s journey. I would also like to extend my deepest thanks and gratitude to my family, the sons of Hamood Alharthy, for their persistent support, encouragement, and for being there whenever I needed them, especially my three older brothers, Nasser Alharthy, Hilal Alharthy, and Ahmed Alharthy.

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I would also like to thank all the members of staff of the Manchester Institute of Innovation Research, who have been extremely friendly and supportive through my PhD research journey.

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I would also like to acknowledge and convey my special thanks to all the participants of the interviews, without whose support I would not have been able to make significant contributions in this study.

Above all, my limitless thankfulness and gratitude go to the one and only creator, Almighty Allah, for His endless blessings and for giving me the strength and stamina to complete this chapter of my life’s journey.
The Author

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During her PhD the author attended several conferences, seminars, and workshops, and has presented papers at three such events, in addition to a poster.

\(^1\) The author contributed as a key member in developing National Research and Innovation Strategy for Oman with International firm CRA International.
Chapter One: Introduction

1.1. Preface

My motivation for studying the phenomena of entrepreneurial universities stems from my position as Senior Research Analyst at the Policy & Study Department at the Research Council of Oman. I wish to contribute to the developing evidence-based STIE policy to inform decision makers in the Sultanate.

This motivation has been built through my professional experience: I work as a project manager in the National Innovation & Research Capacity Development (NIRCD) project at the Research Council. My focus in this project is on entrepreneurial education within the context of the overall National Innovation System for Oman. This project aims to develop an innovation culture among the Omani youth from an early age. The vision of this project is to develop the national capacity for research and innovation, which will lead to an international competitive advantage and will gradually contribute to economic diversification for the future of Oman, which reflects the ‘Oman Vision 2020’. The education system is considered to be a vital pillar in any innovation system around the world. Consequently, the Innovation in Education project will effectively impact the national policy of Science and Technology. This is why education indicators are seen to be one of the key indicators of Science and Technology policy. My efforts in this area are recognized by the Assistant Secretary General for innovation, so I have been assigned as project manager for the Entrepreneurial Education Project.\(^2\) In addition I have worked on developing strategic framework and guidelines for the Academic Innovation Assistance Program; and Community Innovation Assistance Program under the supervision of PhD holders. These projects focus on building a harmonized National Innovation system for the Sultanate. The main focus and outcome of these projects is to develop evidence-based STIE policy to inform policy makers in the Sultanate.

The experiences from the above projects have enabled me to recognize national gaps and the need for national research and innovation ecology that is supported by national science, technology, and innovation policies.

\(^2\) EIAP is a project that focuses on spreading awareness of research and innovation and entrepreneurship in general education schools from early levels.
More recently, a need to re-strengthen the education system, especially higher education, in Oman has been acknowledged as a ‘High National Priority’ at all levels. His Majesty the Sultan of Oman has urged related stakeholders and policy makers to re-evaluate all education programs and policies in order to close the gap between education system outcomes and industry and workplace demands. Accordingly, on the one hand about 60% of the Omani population are at working age, between twenty-four and sixty-five years old, which causes a huge challenge for the Omani government to provide secured jobs for all.  
This is not an option any more, with roughly a 3% annual increase in the population (TRC, 2008). On the other hand, depending on oil and gas (none renewable sources) as a main source for national economic growth has been acknowledged to be supported by economic diversification (Oman, 2020), where knowledge-based economy has been recognized as one strong alternative.

In this context Omani universities are urged to play a vital role in the socio-economic development of Oman. However, whether Omani universities are capable of playing this role by transforming themselves into entrepreneurial organizations is my concern. This has encouraged me to investigate the readiness of Omani universities to transform into entrepreneurial organizations via two key research areas: 1) the extent to which the Omani universities can play a significant role in socio-economic development as part of a broader context of developing knowledge-based socio-economy, and 2) the extent to which the national and institutional policies are supporting the entrepreneurial transformation in Omani universities.

Therefore, I begin by searching for the concept of ‘Entrepreneurial University’ in related literature since 1998, aiming to find the characteristics of the so-called ‘Entrepreneurial University’. Accordingly, through the process of reviewing different published articles from different scholars I came to acknowledge that this concept is under-theorized and there is no such a framework or theory that I can use in order to investigate universities in emerging countries, such as GCC countries including Oman.

Consequently, I have restructured my research to derive an analytical framework from the literature, and apply it to an emerging country (Oman). I present the thesis in four parts to reflect the research steps:

---

3 The Arab Spring put pressure on and presented a huge challenge to the Omani government to meet increasing employment demands.
PART I consists of CHAPTER TWO and CHAPTER THREE, and investigates internal entrepreneurial organizational dimensions, the external entrepreneurial environment where an entrepreneurial university exists, and the interaction between the organization and environment. In this part a comprehensive Entrepreneurial University Framework has been developed with five organizational dimensions: managerial, funding resource, mission, external collaboration, and cultural dimension. In addition, two Ideal Entrepreneurial University Types have been characterized. This has been achieved by analytically reviewing related published literature between 1998 and 2010. Each of the five dimensions has been extensively analysed and characterized, as explained in CHAPTER TWO.

CHAPTER THREE addresses the concept of entrepreneurial environment and the coherence between entrepreneurial organization and entrepreneurial environment via ERIE Funding and Policy Spaces. In this chapter three national frameworks have been analytically reviewed: the National Innovation System (NIS), the Triple Helix Model (TH), and National ERI Funding and Policy Spaces (NERI-FPS). The rationale behind selecting these national frameworks is that all of them consider universities as key players in national socio-economic development. However, NERI-FPS has been selected as the most appropriate framework for characterizing the entrepreneurial environment as it is seen to be national and cultural context-free, provides a variety of opportunities and flexible ‘selection process’, and, therefore, can be applied to emerging countries such as Oman. In-depth details of this extensive analysis are provided in CHAPTER THREE.

PART II is concerned with testing the ‘Entrepreneurial University Framework’, in addition to examining the coherence between an entrepreneurial university and an entrepreneurial environment. Four European universities have been used as case studies for this purpose. The selection of these four universities is based on acknowledgment of them as entrepreneurial universities in more than one published study. CHAPTER FOUR addresses testing the ‘Entrepreneurial University Framework’. CHAPTER FIVE examines the coherence between an entrepreneurial organization and an entrepreneurial environment. As a result, a soft causality has been revealed between entrepreneurial universities and entrepreneurial environment. However, further research is needed in order to validate absolute causality.

PART III contains the empirical work, which applies the ‘Entrepreneurial University Framework’ to two Omani Universities in which the data has revealed that they are ‘classic
universities’ with potential to be transformed into the second Ideal Type, the ‘blended-Technology University’, by creating an enabling entrepreneurial environment. The NERI-FPS framework has thus also been applied to investigate the funding and policy spaces in Oman compared with the four European cases in Chapter Five.

**PART IV** presents the synthesis, conclusion, and implications of the thesis, by summarizing contributions to the theory and the implications from the theory for the case of Oman. The contributions to the theory are the development of a comprehensive Entrepreneurial University Framework as a ‘compass’ that can be used to characterize entrepreneurial organizations, the introduction of new related terminologies, and the provision of an ERIE funding and policy platform that characterizes the coherence and soft causality between internal entrepreneurial organizations and external entrepreneurial environment. The implications from the theory for the case of Oman can be summarized by the five suggested scenarios, and the implications for ‘Entrepreneurial Environment’ landscapes/funding and policy spaces as an enabling environment for Omani universities to be transformed to entrepreneurial organizations are revealed.

It is also worth mentioning that the originality of the study is also found in the new knowledge that will contribute to the field of entrepreneurialism of higher education institutes in general and universities in particular by providing an analytical framework that characterises entrepreneurial universities with context-neutral dimensions, which would take the study of the entrepreneurial university forward. In addition, the novelty of using the case of Oman to implement the framework added new contribution into the field.

Several options for organizational dimensions and two ‘Ideal Types’ of entrepreneurial-led universities have been offered by this research project. This study provides knowledge about the importance of persistence interaction between related ERIE actors.

Moreover, this study is unique in that it contributes to an exploration of the role of the university in socio-economic development in emerging countries like Oman, which can be seen as a representative of Gulf Countries, whose economies are oil-based and which wish to diversify their economies and include knowledge-based contributors.

The thesis ends by highlighting the research limitations and further research possibilities.
1.2. Background of the Research

The international pressure groups, whose focus is on knowledge-based society and economy, have accelerated the need for university contributions in socio-economic growth. Consequently, high pressure has been placed on the higher educational institutes to enhance their role in the contribution to the regional and international competitiveness of their economies (Gibb, 2009). Furthermore, there are increasing demands on the higher education sector to contribute more considerably to local socio-economic developments (Gibb, 2009; Nedeva, 2007). On the other hand, universities and research institutes have been viewed as generators of future economic growth; in a more direct way, this is because they are an important source of wealth creation and economic development in national, regional and international economies (Steffensen et al, 2000; Bower, 2003; Etzkowitz, 2004, 2008).

In addition, there is a growing international focus on government policies. It links the innovation systems and technology, the exploitation of universities’ knowledge, R&D and innovation (entrepreneurial university and innovation hub). Pioneering studies have thoroughly investigated this issue in-depth and discussed the importance and responsiveness of universities to socio-economic demands (Nelson, 1993; Lundvall, 1988; Freeman, 1787; Laredo et al, 2001; Etzkowitz, 2008).

During the last decade there was a dramatic shift in the responsibilities of universities. A third mission has been developed alongside traditional missions of teaching and research. This third mission enables the universities to move towards becoming so-called ‘entrepreneurial universities’. In this context, the universities’ organizational environments and cultures have been changed to align with this new mission. The universities utilize their research and teaching capabilities to contribute to knowledge and technology transfer, consequently responding to socio-economic demands. Accordingly, the entrepreneurial university approach motivates the academic sector to review their research output and knowledge creation from a different angle, where they can commercialize their research results (Etzkowitz, 2008). In this context, and in view of the above illustration of a wide range of literature, one can say that the ‘entrepreneurial university’ is the organization that has ability to take teaching and research outcomes down the value chain: the capability of

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4 Pressure groups are from national economy authorities and social development authorities.
generating and transforming ideas and research output into valuable usage through chained activities. The effectiveness of the system can be judged by its sustainability in generating, capturing, processing, diffusing and exploiting value with consequential partners and beneficiaries. In this context, the beneficiaries could be expecting an outcome of social, economic or socio-economic demand. However, the idea of the transformation process into a valuable outcome is itself costly and requires entrepreneurial changes within a university’s entire system (Nelson, 1993; Lundvall, 1988; Laredo et al, 2001). Moreover, the effectiveness of research into commercialization as a part of the innovation system inside universities requires internal commitments inside the organizational environment and culture. It also requires an external collaboration with the industrial sector and government (Etzkowitz, 2004).

In the last two decades there has been increasing focus on establishing a knowledge-based society and consequently a knowledge-based economy. This leads many countries to seek effective ways in order to utilize the knowledge that has been created in their national organizations such as universities and research organizations.

Both developed and developing countries share the desire to harness their human resource and funding potential for a better use of their production of knowledge. This can be seen by transferring knowledge and ideas that are created inside universities and research institutes into valued products. This approach leads to so-called research commercialization and consequently the establishment of entrepreneurial universities or so-called ‘innovation-based universities’ (Lundqvist & Williams 2006). In order to meet local society demands and national economic growth contribution the universities have to balance multiple missions/functions: teaching, research, and entrepreneurship.

Nedeva (2010, p. 1), argues that “scientific knowledge, scientific communities [universities] and scientific organizations have been cast as the engines of industrial competitiveness and economic progress”.

In view of this one can argue that there is no doubt that universities with entrepreneurial missions and activities could play a central role in socio-economic development. This leads us to a fundamental question: how can a university play this role and be responsible as a partner within the ERIE ecology? This can be clearly seen from the context of knowledge and technology transfer, where a university’s role is strongly demonstrated as a knowledge generator. It is evident that the universities, with their balanced multiple missions,
THE ENTREPRENEURIAL UNIVERSITY AND THE ENTREPRENEURIAL ENVIRONMENT:
ORGANIZATIONAL ANALYSIS AND POLICY CONSIDERATIONS

contribute highly in innovation and entrepreneurship. Nedeva (2007, p. 94) assumes that
the third mission can be seen “…as the institutional imperative of the university to engage
in a variety of exchanges with non-academic domains thus establishing different kinds of
relationships with societal and economic/industrial agents”.

Gibb et al (2009, p.19) highlight that there is a link between innovation and exploitation of
university knowledge: “This link is reflected in the growing focus of government policies ...
upon innovation and technology development and the exploitation of university
knowledge”. Moreover, Gibb et al argue that the “entrepreneurial university is therefore
frequently associated with the concept of innovation hub”.

However, unlike Thursby & Thursby (2002), Lundqvist et al (2006, p. 574) advocated the
role of universities in bridging the innovation gaps. They state two main reasons for this:
“the first is the survival, continuance and sustainability of the university increasingly
dependent upon being “an actor” in the economy; the second is the opportunity, perhaps
necessity, for the university to combine and balance interests, and have incentives towards
research, education and innovation/commercialization”.

Furthermore, universities are often seen as platforms for radical innovation. This is because
of the focus on so-called basic research, and having a constant flow of students
investigating and stimulating the knowledge base (Etzkowitz, 2003).

In this context, there are two elements from Gibb et al (2009) that need to be highlighted.
Firstly, the enormous pressures on the higher education sector, particularly universities, to
play a key role in responding to socio-economic development, which subsequently leads to
the sustainable development of countries in order to ensure wealth for the future
Secondly, as demands move into knowledge-based society and consequently into
knowledge-based economy, there is a need to establish national and educational policies
that should support this move at organizational and national levels.

Nedeva (2010) adds “… [Knowledge producers] are subjected to a number of policy
pressures for change predicated on achieving a desired outcome”.

However, in searching of a comprehensive definition of ‘entrepreneurial university’ that
works across the different nations and cultures in the literature, the author came to
acknowledge that there is no singular definition. There are a number of definitions of the Entrepreneurial University in the literature which reveal no consensus (OECD, 2012).

The following are some attempts from different scholars to define the concepts ‘Entrepreneurial University’ that shows lack of consensus despite some common elements:

<table>
<thead>
<tr>
<th>Year</th>
<th>Author</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1983</td>
<td>Etzkowitz</td>
<td>Universities that are considering new sources of funds like patents, research funded by contracts and entry into a partnership with a private enterprises.</td>
</tr>
<tr>
<td>1995</td>
<td>Chrisman, Hynes and Fraser</td>
<td>The entrepreneurial university involves —the creation of new business ventures by university professors, technicians, or students.</td>
</tr>
<tr>
<td>1995</td>
<td>Dill</td>
<td>—University Technology Transfer is defined as formal efforts to capitalise upon university research by bringing research outcomes to fruition as commercial ventures. Formal efforts are in turn defined as organisational units with explicit responsibility for promoting technology transfer.</td>
</tr>
<tr>
<td>1998</td>
<td>Clark</td>
<td>Seeks to innovate in how it goes to business, to work out a substantial shift in organizational character, to become —stand-up, universities that are significant actors in their own terms.</td>
</tr>
<tr>
<td>1998</td>
<td>Röpke</td>
<td>Mean three things: the university itself, the members of the university —faculty and the interaction of the university with the environment.</td>
</tr>
<tr>
<td>1999</td>
<td>Subotzky</td>
<td>Is characterised by closer university-business partnerships, by greater faculty responsibility for accessing external sources’ of funding and by a managerial ethos in institutional governance, leadership and planning.</td>
</tr>
<tr>
<td>2002</td>
<td>Kirby</td>
<td>Have the ability to innovate, recognize and create opportunities, work in teams, take risks and respond to challenges.</td>
</tr>
<tr>
<td>2003</td>
<td>Etzkowitz</td>
<td>Is a natural incubator, providing support structures for teachers and students to initiate new ventures: intellectual, commercial and conjoint.</td>
</tr>
<tr>
<td>2003</td>
<td>Williams</td>
<td>Is nothing more than a seller of services to the knowledge industry.</td>
</tr>
<tr>
<td>2003</td>
<td>Jacob, M, Lundqvist and Hellsmark</td>
<td>Is based both on commercialisation (custom made further education courses, consultancy services and extension activities) and commoditization (patents, licensing or student owned start-ups).</td>
</tr>
<tr>
<td>2006</td>
<td>Guerrero-Cano, Kirby, and Urbano</td>
<td>—Entrepreneurial University is defined as a university that has the ability to innovate, recognise and create opportunities, work in teams, take risks and respond to challenges (Kirby, 2002a), on its own, seeks to work out a substantial shift in organisational character so as to arrive at a more promising posture for the future (Clark, 1998). In other words, is a natural incubator that provides support structures for teachers and students to initiate new ventures: intellectual, commercial and conjoint (Etzkowitz, 2003).</td>
</tr>
</tbody>
</table>

Definitions of an Entrepreneurial University (OECD, 2012)

Based on the above, it is reasonable to advocate that entrepreneurial universities are the most effective environment for the integration of innovation and entrepreneurial activities, in order to utilize and transfer knowledge into valued products and services that meet local
society demands and national economic growth. This can be seen clearly from Guerrero’s et al (2006) definitions summarised from the table above “Entrepreneurial University is defined as a university that has the ability to innovate, recognise and create opportunities, work in teams, take risks and respond to challenges (Kirby, 2002a), on its own, seeks to work out a substantial shift in organisational character so as to arrive at a more promising posture for the future (Clark, 1998). In other words, is a natural incubator that provides support structures for teachers and students to initiate new ventures: intellectual, commercial and conjoint (Etzkowitz, 2003) ”.

Therefore, in this context one can argue that the entrepreneurial university is needed in both developed and developing countries in order to contribute effectively into socio-economic development. The role of entrepreneurial universities as a partner in socio-economic development can be summarised: entrepreneurial university is promoting knowledge-based innovation and entrepreneurial-led activities which places entrepreneurial university as a key actor within the national innovation and entrepreneurship ecology.

However, there are fundamental questions associated with internal organization changes of entrepreneurial university and its external environment; these questions shaped the research aim and questions of this study (see sections I.3 and I.4).

The situation is very different in the case of developing countries such as the Gulf countries in the Middle East. Despite a desire to capture the concept of entrepreneurialism, there is an absence of any public policy, such as an STI policy, that supports this desire. In addition, there is a lack of acceptance, even amongst the top decision makers, of the changing culture regarding entrepreneurialism. This is because Gulf countries are mostly oil-based economies. However, all national and international indicators are predicting a continued decline in oil production, which is leading decision-makers in Gulf countries to re-think their strategies, and begin to look towards a knowledge-based economy where universities will play a vital role in their countries’ socio-economic development. Nevertheless, as far as I am aware, no single study has yet investigated this phenomenon in Gulf countries, including Oman. Therefore, this research also intends to provide an important lesson for GCC/Oman in order to foster the entrepreneurial university approach.

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5 There are two scenarios GCC will face being oil-based economies. First the oil reservoirs will run out, and/or the oil age will vanish as the Stone Age did base on increasing renewable energy alternatives.
1.3. Research Aims

This study presents an exploratory research project where the key aim is to investigate three aspects in the era of entrepreneurial universities. These are the organizational changes, external environment involvement via fund and policy spaces, and the third is the interaction mechanisms between those two aspects. The study also aims to explore emerging university transformations occurring in Gulf countries such as Oman. The following illustrate the study aims in detail:

1. To contribute to a better understanding of the organizational dimensions of the entrepreneurial university.

2. To contribute to a better understanding of the entrepreneurial-led external environment and how it aligns with the entrepreneurial-led university.

3. To contribute to a better understanding of the importance of creating coherence between organizational changes and the external environment in terms of funding and policy spaces.

4. To test the entrepreneurial university framework in the emerging culture occurring in Gulf countries with an oil-based economy, in order to contribute to a better understanding of university roles in socio-economic transformation.

1.4. Research Questions

In order to address the study aims the following five key research questions have been developed. These are:

1. How can we characterize the entrepreneurial university?

2. How does an entrepreneurial university manage to balance the tension between internal proactive activities and external reactive demands?

3. What is the coherence between an entrepreneurial university and the entrepreneurial environment?
3(a) how can policy spaces support entrepreneurial activities inside universities?

3(b) how does the entrepreneurial university seize policy spaces in its process of transformation?

The above mentioned research questions are addressed in PART I and PART II of the research study.

In addition two more specific research questions have been developed in order to address the PART III of this study as mentioned earlier. These are:

4. How can entrepreneurial universities play a role in socio-economic development in GCC/Oman which are oil-based economies?

5. What STI policy framework can support GCC/Oman in order to foster the entrepreneurial university approach?

1.5. Research Gaps

The author acknowledged the feeble empirical foundations for claims about transformation of universities to being “entrepreneurial” and the lack of consensus on what defines an entrepreneurial university from the analytical review of related literature over the last two decades. The literature concerning the entrepreneurial university starting from Clark’s schemes and through the recent studies is mostly focused on case studies which are not analytically driven. Therefore, this study aims to fill this gap by providing a comprehensive framework for characterizing the ‘entrepreneurial university’ that stays coherent with ‘entrepreneurial environment’. The concept of ‘entrepreneurial environment’ is another contribution of this study, and is described throughout the study.

1.6. Importance of the Study

“There is no choice: The world is moving fast... With or without you! Catching up is difficult. It means learning how to run faster than the competitors (who are already running quite rapidly)” (Alfred Watkins, 2008, World Bank S&T Program Coordinator).
The significance of this study is twofold. First, its contribution to the knowledge of entrepreneurialism can be demonstrated because it contributes to better understanding entrepreneurial university characteristics, to a better understanding of the entrepreneurial-led external environment that aligns with entrepreneurial-led university, and to a better understanding of the importance of creating coherence between organizational changes and external environment fund and policy spaces.

Second, the study contributes to a better understanding of a university’s roles in socio-economic development in emerging culture occurring in Gulf countries/oil-based economies. This is seen to be of national importance for Oman in its desire to diversify its national economy’s resources in order not to depend fully on non-renewable resources/oil and gas, and try to catch up with knowledge-based economy as a good potential for Omani future generations.

The influence of the entrepreneurial universities for Oman can be summarised into several outcomes. These are: stimulating an entrepreneurial mindset and culture among students and academic staff and consequently among the entire Omani society; producing entrepreneurial graduates with entrepreneurship skills (thinking and actions) able to create jobs through creating SMEs rather than seeking secured jobs which contributes to national Omani economy, which in addition contributes to solving the unemployment issues in Oman. Further, the entrepreneurial university would enhance innovation and knowledge-based activities among academic staff which would lead to start up and spinoff firms, and could bridge the gap between the universities’ outcomes and the industry sector through building strong collaborations activities, which will enhance the knowledge-based industry in Oman. This epitomizes the ‘successful university’ that manages to highly balancing between academic values and socio-economic demands.

Therefore, the study examines the effectiveness of organizational changes and capabilities of the entrepreneurial university as a partner in the National ERI system in Oman, learning from some European experiences. This provides policy implications to inform Omani policy makers.
1.7. The Originality of the Study

The novelty of the entrepreneurial organizational framework is based on dealing with all five dimensions of the framework as a comprehensive model, which consists of five parts which should fit together in order to provide a harmonized organizational scheme able to engineer the university's entrepreneurship. It appears that no one has adapted any such comprehensive framework that analyses each dimension individually as well as in relation to other dimensions. Unlike the current literature which is based on case-studies, this framework is analytically driven. This can take the knowledge of entrepreneurial university forward. In this context, the exploration of the five dimensions also has provided the points of convergence or the mutual indicators between them which lead to and sharpen the university transformation.

Therefore, the originality of this study can be found in the new knowledge that will contribute to the field of entrepreneurialism of higher education institutes in general and universities in particular. Several organizational dimensions and two Ideal Types of entrepreneurial- led universities are offered by this research project. Moreover, this study provides knowledge about the importance of regular interaction between related actors.

Additionally, this study can be seen as one of a kind in that it offers one exploration of the role of the university in socio-economic development in emerging countries like Oman, a representative of gulf countries which are oil-based in terms of economy and have a desire to diversify their economy to include knowledge-based contributions.

1.8. The Structure of the Thesis

The study is divided into three different parts, each of which has a specific purpose. The following briefly highlights each part:

PART I: This consists of two chapters where the main purpose is to analyze the research gap, develop the conceptual framework, and test the research framework:
Chapter Two: the analysis of the organizational dimensions of the entrepreneurial university. One of the purposes of the literature review is identifying the gaps and providing the theoretical and conceptual framework from existing knowledge in the area.

The chapter concludes by developing a conceptual framework of five comprehensive dimensions. These are: managerial, funding, mission, culture and beliefs, and external links. In addition, the thesis provides the definitions of the different dimensions, and the key indicators that help to characterize entrepreneurialism in universities.

Chapter Three addresses the concept of entrepreneurial environment and the coherence between entrepreneurial organization and entrepreneurial environment. In this chapter three national frameworks have been analytically reviewed: the National Innovation System (NIS), the Triple Helix Model (TH), and National ERI Funding and Policy Spaces (NERI-FPS). The rationale behind selecting these national frameworks is that all of them consider universities as key players in national socio-economic development. However, NERI-FPS has been selected as the most appropriate framework for characterizing the entrepreneurial environment as it is seen to be national and cultural context-free, provides a variety of opportunities and a flexible ‘selection process’, and, therefore, can be applied to emerging countries such as Oman.

**PART II:** This consists of two chapters where the main purpose is testing the ‘Entrepreneurial University Framework’, in addition to examining the coherence between the entrepreneurial university and entrepreneurial environment. Four European universities have been used as a case study for this purpose. The selection of these four universities is based on them being acknowledged as entrepreneurial in more than one published study.

Chapter Four tests the ‘Entrepreneurial University Framework’ in four European universities: Chalmers University of Technology, the University of Twente, the Norwegian University of Technology, and Strathclyde University.

The chapter concludes by positioning each of the four cases based on their organizational analysis into related entrepreneurial university type.

Chapter Five examines the coherence between the entrepreneurial organization and entrepreneurial environment by adapting an NERI-FPS framework, and applying it to the same four cases that have been used to validate the entrepreneurial university framework. As a result, soft causality has been revealed between entrepreneurial universities and
entrepreneurial environment. However, further research is needed in order to validate absolute causality.

**PART III**: This consists of three chapters whose main purpose is to contribute to a better understanding of the role of universities in emerging cultures in Gulf countries like Oman, which has an oil-based economy and a desire to diversify its economy to include knowledge-based contributions.

Chapter Six highlights the research strategy design, research methodology approaches, research validity, and credibility of the study.

Chapter Seven illustrates the empirical findings from semi-structured interviews with two Omani universities, and in-depth interviews with Omani policy makers. The chapter concludes by providing the current situation of Omani universities with regard to the entrepreneurial approach, based on the entrepreneurial university framework.

Chapter Eight discusses the empirical work and identifies the Omani universities’ organizational gaps and policy spaces gaps with regard to entrepreneurism.

**PART IV** provides synthesis, conclusions and implications of the thesis’ ultimate findings. Contributions of the research, policy implications, and entrepreneurial university scenarios for Oman are proposed. In addition, limitations of applicability are discussed and some further research possibilities are suggested.
PART I

In Search of the Entrepreneurial University: Towards a Framework of Organizational Analysis

“An entrepreneurial society refers to places where knowledge-based entrepreneurship has emerged as a driving force for economic growth, employment creation and competitiveness… entrepreneurial universities play an important role as both knowledge-producer and a disseminating [Organization]” (Guerrero, et al, 2010, p. 1).

Many studies have described entrepreneurial universities by using the case-study approach, which is not analytically driven. They lack a robust theoretical framework for understanding, as has been mentioned earlier (Guerrero et al, 2010). In addition, the genuine study of what comprises entrepreneurialism in higher education institutions in general, and universities in particular, is still empirically weak (Gjerding et al, 2010; D’Este, et al, 2010; Sotirakou, 2004; Etzkowitz 2003, Jacob et al, 2003; Rinne and Koivula, 2005). However, most studies reveal the important issues of the complexity, conflicts and tensions of the entrepreneurial university revolution. Most studies that have analyzed this phenomenon around the world (North America, Europe, Australia, and some Asian countries) by studying examples of entrepreneurial universities have arrived at common conclusions. These are related to core mission, adaptation processes and organizational changes, internal and external strategies, different types of entrepreneurial activities, academic characteristics, the environmental pressures, and cultural behaviours. Having said that, the ‘entrepreneurialism’ in universities requires different management styles and cultural changes. This opens up different areas for research and studies to support successful environmental and organizational changes inside the university, in addition to the flourishing of external collaborations (Lee et al, 2010), and to consider bottom–up activities as well as top–down strategies.

In addition, there is now a considerable amount of literature addressing the relationship between universities as organizations and external environment, which has recently attracted a wide range of scholars around the world (Barber et al, 2013; Nedeva, 2006, 2013; Nedeva et al, 2013; Gibb et al, 2009; Fong et al, 2012; Kitagawa and Wigren, 2010; van der Heide & van der Sijde, 2008).
“Building relationships with [environment], putting in place the virtuous circle of good university, close links with business and public authorities, collaborative research and development, spin-offs and start-ups, the attraction of talented students and faculty, the development of ‘cool’ places to live, and then the further development of the university and the [external environment] should now become central to any … university. This is a role a university can play” (Barber et al., 2013, p. 54).

It is worth mentioning that entrepreneurial environment⁶ is seen to be the climate or the conditions under which entrepreneurial universities exist.

Moreover, developed countries have taken steps to move universities towards an entrepreneurial paradigm. This can be seen in the development of their national science, technology and innovation policy spaces at the decision-makers’ level, in addition to the re-structuring of organizational governances in their quest to foster entrepreneurial culture at organizational and national levels. Several national approaches have been developed in order to explain the interaction between Education, Research and Innovation and Entrepreneurship (ERIE) spaces and external environment/policy spaces. Chapter Three analytically reviews literature on three national frameworks (NIS, TH, and NERI-FPS) for the purpose of investigating the best environment for an entrepreneurial university to successfully seize a variety of opportunities for better entrepreneurial activities.

Therefore, the aim of this part is to contribute to a better characterisation of the entrepreneurial university and the importance of interaction between entrepreneurial universities and entrepreneurial environments: “the environment that is characterized as offering varieties of opportunities: funding resources, research, innovation, and entrepreneurial programmes, and a flexible interaction and networking mechanisms” (Nedeva, 2013).

Chapter Two provides the research framework of an entrepreneurial university’s dimensions based on an analytical review of studies of entrepreneurial universities between 1998 and 2010, in order to characterize the entrepreneurial university based on organizational theories. This framework is used as a ‘compass’/tool that helps to differentiate between ‘The University’ and a specific university; this then will be used to investigate the universities in Oman.

⁶ Entrepreneurial Environment is the environment which provides a variety of entrepreneurial opportunities and a flexible eco-system. More explanations can be found in Nedeva, 2013 online blog.
In addition Chapter Three illustrates the coherence between the entrepreneurial university and entrepreneurial environment.

This part focuses on addressing the following research questions:

1. How can we characterize the entrepreneurial university?

2. How does an entrepreneurial university manage to balance the tension between internal proactive activities and external reactive demands?

3. What is the coherence between an entrepreneurial university and the entrepreneurial environment?

   3(a) how can policy spaces support entrepreneurial activities inside universities?

   3(b) how does the entrepreneurial university seize policy spaces in its process of transformation?
Chapter Two: The Entrepreneurial University Organizational Dimensions’ Characteristics

I.2.1. Introduction

The phenomenon of the ‘entrepreneurial university’ has attracted interest as part of a broader context of developing knowledge-based economies. A body of literature has discussed this phenomenon following Clark’s book in 1998, which first introduced the term. It is associated with increasing pressures facing universities to contribute to socio-economic development. A linked trend has been the ‘second academic revolution’, which refers to an extended mission for universities, the so-called ‘third mission’ (Etzkowitz, 2004; Jongbloed, et al, 2008; Nelles and Vorley, 2011; Lee et al, 2010; Nedeva, 2010). This stresses the need for universities to make changes at different levels, from organizational dimensions, the academic and knowledge production dimension, to the creation of organizational linkages between universities and external entities (industry and government), and the cultural and beliefs dimension (Clark 1998, 2004; Deem, 2001; Marginson et al, 2000; Nowotny et al, 2002; Williams, 2003; Shatock, 2003; Slaughter and Leslie 1997; Etzkowitz, 2001, 2003; Etzkowitz, et al, 2000; Barnett 2003; Rinne et al, 2005). This has also led to governments in different countries around the world, especially in the US and Europe, launching public policies to support and encourage universities to be entrepreneurial. However, the policies seem to focus on knowledge commercialization by encouraging universities to collaborate with industry (Bratianu et al, 2010). This is viewed as promising monetary incentives to academia.

Since then, extensive studies have probed the concept of the entrepreneurial university in depth, and from different perspectives, to investigate their organizational, operational (actual academic functions) and cultural changes. (Clark, 2004; Deem, 2001; Marginson and Considine, 2000; Nowotny et al, 2001; Williams, 2003; Shatock, 2003, 2005; Sporn, 2001; Slaughter and Leslie 1997; Etzkowitz, 2001, 2003; Barnett 2003; Lazzeroni and Piccaluga, 2003; Rinne et al, 2005; Fuller 2005; Kogan et al, 2006; Barnett, D’Este, et al, 2010; Lee et al , 2010).

It is worth mentioning that some of the above mentioned studies have investigated the entrepreneurial university's dimensions, while others have focused on the indicators used
to measure such dimensions. In this chapter an extensive range of literature published between 1998 and 2010 on the “entrepreneurial university” has been reviewed in order to identify the five key dimensions of entrepreneurial universities as organizations.

By analytically reviewing the literature, five organizational dimensions have been identified: managerial, funding, mission, external collaboration and cultural dimension/behaviours and beliefs. A comprehensive organizational framework, then, has been developed. This framework is used as a guide to identify the ideal types of entrepreneurial university.

The chapter provides the definitions of the different dimensions and the key indicators that help to characterize entrepreneurialism in universities. Two ideal types of entrepreneurial university have been created with clear visual and narrative explanation.

I.2.2. Emergence of Entrepreneurialism

The phenomenon of the so-called ‘entrepreneurial university’, or entrepreneurial education, has gradually emerged over about two decades. The concept was first highlighted by an American sociologist, Burton R. Clark, in his books on entrepreneurship in education (Creating Entrepreneurial Universities: Organizational Pathways of Transformation, 1989). Clark formulates the problems and challenges that face higher education in general and universities in particular:

“Knowledge-based enterprises in the economy and society creates an expanding and rapidly changing professional labour market for which universities are expected to provide competent graduates. Governments expect universities to do much more for society in solving economic and social problems, but at the same time they back and fail in their financial support and become unreliable patrons” (p. 4).

Clark highlights the push-and-pull pressure on universities to change their environmental demands and institutional capacity. These include teaching activities, such as changing curricula into multidisciplinary and interdisciplinary fields, research activities, and knowledge production, which is rapidly growing in all universities. He also hypothesizes the complexity and uncertainty for universities in proceeding with these environmental and
institutional changes. He suggests the need to learn by experiment, and from efforts to make innovations in the university’s overall characteristics.

Clark’s study focuses on existing universities which are considered to have been innovative or entrepreneurial for eight years or more. These universities are the University of Warwick (England), the University of Twente (the Netherlands), the University of Strathclyde (Scotland), Chalmers University of Technology (Sweden), and the University of Joensuu (Finland). He views the study of these five universities as experiments in the construction of change. Clark extended his ideas of entrepreneurialism in his second book, *Sustaining Changes in Universities* (2004). Clark’s findings and conclusions will be discussed in detail in the next part of this paper.

There is increasing pressure on the higher education sector to play a major role in socio-economic development. This phenomenon has become a major theme worldwide, especially in the US and Europe. For example, it was the key theme of the OECD IMHE General Conference, 2000, and was reflected strongly in the commissioned paper: “Mobilising the Brainpower of Europe: Enabling universities to make their full contribution to the Lisbon Strategy” (OECD, 2005, p. 10).

Moreover, the European commission (COM 2003/58 p. 10) argue that “… [The universities] are situated at the crossroads of research, education and innovation. Universities in many respects hold the key to the knowledge economy and society”. This emphasises the importance of universities in training highly qualified graduates, creating more jobs, and in knowledge production and diffusion, which can be seen as an engine of socio-economic progress (Etzkowitz, 2004). Consequently, these views generate debates about the emergence of entrepreneurialism in universities. According to Shattock (2005), the entrepreneurialism in business that has been explained in the EU green paper (COM, 2003) as well as the entrepreneurial dynamism in the United States is certainly reflected in the debate about entrepreneurialism in universities. Shattock argues, however, that, “there are significant divergences” (p. 16) between entrepreneurialism in economy and entrepreneurialism in universities. Entrepreneurialism in business is seen to be the “ability to blend creativity and innovation with sound business in addition to a readiness to take risks and a taste for independence and self-realisation” (EU Green Paper, 2003f, p. 22). This means turning “business ideas into success” (Shattock, 2005, p.16), or in other words being profit or market-orientated. On the other hand, entrepreneurialism in the university
must be seen as a “contested concept”. Shattock, in this respect, shares Rinne and Koivula’s (2005, p. 103) view that “it is not at all clear that an entrepreneurial university is always purely for profit or that a traditional university would not seek a profit at all”.

In view of the above arguments, it is worth exploring how the concept of the entrepreneurial university has been developed and accepted among the key players and related bodies. It is also worth mentioning that there are several concepts which emphasise the approach of universities that are changing in order to be responsive and meet socio-economic demands.

Rinne & Koivula (2005) in their study of the changing environment of European universities, both public and private, towards a more entrepreneurial culture and set of values, highlight the following different concepts:

- The “Innovation University”: a broad concept that does not necessarily have the negative implications of being profit-seeking, but rather is seeking creativity.

- The “Service University” (Cummings, 1999): this focuses on research customization.

- The “McUniversity” (Rinne, 1999 and Ritzer, 2002), which underlines several factors such as efficiency, calculation, predictability, and control.

- The “Corporate University” (Nowotny et al., 2001), which focuses on seeking profit, and mass-producing academic “products”.

- The “Enterprise University” (Marginson and Considine, 2000; Williams, 2003), which emphasises the academic and organizational consequences of universities being forced to diversify their funding resources by engaging in research for non-public funding bodies.

- The “Entrepreneurial University” (Clark, 1998, 2004; Etzkowitz, 2003; and others, who were inspired by Clark’s approach). This generally focuses on entrepreneurial activities, behaviours, organizational structure, culture, and attitudes in the university.

In addition, there is the so-called “Civic University”, discussed by John Goddard (Goddard and Vallance, 2011), which adds the civic mission to the university.
The above mentioned models demonstrate the accentuated link between economic aspects and the efficiency and competitiveness of the universities (Rinne & Koivula, 2005). This, however, leads to a debate between scholars such as Clark, (1998, 2004), Etzkowitz, (2003, 2004), and Shattock, (2003), who emphasize the positive image of entrepreneurial universities. According to these scholars it is encouraging innovative academic behaviour, and it is the way to incentivise entrepreneurial academic activities. It also encourages external collaboration and strengthens academic performance by attracting additional funding resources, and increasing research and teaching activities (Shattock, 2005, p. 17).

On the other hand, Slaughter and Leslie (Academic Capitalism, 1997) and Marginson and Considine (2000) highlight a less positive image when emphasising the academic and organizational consequences of a university being forced to diversify its funding resources by engaging in research for non-public funding. In addition, Williams (2003) points out that the emergence of the “Enterprise University” and of entrepreneurialism certainly raises several fundamental questions about the nature and purpose of the university.

What has been the impact in universities of the new cultures of enterprise and entrepreneurialism?

Moreover, entrepreneurialism in universities has been viewed by Etzkowitz (2003) as a natural continuation of the development of the university. However, Slaughter and Leslie (1997) have seen it as the deformed child of the “Research University”. According to Clark (2004) “genetic entrepreneurialism” is referring to dynamism, and has been built into the best US universities.

Generally speaking, entrepreneurialism in universities has emerged differently in the United States than in Europe. According to Etzkowitz (2003), the entrepreneurial university has been developed in the United States from grass-roots level [bottom-up], whereas in Europe, the goal of entrepreneurialism has developed at the top administrative level [top-down] as an answer to the perceived “innovation gap” between the US and Europe. In this context Rinne and Koivula (2005, p. 105) suggest that special attention should be paid to these different approaches of the USA and Europe when analysing university changes, and research should reflect both top-down administrative and policy levels, and bottom-up “cumulative changes”. In addition, Clark (1998, p. 4) highlights the idea that in the academic values that direct the changes, and in a “bottom-heavy knowledge”, grass roots innovation is a crucial form of change. Moreover, Shattock (2003,
p. 182) advocates that the successful university (see section 1.6 P28 for the definition of successful university), should consider bottom–up initiatives as well as top-down policies and strategies.

The above arguments suggest that entrepreneurialism in universities requires different management styles and organizational and cultural changes. This opens up different avenues for research to support successful environmental and organizational changes inside the university, in addition to the flourishing of external collaborations (Lee et al, 2010), which consider bottom–up activities as well as top–down strategies.

However, the genuine study of what comprises entrepreneurialism in higher education institutions in general, and universities in particular, is still empirically weak (OECD, 2005; Gjerding et al, 2010; D’Este, et al, 2010; Sotirakou, 2004; Etzkowitz 2003; Jacob, et al, 2003; Rinne and Koivula, 2005). This is because most studies concentrate on the important issues of the complexity, conflicts, and tensions of the entrepreneurial university revolution, “One hundred universities require one hundred solutions” (Clark, 2004, p. 183). This idea has been also suggested by Gjerding et al (2010, p. 85) in their study of four European entrepreneurial universities: “…practices have been implemented only to various degrees and rather unsystematically. There are important differences among the universities”. This leads to an important question: how, then, do we characterise an entrepreneurial university?

Several studies have extensively examined the dimensions of the entrepreneurial university. Most are inspired by Clark, who was seen as a pioneer in using the case-study approach. He suggests, as mentioned earlier in this chapter, the need to learn by experiment, and from efforts to innovate the university’s overall characteristics. Nevertheless, there are some criticisms of Clark’s approach and findings which will appear through the analytical discussions in the following pages. This because Clark’s approach and other studies that have inspired by him are not analytically driven rather they are case-study based.

The following pages analyse the entrepreneurial university’s dimensions as discussed by several studies which have used the case-study approach.
I.2.3. Dimensions of the Entrepreneurial University

One can argue that there are different concepts describing entrepreneurialism in education. However, those concepts are focused on almost analogous changing dimensions. Therefore, the discussion focuses on entrepreneurial changes in five universities’ dimensions regardless of the general concept of the university itself, as different scholars have used different concepts. It is also worth mentioning that in discussing the dimensions, different concepts have been used by different scholars, such as elements, characteristics, positions, pillars, indicators etc. For the purposes of this study, as we are focusing on how to characterize entrepreneurial universities, we are using the concept ‘characteristics’ to explore each of the following five dimensions: managerial, funding, mission, external collaboration and cultural dimension. In addition, the exploration will link each dimension with several indicators of how to measure the practices and activities of each dimension: ‘indicator-driven dimensions’.

The selection and exploration of these entrepreneurial university dimensions is based on the analytical review of the case studies by Clark (1998, 2004) of more than five universities that have a history of innovative profiles dating back more than eight years; Marginson and Considine (2000) - a case study of 17 Australian universities; Williams (2003) - a study of the United Kingdom, the United States, South Africa, and Commonwealth universities and polytechnics as enterprising organizations; and a study of 30 European universities from 7 countries by Shattock et al (2005). In addition, other studies that have examined some aspects of entrepreneurialism in universities between 1997 and 2010 from a different perspective have also been used as supporting resources.

The selection of organizational dimensions is based on the organizational theories as mentioned in the introduction of part I that focus principally on: strategy, finance, marketing, information technology, human resources, and communications. However this thesis modifies these dimensions to serve the purpose of university’s organizational environment. One can argue that these dimensions are equivalent to managerial that deals with strategy and goals, funding resources with deals with finance, mission that deals with operation and human recourse, external collaboration which deals with communication and information technology, and culture which deals with marketing and reputation of the organization. Moreover the funding dimension in this study is seen to be of significant dimension for several reasons: 1) preserve the entrepreneurial university sustainability (
entrepreneurial activities and programs), 2) offers incentives that motivate entrepreneurial university at all level (strategic and operational levels including students) to move toward entrepreneurialism to meet socio-economic development, 3) maintain the linkages and external collaboration by sharing the ownership of entrepreneurial activities and projects, and 4) positions the entrepreneurial university at the heart of national ERIE strategy as a key actor sharing the responsibilities and ownership of national strategy (Nedeva and Jacob (2012) Hannon, (2013)).

1.2.3.1. Managerial Dimension

1.2.3.1.1. Dimension’s Definition

The definition of the ‘Managerial Dimension’ synthesized from different studies can be stated as: ‘the strategic level of decision making, executive leadership, and power that can be viewed as strong executive leadership, and executive strategy and decision-making, where the power should be linked to the formation and use of strategic choice’.

1.2.3.1.2. Dimension’s Characteristics

The managerial dimension can be seen from two angles: first, the composition of the entrepreneurial management, and second, its roles and actions. According to Rinne and Koivula (2005, p. 108) there are three characteristics of the managerial revolution after the late 1980s. These are the state pushing the university to take greater action towards societal demands, universities seeking to take responsibility for strategic management and develop “managerial professionalism”, and universities adopting practices from the business sector. Therefore, according to Shattock (2000) the term ‘university administration’ has recently been changed to ‘university strategic management’. This view has been argued by Clark (1998, 2004), who describes the entrepreneurial university and the need to strengthen its managerial capacities. Clark emphasizes the importance of combining the centralized managerial group as well as the academic departments in order to align traditional academic and managerial values and consequently become more flexible, efficient, and react entrepreneurially to changing demands. This view has been advocated by Sporn (2001), Marginson and Considine (2000), and Shattock (2005).
In addition, Marginson and Considine (2000, p. 234) illustrate in their study the key changes that have taken place in leadership and management structures as well as in the decision-making system. They conclude that the key changes in Australian universities in the managerial dimension are seen to be strengthening executive leadership and executive strategies, the rise of vice-chancellors’ groups, commercial arms, informal linkages of consultation and collaboration, enhancing flexibility, and continuing re-engineering. Thus, they share a similar view to Clark on this dimension.

This leads us to discuss the second angle of this dimension, which is the role and action of the entrepreneurial strategic management. The definition of the managerial dimension reflects the emphasis on the strategic choice approach by most investigations and case studies in this area. The strategic choice approach is viewed by Child (1997) as focusing on three elements: the role of organization/university, the choice of organizational analysis and its internal environment, and the relationship with the external environment. In other words, the strategic choice approach allows the university to balance and work more flexibly between being proactive and reactive in organizational decision making: proactive on the organizational strategic plane and initiatives, and reactive with respect to external environmental demands and pressures (Child 1997).

Based on the strategic choice approach, Clark (1998) emphasizes the active role of entrepreneurial management involved in promoting and lobbying for universities in regional innovation and research policy. In addition, he emphasises work towards diversifying income sources and seeking out new infrastructure and collaborations with all possible entities, especially the industry and business sectors. Furthermore, Marginson and Considine (2000, pp. 72-74) argue that vice-chancellors, based on power that is linked to the creation and use of strategic choice, are placed at the centre of decision making concerning strategic directions of universities. As a result, according to Marginson and Considine (2000, p. 100) the university council role has changed since the 1990s and come under pressure to become externally orientated. The university council is responsible for the appointment of vice-chancellors in addition to formulating strategy direction, planning for capital expenditure, and for financial audits.

On the other hand, this new managerial approach, which emphasises a holistic strategy, and holds opposing views from the traditional model that consists of basic disciplines and departments without common goals, has raised significant concerns about the academic
voice (Rinne and Koivula, 2005, p. 109). According to some scholars, the new managerial approach hinders the academic voice in decision making (Amaral, et al, 2002; Reed et al, 2002; Neave & Van, 1991). However, Shattock (2002) emphasizes “shared managerialism” to ensure academic input in the governing body. This encourages academic professionals to better understand the workings of market-orientated and strategic management.

To sum up, the managerial dimension of the entrepreneurial university focuses on efficiency, competitiveness, and flexibility. This can be achieved by strengthening executive leadership, executive strategy and decision making, balancing between proactive internal activities and reactive external demands, and balancing academic values and managerial strategic directions.

1.2.3.1.3. Dimension’s KPIs

The Key Performance Indicators that can be used to measure the managerial dimension are extracted from the practices and characteristics of the successful universities in the abovementioned studies. These are:

- Re-structure university governance, and mechanisms to adapt entrepreneurial changes (transparency of structure and processes).
- Align the top-down incentives and bottom-up initiatives (collegiate management), vision, mission, goal-oriented decision making.
- Is the university council (decision-making body) sufficient representative of external entities and the internal body including academic staff?
- Is the university strategy, which is established by the university council, reflecting an entrepreneurial approach?
- Does the decision-making body have power and influence in lobbying for universities in regional innovation and research policy?
- Does the decision-making body have power, and is it involved in promotion processes?
- Does the decision-making body have the power and influence to seek new income sources, allocate funding resources, and evaluate financial audits?

**I.2.3.1.4. Analytical Discussion of Managerial Dimension**

The managerial dimension is viewed as the steering mechanism guiding the university/organization towards an entrepreneurial transformation. Based on the role of this dimension it is defined as “the strategic level of decision making, executive leadership and power that can be viewed as strong executive leadership, and executive strategy and decision making, where the power should be linked to the formation and use of strategic choice”.

The definition emphasises three key elements necessary for the managerial dimension to accomplish its role effectively. These elements are: 1) shared governance, 2) strong executive leadership, and 3) professional management.
The *shared governance* or what Paradeise, (2009, p. 16) has called the "network governance", exemplifies the need of balanced power sharing between different levels inside the organization and different parties in the external environment. Regardless of the fact that different tensions and debates are associated with the emergence of the new public management trend (see Paradeise *et al*, 2009; Braun & Merrien, 1999; Ferlie *et al*, 1996; Barzelay, 1993; Kogan *et al*, 2006), what we mean in this thesis by *shared governance* is a balanced representation with balanced power between the key players from inside the organization and the key players from the external environment. Where balanced governance leads to balanced: decision making, and entrepreneurial–oriented strategic plan. On the other hand, by *strong executive leadership* we mean the empowered voice of a university’s vice-chancellor and a university’s council that enable them to influence national education, innovation and research policies, and compete for more financial resources. In addition, by *professional management* we mean the internal empowered academic voice that facilitates the prioritizing and balancing of academic core missions and values, and the entrepreneurial strategic plan of the university.

Based on the above explanation, the ideal state of affairs in this triangle dimension model is when the three elements work in a completely harmonized manner. However, this is not the case in most current universities as there are always tensions stemming from uncertain and complex environmental circumstances. Therefore, the next section will focus on those possible tensions and the relationship between the three elements.

### 1.2.3.1.6. Relationship & Tensions between Dimension’s Characteristics

In view of the analysis of the managerial dimension as a navigator towards entrepreneurial university transformation, one can argue that the key roles of this dimension is the ability to re-structure university governance, adapt entrepreneurial changes, develop a strategic plan and design its vision, mission, and goals to be entrepreneurial-oriented, manage balanced decision making between external and internal actors, influence national innovation and research policy, compete for and seek new income, allocate funding resources, and evaluate funding audits. The key instrument is a clear strategic plan towards entrepreneurial transformation. This plan is viewed as comprehensive and consists of clear vision, mission, goals, core processes and implementation procedures.
The ideal option is when the three elements work in a harmonized manner. This means that first, balanced shared governance has a synchronized relationship with strong executive leadership in order to grant visionary and financial support. Second, balanced shared governance has a synchronized relationship with professional management that leads to a flexible and fast decision making process. Third, strong executive leadership efficiently communicates with the professional management in order to secure and support the university’s core mission and values.

However, there are some kinds of tensions between the three elements when we look closely at what is happening inside most universities. These kinds of tensions emerge from the conflicts between internally desired goals and values and external pressure and demands, specially socio-economic demands on one hand and a political direction and trends on other hand (Child, (1997), Marginson and Considine, (2000), Shattock, (2005))

For example, the appearance of new public management trends and state influence on higher education institutes’ (universities) governance and steering provides unbalanced power of different management styles. Therefore, the strong power of external parties against internal parties leads to the emphasising of external demands, such as economic growth and political agendas against university values and agendas. In this case the voice of academic and executive leadership is reduced or limited, which leads to a complex decision making process (Paradeise et al, 2009; Braun & Merrien, 1999; Ferlie et al, 1996). On the other hand the new reform of management style that reinforces the executive leadership of the university and reduces collegial management and external power (deliberative parties), leads to top–down administration that focuses on strategic level values with an unbalanced agenda of the university’s core mission and values and weak and slow responses towards external environment demands. This management style can be seen a de-motivating approach for academic and professionals toward entrepreneurial activities (Rinne and Koivula, (2005), Amaral, et al, (2002); Reed et al, (2002)).

In this context one can argue that different reforms in different countries support different management styles in balancing the management power. For instance market-led reform that focuses on job- market demands and societal needs give more power to external environment body, while the reform that focuses on entrepreneurial and economic demands gives more power to executive leadership, on the other hand the reform that academic values give more power to senior management and non-executive.
However, in this thesis we are exploring a kind of balanced power between all three key players: external environment bodies, executive leadership, and professionals. We believe that there are three different suggested options which can offer a new reform that supports universities’ transformation in accordance with the entrepreneurial trend with minimum challenges.

1.2.3.1.7. Options and Possibilities

The absolute congruence of the managerial dimension style is unlikely to be established in all entrepreneurial universities nationally or internationally, because of different circumstances affecting university transformation. However, there is a degree of similarity that should be materialized for the rationale of the entrepreneurial approach. Therefore, the following three options are proposed as alternatives for universities:

Option 1: Coordinated Management

This option suggests that the three elements of managerial dimension, shared governance, strong executive leadership, and professional management, work in a completely harmonized mode: balanced power between all representatives of the strategic level (university board, university council, and academic body) in decision making, developing the university strategic plan, and total alignment between top-down administration and bottom-up core processes. This enables equal say from executive leadership, academic professional, and the external entities.

The newly established universities with ambition to endorse the entrepreneurial approach into their organization can simply adopt a management style with fair representative members internally and externally where the management power is equally distributed. This approach should be supported with clear job descriptions for the management body as a whole and for each individual member. However, the universities with long established history may need to re-structure their management style with a personalized appointing process for the administration members in addition to endorsing the job description documents as part of the organizational strategic plan.
Option 2: Hybrid Management Style

This option suggests that the three elements of the managerial dimension work in a synchronized mode where both executive leadership and professionals are given an equal amount of the management power, and more than the external entities, with fair representative members (internal and external) appointed in strategic positions. This enables the external entities to be highly involved in the decision-making process. The success of this option lays in the total alignment between top-down administration and bottom-up core processes.

Both newly established universities and long established universities can merely adapt this management style with a high degree of success.

Option 3: Strong Influence for Success

This option proposes that the three elements of the managerial dimension work to some extent in a harmonized mode, however, it gives executive leadership more of the management power than the professional management and external entities. There is still a fair amount of representative members (internal and external) appointed in strategic positions strategic. This gives both professional and external bodies the opportunity to be highly involved in the decision-making process. The success of this option lays in strong executive leadership that secures sustainable income and balances the university’s values and external demands via a strategic choice approach.

Both newly established universities and long established universities can merely adapt this management style with a high degree of success.

1.2.3.2. Funding Resource Dimension

1.2.3.2.1. Dimension’s Definition

The diversification of funding resources by which a university promotes different streams of income through teaching and research programmes means, that it is not dependant solely on government funds.
1.2.3.2.2. Dimension’s Characteristics

Generally speaking, the core funding for universities in developed and developing countries comes from the government, in addition to other sources, such as research grants, national and international awards, and fees from international students. However, the fact that government funding to universities has been declining recently creates a challenge for universities: “Governments expect universities to do much more for society in solving economic and social problems, but at the same time, they back and fail in their financial support and become unreliable patrons” (Clark, 1998, p. 4).

Nevertheless, Clark argues that universities can turn this funding decline to their advantage by seeking other sources of funding. This can be done by trying to raise funds from second and third streams (Clark, 1998, p. 7); and Shattock (2005, p. 18). According to Shattock (2003, p. 27), the most successful universities are those “which manage to adapt to new environments and diversify their funding sources”. In addition, an ability to diversify university funding leads to the autonomy of the university (Shattock, 2003, 2005; Clark, 1998, 2004).

On the other hand, Slaughter and Leslie (1997) and Marginson and Considine (2000) stress a less positive image when emphasising the academic and organizational consequences of a university being forced to diversify its funding resources by engaging in research financed by non-public funding, as mentioned above.

Based on Clark’s view, the second funding stream (projects-based funding) comprises the research council grants which universities can compete for. This, of course, requires highly qualified academic staff. The third funding stream (private fund) is argued by Clark to be funding from the private sector - the corporate and industrial sectors - through joint projects, in addition to regional and international joint projects, international students’ fees, and alumni activities (Slaughter and Leslie, 1997; Shattock, 2005; Clark, 1998).

Furthermore, Shattock (2005, p. 18) highlights the possibilities of fund-raising by academic activities for so-called “soft money”: “whole new academic enterprises may be created on soft money which through their output of books and articles generates new courses and teaching programmes”. Shattock’s view emphasises the idea that the independent researcher can lead to academic innovation and can be seen as an indicator and a measure for entrepreneurial universities’ activity.
To sum up, the funding resources dimension focuses on diversifying resources from second and third stream income. The income process for fund diversification is seen to be academically-led rather than profit-led.

1.2.3.2.3. Dimension's KPIs

The Key Performance Indicators that can be used to measure the funding resource dimension are extracted from the practices and characteristics of the successful universities mentioned in the above studies. These indicators are:

- The extent to which university is financially independent/autonomous.
- The volume of government funding in the total university fund.
- The volume of project funds from the total university fund.
- The volume of private funds income from the total university fund.
- The volume of patents per year.
- The volume of international students/enrolled/graduates there are per year.
- The volume of spinoff and start-up companies there are per year.
- The volume of soft-money by academic activities per year.

1.2.3.2.4. Analytical Discussion of Funding Resource Dimension

![Figure 2: Funding Resource Dimension](image)
1.2.3.2.5. Definition and Dimension’s Characteristics

Generally speaking, the funding resources dimension can be seen as the empowering and motivating gear which enables universities to promote entrepreneurial activities by orienting their core mission programs to develop new programs. These programs meet both academic goals and socio-economic demands. Therefore, this dimension focuses on “the diversification of funding resources by promoting different stream incomes through teaching and research programmes, and not depending solely on government fund”. In this context diversification of funding resources is meant to be seeking and competing for more income from three main streams. Firstly, the block fund, which is the government, state, or public fund that is mostly directed, in today's increasing knowledge-based socio-economy trend, towards research for innovation in order to contribute to economic growth (Nedeva and Jacob, 2012). Secondly, there is project fund, which comes from other government organizations such as research council grants through research and project contracts. Thirdly, there is private fund, which comes from private companies and industries through joint projects. It is also important to highlight that by funding resources we mean monetary and non-monetary resources. For example, monetary resources are those funding resources that come from three main streams as tangible money. However, non-monetary resources are defined as all kinds of scientific instrument, science labs, research centres, and any infrastructure that can be used by universities in order to promote their missions toward entrepreneurial activities. In addition, according to Eckhardt and Shane (2003, p. 340) “the creation of a new good or service can create an opportunity for entrepreneurial profit”. The definition of opportunities by Eckhardt and Shane adds a value to what we mean by diversifying funding resources. “Entrepreneurial opportunities as situations in which new goods, services, raw materials, markets and organizing methods can be introduced through ... means-ends relationships” (p. 336), where the means and ends symbolize the activities and results by key players about the values of opportunities as resources.

One can argue that the successful university can intelligently expand to maximise their income from different resources by improving their entrepreneurial activities that lead to more government support, attracting private and industry sectors, and win competitions for research grants and awards. The following explains the opportunities for maximizing universities’ income.
1.2.3.2.6. Relationships & Tensions between Dimension’s Characteristics

Increasing and sustaining the universities’ income becomes one of the key challenges in today’s uncertain and continually changing environment that entrepreneurial universities in particular face to survive and offer a better contribution into economic growth.

Therefore, successful universities can be seen as those organizations that are able to maintain and maximise their income from all three main resources. For example, one can say that the university can effectively use and allocate its block fund from the government to improve its teaching and research programs (especially postgraduate programs), infrastructures, and facilities in a manner that attracts private and industry sectors for more joint projects, in addition to attracting funding from research councils and other funding organizations. Notably, in this situation the three streams sustain each other by sharing monetary and non-monetary resources, such as scientific equipment, labs, and training programs between universities and external entities. This effectively meets both academic professionals’ interests and desires and solves private and industry problems. In this situation all three resources are working effectively parallel to each other, and consequently are utilized by the universities to continue to sustain more income. It is worth noting that there is no reason why the three resources cannot collaborate together to sustain university income.

However, on the other hand, limited block funds lead some universities to focus on solving inside issues rather than improving their program so they can attract the other two funding resources. In this situation universities can be seen to be struggling to maintain more income and depending most of the time on international students’ fees, which will not lead to a more stable and sustainable mode, and might lead to huge organizational failure in the era of entrepreneurial movement. There is no doubt those universities that fail to compete and attract research project grants by not improving their research programs will likely fail to attract private funds. However, some universities may choose to focus on a specific research area that can attract and meet specific private sector demands or specific industry needs and build linkages that are enough to sustain their income.
1.2.3.2.7. Options and Possibilities

The unlimited resemblance of the funding dimension structure is unlikely to be launched in all entrepreneurial universities nationally or internationally, because in each country or area there are different opportunities for funding resources based on size and category of national economy, and the size and capabilities of industry and private sectors. However, there is a degree of likeness that should be materialized for the justification of entrepreneurial activities’ requirement. Therefore, the following three options are introduced as alternatives for universities:

Option 1: To the Maximum

This option proposes that the university seizes sustainable income from all three streams to the maximum. This option relies on the ability of the organization to efficiently allocate block funds to improve its capacity building and teaching and research programs in a manner that attracts both private and industry sectors to establish a strategic relationship. This strategic relationship leads to competing for project funding and private funds. The Qualified and identified professionals with highly accredited teaching and research programs are the basis of creating a centre of attention to maximize project and private funds.

Both newly established organizations and long established universities can simply seek more income by intelligently utilizing and capturing the accessible opportunities.

Option 2: Project-Oriented

This option underlines that some universities may choose to maximize their income from one stream, the project fund stream. In this case the university chooses to focus on certain fields aiming to attract specific project fund agencies, such as research councils locally and internationally, and maximize their income mostly from this stream by improving research capacity in the areas that catch the attention of project fund agencies, besides seeking some income from other private sectors if the opportunity is offered.

Both newly established universities and long established universities may decide to focus on specific research areas and build strategic collaboration with specific project fund entities.
**Option 3: Private-Oriented**

This option highlights the fact that some universities may choose to maximize their income from one stream, the private fund stream. Here, the university chooses to focus on certain fields aiming to attract specific private companies or specific industry fields locally and internationally, and maximize their income mostly from this stream by improving their research capacity and facilities in the areas that catch the attention of private and industry sectors, besides seeking some income from other project-fund organizations if the opportunity exists.

Both newly established universities and long established universities may decide to focus on specific research areas and build strategic collaborations with specific private and industry entities.

**1.2.3.3. Mission Dimension**

**1.2.3.3.1. Dimension’s Definition**

This describes the relationship of the heart, core mission, of the university (teaching and research) to the external environment in order to build relationships, new teaching, and research programmes.

**1.2.3.3.2. Dimension’s Characteristics**

According to Kitagawa (2005), universities come to be viewed and placed by the policy community at the heart of a knowledge-based economy. In addition, Lee et al (2010, p. 189) argue that “universities play an increasingly important role in society as an efficient producer of knowledge, in addition to teaching and research, university-industry collaborations have emerged as the third mission”. Furthermore, Shattock (2005, p. 19) highlights that “governments are increasingly encouraging the creation of the third mission supported by ‘third stream income’”. However, it is argued that the discipline and professional unions are the last place where changes take place. This is because, as Clark (1998, pp. 27, 52, 109) highlights, the disciplinary departments form the academic heart of the university in which the core missions of teaching and research are undertaken. He adds that for entrepreneurial changes to take place, it is important for those central departments to orientate themselves to the external environment by building new linkages, relationships, and collaborative programmes in teaching and research. This leads to the
promotion of third-stream income through teaching and research commercialization (Shattock, 2005; Lee et al, 2010; Nedeva, 2011).

According to Clark (1998, p. 141), central units respond differently to entrepreneurial changes. Because science and technology departments are the most involved in external linkages, they are much quicker to adapt to entrepreneurial changes than the humanities and social sciences departments. However, he emphasises that the form of stimulation can occur in different ways, such as melding the periphery mission into the core mission, establishing multidisciplinary graduate schools, research fellowship programmes, and restructuring the university. Both Clark’s (1998, 2004) and Marginson and Considine’s (2000) case studies emphasise the importance of research departments establishing bridges and linkages with industry, companies, and the external environment, and selecting joint projects according to their disciplinary interests in a comparative manner. Furthermore, Lazzeroni and Piccaluga (2003, p. 40) identify four missions for entrepreneurial universities, which summarise most of the case studies’ findings. These are: the knowledge factory, the human capital factory, the technology transfer factory, and the territorial development factory. On the other hand, Etzkowitz (2001) points out that universities will be multiform organizations which combine teaching and research with the third mission of economic development. This view has been viewed less positively by Rinne (1999, p. 161), who points out the threat to the university and researcher of losing the ability to hold on to the university’s core (traditional) goals under the pressure for income generation.

To sum up, the mission dimension for the entrepreneurial university focuses on improving the core mission, which is teaching and research by establishing new teaching and research programmes that are orientated to the external environment. It also focuses on enhancing the third mission by melding it into the core mission through building bridges with industry and the private sector in specific disciplines of academic interest.

**1.2.3.3. Dimension’s KPIs**

The Key Performance Indicators that can be used to measure the mission dimension are extracted from the practices and characteristics of the universities in the abovementioned studies. These are:
The number of new research and teaching programmes that are orientated to the external environment.

The number of joint projects with industry and the private sector.

The number of spin-offs and start-up companies.

The number of research commercialization projects/patents/licences.

The number of multidisciplinary graduate schools/programmes.

The number of PhD students graduating in the fields of science, technology, and innovation.

1.2.3.3.4. Analytical Discussion of Mission Dimension

1.2.3.3.5. Definition and Dimension’s Characteristics

A university mission always creates huge debates between the key players (professional, policy makers, political parties and economists). The debate focuses on the university’s responsibilities and what they should and should not do. What are their core missions and what are their peripheral missions?
Therefore, the mission dimension is seen to be the dynamic and energetic gear for the university as an organization. Although some authors continued to add more missions via their research and studies, in our framework we believe the three missions that we have introduced are able to achieve universities’ responsibilities as knowledge creators and knowledge dissemination industries. This is evidenced by the creation of highly qualified students at undergraduate level and postgraduate level, especially PhD students/researchers, in addition to high quality research projects that are aligned with socio-economic needs and development, and, moreover, increasing third mission activities. Therefore, successful universities are those that can effectively manage to balance their core and peripheral missions. This facilitates improved teaching programs and research programs that meet national and international accreditation standards and criteria, market job demands, national economic agendas etc. This improvement leads directly to smoothing the progress of the third mission activities.

In this context, by improving their teaching and research programs in a manner that is consistent with the third mission activities, universities to some extant will be able to respond flexibly to social and civic needs, in addition to national economic growth demands. It is worth noting that for research universities, and especially those which are focused on technology, orienting their research programs to third mission activities is to their advantage, as they are focusing on research commercialization, patenting, licensing, creating spin-off firms etc. However, this can be perceived differently by different universities based on their ambitions and opportunities.

1.2.3.3.6. Relationships & Tensions between Dimension’s Characteristics

Within the continuing debate around universities’ missions and responsibilities some tensions have been highlighted between the three elements of this dynamic gear. However, some interrelations have been witnessed also. One can argue that it is undoubtable that most universities are paying more attention to teaching and research as core missions, especially those universities with postgraduate programs, and giving less attention to peripheral third mission activities. This is because through their historical development as educational organizations the main focus has been accomplishing academic professionals’ desires to meet promotion process criteria, in addition to producing qualified job market-
oriented graduates. However, the uncertain environment with all its complexities requires universities to re-think their responsibilities, as they are located in the heart of the knowledge world as knowledge creators and knowledge diffusion industries. Consequently, the interrelation between the three missions becomes of interest for both universities and the external environment. Therefore, the successful university will choose to pay more attention to third mission activities with the realization that they cannot segregate research activities (second mission) from the third mission activities. In other words, research performance and research project outcomes have more value if they are utilized to promote third mission activities which can be seen as a direct benefit for all key players (professionals, university, and external entities). “Interdependent funding formula across both streams could be interpreted as double counting of specific research-based activities when distributing funds. Yet it is worth noting that there is no reason why, and no evidence that Third Stream activities, rather than their results, are correlated with research performance.” (Molas-Gallart et al, 2002, p. 9).

On the other hand, the teaching mission, which is seen to be the ‘parent-child’ mission in a successful and flexible entrepreneurial atmosphere, is interrelated with the third mission in a mode that allows more collaboration between academic professionals at strategic level, and flexible mobility between academic professionals and external experts, such as private sectors and industry consultants. As a result, these interrelations lead to enhancing teaching programs, and creating and developing new teaching approaches, as well as facilitating third mission activities.

It is worth noting that the successful university can pay balanced attention to all three missions. This also verifies the importance of correlating the managerial and funding dimension with the mission dimension and the other two dimensions mentioned earlier, which clearly demonstrate the advantage of this comprehensive mode.

1.2.3.7. Options and Possibilities

The complete equivalence of the mission dimension performance is unlikely to be reputable in all entrepreneurial universities nationally or internationally. The reason for this is that different universities specialize in different disciplines and are located in different countries with different national strategy agendas and different socio-economic priorities.
However, there is a degree of similarity that might be taking place for the rationale of entrepreneurial approach. Therefore, the following two options are proposed as alternatives for university choices:

Option 1: Extremely Entrepreneurial

This option suggests that the university chooses to specialize on entrepreneurship education by teaching entrepreneurial courses as a main discipline and endorsing entrepreneurship skills in other subjects. In this case, teaching entrepreneurship becomes a core mission for the university. On the other hand, research activities (mostly applied research) are strongly linked with teaching activities and third mission activities as an expected result of adapting the entrepreneurial teaching approach. Obviously there is no reason why universities with this option cannot integrate the three mission activities in order to establish flourishing entrepreneurial culture concurrent with a strong external environment.

The newly established university can effortlessly succeed with this option by adopting entrepreneurial-based missions by selecting specific disciplines, and tying them with third mission activities.

On the other hand, universities with a long history can choose to reform some disciplines and endorse entrepreneurial skills by linking them with research project activities that are interrelated to the third mission activities.

Option 2: Hybrid Technology

This option suits the university that focuses on technology disciplines such as engineering, medicine, and agriculture. In this option the university chooses to adopt two streams: the first stream focuses on basic research, and the second stream focuses on applied research. Therefore, some research and teaching activities will be directed to third mission activities while others will be directed to basic research. As a result, the university will achieve a hybrid technology approach.

Both newly established universities and old universities may decide to adapt this approach by setting the organization to accommodate both streams/ Basic and applied researches.
1.2.3.4. External Linkages and Collaboration Dimension

1.2.3.4.1. Dimension's Definition

It is the nature of linkages and collaboration with the external environment: in order to be more responsive to the complexity and uncertainty of the external environment this leads to improving the organization’s capacity to respond more flexibly.

1.2.3.4.2. Dimension's Characteristics

Universities are facing challenges to be more responsive to socio-economic demands. Therefore, they have to cope with ever-increasing environmental complexity and uncertainty (Clark, 1998). According to Clark, for universities to become entrepreneurially orientated, they need to link organizational activities with external organizations and entities. These linkages provide universities with information and data about the uncertain environment in order to improve the universities’ capacity to respond to socio-economic demands more flexibly and faster.

In view of the above, managing the external environment and stakeholders can be one of the difficult challenges facing universities. Therefore, according to Clark (1998) and Scott (2003), building and maintaining bridges to the external environment is the way to analyse the boundary roles of the universities. This view is criticised by Daft (2007), who emphasises the need to separate the academic heartland from the influence of the external environment. This, in his view, secures the academic values from being tools for achieving external environment desires. However, Clark (1998) and Scott (2003) argue that traditional departmental and heartland units can establish linkages with external entities and groups through project-based specialists, and by providing the training that is required to promote external linkages in their practices and behaviour.

According to Clark (1998), Lee et al (2010) and Scott (2003), the extended boundary - “boundary spanning” - can take different forms and shapes: research centres as a part of the university, science parks, and technology transfer offices, industry liaison offices that promote links with industry, university project-collaboration networks, joint ventures, strategic alliances associations, and consortia. This allows mobility between academic staff and industry experts, and enables them to exchange knowledge through joint projects.
To sum up, universities are challenged to build linkages and establish bridges with the external environment in order to respond more flexibly and faster to complex and uncertain socio-economic demands. This linkages and collaborations should reflect the win-win approach between internal and external environment.

1.2.3.4.3. Dimension's KPIs

The Key Performance Indicators that can be used to measure the external linkages dimension are extracted from the practices and characteristics of the successful universities in the abovementioned studies. These are:

- The establishment of technology transfer offices/innovation offices
- The number of research centres/science parks linked with university
- The volume of industry-university projects
- The number of researchers and students who have moved to work in industry or external labs
- The number of external experts who have moved to work in university labs
- The volume of joint ventures
- The volume of research projects in collaboration with external group
1.2.3.4.4 Analytical Discussion of External Collaboration Dimension

The interaction between universities and the external entities provide roots to build strong links and bridges between universities as creators of knowledge and the external environment as the end user. Therefore, this dimension can be seen as the sustaining and stirring gear for the university as an organization, whereby through all three university’s missions, as mentioned above, an effective collaboration can be established between universities and the external environment. Accordingly, successful universities can become more responsive and flexible to the complexity and uncertainty of the external environment. In addition, the organization's capacity improves when these linkages allow for more collaboration and mobility between university and external environment, more motivation and enticement for academic professionals to accelerate their performance through teaching and research activities, and high financial incentive through joint research projects, student training programmes, sharing infrastructure, knowledge applications,
knowledge dissemination supports, and new science discovery, in addition to producing industry solutions which contribute to national economy growth.

In light of the above, the external collaboration dimension offers opportunities for universities to build strong collaboration ties in multi-disciplinary fields with other universities, in addition to the private sector and industry bodies. This may leads to improving the quality of teaching programs and research activities, especially those disciplines that require high-tech scientific equipment, scientific labs, and science and business parks. Furthermore, the strong bridges built through third mission activities create opportunities for creating spin-off and start-off firms.

1.2.3.4.6. Relationship & Tensions between Dimension’s Characteristics

The trends of knowledge-based economy and entrepreneurial transformation add pressure to universities to be responsive in a fast and flexible manner. As a result, universities face challenges with the complexity of this uncertain environment, which cause the need for interrelation between external collaboration elements. Therefore, for a university to build strong bridges and linkages with its external environment it needs to have a highly qualified capacity in order to attract and encourage other parties into more collaboration, by exchanging expertise and sharing facilities and infrastructure. Accordingly, succeeding in building bridges with the external environment leads to improvement in organizational capacity, which in return becomes more responsive to the external environment in a faster and more flexible manner. Therefore, one can argue that in a successful university, building strong bridges with external entities through university activities, and a highly qualified organization capacity creates a flexible atmosphere that allows universities to be effectively responsive to socio-economic development.

1.2.3.4.7. Options and Possibilities

It is noticeable that the external collaboration dimension’s options are directly linked with mission and funding dimensions options. For example, if a university decided to maximize its funding from all three resources then it should focus on their teaching and research
activities to attract all three funding entities (state, industry, and private sector). Consequently, the university builds strong linkages and bridges for option 1: strategic collaboration with all three streams. In light of this the organization’s capacity and infrastructures should translate this desire option. However, if the university decides to attract specific funding organizations, private, or industry bodies, then its teaching and research activities will focus on specific fields of interest of that specific organization (industry or private company), which leads to strong linkages and to being either project-oriented funded, or private-oriented funded based on the teaching, research (basic and applied), and third mission activities. This can give a second option (project-driven collaboration).

I.2.3.5. Cultural Dimension

I.2.3.5.1. Dimension’s Definition

A pattern of shared goals, values, and ambitions that lead the university to adapt to new approaches of action, to seek a high reputation, and to secure a strong identity to achieve self-directed autonomy.

I.2.3.5.2. Dimension’s Characteristics

The cultural dimension explains the readiness of the university to move towards the entrepreneurial environment in all other dimensions. According to Schien (2004, p. 17), the organization culture is “a pattern of shared basic assumptions that was learnt by a group as it solves problems of external adaptation and internal integration”. This explains that universities which seek internal changes and external relationships should reflect this desire in their strategy goals, vision, and mission. Sporn (2001, p. 128) argues that a clear mission and goals guide decision-making, strategic planning, and orientation for all the university’s members. In addition, the actions and behaviour inside the university are a sequence of adaptations following a set of goals based on a shared mission that enhances internal integration.
According to Shattock (2005, p. 105) university culture focuses on “striving to compete, ambition, readiness to adapt new modes of action and fostering a good reputation and securing strong identity to achieve self-directed autonomy”. Furthermore, (Barnett, 2003, p. 65) points out that the dedication to an entrepreneurial culture means an identity and relationship for both academics and students. Clark (1998) argues that strong cultures are rooted in strong practices. Therefore, he emphasises the need for changes in organizational internal steering and re-organising academic activities as a key tool for transforming beliefs towards an entrepreneurial culture. An entrepreneurial culture requires that university members inside the university believe in it and commit to the changes (Clark, 1998, 2004; Shattock, 2005). However, Scott (2003) and Shattock (2003) highlight the complexity of developing an entrepreneurial culture based on the bureaucratic nature of universities and their many levels of authority, in addition to the difficulty of distinguishing between the role of academic actors and their culture, beliefs and behaviour.

To sum up, the cultural dimension focuses on committed practices and behaviours which are reflected and translated at all university levels: at a strategic level through a strategic vision, mission, goals, and strategic planning; and at an operational level through teachers, researchers, and student beliefs and behaviour, in order to achieve independence, and foster innovation activities and ambition for entrepreneurship.

I.2.3.5.3. Dimension’s KPIs

The Key Performance Indicators that can be used to measure the cultural dimension are extracted from the practices and characteristics of the successful universities in the abovementioned studies. These are:

- A clear vision, mission, and goals statement in favour of an entrepreneurial culture
- Strong executive leadership and decision makers
- Entrepreneurial behaviours in teachers and students
- The university’s organizational structure reflecting the cultural changes
- Building a network culture with the external environment (professional, industry, societies, and regional and international collaboration)
• Re-structuring university governance and mechanisms to adapt to entrepreneurial changes (transparency of structure and processes).

1.2.3.5.4. Analytical Discussion of Cultural Dimension

![](Figure 5: Cultural Dimension)

1.2.3.5.5. Definition and Dimension’s Characteristics

In this mode we believe that the culture dimension can be viewed as the organizational platform towards transformation. It is also worth noting that cultural notions are the most difficult to be analysed and measured. The reason for this is that cultural notions are mostly focused on values, beliefs, attitudes, thinking approaches, and behaviours, which difficult to accurately observe or measure. On the other hand, the cultural dimension is an important factor as it reflects the organization’s desire and ambition for change and transformation. Thus, in our model we are introducing three elements that we believe translate cultural notions into measurable elements. These elements can be seen from the proposed definition of the cultural dimension as ‘a pattern of shared goals, values, and ambitions that lead the university to adapt to new approaches of action, to seek a high
reputation, and to secure a strong identity to achieve self-directed autonomy’. In view of this definition the three elements can be identified: firstly, organization *autonomy*; secondly, *shared goals and values* that clearly state the university’s strategic plan and seek agreement between the strategic level/top-down and operational level/bottom-up; and thirdly, the organization *reputation and identity*, where the university can be situated in a specific position on a national and international list of universities using accredited standards. It is worth mentioning that the cultural dimension as an organizational platform affects all other four dimensions by translating university commencement and readiness for transformation in each of them. Therefore, it can be described as an inspiring and encouraging gear.

**1.2.3.5.6. Relationship & Tensions between Dimension’s Characteristics**

Analysing the tension and relationships between cultural elements also can be seen as a challenge. However, in our model we propose that this relationship can be observed from the degree of socio-economic credibility and relevant services between internal organization and external environment, the degree of organizational and individual responsibility commitments, win-win situation between internal productivity and external satisfaction, and the degree of rewarding, hiring, and promoting ecosystem processes. It is also worth mentioning that cultural dimension inside organizations can also be affected by external culture and trends of an entire country. Therefore, different universities in different counties respond differently to any national or global demands and changes based on their country’s circumstances. For example, countries with oil-based economies, will respond differently to those with knowledge-based economies. In addition, universities in countries with mature policy making system react more flexibly than those universities in a country with immature policy making systems.

Nevertheless, we believe that the proposed cultural dimension will help to guide decision making, strategic planning, and orientation for all the university’s members. In addition, the actions and behaviour inside the entrepreneurial organization can be viewed as a sequence of adaptations following a set of goals based on a shared mission, which enhances the internal integration.
I.2.3.5.7. Options and Possibilities

As mentioned earlier, the culture dimension can be seen as the platform for the other four dimensions because organizational culture translates to the organization’s desire for change. Therefore, the possibilities and options of the cultural dimension depend on other dimensions’ options. Noticeably, a university with a prevalent identity and reputation as an entrepreneurial organization with option 1: entrepreneurial culture, achieves high self-directed autonomy, balanced alignment between top-down administration and bottom-up activities, and responds flexibly to external environment demands. In addition, a balanced strategic choice process between internal proactive values and external reactive demands is also reflected by strong strategic collaboration with the external environment, which can provide the university with option 2: sustainable culture. On the other hand, unsteady commitments and responsibilities from strategic management and individuals towards entrepreneurial transformation lead to unsustainable culture that affects a university’s reputation and credibility relating to internal desires and external responses.

I.2.4. Entrepreneurial University's Ideal Types

It is unmistakably that universities are unlikely to attain absolute characteristics similarity as entrepreneurial organization. This is based on different national agendas and priorities, different policy backgrounds, different national economy growth, different industry circumstances (kinds, size), different funding resources opportunities, and different societal and cultural background and movements. However, the following two options provide the ultimate spectrum where all entrepreneurial universities are seen to belong based on the above developed framework.

I.2.4.1. First Type: Fully Fledged Entrepreneurial Organization

This type offers organizational characteristics and practices for those universities that desire to label themselves and identify as fully-fledged entrepreneurial organizations, with all five organizational dimensions flourishing in favour of entrepreneurial transformation.
This is exemplified by the following: 1) Balanced power between all representatives of the strategic level (university board, university council, and academic body) in decision making, and total alignment between top-down administration and bottom-up core processes. This leads to a clear vision, a flexible and fast decision-making process, and a balanced strategic choice approach between organization values and mission, and external demands. 2) The university seizes sustainable income from all three streams to the maximum by creating a centre of attention to maximize state, project, and private funds through attractive teaching and research activities, and highly qualified organization capacity. 3) Strongly linked teaching and research activities with third mission activities as an expected result of adapting to an entrepreneurial teaching approach. 4) The university builds strong linkages and bridges for strategic collaboration with its external environment and seeks all collaboration opportunities through project-based specialist programs, joint ventures, strong networks and alumni, sharing research centres, science park facilities, expert and professional motilities etc. 5) High self-directed autonomy, balanced alignment between top-down administration and bottom-up activities, and a balanced strategic choice process between internal proactive values and external reactive demands, which leads to high socio-economic credibility and highly commended administration and individuals working towards entrepreneurial transformation.

I.2.4.2. Second Type: Blended Technology Organization

This type puts forward the minimum fundamental requirements for any university that has an ambition to enter the entrepreneurial culture. It is, therefore, worth noting that the five organizational dimensions are correlated and there is no reason for scrutinizing them independently. Thus, the success of this type lies on the following: 1) Strong executive leadership influences to secure sustainable income and balance between the university’s values and external demands using the strategic choice approach, where both professional and external bodies are highly involved in the decision-making process. 2) Maximizing university income by attracting at least one resource (Project Fund or Private Fund) fund besides Block Fund by improving teaching and research programs to capture resource funding organization interest and demands. 3) Establishing teaching and research programs that focus on technology and applied outcomes in certain fields. 4) Building strong strategic collaborations with at least one external body that guarantees more third mission
activities and more sustainable income. 5) The organization culture reflects the alignment between top-down strategy and bottom-up core processes with a committed administration and responsible individuals.

The following diagram illustrates the organizational dimensions of the two entrepreneurial universities’ ‘ideal types’ compared with the ‘classic university’.
Figure 6: Entrepreneurial universities’ ‘Ideal Types’ & ‘classic university’.
The above diagram characterizes the three types of universities based on the options of the five organizational dimensions. The **Fully-Fledged Entrepreneurial University** is characterized with the following criteria: 1) Coordinated management style, which shows a balanced power in decision making process, and total alignment between top-down administration and bottom-up core processes with strong executive leadership. 2) The university seizes sustainable income from all three streams by creating a centre of attention to maximize state, project, and private funds through teaching and research activities and highly qualified organization capacity. 3) The core mission of the university is teaching and research that emphasise innovation –led programs and entrepreneurial-oriented activities. 4) The university builds linkages and bridges for strategic collaboration with its external environment and seeks all collaboration opportunities through project-based specialized programs. 5) The university has a high reputation and identity as an entrepreneurial organization with self-directed autonomy, balanced alignment between top-down administration and bottom-up activities, and balanced strategic choice process between internal proactive values and external reactive demands.

The **Blended Technology University** as shown in the diagram in blue is characterized with the following: 1) Strong executive leadership influence to secure sustainable income and balance between the university’s values and external demands using the strategic choice approach, where both professional and external bodies are highly involved in the decision-making process. 2) Maximizing university income by attracting at least one resource (project fund or private) fund besides block fund by improving teaching and research programs. 3) Establishing teaching and research programs that focus on technology and applied research in certain areas. 4) The university builds strategic collaborations with at least one external body that guarantees more third mission/entrepreneurship activities, and sustainable income. 5) The university culture reflects the alignment between top-down strategy and bottom-up core processes with committed responsibilities at all level that represent the organization’s reputation and identity.

The **Classic University** type is characterized, as shown in the above diagram in green, with the following: 1) Centralized management style where the top administration level dominates the decision-making process against the professional body and external entities, which leads to limiting the benefiting regardless of the availability of opportunities. 2) The university depends exclusively on Block Fund and fails to compete for more income.
from project funds and private funds based on inflexible mechanisms through rigid regulations and rules. 3) The university core mission is mostly teaching with theoretical entrepreneurship rather than entrepreneurship-led teaching, and research which is interest-oriented rather that policy or strategic-oriented research. This leads to failing to attract industry and business sectors for more entrepreneurial activities. 4) The collaboration between the university and industry and external environment is unstable, and there are unsustainable linkages and collaborations based on lacking ability to compete and attract the external environment for sustainable collaboration. 5) The university is lacking alignment between top-down and bottom-up activities, which leads to some kind of tension between top management and professional personnel in achieving the university’s vision and goals.

I.2.5. Conclusion: Organizational Dimensions’ Framework

The evidence of truly entrepreneurial changes within higher education institutions and universities as organizations is difficult to identify and measure without deep longitudinal studies of specific entrepreneurial university models (Rinne and Koivula, 2005, p. 114). However, this chapter exemplifies what an entrepreneurial university could look like in order to cope with national and international socio-economic demands and competition.

An entrepreneurial university, as an academic organization, will have to adapt to an entrepreneurial culture, which will help to develop new platforms for innovation and entrepreneurship. This adaptation and change impacts upon all organizational dimensions: a commitment to strong executive leadership provides visionary and financial support for entrepreneurial changes, a shared governance, and professional managerialism. Committed leadership helps to support the university’s core missions and activities as well as flexible and quick decision-making processes. In addition to academic freedom and engagement, in order to meet internal and external expectations, new research and teaching activities emerge in order to meet the external environment’s and groups’ demands. Furthermore, the university members’ beliefs, behaviour and practices, that reflect the entrepreneurial culture, support the transfer of knowledge and technology between university divisions on the one hand, and external partners on other, through different channels and linkages.
The Framework has been presented in ‘EU-SPRI Early Career Research Conference: Early Career Researcher Conference, University of Twente 9th-11th May 2012’.

It is important to mention that the analytical review of the studies on entrepreneurial universities reveals that the specific case studies of those universities cannot be generalized, especially in emerging countries such as GCC. In addition to analysing the mission dimension, most of the studies give much weight to research, whereas teaching is less of a feature. This can be seen differently in GCC countries which have a short history in teaching development compared with Europe and the United States. Therefore, the analytical framework offered by this study that characterise entrepreneurial universities with context neutral dimensions would take the field of entrepreneurial university forward.
Entrepreneurial University’s Organizational Dimensions

Figure 7: Entrepreneurial University’s Organizational Dimensions
The table below shows the summary of the entrepreneurial university’s organizational dimensions:

<table>
<thead>
<tr>
<th>Organization’s Dimensions</th>
<th>Dimension Characteristics</th>
<th>Dimension’s Options</th>
<th>Measuring Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Managerial:</strong> Whether the university has strong executive leadership, executive strategy and decision making, balancing between proactive internal activities and reactive external demands, and balancing between academic values and managerial strategic directions.</td>
<td>Shared Governance</td>
<td>Option 1: Coordinated management style</td>
<td>- Re-structure university governance and mechanisms to adapt entrepreneurial changes (transparency of structure and processes).</td>
</tr>
<tr>
<td></td>
<td>Strong Executive Leadership</td>
<td>Option 2: Hybrid management style</td>
<td>- Align the top-down incentives and bottom-up initiatives (Collegiate management), vision, mission, goals-oriented decision making.</td>
</tr>
<tr>
<td></td>
<td>Professional Management</td>
<td></td>
<td>- Is the university council (decision-making body) sufficiently representative of external entities and the internal body, including academic staff?</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>- Is the university strategy, which is established by the university council, reflecting an entrepreneurial approach?</td>
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<td></td>
<td></td>
<td></td>
<td>- Does the decision-making body have power and influence in lobbying for universities in regional innovation and research policy?</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>- Does the decision-making body have power, and is it involved in the promotion process?</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>- Does the decision making body have the power and influence to seek new income sources, allocate funding resources, and evaluate financial audits?</td>
</tr>
<tr>
<td><strong>Funding:</strong> To what extent is the university able to diversify its funding resources from second and third stream income, and to what extent it is seen to be academically-led rather than financially-led?</td>
<td>Block Grant</td>
<td>Option 1: To the Maximum</td>
<td>- The extent to which the university is financially independent/autonomous.</td>
</tr>
<tr>
<td></td>
<td>Project Fund</td>
<td>Option 2: Project-based</td>
<td>- The percentage of government funding in the total university fund.</td>
</tr>
<tr>
<td></td>
<td>Private Fund</td>
<td>Option 3: Private-based</td>
<td>- The percentage of project funds in the total university fund.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- The percentage of private funding income in the total university fund.</td>
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<td></td>
<td></td>
<td></td>
<td>- The volume of independent/innovative researchers.</td>
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<td></td>
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<td></td>
<td>- The volume of international students enrolled/graduates there are per year.</td>
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<td></td>
<td></td>
<td></td>
<td>- The volume of publications there are per year (books, articles, etc.).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- The volume of national and international awards there are per year.</td>
</tr>
<tr>
<td><strong>Mission:</strong> Whether the university is able to enhance</td>
<td>Entrepreneurial-Oriented Teaching</td>
<td>Option 1: Extremely Entrepreneurial</td>
<td>- The volume of new research and teaching programs that are orientated to the external environment.</td>
</tr>
</tbody>
</table>


its third mission by incorporating it into the core mission through building bridges with industry and the private sector in specific disciplines of academic interest

| Collaboration: To what extent the university is able to cope with the challenges in building linkages and establishing bridges with the uncertain socio-economic demands? | Option 2: Hybrid Technology | - The volume of joint projects with industry and the private sector.  
- The volume of spin-offs and start-up companies.  
- The volume of research commercialization projects/patents/licenses.  
- The volume of multidisciplinary graduate school programs.  
- The volume of PhD students graduating in the fields of science, technology, and innovation. |
|---|---|---|
| Organization’s Capacity | Option1: Strategic Collaboration | - The establishment of technology-transfer offices/innovation office.  
- The number of research centers/science parks linked with the university.  
- The volume of industry-university projects.  
- The number of researchers and students who have moved to work in industry or external labs.  
- The number of external experts who have moved to work in university labs.  
- The volume of joint ventures.  
- The volume of research projects in collaboration with external groups. |
| Strong Bridges and Linkages | Option 2: Project-Driven Collaboration | --- |
| Response | --- | --- |

| Cultural: Whether entrepreneurship is in the organization’s core mission, and to what extent the university is committed to supporting the approach at all levels (top-down and bottom-up) | Autonomy | Option1: Strong Entrepreneurial Culture | - A clear vision, mission, and goals statement in favor of an entrepreneurial culture.  
- Strong executive leadership and decision makers.  
- Entrepreneurial behaviors among teachers and students.  
- The university’s organizational structure reflecting the cultural changes.  
- Building a network culture with the external environment (professional, industry, societies, and regional and international collaboration).  
- Re-structuring university governance and mechanisms to adapt to entrepreneurial changes (transparency of structure and processes). |
<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Shared Vision &amp; Goals</td>
<td>Option 2: Sustain Culture</td>
<td>---</td>
</tr>
<tr>
<td>Reputation &amp; Identity</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

Table 1: Summary of Entrepreneurial University’s Organizational Dimension
Chapter Three: The Coherence between the Entrepreneurial University and the Entrepreneurial Environment

I.3.1. Introduction

The entrepreneurial university is seen to be the organization that focuses on creating the internal culture at the forefront of structure in terms of organizational priorities and individual recognition. More time is spent developing a supportive academic culture of continual internal renewal with redefined goals and objectives. As such, the entrepreneurial university thrives on big and complex societal [and economical] problems and involves the entire [Environment] in seeking solutions. It also celebrates risk taking and accepts a certain amount of failure as a necessary component of the learning process" (Zaki, 2013).

As mentioned earlier, the environment is seen as the climate or the conditions under which the entrepreneurial university exists. According to the OECD report (1998), in order to foster entrepreneurship it is important to provide a favourable environment for enhancing entrepreneurship at a national level.

In this context this chapter explores and highlights the coherence between entrepreneurial university and external entrepreneurial environment that is seen to offer a harmonized platform for the entrepreneurial university. It is therefore important to define the conceptual meaning of the word ‘coherence’ that used in this context. It is the alignment between entrepreneurial university and entrepreneurial environment where all ERIE related actors work as a team sharing responsibilities and ownership. The alignment can be seen between national ERIE strategy and direction and organizational ERIE strategy which is characterized by three key elements: 1) persistence flexible interaction between all ERIE related actors (Knowledge creators, Knowledge funders, knowledge users, and policy makers), in order to develop a coordinated ERIE strategy, 2) availability of varieties of ERIE opportunities (funds and policy instruments), 3) flexible ERIE performance and evaluation mechanisms. (More explanation see II.5.8)

In view of that, the purpose of the framework that has been adopted in this chapter is to provide a comprehensive platform that interlinks the different entrepreneurial organization
types with the entrepreneurial environment ERIE funding and policy spaces, in order to increase entrepreneurial dynamics.

I.3.1.1 Entrepreneurial Environment

Different explanations have been for the term ‘entrepreneurial environment’. According to Malecki (1990), it is ‘entrepreneurial climate’, however, Tan et al (2000) describe it as ‘entrepreneurial infrastructure’, and others just describe it as an entrepreneurial community. In addition, Nedeva (2013, online) explains this concept as “the environment that is characterized as offering varieties of opportunities: funding resources, research, innovation, and entrepreneurial programmes, and a flexible interaction and networking mechanisms”. However, as the study is investigating the macro-level at national scale, the term ‘entrepreneurial environment’ is seen to be more acceptable. Thus, ERI entrepreneurial environment can be characterized as the ‘position where it offers variety of ERIE opportunities and flexible interaction mechanism between ERIE related actors’.

I.3.2. Analysis Approach

In searching for the appropriate framework that can help explore the interaction between entrepreneurial universities and entrepreneurial environment, three different existing frameworks and typologies that have deliberated the relationship between universities’ roles and performance with external environment funding and policy spaces have been suggested. These are, National Innovation Systems (NIS), (Nelson, 1993; Lundvall, 1988, 1992/2010; Freeman and Lundvall 1988; Lundvall et al, 2009), the Triple Helix (Etzkowitz and Leydesdorff, 2000) and (Etzkowitz, 2008), and the National ERI Funding and Policy Spaces (Nedeva et al, 2013).

The following pages provide brief explanation of the key characteristics and criticisms of each three frameworks/models. In addition, a comparative analysis has been provided of the three frameworks to see whether they are appropriate for the purpose of examining the interaction between entrepreneurial universities and the entrepreneurial environment.

The purpose of this analysis is not to provide a new typology, rather it is to select an appropriate national framework that can be applied and work regardless of the national and
cultural boundaries, and in the same time facilities the coherence between entrepreneurial university types and entrepreneurial environment.

I.3.2.1 National Innovation Systems (NIS)

The National Innovation System has been given several definitions by different scholars. These definitions have common characteristics where the interaction between key related actors, processes and mechanisms, and performance are the key factors. According to OECD NIS (1997, pp. 9-10) the NIS centres on understanding interaction among the related actors involved in innovation as a key factor in improving technology performance, where innovation and technical progress are the result of a complex set of relationships and linkages between key related actors creating and using various kinds of knowledge. The following definitions have been accumulated by Niosi, (2002, p. 292):

“.. The network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies” (Freeman, 1987).

“.. The elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge ... and are either located within or rooted inside the borders of a nation state” (Lundvall, 1992, 2010).

“... A set of institutions whose interactions determine the innovative performance ... of national firms” (Nelson, 1993).

“... The national system of innovation is constituted by the institutions and economic structures affecting the rate and direction of technological change in the society” (Edquist and Lundvall, 1993).

“... A national system of innovation is the system of interacting private and public firms (either large or small), universities, and government agencies aiming at the production of science and technology within national borders. Interaction among these units may be technical, commercial, legal, social, and financial, in as much as the goal of the interaction is the development, protection, financing or regulation of new science and technology” (Niosi et al, 1993).

“.. That set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies and which provides the framework within
which governments form and implement policies to influence the innovation process. As such it is a system of interconnected institutions to create, store and transfer the knowledge, skills and artefacts which define new technologies” (Metcalfe, 1995).

The above four definitions clearly articulate the key elements of the National Innovation System, which are as follows: different public and private actors, interaction and collaboration between those actors via their affiliated institutions, and the innovative technologies outcomes of creating and using knowledge.

1.3.2.1.1 Characteristics of National Innovation System (NIS)

The main Characteristics of NIS can be summarized based on the intensive studies and findings that have been analysed and published by Nelson (1993), Lundvall (1992), OECD (1997), Lundvall et al (2005), and Lundvall et al (2009). Accordingly, NIS takes into consideration three key factors: 1) The economic role of knowledge; 2) The increasing use of systems approaches; and 3) The variety of agencies and actors involved in knowledge creation (OECD, 1997, p. 11). In addition, NIS has emerged to reflect the rise of systemic approaches to the study of science and technology as divergent to the “linear model of innovation”. The linear model of innovation has failed to explain the complexity of interactions and relationships between different actors and institutions involved in innovation processes Lundvall et al (2009).

Furthermore, according to the analytical studies by Lundvall (2005) and Lundvall et al (2007, 2011), innovation process reflects two modes. These modes are best described as “1) innovation strategies (STI-mode of innovation) that give main emphasis to promoting R&D and creating access to explicit codified knowledge, and 2) innovation strategies (DUI-mode of innovation) that are mainly based on learning by doing, using and interaction. These will typically involve organizational frameworks and relationships between employees that utilize implicit knowledge and promote interactive learning. One is experience-based and the second is science-based”.

In light of the above NIS definitions and characteristics, one can summarizes the NIS framework characteristics as follows:1) The term ‘National System of Innovation’ has been around for more than two decades and today it has been attractive to policy makers as well as scholars all over the world (Freeman 1982 and Lundvall 1985); 2) NIS has helped to move attention towards national policy strategies that constitute positively both
internationally and nationally, and has moved the attention in policy circles in charge of research, innovation and industrial development from the linear model to the interactive model of innovation (Lundvall et al, 2007, 2011). 3) In NIS the element of knowledge creation and users linked with economic performance nationally and internationally is embodied in all related agents and actors, in routines of firms, and in relationships and collaboration between related agents; 4) NIS provides systemic interactions and relationships between R&D-efforts in firms, S&T-organizations, including universities, and public policy by the governments, where learning and innovation is best understood as the outcome of interaction between related agents/actors (learning and innovation are strongly interconnected processes); 5) This, however, explains that the interactive learning is a socially embedded process and, therefore, a purely economic analysis is insufficient; 6) It is worth mentioning that the National Innovation Systems differ from one nation to another in terms of specialization both in performance and in terms of knowledge base. Finally the National Innovation Systems are systemic in the sense that the different elements are interdependent and that interrelationships matter for innovation performance.

1.3.2.1.2 Criticisms of National Innovation System (NIS)

Based on recent analytical studies by modern authors writing on the NIS approach (Lundvall, 1992; Lundvall, 2005, Nelson, 1993; Edquist, 1997, 2005), despite the popularity of NIS in developed and developing counties, the NIS concept has been criticized thoroughly. The following highlights eight criticisms from the above scholars. First, the ‘system’ term is vague and interactive learning cannot be seen as leading to a ‘network level’ rather than a ‘system level’ (Edquist, 2005). Second, it been argued that the lack of agreement on where to draw the lines around the innovation system makes the concept ‘diffuse’ and that this lack of clarity constitutes a barrier for further progress towards a more ‘rigorous’ and ‘theoretical’ concept (Edquist, 1997, 2005). Third, some policy makers have abused the NIS concept by paying lip-service to the concept while neglecting it in practice, (Lundvall, 2005, Nelson, 1993). Fourth, the concept of NIS was developed mainly in rich countries, so to apply the concept in developing countries may be seen as ‘re-exporting’. Fifth, it may be argued that since it takes on different meanings in different contexts, the NIS-concept is not a theoretical concept. In particular the broader definition may be criticized since it might give the impression that anything can be
included and nothing excluded in the definition. Sixth, the ‘general theory’ of innovation systems that abstracts from time and space might undermine the utility of the concept both as an analytical tool and as a policy tool. Seventh, NIS is seen to be difficult to apply in less developed countries, where the size of industry is less engaged in innovation and learning and it might be virtually impossible to gather data on what goes on inside firms through surveys, and register data may also unreliable. Eighth, the standard indicators on research, innovation and competence may not capture the reality of the innovation systems in developing countries (Edquist, 1997, 2005, Lundvall et al, 2011).

I.3.2.1.3 Summary

In summary, the National Innovation System concept has contributed intensively during the last fifteen years as analytical tool for national innovation performance in many developed countries such as OECD, and as a policy tool to inform decision makers of the importance of developing national research and innovation strategies for better socio-economic growth in knowledge–based societies. NIS is both social and dynamic (Lundvall, 2000, p. 24). “This refers to both the nature of the institutions that make up the system, as well as to the linkages and flows that connect them to one another. It is social in the sense that it relies on “an institutional context...constituted by laws, social rules, cultural norms, routines, habits, technical standards”, and it is dynamic due to the “financial flows between government and private organizations...human flows between universities, firms, and government laboratories, regulation flows emanating from government agencies towards innovation organizations, and knowledge flows (spill-overs) among these institutions” (Niosi, 2002, p. 292).

NIS has enhanced the attention of policy makers in charge of research, innovation and industrial development to move from the linear model to the interactive/open model of innovation, where different related actors are involved in knowledge creation and knowledge use and application. NIS has introduced the systematic approach in the sense that the different elements are interdependent and that interrelationships matter for innovation performance. These key different elements are as follows: different public and private actors, interaction and collaboration between those actors via their affiliated institutions, and the innovative technologies outcomes/innovation performance.
However, the NIS concept has been utilized differently by different policy makers and scholars based on the different contexts of their interests. Therefore, the NIS concept is seen to be ‘vague and diffuse’ based on lack of agreement on where to draw the lines around the innovation system (Lundvall, 2005, Edquist, 2005). In addition NIS is lacking clarity when it comes to be applied in less developed countries. This means that NIS works in some specific cultures where it was originated, and neglects other cultures with difficulties in their national data systems and poor performance in their industry firms.

Furthermore, although NIS pays intensive attention to knowledge creation and links it with economic performance nationally and internationally, where universities are considered as key actors as knowledge creators, NIS is lacking clarity in how the external environment as part of the national system can introduce the funding and policy spaces that enhance a university to be more innovative and more entrepreneurial. NIS is seen to be focusing on economic growth based on firms’ performance, rather than paying attention to all knowledge creation organizations as contributors to national socio-economic development.

I.3.2.2 The Triple Helix (TH)

“The Triple Helix thesis emerged from a confluence between Etzkowitz’s longer-term interest in the study of university-industry relations (e.g., Etzkowitz, 2002) and Leydesdorff’s interest in an evolutionary model that can generate a next-order hyper-cycle—or in terms of the TH, an overlay of communications” (Leydesdorff, 2013, p. 1844).

The Triple Helix approach has emerged as a result of several trends. According to Etzkowitz (2008), the Triple Helix of University-Industry- Government interaction is a result of several trends. These are as follows: 1) The participation of ‘entrepreneurial scientists’ in decision making as backers of firms; 2) Emergence of science-based industry; 3) The university-industry relations where the government plays the role of establishing rules, laws, and regulations of the U-I relationships; and 4) The second revolution of university mission ‘capitalization of knowledge’, which is linking universities with knowledge users and consequently plays a key role in economic growth. Moreover, the Triple Helix is described as one of the critical ideas that contributes to explaining the innovation system concept as an interactive process (Lundvall, 2005).
The following diagram best describes the Triple Helix concept:

![The Triple Helix Interaction Model, Etzkowitz (2008)](image)

**1.3.2.2.1 Characteristics of Triple Helix (TH)**

The key characteristics of the Triple Helix model can be best summarized based on the intensive studies by Etzkowitz and Leydesdorff (2000), Etzkowitz (2008), and Leydesdorff (2012). According to Leydesdorff (2012, p. 5) “Unlike discussions about national (Lundvall, 1988; Nelson, 1993) or regional (Braczyk et al, 1998) systems of innovation, the Triple Helix model enables us to consider empirically whether specific dynamics... among the three composing media emerge at national and/or regional levels”.

In this context the Triple Helix pays crucial attention to the roles and the interaction between university, industry, and government as key players in knowledge-based societies, and knowledge-based economies. It can be seen as a platform that has attracted many nations, offering an operational strategy for national, regional, and international socio-economic development, and in some other cases as a platform for generating incubators in the university context (Leydesdorff, 2012).

In light of above overview about TH the following summarizes the key characteristics: 1) TH is generated from the analysis of the relationships and interaction between universities, industry, and government, and their roles in the innovation process. 2) TH is a platform for operational strategies of national, regional, and international development in the era of knowledge-based socio-economies (Jacob, (2006), Etzkowitz, (2008)). 3) TH helps to shift the attention from bilateral to trilateral interaction (University, Industry, and Government) (Etzkowitz, 2008). 4) TH emphasizes that universities play a leading role in knowledge-
based society, which shifts them from secondary organizations into the primary subsystem sphere. 5) TH theorizes that each of the three subsystems can play the role of the other. For example, universities can form firms via start up and spinoff without being enterprises, governments can play the role of venture capitalists, and industries can provide training and research programs for academic students. 6) TH helps shift the subsystem relationships from Laissez Faire and Statist to hybrid models of intersecting Institutional Spheres. 7) TH helps to draw lines with gradations between independence and interdependence of each of the three spheres without losing their identities. 8) TH identifies that knowledge creation and utilization are linked with economic growth nationally, regionally, and internationally. 9) TH describes the ‘capitalization of knowledge’ as at the heart of universities’ new missions, where the university is seen to be an economic actor in its own right. 10) Entrepreneurial universities that have strong degrees of autonomy to develop their own strategic direction and collaborate with industry and government on an equal basis in joint projects for socio-economic development are a drivers for TH (Etzkowitz and Leydesdorff (2000), and Leydesdorff (2012).

**I.3.2.2 Criticisms of the Triple Helix**

Regardless of wide acceptance of the TH model by both policy makers and scholars around the world, at different national, regional, and international levels, it has faced some thorough criticisms. The following seven points summarize the criticisms that have been made by several scholars:

First, the TH model seems to be abstract in character, rather than a concrete model (Viale and Pozzali (2010), and Yuzhuo Cai (2013). Second, the TH model fails to recognize the different national and cultural contexts and other social settings that influence the interaction between university, industry and government (Shinn, (2002), Balzat and Hanusch (2004), Third, the TH model seems to be functioning in the “deinstitutionalized, fluid and amorphous environment”, since there are big differences in innovation systems of different nations, which are not considered in the model (Balzat and Hanusch, 2004). Fourth, the TH model is not a theoretical concept or model, but rather a normative political agenda. Fifth, the TH model is a lock-down model, lacking “a solid micro foundation” (Shinn, 2002) (Viale and Pozzali, 2010). The TH model ignores people, who are initial
drivers of the innovation process, and that innovation system is viewed differently by researchers and entrepreneurs. Sixth, the TH model did not deal with the issues and tensions in the process of each actor taking the role of the other (Tuunainen, 2005, Cooke, 2005). Seventh, not all universities have the potential to become entrepreneurial organization, as posited by the TH model (Jacob et al, 2003).

1.3.2.2.3 Summary

To conclude, the Triple Helix model has systematically contributed to the innovation and entrepreneurship processes. The TH model has been accepted and adopted by a wide range of nations as a tool of operational strategy development at national and international levels. Moreover, the TH model emphasises that ‘capitalization of knowledge’ is at the heart of new university missions as an economic actor in knowledge-based socio-economic societies. In addition, the TH model facilitates shifting the U-I-G relationships from Laissez Faire and Statist to a hybrid model of intersecting institutional spheres.

However, the TH model has also faced several criticisms by different scholars. According to Elzinga (2002), the TH model is “promote[s] particularism while claiming for generality”, and is lacking in its national and cultural context recognition. In addition, the TH model is seen to be lacking a solid foundation at micro-level, and thus is seen as a highly abstract model. Moreover, Edquist (2001) and Whetten (2009) argue that the TH model is not like other innovation systems approaches in that it is not a theoretical concept or model, but rather a normative political agenda: “all theories are context bounded…they should not unknowingly be applied in circumstances that exceed their operational boundaries” Whetten (2009, p. 11).

1.3.2.3 National ERI Funding and Policy Spaces

The National ERI Funding and Policy Spaces is a comparative framework that has been developed based on systematic analysis of the interaction between ERI spaces and research fields by Nedeva, et al (2013). The National ERI Funding and Policy Spaces framework is structured by two key dimensions: first, the funding arrangements, which include origins
and levels of funding resources for ERI activities, and second, the ERI governance, which include all kind of rules, laws, and regulations for all related actors, both knowledge creators and knowledge users.

The table below (2), illustrates the typology of the framework which has been adopted from Nedeva et al, (2013) 'Study of Research Funding Trends and Practices of Research Funding Organisations: Report to the Swiss Science and Technology Council’.

The framework consists of two main elements: the funding arrangements (level, modality, origin, and actors), and the governance of the landscapes (authority rights, and evaluation).

<table>
<thead>
<tr>
<th>Funding Arrangements</th>
<th>Governance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Modality</td>
</tr>
<tr>
<td>High</td>
<td>-Block grants</td>
</tr>
<tr>
<td>Medium</td>
<td>-Project funding</td>
</tr>
<tr>
<td>Low</td>
<td>-Mixed</td>
</tr>
</tbody>
</table>

Table 2: NERI-FPS framework

1.3.2.3.1 Characteristics National ERI Funding and Policy Spaces (NERI-FPS)

The main characteristics of the NERI-FPS framework can be summarized from the analytical study, by Nedeva et al, (2013). The following highlight these characteristics: 1) NERI-FPS helps understanding of the relationship between levels of funding arrangements with the share of public funding for research based on GERD (gross domestic expenditure on R&D). 2) NERI-FPS helps understanding of the relationship between the modality of fund of ERI space with organisation’s/university’s performance and its governance arrangements. 3) NERI-FPS helps description of the relationship
between characterisation of the funding agencies and different ERI spaces. 4) NERI-FPS emphasizes the dynamic of interaction between related actors of ERI (knowledge creators, knowledge funders, and knowledge users. 5) NERI-FPS helps to link national ERI spaces with national policy spaces. 6) NERI-FPS links the distribution of authority rights for research priorities (funding and infrastructure) with ERI governance, which can be centred or subject to multi-level governance. 7) NERI-FPS links types of evaluation, funding arrangement and governance, and organizational performance. 8) NERI-FPS can be generalized, as it fits with any national and cultural context based on each nation’s circumstances.

1.3.2.3.2 Criticisms of National ERI Funding and Policy Spaces (NERI-FPS)

The National ERI Funding and Policy Spaces framework is recently published, and so lacks analytical criticisms\(^7\) from scholars. However, one can argue that the NERI-FPS has some empirical limitations. The following highlights the main limitations. First, the NERI-FPS framework has been applied to few cases and so is difficult to generalize, especially as most cases are from a European context and seen to be high or medium investors in research. Second, the NERI-FPS framework is lacking robust standardisation, as it has been developed based on qualitative indicators. Third, the NERI-FPS framework is lacking clarity of where to draw lines of interaction and collaboration between authority rights actors. Fourth, the NERI-FPS framework is lacking clarity about national innovation and entrepreneurship policy spaces indicators.

1.3.2.3.3 Summary

To conclude, the National ERI Funding and Policy Spaces framework can be used as an analytical tool in order to identify the relationships between ERI spaces’ performance and national REI policy spaces’ characteristics. However, the lack of robust standardisation of the framework needs to be taken into consideration when applying it to different national and cultural contexts.

\(^7\) The characteristics and criticisms of NERI-FPS made by the authors as it is newly published.
1.3.2.4 Comparative Analysis of the Three Frameworks

The following table (3) highlights the availability of key elements that each national framework suggests should be emphasized in order to provide an entrepreneurial environment that creates harmony with an entrepreneurial university.

<table>
<thead>
<tr>
<th>Key elements</th>
<th>NIS</th>
<th>TH</th>
<th>NERI-FPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>University role</td>
<td>Related</td>
<td>Key actor</td>
<td>Key actor</td>
</tr>
<tr>
<td>Key actor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Related actor</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Minority actor</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Knowledge-based framework</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitate</td>
<td>Centralized strategy</td>
<td>Centralized strategy</td>
<td>Centralized and/or coordinated strategies</td>
</tr>
<tr>
<td>Centralized strategy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coordinated strategy</td>
<td>More to Economic aspect</td>
<td>Socio-economic aspects</td>
<td>Socio-economic aspects</td>
</tr>
<tr>
<td>Fragmented strategy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social aspect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economic aspect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Socio-economic aspects</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dynamic interaction between actors</td>
<td>Yes</td>
<td>Abstract</td>
<td>Yes</td>
</tr>
<tr>
<td>Clear ERIE policy space characteristics</td>
<td>Abstract</td>
<td>Abstract</td>
<td>Yes</td>
</tr>
<tr>
<td>Theoretical concept</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Clear ERIE funding spaces</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>National &amp; cultural bounded</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 3: Three National Frameworks Compared

1.3.2.1. Rationale for Selecting the Appropriate National Framework

In searching for an appropriate framework that can help with exploring the interaction between entrepreneurial universities and entrepreneurial environment, three different frameworks have been suggested. These are National Innovation Systems (NIS), (Nelson, 1993; Lundvall, 1988,1992/2010; Freeman and Lundvall 1988; Lundvall et al, 2009), the Triple Helix model, (Etzkowitz and Leydesdorff, 2000; Etzkowitz, 2008), and the

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8 The selection of comparison elements is based on role of university into national systems as a player of the game, and on national and cultural context -less
National ERI Funding and Policy Spaces (Nedeva et al, 2013). However, the first and second options are seen not to be fitting for six reasons: 1) GCC including Oman are lacking structured scientific research and technological frameworks, and a need to improve efficiency in innovation and entrepreneurship schemes, as well public policy. 2) There is absence of clear NISs in GCC countries. 3) They are lacking in a comprehensive R&D-driven strategy which includes strong basic research capacity and skilled researchers. 4) GCC countries do not have variety or large R&D&I intensive firms. 5) GCC does not have strong public research and innovation labs. 6) GCC do not have a long history of university-industry links excluding oil and gas fields.

It is important to mention that there are key external factors affecting the entrepreneurial university transformation, such as the: 1) availability of strong industry sector, 2) availability of knowledge-based firms, 3) availability of variety of knowledge funder, such as: national, regional, and international, private and public funds, 4) availability of knowledge user such as science-based companies, science parks, and innovation-led research centres, and 5) national ERIE strategies. However, Oman and GCC’s external environments are lacking the above mentioned factors and elements which lead to focus on funding and policy spaces as the most drivers for fostering an entrepreneurial university approach in Oman in the current situation.

Therefore, the third framework (NERI-FPS) is seen to be the most suitable for the aim of this study. The rationale behind adopting the NERI-FPS framework is that this framework uses key elements of the resource funding dimension of the entrepreneurial university model. Second, the framework offers variety and flexibility as key elements that explain the interaction between the university as an organization and the external environment; these are the variety of ERI fund resources (modality & origin), the variety of actors, authority rights, and flexible national evaluation systems, and the framework’s distinct advantage in that it offers a strategic actions platform that is needed for future foresight by harmonizing the different agencies’ roles and responsibilities within a flexible national entrepreneurial environment.
1.3.2.2. The Selected Framework (NERI-FPS)

The table below illustrates the selected framework which has been adopted from Nedeva et al, (2013) study (see Table 2: NERI-FPS framework).

The framework consists of two main elements: the funding arrangements: (level, modality, origin, and actors), and the governance of the landscapes (authority rights and evaluation).

Taking a closer look at the above elements of the framework, one can realize that this framework is explicitly highlighting the variety of ERI funding resources (modality, origin), and variety of ERI actors (knowledge, creators, users, and funders) and a flexible dynamic of interaction between ERI related actors (authority rights and evaluation system) in prioritizing ERI national strategy (how much go where, what infrastructure is needed, and ERI performance evaluation). This matches the characteristics of an entrepreneurial environment. For more explanation of the framework elements see Appendix (1).

Furthermore, to address the purpose of examining the coherence between an entrepreneurial university and an entrepreneurial environment, this framework has been further developed for the purpose of examining whether there is causality between an entrepreneurial university and the entrepreneurial environment in which it exists. This is shown in the table below:

<table>
<thead>
<tr>
<th>Coherence between entrepreneurial university &amp; entrepreneurial environment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Entrepreneurial university/ Ideal Types</strong></td>
</tr>
<tr>
<td>- Fully-Fledged Entrepreneurial Organization</td>
</tr>
<tr>
<td>- Blended Technology Organization</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

*Table 4: Coherence between Entrepreneurial University & Entrepreneurial Environment*
The above table focuses on three elements in order to illustrate the harmonization between internal organization environment and external environment. The following provides the definitions of the above mentioned elements:

**Entrepreneurial University Ideal Types:** These are the types of universities that have been described in Part I of chapter two:

*Fully-Fledged Entrepreneurial Organization:* These universities desire to label themselves and identify as fully-fledged entrepreneurial organizations, where all five organizational dimensions are seen to be flourishing in favour of entrepreneurial transformation.

*Blended Technology Organization:* The minimum fundamental requirements for any university that has an ambition to earn entrepreneurial status. It is, therefore, worth noting that the five organizational dimensions are correlated.

**National ERIE/Fund and Policy Landscapes:** This element emerges from combining the dynamic interaction between funding arrangements and governance from the NERI-FPS framework that facilitates building an NERIE strategy which can be centred, fragmented, or coordinated:

*Centralized Strategy:* Where ERI policy making is driven by a centralized national strategic plan for the future of the entire country.

*Fragmented Strategy:* Where ERI policy making is driven by fragmented authorities with visions and goals that are not necessarily aligned with national level and ERI policy making. This can be affected by individual interests either academically or industry related (project-based).

*Coordinated Strategy:* Where ERI policy making process is driven by collaboration vision between all strategic and operational actors. There is balanced between national, organizational, and individual visions and goals.

**ERIE Characteristics/Process and Mechanisms:** This element explains the variety of ERIE policy opportunities, flexible ERIE processes and mechanisms that offer an entrepreneurial environment:

*Centralized Policy Spaces:* Where the policy development and policy making process is centralized and facilitates by the top-down approach with centralized evaluation system.
Policy Mix: a variety of policy instruments and programs that are developed with coordination between all ERIE actors and allow all ERIE actors to adopt different policies and programs in a flexible and free manner, without any being forced to follow specific policy spaces. In addition, this provides critical mass and infrastructure development that allows mobilization and sharing of national and international experts and infrastructure.

Fragmented Policy: this reflects the absence of national policy space where a fragmented and weak interaction between ERIE related actors, where each actor or agency has their own policy space, and, therefore, weak collaboration between ERIE actors.

The following diagram (Figure 8) further demonstrates the dynamic interaction between entrepreneurial organizations/universities and entrepreneurial environments.

The entrepreneurial university (knowledge creator/generator) communicates and interacts with a variety of knowledge funders (public, private, project, national, international funding agencies) and knowledge users (industry and business firms, national and international).

The ERIE (Education, Research, Innovation, & Entrepreneurship) entrepreneurial environment offers a variety of policy spaces which interact in a dynamic and flexible manner with different ERIE agencies, where the type of interaction provides different national strategy patterns (coordinated, centralized, or fragmented), and the National Strategy pattern reflects the type of selection process where different ERIE agencies and actors can operate.

9 "policy mix the combination of policy instruments, which interact to influence the quantity and quality of R&D investment in public and private sectors". Manchester Institute of Innovation Research December 2005 – April 2009
Figure 8: Interaction between Entrepreneurial University & Entrepreneurial Environment

- Entrepreneurial Organization/KC
- Public/block fund
- Project fund/N&I
- Private fund/N&I
- Industry/N&I
- Business firms
- Knowledge funders/KFs
- Knowledge users/KUs

Entrepreneurial environment:
ERIE Funding and Policy Spaces

Agencies actors
Interactions Possibilities
ERIE policy spaces actors

output

Variety of KFs & KUs

Coordination strategy or
Centralized strategy or
Fragmented strategy

KC: Knowledge creator
KU: Knowledge User
KF: Knowledge Funder
N&I: National & International

Figure 8: Interaction between Entrepreneurial University & Entrepreneurial Environment
1.3.3 Variety and Flexibility as key Factors for the Entrepreneurial Approach

Accordingly, based on the analytical discussions of the organizational dimensions above and the availability of different options that emerge from relations and tensions between dimensions’ characteristics, one can argue that in order to catch up with successful entrepreneurialism, two significant factors should be taken into consideration, namely, variety of programs and opportunities, and flexibility of processes and mechanisms.

There is not much in the academic literature about the impact of variety of opportunity and flexibility of processing and mechanisms on entrepreneurialism in general, and in education in particular. However, as was mentioned earlier in the introduction to this part there is a relationship between entrepreneurship in education as a knowledge creator and economic growth. As Shattock (2005) highlights, the entrepreneurialism in business that has been argued for in Europe, as well as the entrepreneurial dynamism in United States, has reflected on the debate about entrepreneurialism in universities. Therefore, we have access to economics literature that discusses the factors of successful entrepreneurialism, which include the importance of availability of a variety of opportunities.

Open Innovation and Evolutionary Economics literature has embarked upon the creation of variety as a key factor for entrepreneurialism. For example, Menipaz et al (2009) emphasise the importance of wide range of job opportunities and secured systems for successful entrepreneurs: “A wide variety of employment opportunities and Social Security enable more alternatives to entrepreneurship”. ‘Social Security’ is seen to be a secured environment and conditions where entrepreneurship activities can survive. Furthermore, Chesbrough, et al (2014) highlight that an ‘open innovation’ system is one that uses a wide range of internal and external actors and resources in order to achieve and sustain innovation for firms. In their study they verify that to better sustain innovation processes, availability of a wide range of related actors and resources is a key factor.

On the other hand, Parris et al (2010, p. 10), points out the importance of flexible funding and policy spaces to support technology-based economic development: “The linkage of Venture capitalism activity and maturation of technology and economic development is long held and is increasingly given as the reason for public policy activity in supporting and encouraging the supply of venture capital”.
In addition, Metcalfe (1998), has investigated Schumpeter’s lectures about competition that seeks innovation and entrepreneurship approaches as a key factor of ‘Evolutionary Economics’. He speculates that the occurrence of change for a better competition process inside firms or organizations is driven by ‘variety’. This is the basis of ‘Fisher’s Principle’, that is seen as “a development of central theme in evolutionary theory; namely that variety drives change”.

Metcalfe links the innovation with evolutionary theory: “innovation must take pride of place in any evolutionary theory of structural change for it is the continuance of new behaviour which recreates the variety on which selection depends” (p. 86).

Metcalfe uses three principles in order to explain the evolutionary process: the ‘principle of variation’, where variation can be seen in related actors and opportunities, the ‘principle of heredity, which deals with mechanisms/systems and actors’ behaviours, and the ‘principle of selection’, which is concerned with the interaction between actors and the environment. This interaction specifies the growth and changes of the agents based on actors’ behaviours and characteristics of the environment. Therefore, Metcalfe (p. 22) states that “evolutionary change involves the mutually supportive ideas of interaction and coordination”.

He also points out that “evolutionary competition is active when the relative frequency of various entities in a population is changing under the influence of an explicit selection process” (p. 40)

Furthermore, according to Nedeva (2013), since the environments are likely to be different based on the national and cultural contexts of different nations; the entrepreneurial environment is characterized based on two key elements: variety and flexibility.

“For entrepreneurship to blossom, however, variety and flexibility ought to pervade all areas and aspects of society. There is little point, for instance, to aspire to develop an entrepreneurial university in social, political and funding environments lacking variety of opportunities and flexibility of structures. Similarly, a university cannot be entrepreneurial – neither can be its lecturers and students – if it is riddled with hierarchical and centralised governance structure, inflexible rules, promotion structures that take close to a
year, accounting arrangements where processing a claim for £5 costs the organisation £75, and where student assignments are rigidly specified and approved”.

In light of the above views from Nedeva, Metcalfe, Schumpeter’s lectures, Parris et al, and Chesbrough et al, one can argue that bringing about change for advancing development of any organization involves three key elements: variety of related actors/entities, variety of actions that include behaviours, missions and activities, and interaction between internal and external environment based on ‘selection process’. The concept of ‘selection process’ characterizes the environment that offers the process/system with a variety or mixture of opportunities, choices, and flexible mechanisms that allow deferent actors to make their own choices and decisions, and act and behave under this wide range of opportunities. Therefore, the selection process can represent ‘management style’ inside organizations that can be seen as adopting ‘Coordinated Management Style’, and represent national strategy in the external environment where it seen to be ‘National Coordinated Strategy’.

The following diagram (Figure 9) explains the consequence of availabilities of variety opportunities and flexible dynamics for entrepreneurial culture. This applies for internal organization culture, external environment culture, and the interaction between the organization and environment.

This ideal pattern should provide a variety of opportunities (funding, policy, ERIE critical mass) within a flexible eco-system, and the selection process should create innovative and entrepreneurial actions and behaviours as key conditions to enable entrepreneurial activities to survive and sustain.

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11 This explains that universities are usually spending fifteen times more on processing certain amounts of funds that they receive.

Entrepreneurial Culture: Variety opportunities & Flexible eco-system/selection Process

- Policy Spaces/ policy mix
- Funding
- Critical Mass/ A&I

Variety Opportunities, Actors

Eco-system, Selection process

N-Coordinated Strategy

Interaction

Availability of broad opportunities of ERI, policy mix, funding resources and qualifies critical mass with a flexible eco-system mechanisms between related authorities provide national coordinated strategy.

Entrepreneurial and innovative performance is flourished within an environment that provides open opportunities of policy spaces, fund resources and qualifies critical mass from both academic and industry sectors.

Variety & Flexibility

Entrepreneurial Culture

Performance, Action, Behaviour

National Coordinated Strategy that has been developed via flexible interaction mechanism between different related actors is enhancing innovation and entrepreneurship between knowledge creators and knowledge users.

Innovation

Entrepreneurship

Keys: PPP: Public, project, private, A&I: academic & Industry, N: national

Figure 9: Variety and Flexibility of Entrepreneurial Culture
1.3.3.1 Variety and Flexibility as key Factors for the Entrepreneurial University

The following implications have been built upon the comprehensive framework of the entrepreneurial university, where the element of harmonization between the five dimensions has been put in place via availability of a variety of opportunities and flexible selection processes. These implications demonstrate the importance of a flexible system:

**Implication 1: Variety of Opportunity & Flexible Processes**

![Figure 10: Variety of Opportunities & Flexible Processes](image)

The entrepreneurial management style is facilitated by coordinated management style where there is balance between top-down and bottom up strategies, availability of a variety of related actors, insiders and outsiders with balanced decision-making power, and strong executive leadership via a strong voice from the university’s vice chancellor.

The university is able to seek more ERI income based on the availability of a variety of fund resources (block grants, project funds, and private funds), and flexible interaction mechanisms between related actors (knowledge creators, knowledge users, and fund agencies), via entrepreneurial management style.

The university’s entrepreneurial-led performance can be facilitated by the availability of a variety of entrepreneurial-led teaching and research programs, and flexible interaction mechanisms between knowledge users and fund agencies via entrepreneurial management style.
The university can develop strong entrepreneurial collaboration with its external environment via establishing a variety of ERI programs and activities that can attract knowledge users, especially industry and private companies, and building strong strategic bridges and linkages facilitated by flexible interaction mechanisms.

As the university’s culture is seen to be the platform of the organizational pyramid, the university’s reputation and clear goals and vision towards entrepreneurship are seen to be indicators of this dimension. Therefore, the university can gain a strong entrepreneurial culture by positioning high organizational autonomy, and clear entrepreneurial vision and goals, through entrepreneurial management style that facilitates high entrepreneurial performance.

**Implication 2: Variety of Opportunities & Inflexible Processes**

The negative management style of the entrepreneurial path can be a sign of centralized management style that is applying top-down strategy and ignoring the bottom-up initiatives, despite the availability of different active actors at management level, and strong executive leadership.

The university can be affected negatively by centralized management style, which may lead to de-motivation of academic actors and culture, and consequently unstable ERI income, despite the availability of a variety of fund resources and flexible interaction mechanisms with related actors.

The university’s performance with regard to entrepreneurial activities can be affected negatively by centralized management style and centralized interaction processes with
related actors. This leads to de-motivation within the academic culture and a limiting of the opportunities to attract fund agencies, despite the availability of different entrepreneurial-led teaching and research programs.

The university may limit its opportunities in attracting knowledge users and consequently fund agencies via centralized management style and centralized interaction processes with related actors, which leads to wobbly entrepreneurial-led performance, despite the availability of a variety of ERI activities.

However, high organizational autonomy can be affected by centralized management style and unsteady vision towards the entrepreneurial approach. Consequently, this can lead to unstable organizational culture and weak entrepreneurial performance.

To sum up, the selection processes that represent the management style inside the entrepreneurial university plays a crucial role in the university’s identity as an entrepreneurial organization, regardless of the availability of a variety of knowledge funders and knowledge users. Therefore, as mentioned earlier it is vital to realize that the entrepreneurial university framework with the five organizational dimensions is a comprehensive framework that requires all five dimensions to work in harmony.

I.3.3.2 Variety and Flexibility between the Entrepreneurial University and the Entrepreneurial Environment

Based on the earlier discussion of the importance of the two elements of variety and flexibility as key factors in the interaction between organizations and their surrounding environment, the following implications demonstrate the soft causality (it is still first level of evidence that shows causality between entrepreneurial university transformation and entrepreneurial environment as five cases only have been used to test the framework, however for total causality we need large number of cases and wider landscapes), between the entrepreneurial university based on the entrepreneurial university framework that has been developed in chapter two, and the entrepreneurial environment that has been selected in this chapter (National ERIE Funding and Policy Spaces).
The following implications\textsuperscript{13} best describe the effects of these two elements (variety and flexibility) in the process of the interaction between the entrepreneurial university and the entrepreneurial environment.

1. The availability of varieties of funding resources and agencies, which is facilitated by national coordinated strategies using flexible interaction mechanisms between related ERI actors, leading to advancement of entrepreneurial organizations that are able to seek more income from different streams and seize different ERI program opportunities. This can be represented as:

2. The availability of varieties of funding resources and agencies which are managed under centralized strategy leading to inflexible interactions between related actors, which causes an unstable entrepreneurial organization where seeking more income can be challenging, in addition to the difficulty of attracting different knowledge users and fund agencies because of mismatched demands. This can be represented as:

3. The availability of varieties of funding resources and agencies which are managed under fragmented strategy, which causes rigid interactions between related actors and leads to an unstable entrepreneurial organization where seeking more income can be challenging, in addition to the difficulty of attracting different knowledge

\textsuperscript{13} The implications have been given as simple formulas in order to simplify the interaction between organization and environment.
users and fund agencies because of mismatched demands. This can be represented as:

![Diagram showing the relationship between Variety of fund Resources, National fragmented strategy, National fragmented ERI spaces, and Unstable Entrepreneurial organization]

To conclude, it is worth reinforcing the argument that the entrepreneurial university which is likely to perform best within its entrepreneurial environment is one that is offering a variety of ERIE platforms.

### I.3.4 Conclusion

The purpose of this chapter was to highlight the coherence between an entrepreneurial university’s transformations and its external environment. The results reveal a soft causality between creating fully-fledged entrepreneurial organizations and entrepreneurial environments that offer a variety of funding opportunities, varieties of research and innovation, entrepreneurship platforms, and flexible coordinated strategy. Thus, in order for the entrepreneurial university (described in chapter one) to achieve its missions of Education, Research, Innovation and Entrepreneurship (ERIE) and successfully perform based on national measures and indicators, it must sustain within the external environment. Therefore, three flexible platforms are seen to be key pillars for this coherence.

These are as follows: the funding platform, where universities are allowed to maximize their income and build strong linkages and collaborations with funding agencies, the flexible policy spaces platform, where there is alignment between the strategic level, the intermediate level, and the organizational level in formulating policy spaces with involvement of different ERIE actors, and the ERIE Characteristics platform, where varieties of flexible policy programs and instruments are offered as clear measures for university performance with high sustaining of critical mass, infrastructure, and strategic interaction between knowledge community, funds agencies, and policy making body.
PART I: CONCLUDING REMARKS

The purpose of PART I, was to develop an Entrepreneurial University Framework that can be used as a ‘compass’ in order to characterize ‘The Entrepreneurial University’ from any other Classic University. Therefore, from analysing a wide range of scholarly literature from the last two decades about entrepreneurialism in education, a comprehensive organizational dimensions framework has been developed. It characterizes five organizational dimensions: Managerial, Fund Resource, Mission, External Collaboration and Cultural. Each of these five dimensions has been thoroughly analysed, and definitions, characteristics, relationships, and tensions between each three elements that describe each dimension, along with measuring indicators have been provided.

In addition, two ‘Ideal types’ of entrepreneurial university have been identified based on the different possibilities of each dimension. These are the Full-Fledged-Entrepreneurial University, and the Blended-Technology University.

Consequently, investigating what climates and conditions, i.e. the ‘Entrepreneurial Environment’, in which the entrepreneurial university better flourishes, a second analytical review has been undertaken. Three National Frameworks have been selected for this purpose. Two of them are well known and widely used, especially in developing countries. There are the National Innovation System (NIS), and the Triple Helix (TH) Model. As a result of analysing these two concepts, both have been criticised as they are not theories, and they are nationally and culturally bound. Therefore, since the investigation seeks to identify a comprehensive framework for an entrepreneurial environment regardless of national and cultural contexts, as a tool for both developed and developing countries, including GCC countries, a third framework, the National ERI Funding and Policy Spaces (NERI-FPS) framework, has been selected.. This framework is characterized by two key elements: ‘funding arrangement’ that describes funding level, funding origin, and funding allocation, and ‘ERI governance’, which illustrates ERI Authority Rights, and national evaluation mechanisms.

However, it is worth reinforcing the importance of the two key factors, variety and flexibility, for the five entrepreneurial organizational dimensions to work in harmony. Two implications have been demonstrated that reflect the impact of these two factors.
Furthermore, the need for variety and flexibility as key factors for the entrepreneurialism argument is further strengthened when discussing the interaction between the entrepreneurial university and the entrepreneurial environment.

The thesis now moves on to Part II, which is concerned with testing and validating the Entrepreneurial University Framework and the Entrepreneurial Environment Framework.
PART II

Testing the Entrepreneurial University and Entrepreneurial Environment Frameworks

One of the most significant discussions in connection with creating entrepreneurial universities relates to structuring the university environment. As mentioned earlier in chapter two, several studies have contributed to explaining this phenomenon by using the case study approach. However, the major concern with those studies is the lack of a robust theoretical framework for understanding it (Guerrero, et al., 2010). Despite this absence of a basic framework, however, most studies that have analysed this phenomenon around the world (North America, Europe, Australia, and some Asian countries) by studying examples of entrepreneurial universities, have arrived at common findings. These relate to the core mission, the adaptation processes and organizational changes, internal and external strategies, different types of entrepreneurial activities, the academic characteristics, the environmental pressures, and cultural behaviour.

In this context, this part aims to contribute to a better understanding of entrepreneurial university characteristics by analysing four European universities in order to examine and validate the theoretical framework of entrepreneurial university organizational dimensions that have been developed in Chapter Two. In addition, this part examines the surrounding environment of these four cases by adopting the NERI-FPS framework, which has been analysed in Chapter Three. These universities are Strathclyde University, Chalmers University of Technology, the University of Twente, and the Norwegian University of Science & Technology. The chapter seeks to answer the question “which of these examples would provide important lessons for the on-going approaches of Gulf countries in general, and Oman in particular?”

The selection of the four universities is based on four elements: first, they all are seen as examples of entrepreneurial universities. Second, they have all been used as case studies in order to investigate the entrepreneurial phenomenon. Third, they are all European universities with similar policies regarding their environment. Fourth, they all have a focus on technology. In addition, it is easy to obtain access to their secondary data and information. The methodology used in this benchmark study is analysing secondary data
which includes published case study articles, university strategy documents, and annual review reports.

The structure of this part is as follows: Chapter Four begins by laying out the overview of each university, focusing on the importance of its geographical locations. Then, section two analyses documents (articles and reports) from each university based on the Entrepreneurial University Framework. Section Three summarizes the entrepreneurial profile of each of the four cases, and Chapter Five analyses the external environment in each of the four cases using the NERI-FPS framework. Finally, the last section, the Concluding Remarks of Part II, discusses the interaction between entrepreneurial universities and their entrepreneurial environment.
Chapter Four: Analytical Review of Four Case Studies - European Universities

II.4.1. Introduction

This chapter aims to contribute to a better understanding of entrepreneurial university characteristics by analyzing four European universities and using them for validation to ensure a robust framework for the entrepreneurial university. In addition, it will provide good examples for emerging countries such as GCC. The chapter asks two questions: first, "to what extent can the theoretical framework be applied to fulfil the entrepreneurial university approach?" Second, "which of these examples puts forward important lessons for the on-going approaches of Gulf countries in general, and Oman in particular?" The universities that have been taken as case studies in this chapter are Strathclyde University, Chalmers University of Technology, the University of Twente, and the Norwegian University of Science & Technology. The selection of the four universities is based on four elements. First, they are all examples of entrepreneurial universities. Second, they have all been used as case studies in the academic literature in order to investigate the entrepreneurial phenomenon. Third, they are all European universities with a broadly similar policy environment. Fourth, they all have a focus on technology. In addition, it is easy to obtain access to their secondary data and information.

The methodology used in this chapter involves analyzing secondary data, which includes university strategy documents, annual review reports, and published case study articles. This analytical review is used to test the conceptual framework (Entrepreneurial University Framework, Part I – Chapter Two). The analysis is based on the framework that has been developed in the entrepreneurial university dimensions as mentioned earlier in Chapter two. The chapter concludes that the universities’ transformation towards an entrepreneurial culture requires significant changes in organizational structures, knowledge-production, and cultural beliefs and behaviour.

All four universities have, in the past, made considerable changes at different levels. The four cases show the importance of re-structuring university infrastructure with the influence of strong leadership and professional management. The cases of NTNU and Twente are excellent demonstrations of the way in which strong leadership can transform a
university from a failing institution into a successful entrepreneurial university with a strong reputation. In addition, the four cases illustrate the importance of a mixture of funding from public, private, and industrial projects, where strong leadership plays a vital role in generating more income and allocating it efficiently. NTNU and Twente also provide evidence for the importance of education in entrepreneurship, and high quality entrepreneurship courses and programs. Moreover, the four universities all implement, to some extent, project-based teaching and research programs.

The analysis provides us with a robust structure for the entrepreneurial university framework. On the one hand, there are common changes which are applied by all the universities. On the other hand, there are specific elements and practices based on each individual university’s circumstances and culture which we cannot generalize as being suitable for all cultures. This information can be used to address the question “which of these examples would put forward important lessons for the on-going approaches of Gulf countries in general, and Oman in particular?”

It is important to mention here that this chapter intends to further develop the entrepreneurial university framework as a coordinated analytical review, as a step towards building the overall theoretical framework. It is also worth mentioning that the four case studies are considered as medium sized organizations with seven to eight departments and accommodate around 20,000 to 30,000 students.

II.4.2. The Analysis Approach

The approach is based on documentary analysis. It starts by identifying the universities which are suitable for use as case studies in relation to university-based entrepreneurship in the context of Europe. The major component has been the availability of published articles on each particular case. The study focuses on the scholars’ views and findings in five dimensions: (1) the managerial dimension, (2) the funding resource dimension, (3) the mission dimension, (4) the external collaboration dimension, and (5) the cultural dimension. A common set of elements has been identified as a template for analysis (King, 2004) (see Table 5).
II.4.3. Documentary Materials

Approximately twenty-five documents have been used in this part of the verification study. These documents include published articles, strategy reports, annual review reports, and some university website documents and facts. The summary of the findings of the analysis is illustrated in Table 2.

II.4.4. Matrix and Theoretical Dimensions

While a variety of dimensions of the university-based entrepreneurship structure have been discussed thoroughly, this chapter will use the dimensions that have been developed in the theoretical framework of the research. A wide range of indicators were considered to be relevant for each dimension. The metrics of the theoretical dimensions were clustered into the following categories. There are summarized below, for the ease of reading, having been elaborated previously in Part I.

II.4.4.1. Managerial Dimension

Definition: “the strategic level of decision making, executive leadership and power that can be viewed as strong executive leadership and executive strategy and decision making, where the power should be linked to the formation and use of strategic choice”. Three types of matrices have been described: shared governance, strong executive leadership, professional management. These matrices are used to examine ‘whether the university has strong executive leadership, executive strategy and decision making, balance between proactive internal activities and reactive external demands, and balance between academic values and managerial strategic directions’. As discussed in Chapter two-section (I.2.3.1)
II.4.4.2. Funding Resource Dimension

Definition: “The diversification of funding resources by promoting third stream income through teaching and research programmes, and not depending solely on government”. Three sets of matrices have been described: block funding, project funding (second stream), and private funding (third steam). These matrices are used to examine ‘to what extent the university is able to diversify its funding resources from second and third stream income and to what extent it is seen to be academically–led rather than financially–led. As discussed in Chapter two - section (I.2.3.2)

II.4.4.3. Mission Dimension

Definition: “The orientation of the heartland of the university (teaching and research) to the external environment in order to build relationships and new teaching and research programmes”. Three types of matrices have been described: teaching activities, research activities, and entrepreneurship activities. These matrices focus on assessing ‘whether the university is able to enhance its third mission by incorporating it into the core mission through building bridges with industry and the private sector in specific disciplines of academic interest.’. As discussed in Chapter two- section (I.2.3.3).

II.4.4.4. External Collaboration Dimension

Definition: “The increase in linkages and collaboration with the external environment, to be more responsive to the complexity and uncertainty of the external environment in order to improve the organization’s capacity to respond more flexibly”. Three sets of matrices have been described: the organization’s capacity development, response to external demands, and building strong bridges with the external environment. These matrices highlight ‘to what extent the university is able to cope with the challenges in building linkages and establishing bridges with the uncertain socio-economic demands’. As discussed in Chapter two - section (I.2.3.4)
II.4.4.5. Cultural Dimension

Definition: “A pattern of shared goals, values and ambitions that lead the university to adapt to new approaches of action, to seek a high reputation and to secure a strong identity to achieve self-directed autonomy”. Three sets of matrices have been described: the university’s autonomy, shared goals and values, and reputation and identity. These matrices are used to examine ‘whether entrepreneurship is in the organisation's core mission, and to what extent the university is committed to supporting the approach at all levels (top-down and bottom-up). As discussed in Chapter two- section (I.2.3.5)

II.4.5. An Overview of Selected Case Studies

In the history of the knowledge-based economy, entrepreneurial universities have been thought of as key pillars in the socio-economic development of their nations. Therefore, it is becoming increasingly difficult to ignore the huge pressure facing higher education institutions in general and universities in particular, to respond rapidly to the changing demands of the external environment. The following overviews highlight each case study’s historical path, profile, geographical location, and key strategic approaches.

II.4.5.1. Chalmers University of Technology

According to the Chalmers University of Technology profile, (2012), Chalmers University of Technology is located in Gothenburg, the second largest city in Sweden, with around half a million inhabitants. Gothenburg is the capital of a region with a strong industrial base. The university is named after the major benefactor, William Chalmers, one of the directors of the successful Swedish East India Company in Göteborg. Established in 1829, Chalmers is the second largest of the six technical universities in Sweden. Chalmers has around ten-thousand students and two-thousand six-hundred and fifty employees (Chalmers for a Sustainable Future, 2012). Chalmers’ turnover is approximately EUR 220 million per year, more than two-thirds of which is related to research. Almost two thirds of the funding comes from the Ministry of Education, while other public and foundation money constitutes about one-third. Direct income from industry is reportedly nine percent
of the total budget. The strategic vision (2010-2020) of Chalmers is to be regarded as one of the ten best technical universities in Europe, and the best in co-operation with industry. A vice-rector for external activities was appointed. Chalmers has several units designed to reinforce collaboration with industry, and commercialization. The connections with industry and commerce have, therefore, been natural from the very beginning. The structure of these organizations has, to a large extent, grown out of individual initiatives as opposed to having been set up as part of a planned strategy. Located on campus is Chalmers Science Park, comprising a number of company R&D labs and various university bodies involved in the interaction with industry. According to published material, several hundred spin-off companies have emanated from Chalmers, employing more than four-thousand people (Chalmers for a Sustainable Future, 2012). Sources at Chalmers estimate that fifteen knowledge-based companies are established every year as a result of some type of university activity, including student companies. However, the spin-off companies with the greatest potential emanate from long-term research projects. The Gothenburg region has many large technology companies, and this creates a market for new technology and spin-off companies from Chalmers (Chalmers for a Sustainable Future, 2012).

II.4.5.2. Norwegian University of Science & Technology (NTNU)

As its name indicates, NTNU is the national centre for education and research within the natural sciences and technology fields. NTNU is located in Trondheim. With a population of approximately one-hundred and fifty-thousand, Trondheim is Norway’s third largest city. NTNU has traditions inherited from the Norwegian Institute of Technology (NTH) established in 1910 (NTNU website, 2013). Comprising twenty-thousand students and a professional teaching staff of nearly three-thousand three-hundred, NTNU is the second largest university in Norway and the only one with a major technological focus. NTNU has seven faculties and fifty-three departments (Saetre et al, 2006). Its total income is EUR 281 million, of which eighty-three percent is public funding. In addition NTNU cooperates closely with SINTEF (The Foundation for Scientific and Industrial Research at the Norwegian Institute of Technology) and ALLFORSK (The Arts and Science Research Foundation) which are located in the same city in order to bridge the gap between the academic sector and industry (NTNU Annual review report 2011/2012). The activity at
NTNU and SINTEF has resulted in the creation of about one-hundred and twenty spin-off companies over the last twenty years, most of them established either in the mid-eighties or in recent years. The focus on commercialization activities has increased, and twenty new companies were formed in 1999, and thirteen in 2000. NTNU and SINTEF are the major shareholders in a commercialization unit which provides business advisory services, incubation space, and capital. A research group at NTNU conducts research and provides courses on entrepreneurship, and is also involved in business development projects. Recently, NTNU has taken a more proactive role in commercialization and new venture creation. NTNU’s management has adopted an aspiring strategic plan regarding entrepreneurship and innovation. This plan includes new initiatives for teaching, research, incentives, and infrastructure, as well as changes in rules and regulations aimed at stimulating the commercialization of research (NTNU, 2013, NTNU strategy 2010-2020).

II.4.5.3. University of Twente (UT)

According to Twente University’s profile, (2010), the University of Twente is a relatively new institution, and was created in 1961 as part of a broader post-war drive within the Netherlands to encourage a shift towards an economy based on high value-added production rather than cost competition (Kees Eijkel (2012 ). Despite the relatively recent creation of TU, the University of Twente has had something of a turbulent history. The institution began life as the Technical Polytechnic of Twente (“THT”), and was created with a remit to behave very experimentally and innovatively. The collapse of textiles in Twente in the 1970s, as well as the abandonment of some of the features trialled by THT during this time, left the institution as an apparent luxury which the recession-hit Netherlands could ill afford. This resulted in Parliamentary calls for its closure, and in turn provoked the university to reinvent itself under the leadership of the renowned Rector Magnificus, Prof. Harry van den Kroonenberg. A great deal of effort was put into increasing the impact of the university in the region, culminating in its rebranding as the “University of Twente: the entrepreneurial university”. Following his retirement from the Executive Board in 1988 for the second time, the university continued on the same trajectory, although subsequent pressures diluted the focus on regional engagement. By 2003, commitment had drifted to the point where the Executive Board once more decided to revitalise the university’s emphasis on promoting regional engagement and
entrepreneurship (Benneworth, 2005). Today, UT consists of six faculties and six research centres. Moreover, it has created a centre with 9000 students and 4000 professional teachers and scientists, seven-hundred spin-off companies in twenty years, one-hundred and thirty student companies, and as a consequence created five-thousand jobs (UT website, 2013, P. van der Sijde and A. Ridder (2008)).

II.4.5.4. Strathclyde University (UoS)

According to (Strathclyde University’s profile, 2010), The University of Strathclyde is situated in the heart of Glasgow, and is Scotland’s third largest University. The University has a long history beginning in 1796, when Professor John Anderson left a bequest in his will for the establishment of ‘a second higher education institution’ in Glasgow. His vision was the creation of a place of ‘useful learning’ and of education for all, regardless of gender or social class. The University developed rapidly, and by the end of the nineteenth century, had become a major technological institution. It is a leading university, meeting the needs of students, employers, industry, and the wider community through its teaching, research, consultancy, and knowledge transfer (Clive Alderson & John Burke (2007-2009)). During the nineteen-hundreds it continued to grow, and although it offered some courses in management, the focus was still on science and engineering. This was until the 1960s, when the college broadened its activities by merging with the Scottish College of Commerce, which offered a wide range of business and arts subjects. The enlarged Royal College was granted the Royal Charter, and became the University of Strathclyde in 1964. In 1993 the University merged with the Jordanhill College of Education, a major teacher training college, and the new Faculty of Education was created (Peter, (2008), William and Sarah (2004). The University continues to grow and is today the third largest university in Scotland. There are currently approximately 29,000 full and part-time students attending the University of Strathclyde, with almost 3,000 staff in four faculties. The institution enjoys a powerful reputation for its commitment to commercially relevant research, experience in entrepreneurship education, and its strong links to industry and commerce. Its location in the city centre provides a strong physical civic presence (Clive Alderson & John Burke (2007-2009), University of Strathclyde website, 2013).
II.4.6. Documentary Analysis

The aim of this part of the paper is to examine the "extent to which the theoretical framework can be applied to support the entrepreneurial university approach". The list of documents that have been used for this particular purpose can be found in Appendix (2). Table (5) illustrates the key indicators in each of the five matrices that have been used as an analysis guideline. However, it is worth mentioning that some of those indicators have not been studied or discussed in the documents that have been used for this analysis. The table (5) below summarizes the importance of the indicators already presented for in Chapter two- Table (1) for ease of reading.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Managerial</td>
<td>1. Re-structure university governance and mechanisms to adapt entrepreneurial changes (transparency of structure and processes).</td>
</tr>
<tr>
<td></td>
<td>2. Align the top-down incentives and bottom-up initiatives (Collegiate management), vision, mission, goals-oriented decision making.</td>
</tr>
<tr>
<td></td>
<td>3. Is the university council (decision-making body) sufficiently representative of external entities and the internal body, including academic staff?</td>
</tr>
<tr>
<td></td>
<td>4. Is the university strategy, which is established by the university council, reflecting an entrepreneurial approach?</td>
</tr>
<tr>
<td></td>
<td>5. Does the decision-making body have power and influence in lobbying for universities in regional innovation and research policy?</td>
</tr>
<tr>
<td></td>
<td>6. Does the decision-making body have power, and is it involved in the promotion process?</td>
</tr>
<tr>
<td></td>
<td>7. Does the decision making body have the power and influence to seek new income sources, allocate funding resources, and evaluate financial audits?</td>
</tr>
<tr>
<td>Funding</td>
<td>1. The extent to which the university is financially independent/autonomous.</td>
</tr>
<tr>
<td></td>
<td>2. The percentage of government funding in the total university fund.</td>
</tr>
<tr>
<td></td>
<td>3. The percentage of project funds in the total university fund.</td>
</tr>
<tr>
<td></td>
<td>4. The percentage of private funding income in the total university fund.</td>
</tr>
<tr>
<td></td>
<td>5. The volume of patents per year.</td>
</tr>
<tr>
<td></td>
<td>6. The volume of international students/enrolled/graduates there are per year.</td>
</tr>
<tr>
<td></td>
<td>7. The volume of spinoff and start-up companies there are per year.</td>
</tr>
</tbody>
</table>
### Table 5: Key Indicators of the Organizational Dimensions summarized from Table1

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mission</td>
<td>• The volume of new research and teaching programmes that are orientated to the external environment.</td>
</tr>
<tr>
<td></td>
<td>• The volume of joint projects with industry and the private sector.</td>
</tr>
<tr>
<td></td>
<td>• The volume of spin-offs and start-up companies.</td>
</tr>
<tr>
<td></td>
<td>• The volume of research commercialization projects/patents/licenses.</td>
</tr>
<tr>
<td></td>
<td>• The volume of multidisciplinary graduate school programmes.</td>
</tr>
<tr>
<td></td>
<td>• The volume of PhD students graduating in the fields of science, technology, and innovation.</td>
</tr>
<tr>
<td>External</td>
<td>• The establishment of technology-transfer offices/innovation offices</td>
</tr>
<tr>
<td>linkages</td>
<td>• The number of research centres/science parks linked with the university</td>
</tr>
<tr>
<td></td>
<td>• The volume of industry-university projects.</td>
</tr>
<tr>
<td></td>
<td>• The number of researchers and students who have moved to work in industry or external labs</td>
</tr>
<tr>
<td></td>
<td>• The number of external experts who have moved to work in university labs</td>
</tr>
<tr>
<td></td>
<td>• The volume of joint ventures</td>
</tr>
<tr>
<td></td>
<td>• The volume of research projects in collaboration with external groups</td>
</tr>
<tr>
<td>Cultural</td>
<td>• A clear vision, mission, and goals statement in favour of an entrepreneurial culture</td>
</tr>
<tr>
<td></td>
<td>• Strong executive leadership and decision makers.</td>
</tr>
<tr>
<td></td>
<td>• Entrepreneurial behaviours among teachers and students</td>
</tr>
<tr>
<td></td>
<td>• The university’s organizational structure reflecting the cultural changes</td>
</tr>
<tr>
<td></td>
<td>• Building a network culture with the external environment (professional, industry, societies, and regional and international collaboration)</td>
</tr>
<tr>
<td></td>
<td>• Re-structuring university governance and mechanisms to adapt to entrepreneurial changes (transparency of structure and processes)</td>
</tr>
</tbody>
</table>

In the pages that follow, the five theoretical dimensions for each of the four cases will be discussed.
II.4.6.1. Managerial Dimension

Based on the three matrices that describe this dimension, the analysis aims to address ‘whether the university has strong executive leadership, executive strategy and decision making, balance between proactive internal activities and reactive external demands, and balance between academic values and managerial strategic directions’. (See II.4.4.1)

II.4.6.1.1. Chalmers University of Technology

According to Chalmers’ long term strategy (2010/2020, p. 4), its vision is: "Chalmers for a sustainable future". This has been described by Chalmers’ President and CEO, Karin Markides, as the vision which will inspire Chalmers to adopt a broader perspective as it strives to develop the technology and know-how necessary to meet both the present demands and the future ambitions. In addition, the vision draws attention to the outstanding research and education at Chalmers that provides a motivating, academic environment which facilitates interaction and collaboration with industry and society, locally and internationally. With these criteria, Chalmers University of Technology is highlighting the entrepreneurial approach as a strategic long term plan. On the other hand, according to the studies in relation to Chalmers’ development, the long tradition of organisational flexibility in innovation, service-mindedness at administration level, and a flexible action system through all levels of the university demonstrate the historical transformation of the university towards the entrepreneurial approach. Since 1994, Chalmers University of Technology has been able to frame itself in terms of the new language of public spiritedness, collaboration, and entrepreneurial intentions. The University gained freedom after a long dialogue between 1990 and 1994 because of the strong leadership of its chairman and board members: “The discussions on the Chalmers board were very constructive. Considerable emphasis was placed on the standpoint of the students. The trade unions were initially opposed to the organisational form that had been put forward but we had a very good dialogue. Once the decision was reached they congratulated me and said: ‘We are on board with you’. A very tangible reflection of the Chalmers spirit” (Anders Sjöberg, Chalmers' president, 1993, Chalmers University of Technology Foundation 2004, p. 7). This demonstrates Option 1 coordinated management style (see section I.2.3.1.7). This freedom has several aspects: the freedom to build up the University’s own funds, the freedom to own and manage its own properties, the freedom to
decide on its own organization, the freedom to develop its own career and human resource structure, and the freedom to develop its own recruitment process. As a result, Chalmers was able to accumulate capital from the various entrepreneurial initiatives as a part of the university’s landscape which came with privatisation. Moreover, the shift from a research to an innovation-oriented policy in Sweden has made Chalmers more aware of the need to balance its knowledge exploitation activities with a strong culture of exploration and knowledge creation. On the other hand, fragmentation and a lack of transparency are perceived by many in the university to be problematic. However, it is a logical outcome of the natural way in which the system developed in its earlier stages.

II.4.6.1.2. Norwegian University of science & Technology (NTNU)

According to the NTNU strategic plan (2011/2020), its vision is "Knowledge for a better world". This vision has been expanded by the NTNU board to state that NTNU endeavours "to create the basis for the development of knowledge and to create value – economic, cultural and social. We will make the best possible use of our main profile in science and technology, our academic breadth, and our interdisciplinary expertise to tackle the large and complex challenges faced by Norway and the world community". Therefore, with this explanation, NTNU focuses the attention of the university on technology and responding to social, economic, and cultural values and demands. In addition, NTNU has gained a new overarching document for governance and new faculty strategies. Broad-based involvement and strong engagement have been features of the university system. Of the eleven members of the Board, three are from the academic staff at NTNU, one represents academic or research staff without tenure, and one member represents the technical and administrative staff. There are also two student members of the Board and four external representatives (all from outside the university). Studies of NTNU development reveal that, NTNU is the first Norwegian university to have appointed a Pro-rector of innovation and external relations. This demonstrates that NTNU management style is Option1: coordinated management style (see section I.2.3.1.7). Moreover, NTNU has first-class laboratories and a first-class infrastructure for research and education. According to survey findings, "Norwegians believe that NTNU is a university with a strong sense of responsibility to society and that it contributes to the creation of value in the country". With regard to historical development, the studies reveal that NTNU was established in
1996 as a result of the re-organization of the University of Trondheim. This organizational re-structuring has enabled it to meet the university’s drive towards technology and innovation: "Our main profile in science and technology gives us a particular responsibility to develop the technological foundation for the society of the future programmes of professional" (NTNU, 2013).

II.4.6.1.3. University of Twente (UT)

According to the UT strategic plan (2009-2014), the university’s vision is as follows: "UT is an entrepreneurial university in action". This vision has been translated in the UT mission: "UT is an entrepreneurial (technical) research university focusing on technological developments in the knowledge society. Internationally recognized excellence in research and teaching is its objective, as well as stimulating economic and social development via the resulting valorisation activities in the region".

Studies which relate to this dimension suggest that this vision was inspired by one of the strongest influences in the university, the Rector Magnificus, Professor van den Kroonenberg, who served two terms (1979-1982 and 1985-1988). The Professor was an expert in energy technology, but was also very highly motivated to develop the regional role of UT. This demonstrates that TU management style is Option 1coordinated management style (see section I.2.3.1.7). Furthermore, the studies reveal further details with regard to UT development in this particular dimension. These are as follows: the UT informal governance structure was replaced with the generic Executive Board and Court mode, and the university has shaped its approach to regional engagement to strengthen the regional economy in order to meet its vision. In addition, in the 1980s, the School of Technology and Management founded a centre for entrepreneurship, which developed into the Dutch Institute for Knowledge-Intensive Entrepreneurship, “Nikos”, and in 2002, Twente Kennispark (Knowledge Park) was also founded. The partnership played a strong role in national funding for UT regional projects.
II.4.6.1.4. Strathclyde University (UoS)

The University of Strathclyde’s Vision, set out in their strategic plan (2011-2015), is as follows: "The Place of Useful Learning: Innovative Learning, Research and Innovation, Knowledge Transfer". This vision has been articulated by the university’s mission statement in terms of having a reputation for excellence across research, education, and knowledge. It highlights the idea that knowledge-exchange is one of the three strategic pillars of the university, and reflects the university’s desire to move towards an entrepreneurial culture. This culture has been inspired by the founder of Strathclyde University, Professor John Anderson’s (1726-1796) statement: “learning should be relevant to the new industrial age”. With regard to the university’s historical development in this dimension, the studies reveal several actions taken by management. These are: the development of the Research and Knowledge Transfer Strategy Committee and the International Policy Forum, the assignment of Vice Deans for knowledge exchange within each faculty, This demonstrates that UoS management is Option2 hybrid management style (see section I.2.3.1.7). The development of connections, networks, and collaborations through the alumni office, and establishing the Strathclyde Entrepreneurial Network, Strathclyde Links, and the West of Scotland KTP Centre. In addition, the largest entrepreneurship centre in Scotland, and one of the largest in the UK, the Hunter Centre, has been created by one of UoS’ alumni.

II.4.6.2. Funding Resource Dimension

Based on the three matrices that describe this dimension, the analysis aims to address ‘to what extent the university is able to diversify its funding resources from second and third stream income and to what extent it is seen to be academically–led rather than financially–led’. (See II.4.4.2)

II.4.6.2.1. Chalmers University of Technology

According to Chalmers’ strategic plan and other studies in relation to this dimension, 3,028 (SEK million) is their total income, of which 889 million is from first degree and master’s
programmes, and about 2,139 million is from doctoral programmes and research projects. This shows that Chalmers’ financial resources come from a mixture of public and private money; in other words, a joint investment by the state and the private sector. The percentage distribution is as follows: Chalmers Foundation 2%, public foundations 3%, other (student fees) 6%, EU 4%, companies and private sectors 11%, other government 23%, and Ministry of Education and Research 49%. This shows that about two-thirds of the funding resources come from government. In addition, there are the Chalmers-owned venture capital funds from Innovationskapital, which was set up in 1994 for independent third-party ventures. This demonstrates that Chalmers resource funding is in Option1: to the Maximum (see section I.2.3.2.7).

II.4.6.2.2. Norwegian University of science & Technology (NTNU)

According to NTNU (2011), the total budget of the university is EUR 640 million. This is distributed as follows: Ministry of Education 72%, the Research Council of Norway 13%, industry 7%, state municipal funds 4%, other (student fees) 3%, and the EU 1%. In addition, some examples of the projects in which NTNU collaborated with companies and generated income between 2002 and 2008 are PointCarbon (2000), acquired by Thomson Reuters for NOK 1100 million, FAST, acquired by Microsoft for NOK 6600 million, 2008, TrollTech, acquired by Nokia for NOK 850 million, 2007, Nacre, acquired by Bacou-Dalloz for NOK 840 million, 2006, Falanx, acquired by ARM for NOK 170 million, 2005, ChipCon, acquired by TI for NOK 1360 million, and Atmel Norway, with annual turnover of more than NOK 180 million, 2002. NTNU income is increased from all three streams: Block, Project, and Private with more focus on private companies. Therefore, NTNU can be positioned in Option1: to the Maximum (see section I.2.3.2.7).

II.4.6.2.3. University of Twente (UT)

According to UT (2011-2013), the university’s total income is over 33 million Euros, and is distributed as follows: 55% from the Ministry of Education, 27% from contract funding, 13% from industry, and 5% from the EU. This shows that for UT, like Chalmers University and NTNU, the largest amount of the total budget comes from the country’s
Ministry of Education. There is no breakdown information of the spending for University of Twente. Nevertheless, UT seeks the income from the three fund resources (UT, 2013), where can be positioned in Option1: to the Maximum (see section I.2.3.2.7).

**II.4.6.2.4. Strathclyde University (UoS)**

Studies relating to UoS funding resources show that The University of Strathclyde’s annual income are in excess of £200 million. This income comes from three sources: (1) income from public funds via a block grant from the Scottish Funding Council and tuition fees paid by the Scottish Government or by local authorities; (2) tuition fee income from both home and overseas students; (3) income from private sources including research contracts, services rendered, courses and conferences, endowments, residence and catering operations, grants and donations. An additional income stream is generated through the provision of supported workspace through the Strathclyde University Incubator Ltd. Company. An important element of income generation is the activity of the Alumni Office. Income generation ranges from small donations, to the generation of large endowments such as the one which helped to create the Hunter Centre for entrepreneurship. Up until now, the university has engaged with over two-hundred entrepreneurs, assisted in the formation of twenty-eight new businesses, created forty-seven new jobs, and increased sales in assisted businesses by over £800,000. It has also had a huge knock-on effect on other Scottish industries - with £63 million being generated in a range of sectors for every £100 million spent by the University. Overall, the University’s activities generated over £305 million of output in Scotland, with around £210 million of this in Glasgow and around £95 million in the rest of Scotland. The University’s own overseas revenue of nearly £24.4 million, together with the estimated off-campus expenditure of overseas students and visitors (£20.3 million), indicate that the University of Strathclyde was responsible for generating nearly £45 million of export earnings. This is equivalent to around 1.5% of all Scottish Service Sector export earnings. The university also generates income by allowing the community access to its sports and leisure facilities. Therefore, NTNU can be positioned in Option1: to the Maximum (see section I.2.3.2.7).
II.4.6.3. Mission Dimension

Based on the three matrices that describe this dimension, the analysis aims to address ‘whether the university is able to enhance its third mission by incorporating it into the core mission through building bridges with industry and the private sector in specific disciplines of academic interest’. (See II.4.4.3)

II.4.6.3.1. Chalmers University of Technology

In order to test this dimension within Chalmers University of technology, several studies and reports have been reviewed. The review shows that privatisation was seen as a move which would afford Chalmers much longed-for autonomy in its teaching and research, but more importantly, in developing its infrastructure for promoting innovation. Furthermore, the university was able to integrate innovative research, entrepreneurial students and action-based training. This led to the situation where research and education became traditionally very strongly linked to industry. In one year, forty-five students graduated from the school and a total of twelve new companies were created from this group. These companies together raised more than US $10 million in venture capital and created one-hundred and thirty six new jobs. Also, fifteen knowledge-based companies are established every year. The indicators of research outcome reveal that one-thousand two-hundred and fifty-four peer-reviewed scientific articles were published in addition to eight-hundred and forty-five peer-reviewed conference contributions. In addition, there were one-thousand one-hundred and forty-seven doctoral students, of which three-hundred and four degrees were awarded (138 PhDs and 166 Licentiates). Therefore, Chalmers can be positioned in Option1: extremely entrepreneurial (see section I.2.3.3.7).

II.4.6.3.2. Norwegian University of Science & Technology (NTNU)

According to NTNU’s entrepreneurial activities, the indicators demonstrate that education in entrepreneurship is a core mission. This can be seen by: (1) the establishment of the NTNU School of Entrepreneurship for educating future entrepreneurs, (2) several courses related to entrepreneurship at the Centre for Entrepreneurship, (3) NTNU Entrepreneurship...
Centre Undergraduate to PhD courses in entrepreneurship. In addition, two-hundred and sixty doctoral degrees were awarded in 2010. There have been more than two-thousand research projects, sixty-four projects in the EU’s seventh Framework Programme, sixty-two EU projects between 2002 and 2006, and more than three-hundred cooperative agreements with universities globally. More than ninety companies have also been created from NTNU since 2003. Research output indicates that NTNU has generated two-thousand three-hundred and eighty-five scientific papers and review articles, four-thousand one-hundred and thirty-nine scientific presentations, two-hundred and twenty-five books, six-hundred and forty-two reports and theses, and one-thousand one-hundred and eighty-nine book chapters/reports. In addition, prizes were awarded to staff in a variety of disciplines: medicine, technology, natural sciences, architecture, humanities, and visual arts. These provide evidence of the academic breadth at NTNU, and reflect the high level of their activities. Therefore, NTNU can be positioned in Option1: extremely entrepreneurial (see section I.2.3.3.7).

II.4.6.3.3. University of Twente (UT)

Based on the indicators of this dimension, UT demonstrates a strong focus on entrepreneurial activities through promoting talent to develop (student) entrepreneurship. Nikos is involved in two extracurricular courses, incubators, and spin-off support, and this courses moved from being extracurricular towards curricular. Significant amounts of UT’s research was co-ordinated through multi-disciplinary research institutions and regional engines for innovation, with three-hundred and thirty companies on site and five-thousand nine-hundred commercial jobs. In addition, the University of Twente and Saxion had joint projects that generated seven-hundred and fifty spin-offs (forty to fifty start-ups per year), and created six-thousand five-hundred jobs. Furthermore, UT established the TOP (Temporary Entrepreneurial Positions) program, which resulted in creating two-hundred and ninety jobs between 1979 and 2004. Other education programs are designed to facilitate starting and growing businesses (entrepreneurship), and stimulate innovation in existing companies (innovation). Altogether, three-thousand three-hundred scientists and professionals, and more than nine-thousand students have created more than seven-hundred successful spin-off companies. Therefore, UT can be positioned in Option1: extremely entrepreneurial (see section I.2.3.3.7).
II.4.6.3.4. Strathclyde University (UoS)

The studies show that the UoS has taken significant initiatives toward promoting entrepreneurial education. Teaching entrepreneurship at the UoS currently involves seven-hundred and one students, six-hundred and forty undergraduates and sixty-one postgraduates. All faculties have strong links with industry and professional bodies and place great emphasis on the influence of these connections on the curriculum. Specific programmes such as KTPs\textsuperscript{14} and the CPD\textsuperscript{15} initiatives have impacted upon the organisation of teaching and learning. In addition, the university has a long-established track record of generating research patent royalty income, and is one of the UK’s most successful universities in this arena. The UoS is also working with representatives from industry to discuss curricula and new degrees in order to meet industrial demand. It is working in cooperation with industry in respect of industrial placements and project-based learning, the demand for continuing professional development, and research projects between academics and industry. Therefore, UoS can be positioned in \textit{Option2: hybrid technology} (see section I.2.3.3.7).

II.4.6.4. External Collaboration Dimension

Based on the three matrices that describe this dimension, the analysis focuses on addressing ‘to what extent the university is able to cope with the challenges in building linkages and establishing bridges with the uncertain socio-economic demands’. (See II.4.4.4)

II.4.6.4.1. Chalmers University of Technology

The external linkages and collaboration dimension at Chalmers University of Technology can be examined by highlighting the following university activities: Chalmers is constantly developing new models for interaction, ensuring that education, research, and innovation

\textsuperscript{14} KTPS is Knowledge Transfer Partnership - one of the world’s leading knowledge transfer mechanisms.

\textsuperscript{15} CPD is Continuing Professional Development in Engineering Faculty.
will be of benefit to the community. In addition Chalmers Innovation comprises new innovative companies based mainly on research and education at Chalmers.

Some of the Chalmers science parks are Johanneberg Science Park which is developed in order to clarify the link to three of the Chalmers areas of advancement: built environment, energy, and materials science, Lindholmen Science Park which brings together high-tech, development intensive companies within mobile communication, intelligent transport, and the modern media industry, and Sahlgrenska Science Park which is a business incubator and technology park that gives people with ideas, and new companies working in life sciences the best possible start to their new ventures. In addition Chalmers’ spirit was characterised by a strong alumni network that linked both staff and former students, and opens trust-based relations. Therefore, Chalmers can be positioned in Option1: strategic collaboration (see section I.2.3.4.7).

II.4.6.4.2. Norwegian University of Science & Technology (NTNU)

The external linkages and collaboration at NTNU can be described through the following university initiatives:

NTNU has more than four-thousand industrial contracts. In addition NTNU is home to three centres of excellence, four centres of research-based innovation, and two centres for environment-friendly energy research.

NTNU also apply Stimulation program of student enterprise and relations with industry. Furthermore, NTNU operates several research canters and incubators, such as Centres at NTNU: Leiv Eiriksson Nyfotek (LEN) Gloshaugen innovation centre, Outside incubators and on-campus incubators, and Gløshaugen Innovation Centre (eighteen companies in-house, April 2011). In addition NTNU Technology Transfer Office (AS) offers help and support for people with business ideas, Start NTNU – a student-run organization for innovation. The strong NTNU Alumni (network for former students) has twenty-four thousand members and about three-hundred alumni groups. NTNU can be positioned in Option1: strategic collaboration (see section I.2.3.4.7).
II.4.6.4.3. University of Twente (UoT)

The external linkages and collaboration dimension at the University of Twente can be explored through the following university initiatives:

University of Twente has establishment of Commercialisation of University Knowledge (“Kennis”). Moreover University of Twente is organising One-hundred and fifty events per year with partners, such as entrepreneur associations, developed an office within the University Entrepreneurship Promotion and external engagement in 1979. This was originally called the Transferpunt, Established Business Technologie Centrum-Enschede in an industrial estate, and Research Joint Ventures: Jointly run with industrial partners: TPRC, Boeing, ten Cate, Stork, CMI, Siemens, UMCG, High Tech Factory, twenty nano-companies, Centre4Cloud, and Google, IBM, KPN.

University of Twente also has MESA+ Institute for Nanotechnology Micro-electronics, Materials Engineering, Systems and Actuators. UT can be positioned in Option1: strategic collaboration (see section I.2.3.4.7).

II.4.6.4.4. Strathclyde University (UoS)

The external linkages and collaboration dimension at the University of Strathclyde can be examined by looking at the following university initiatives:

Strathclyde University has developed an external partnerships program, and engagement with business and the broader community is a priority within the university’s future strategic plans. Individual faculties also manage relationships with external organisations and learners independently from the central team. Moreover Strathclyde University has Close engagement with industry & business and a strong tradition of knowledge exchange.

Strathclyde University also balances between fundamental and applied research and contributes regional regeneration. UoS can be positioned in Option2: project-driven (see section I.2.3.4.7).
II.4.6.5. Cultural Dimension

Based on the three matrices that describe this dimension, the analysis aims to address ‘whether entrepreneurship is in the organisation's core mission, and to what extent the university is committed to supporting the approach at all levels (top-down and bottom-up)’. (See section II.4.4.5)

II.4.6.51. Chalmers University of Technology

The entrepreneurial university may be seen not as a policy outcome but as an internally driven process that may be better explained by the culture of an engineering school rather than responses to top-down steering (Chalmers 2011/2012 Fact; Jacob et al, 2003). The following practices can be used to examine the cultural dimension at Chalmers University of Technology:

Chalmers University of Technology prides itself in being a university where individual initiative on the part of students and/or faculty is highly valued. The existence of an embryonic infrastructure for entrepreneurial activities combined with the new spirit of the times as represented in the macro research policy initiatives meant that Chalmers was at least formally better equipped than most of its counterparts to transform itself into an entrepreneurial university.

The shift in research policy focus at the national level was significant in that it created a climate which legitimized what had been taking place within Chalmers. Chalmers has greater freedom of action and more scope for exploring new paths, without sacrificing the current standard of education and research. Different components of the structure are ‘owned’ by a few strong individuals and each component has its own legal structure and board of directors. Chalmers can be positioned in Option1: entrepreneurial culture (see section I.2.3.5.7).
II.4.6.5.2. Norwegian University of Science & Technology (NTNU)

The studies and reports with regard to the cultural dimension at NTNU, (NTNU Annual Review Report 2011/2012; Rasmussen, 2006) provide the following practices:

Norwegian University of Science & Technology attracts the best students and staff, and is internationally renowned for the quality of its student life. Students and staff members feel that they belong to NTNU and are proud of their affiliation. In 2011, NTNU won approval for several major projects in the infrastructure programme of the Research Council of Norway, including NORBRAIN.

The main profile and unique attributes of NTNU provide an advantage in academic competition at national and international level, and in collaboration with private and public-sector organizations. NTNU can be positioned in Option1: entrepreneurial culture (see section I.2.3.5.7).

II.4.6.5.3. University of Twente (UT)

The studies and reports in relation to the cultural dimension at UT (University of Twente, Strategy vision 2009-2014; Eijkel, 2012) provide the following practices:

University of Twente has developed a unique profile and culture in their specific environment leading to a strongly-rooted regional presence. The university Culture and behaviour shaped and developed over thirty years. In addition Excellent English taught education for BSc, MSc and PhD degrees: Times Higher Education World University Ranking: 185, and number 6 in Europe for research.

University of Twente applies entrepreneurship and innovation in all programmes, with Full support for starting up your own business – more than seven-hundred spin-off companies in the last ten years. In addition University of Twente has beautiful, unique campus: great facilities, and relatively low living costs. UT can be positioned in Option1: entrepreneurial culture (see section I.2.3.5.7).
II.4.6.5.4. Strathclyde University (UoS)

The studies and reports with regard to the cultural dimension at the UoS (William A. Lucas and Sarah Y. Cooper, 2004) provide the following practices and activities:

Strathclyde has a long-standing, worldwide reputation for excellence in academic research and innovation which not only benefits society, but is also commercially relevant. Strathclyde also has generated more than forty spin-off companies to date, placing it seventh in The Times Higher Education Supplement’s league of entrepreneurial universities in the UK.

It has one of the largest industrially sponsored research portfolios for a university of its size anywhere in the UK. It has in excess of one-hundred and sixty patents and licence agreements which, over the years, have generated more than £42 million in royalty income. The University of Srathclyde is an entrepreneurial university and all Strathclyde undergraduate students have access to its courses at the Hunter Centre for Entrepreneurship. UoS can be positioned in Option: sustainable culture (see section I.2.3.5.7).

II.4.7. Summary

To summarise, the above analysis shows that the four universities have a high national, regional, and international recognition as entrepreneurial universities. Looking at university history, Chalmers is revealed as having the longest history, whereas the other three universities have relatively similar historical experiences. The four universities are relatively close in size in terms of faculties, students and staff numbers. In addition, all the universities are situated on sites that have significant industrial potential and knowledge facilities. This has given the universities an important element of success, although (Graham, 2013, p. 16) points out that "Some effective strategies appeared to be relatively independent of the university size, location and profile". Generally speaking, the analysis of the entrepreneurial university dimensions of each of the four universities reveals, on the one hand, some common elements, and on the other hand, some different elements specific to each university, as key factors for success. The common elements can be seen in the mission dimension, as all four universities have strong entrepreneurial education
(depending on the type of courses), a high level of research performance which is oriented towards technology and industrial demand, and strong commercialization performance. In addition to this, they have significant mechanisms and infrastructures to help them create companies, great businesses and spin-offs, and start-up companies. The second characteristic that the four universities have in common is that they all have relatively strong linkages and partnerships with industry, the private sector, government, and the community, with regional involvements.

On the other hand, the managerial dimension analysis shows some significant differences. While NTNU and the University of Twente encompass strong executive leadership and professional management which helps to accelerate an entrepreneurial culture, Chalmers appears to face some problems with a lack of transference between top management, middle level, and the academic community. In addition, the funding and resource dimension also shows some important differences. Whereas Chalmers depends mainly on public funds with the majority of its funding (49%) coming from the Ministry of Education, NTNU and Twente generate funds from a huge number of national and regional projects (public and private, including industry), and Strathclyde has a mixture of funds from all three streams (public, project, and private). Table (6) summarizes the findings on the four universities:
<table>
<thead>
<tr>
<th>Dimension</th>
<th>Chalmers</th>
<th>NTNU</th>
<th>Twente</th>
<th>Strathclyde</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Managerial:</strong> whether the university has strong executive leadership, executive strategy and decision making, balance between proactive internal activities and reactive external demands, and balance between academic values and managerial strategic directions.</td>
<td>Strong executive leadership, autonomous, and there is balance between internal and external demands, clear strategy toward entrepreneurship, and balanced representatives (top management, academic, external entities)</td>
<td>Strong executive leadership, clear strategy toward entrepreneurship, and balanced representatives (top management, academic, external entities)</td>
<td>Strong executive leadership, clear strategy toward entrepreneurship, and balanced representatives (top management, academic, external entities)</td>
<td>clear strategy toward entrepreneurship, and balanced representatives (top management, academic, external entities)</td>
</tr>
<tr>
<td><strong>Funding:</strong> to what extent the university is able to diversify its funding resources from second and third stream income and to what extent it is seen to be academically-led rather than financially-led.</td>
<td>Highest % comes from Gov. Then second and third stream</td>
<td>Highest % comes from Gov. Then Second and third stream</td>
<td>Highest % comes from Gov. Then second and third stream</td>
<td>Mixed funds (public, project, private)</td>
</tr>
<tr>
<td><strong>Mission:</strong> whether the university is able to enhance its third mission by incorporating it into the core mission by building bridges with industry and the private sector in specific disciplines of academic interest.</td>
<td>Strong entrepreneurship education Project-based research High performance of commercialization and spin-offs</td>
<td>Strong entrepreneurship education Project-based research High performance of commercialization and spin-offs</td>
<td>Strong entrepreneurship education Project-based research High performance of commercialization and spin-offs</td>
<td>Adequate entrepreneurship education Project-based research High performance of commercialization and spin-offs</td>
</tr>
<tr>
<td><strong>Collaboration:</strong> to what extent the university is able to cope with the challenges in building linkages and establishing bridges with the uncertain socio-economic demands.</td>
<td><strong>Option 1:</strong> strategic collaboration</td>
<td><strong>Option 1:</strong> strategic collaboration</td>
<td><strong>Option 1:</strong> strategic collaboration</td>
<td><strong>Option 2:</strong> hybrid technology</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Strong bridges and linkages with regional and international</td>
<td>Strong bridges and linkages with regional and international</td>
<td>Strong bridges and linkages with regional and international</td>
<td>Strong bridges and linkages with regional and international</td>
<td></td>
</tr>
<tr>
<td><strong>Cultural:</strong> whether entrepreneurship is in the organization's core mission, and to what extent the university is committed to supporting the approach at all levels (top-down and bottom-up).</td>
<td><strong>Option 1:</strong> entrepreneurial culture</td>
<td><strong>Option 1:</strong> entrepreneurial culture</td>
<td><strong>Option 2:</strong> sustainable culture</td>
<td><strong>Option 1:</strong> strategic collaboration</td>
</tr>
<tr>
<td>High ranked university and strong commitments at all levels</td>
<td>High ranked university and strong commitments at all levels</td>
<td>High ranked university and strong commitments at all levels</td>
<td>High ranked university and strong commitments at all levels</td>
<td></td>
</tr>
<tr>
<td>Difficult to measure the beliefs</td>
<td>Difficult to measure the beliefs</td>
<td>Difficult to measure the beliefs</td>
<td>Difficult to measure the beliefs</td>
<td></td>
</tr>
<tr>
<td><strong>Geographical location</strong></td>
<td>Located in Gothenburg, the second largest city in Sweden, it is the capital of a region with a strong industrial base</td>
<td>Located in Trondheim. With a population of approximately one-hundred and fifty-thousand, Trondheim is Norway’s third largest city</td>
<td>Located in the region with largest textiles companies in the world</td>
<td>Located in the heart of Glasgow, and is Scotland’s third largest University</td>
</tr>
</tbody>
</table>

Table 6: Entrepreneurial University: Organization Dimension Analysis - Chalmers, NTNU, Twente & Strathclyde
II.4.8 Concluding Remarks

The purpose of this chapter has been to examine and validate the entrepreneurial university framework that has been developed in chapter two. Notably, universities’ transformation towards an entrepreneurial culture requires significant changes in organizational structures, knowledge-production and cultural beliefs and behaviour. This has been evident through the analysis of the four European universities that have an entrepreneurial history and are recognized as entrepreneurial universities nationally and internationally. All four universities have made considerable changes at different levels. The four cases show the importance of re-structuring university infrastructure with the influence of strong leadership and professional management. The case of NTNU and Twente are excellent demonstrations of the way in which strong leadership can transform a university from a failing organization into a successful entrepreneurial university with a strong reputation. In addition, the four cases illustrate the importance of a mixture of funding from public, private, and industrial projects, where strong leadership plays a vital role in generating more income and allocating it efficiently. Chalmers, NTNU, and Twente also provide evidence for the importance of entrepreneurship education and high quality entrepreneurship courses and programs. Moreover, the four universities implement to some extent project-based teaching and research programs. The strong industry and private linkages and partnerships are also revealed to be a vital dimension in university transformation. Finally, despite the fact that cultural behaviour and beliefs are to some extent difficult to measure, they have a role in setting up a flexible and attractive entrepreneurial environment for the university students, the academic researchers, the top management, and external entities.

The analytical review of four different European entrepreneurial universities in this chapter provide a robust and comprehensive entrepreneurial university framework that can be applied to different cultures. This can be explained by the fact that, on one the one hand, there are common changes which are made by all the universities, but on the other hand, there are specific elements and practices based on each individual university’s circumstances and culture, which we cannot apply generally to all cultures. Finally, it is worth mentioning that some of the secondary data that has been used in this part is dated between 2006 and 2008, and we are assuming that entrepreneurial activity will have
increased in all four cases. A further empirical study might be advisable for more robust verification and validation. Interviews with strategic-level members at each of the four universities would provide some valuable discussion and in-depth perspective in relation to the entrepreneurial dimensions. The finding of the analytical review of this Chapter has been presented in ‘Eu-SPRI Early Career Researcher Conference (ECRC), Science dynamics and research systems: The role of research in meeting societal challenges, Madrid, 8-9 April 2013’.

This vision will help to reflect and verify the GCC situation. This will be explained in depth in chapters six, seven and eight.
Chapter Five: Analytical Review of Four Case Studies - European External Environment

II.5.1. Introduction

This chapter intends to contribute to a better understanding of the interaction between the entrepreneurial universities and their external environments by analyzing the four cases using the NERI-FPS framework that has been developed in Chapter Three of this thesis. As mentioned earlier, these case studies are the same cases that have been used in examining the entrepreneurial university framework dimensions in Chapter Four.

The methodology used in this chapter involves analyzing secondary data that includes national official documents of the four case studies, annual review reports, and published case study articles. This analytical review is used to verify the NERI-FPS framework that has been adopted and modified from Nedeva, et al (2013). (See Section, I.3.3.2)

The chapter concludes that the universities’ adoption of an entrepreneurial approach requires significant arrangements at national level that provide a variety of opportunities and flexible interaction processes with regards to Education, Research, Innovation, and Entrepreneurship (ERIE) activities.

II.5.2. The Analysis Approach

The analysis is based on official national review documents of the selected four cases using the NERI-FPS framework. As mentioned earlier the framework focuses of two key elements: ERI Funding Arrangement and ERI governance (see table: 4 in Chapter Three, and Appendix (1).

II.5.3. Documentary Materials

Data for the four case studies has been gathered from publicly accessible (and English language only) websites, official national policy documents, and national review reports.
II.5.4. Data Collection and Data Analysis

It is worth mentioning that the data has been collected using the framework as a tool for data gathering from the four cases. The data of about the Netherlands, Norway and the United Kingdom has been extracted from the same study (Nedeva, et al., 2013), whereas for the Swedish case, the data has been collected by the author from national official documents. The following pages show the analysis of the four ERI-FPS cases.
### II.5.4.1. The NETHERLANDS

#### A. Funding arrangements

<table>
<thead>
<tr>
<th>Level</th>
<th>Modality</th>
<th>Origin</th>
<th>Actors</th>
<th>Authority rights: Which organizations… decide on funding?</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>BERD</td>
<td>Project based</td>
<td>Public-private</td>
<td>Government/ministries</td>
<td>Government, through the Strategic agenda for Higher Education, Research and Science Policy, published every four years.</td>
<td>1) Evaluation of research at universities and institutes, six-year cycle according to the Standard Evaluation Protocol (SEP). 2) Performance contract between the state and the universities (individual or consortia).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Block grants</td>
<td>National-international</td>
<td>Funding agencies</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Governments/ministries</td>
<td>Mainly NWO (741m Euros in 2010) with grants for universities, NWO institutes and support for infrastructure (one six priorities).</td>
<td>2011 strategy defines top economic sectors. NWO strategy has six priorities related to government’s top sectors. University block grants partly dependent on specialization.</td>
</tr>
</tbody>
</table>

#### B. Governance

<table>
<thead>
<tr>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is there a national evaluation system?</td>
</tr>
<tr>
<td>1) Both, but mostly peer review 2) Indicators as adapted to individual universities in performance contracts.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Research performers</th>
<th>act?</th>
<th>Is it linked to funding decisions?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universities (approx. 4 billion/year) and research institutes.</td>
<td>Universities (Approx. 4 billion/year) and research institutes.</td>
<td>1) Universities need to publish the results and follow up, no direct link to funding. 2) A (small-ish) part of the ‘first stream’ funding is conditional on results.</td>
</tr>
</tbody>
</table>

### Table 7: National Funding and Policy Space: The Netherlands

Source: Nedeva et al, (2013, p 44)
The above data for the National Funding and Policy Space of the Netherlands can be described as follows:

**ERI Funding Arrangement:** The Netherlands is categorized in terms of public funding for research as at medium level, as its GERD/DDP is 1.83%, which is between 1 and 2% in 2012. The Netherlands have variety of research fund resources. The majority of research funds for universities come from block fund, with project funds providing the least.

Furthermore in terms of the origins of the funding for university research, the greatest amount comes from the government, the second greatest amount from the business sector, and the least comes from international funds.

The main actors in ERI are the Ministry of Education, Culture and Science, which plays a central role in funding policy. The main funding agency for public research in the Netherlands is the Netherlands Organisation for Scientific Research. Public research in the Netherlands is mainly carried out by universities (higher education sectors). This shows that there is variety of ERI actors (knowledge creators, knowledge funders, knowledge users).

**ERI Governance:** The authority rights of funding prioritizing is the Netherlands government through a national strategy agenda, where co-ordination between universities, the Ministry of Education, Culture, and Science, and the Netherlands Organisation for Scientific Research on funding and priority research areas is stressed. This demonstrates a national co-ordinated strategy. In terms of a national evaluation system the Netherland has implemented two mechanisms (a six-year cycle to Standard Evaluation protocol at universities, and an evolution contract between the state and universities, using peer review and indicators-based review). There is no direct link between funding and performance, however, universities need to publish their results and performance. For more details see Appendix (3).
### II.5.4.2. NORWAY

<table>
<thead>
<tr>
<th>Level</th>
<th>Modality</th>
<th>Origin</th>
<th>Actors</th>
<th>Authority rights: Which organizations…</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Project based</td>
<td>Public-private</td>
<td>Government/ministries</td>
<td>decide on funding?</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>In addition to KD, the main ministries funding research are the Ministry of Trade and Industry, the Ministry of Health and Care Services, the Ministry of Oil and Energy, the Ministry of the Environment, the Ministry of Agriculture and Food, and the Ministry of Fisheries and Coastal Affairs.</td>
<td>RCN’s budget is the subject of annual negotiations with sector ministries, as well as within the envelope of the Ministry of Education and Research, of which it is formally established as an agency.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Block grants</td>
<td>National-international</td>
<td>Funding agencies</td>
<td>decide on priorities?</td>
<td>Is there a national evaluation system?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The RCN is the largest single provider of research funding, with a budget ‘for R&amp;D related activities’ of 7.25bn NOK (2011). 25-30% of all government R&amp;D funding goes through the RCN.</td>
<td>Some RCN priorities are set as part of the negotiations with sector Ministries. RCN decides on its own broad themes for its managed programs within this framework.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Research performers</td>
<td>Act?</td>
<td>Is it ‘peer review’ or ‘indicators’ based?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Universities (8) and independent research institutes (130).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 8: National Funding and Policy Space: Norway

Source: Nedeva et al, (2013, p 52)
The following shows in brief the National Funding and Policy Space of Norway.

**ERI Funding Arrangement:** Like the Netherlands, Norway is categorised at medium level in terms of public funding for research, with 1.7% of Norway’s GEDR in 2011. There are a variety of funding resources in Norway for ERI activities. The majority of ERI funding comes from general university funds as block funds, and its share is 65%, where the project fund from the Research Council of Norway contributes 10% from a total of 56% of the project fund for higher education research. The origin of university research funds in Norway is mostly the government, with 4% coming from private business sectors and individual businessmen. In addition, international funds provide 16% of the higher education research funding.

The main ERI actors in Norway are the Ministry of Education and Research, the Research Council of Norway, which is considered the largest provider of research funds, the Ministry of Trade, the Ministry of Oil and Energy, and other Ministries (see Appendix (4)).

**ERI Governance:** The Research Council of Norway is the main authority rights body which mainly decides the research funding allocation and research priority areas. This is subject of annual negotiations with sector ministries. Through the RCN website the national research agenda is made clear; it is the result of collaboration with the Ministry of Education and Science, and other funding agencies; however, the RCN sometimes prioritises research areas on its own in order to manage its research programs. The council’s published strategy includes a commitment to ensure greater openness and dialogue on research-policy input and priorities. This illustrates National Coordinated Strategy.

The main research actor and research performers are the eight Norwegian universities. The national research evaluation mechanism in Norway is quality assurance by the Agency for Quality Assurance. This checks that educational provision meets national quality standards. However, there is no equivalent quality assurance for research. The evaluation is not linked to the funding.
### II.5.4.3. UNITED KINGDOM

#### A. Funding arrangements

<table>
<thead>
<tr>
<th>Level</th>
<th>Modality</th>
<th>Origin</th>
<th>Actors</th>
<th>Authority and rights: Which organizations…</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Project based</td>
<td>Public-private</td>
<td>Government/ministries</td>
<td>Decide on funding?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provided by the research councils, circa 3 billion GBP/year.</td>
<td>The Department for Business, Innovation &amp; Skills (BIS) funds the research councils and HEFCs. SFC, Departments for Health, International Development, and Environmental Protection, as well as the devolved governments of Scotland and Northern Ireland also provide funds for R&amp;D.</td>
<td>Government through the spending review and science budget.</td>
</tr>
<tr>
<td></td>
<td>Block grants</td>
<td>National-international</td>
<td>Funding agencies</td>
<td>Decide on priorities?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provided by the Higher Education Councils: 2.25 billion GBP/year for the whole of the UK. SFC for Scotland</td>
<td>Main funders of public research: research councils (3 billion), Higher Education Funding Council (2.25 billion) and government departments (3.1 billion). Business (500 million) and non-profits (136 million) also fund research at HEIs and PROs. And SFC (Scotland)</td>
<td>Peer review based evaluation of research excellence Research Assessment Exercise (RAE), to be replaced from 2014 by the Research Excellence Framework (REF).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Evaluation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Is there a national evaluation system?</td>
</tr>
<tr>
<td></td>
<td>Yes.</td>
</tr>
</tbody>
</table>

| Source: | Nedeva et al, (2013, p73) |

---

Table 9: National Funding and Policy Space: UK
The situation in United Kingdom in general, and Scotland in particular, is similar in terms of ERI funding and Policy Space, however, Scotland has its own funding body (the Scottish Funding Council) (SFC), which receives its funding and mandates for university research through the Department for Business, Innovation and Skills (BIS). The following illustrates the ERI Funding and Policy Space in the UK and Scotland.

**ERI Funding Arrangement:** The UK, is like the Netherlands and Norway in that it is at medium ERI funding level, with 1.79% of GDP. There are a variety of ERI funding resources in the UK and Scotland that provided block funds from HEFCs and the SFC, in addition to a project fund from seven UK research councils. The origin of this variety of ERI funding resources is mainly the government and higher education, with the public and private business sectors providing 45.9%. In addition, the UK and Scotland get an international fund from EU Framework Programs; however, the largest amount goes to business research.

The main ERI actors are the Department for Business & Skills, which funds the research councils and HEFCs, international development, and environmental protection. In addition, the devolved governments of Scotland and Northern Ireland provide significant funds for R&D.

**ERI Governance:** The ERI authority right is the UK government. Fund allocation and prioritizing of research areas come from the government, which decides the overall level of funding. In Scotland the SFC receives a ‘Letter of Guidance’ from the responsible government minister, which outlines the money that it will be given in the following academic year, along with a list of strategic priorities. This illustrates that the UK and Scotland are nationally centralized with regards to ERI funding and policy strategy. ERI performance is nationally evaluated by the Research Assessment Exercise/Research Excellence Framework, which is based on peer review, and it is linked with ERI funding. For details see Appendix (5).
II.5.4. 4. SWEDEN

<table>
<thead>
<tr>
<th>Level</th>
<th>Modality</th>
<th>Origin</th>
<th>Actors</th>
<th>Authority rights: Which organizations… decide on funding?</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Project based</td>
<td>Public-private</td>
<td>Government/ministries</td>
<td>The Ministry for Education and Science is responsible for the overall co-ordination of research policy activities and for direct research funding via the Swedish Research Council. The ministry is also responsible for the design of framework conditions for the National Science and Innovation System with a focus on basic research and university education.</td>
<td>Is there a national evaluation system?</td>
</tr>
<tr>
<td></td>
<td>Block grants</td>
<td>National-international</td>
<td>Funding agencies</td>
<td>The public research policy system is characterized by broad decentralization. The dominating role of the academic sector on the performer side has led to a diverse and pluralist landscape with a high degree of autonomy and self-governance on individual, group, department and institution levels.</td>
<td>Is it ‘peer review’ or ‘indicators’ based?</td>
</tr>
</tbody>
</table>

**Sweden’s R&D (overall R&D investment 10,426 million EURO= 3.37% in 2011 of GDP), intensity is above EU-27 average of 2.03%.

**Evaluation**

The budgetary framework for research funding is provided by the Ministry of Finance in close Co-operation with the Parliamentary Committee on Finance.

Yes, evaluations carried out by the Swedish National Agency for Higher Education. The evaluation of research programmers is a common procedure. It is usually undertaken by external Private Sector parties under the auspices of the responsible agency or ministry.

**Table 10: National Funding and Policy Space, Sweden**
The ERI Funding and Policy Space in Sweden is seen to be the most supportive of the entrepreneurial approach. The following is a brief description of Sweden’s NERI-FPS.

**ERI Funding Arrangement:** Unlike the Netherlands, Norway, and the UK, Sweden is at a high ERI funding level, with 3.37% of GDP in 2011 (above the EU-27 average). The ERI funding resources are varied in Sweden; the Ministry for Education and Science provides 40.1% as a block fund for universities. In addition, the Swedish Research Council provides a project fund of SEK 5 billion annually.

The origins of the funding are different; government, public and private business sectors, and international funds from aboard. Swedish universities are consuming 90% of the government funds, whereas most international funds go to business research.

The main ERI actors in Sweden are research councils, governmental agencies, innovation support agencies, private enterprises, and foreign research funders (Erawatch Country Reports, 2012, p. 10).

**ERI Governance:** The authority right of ERI in Sweden: the general policy formulation is carried out largely at a ministerial level; different agencies are responsible for the design and implementation of individual policy instruments, and the level of autonomy and freedom to determine research directions in academic institutions is high (Erawatch Country Reports, 2012, p. 9). The public research policy system is characterized by broad decentralization. The dominating role of the academic sector on the performer side has led to a diverse and pluralistic landscape, with a high degree of autonomy and self-governance on individual, group, department and institution levels (Erawatch Country Reports, 2012, p. 9). This represents National Co-ordinated Strategy.

The main performers in the public R&D system are dominated by the academic sector. The universities, in total fifteen, consume over 90% of the governmental appropriations for R&D, and are in principle responsible not only for basic research but also applied and strategic research programs (Erawatch Country Reports 2012, p. 7).

"...In 2012, all relevant actors in the system have evidently been offered the privilege of contributing, by advance input, to the content of the research bill" (Erawatch Country Reports, 2012, p. 24). The national evaluation of ERI is peer-review and indicators-based, and is linked with the funding. Further explanation can be found in Appendix (6).
## II.5.5. Funding Arrangements, Four Countries Compared

<table>
<thead>
<tr>
<th>Country</th>
<th>Level</th>
<th>Modality</th>
<th>Origin</th>
<th>Actors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Netherlands</strong></td>
<td>Medium</td>
<td>GERD/GDP: 1.83% (2010)</td>
<td>64% of research funding for universities (2009). 10% of research funding for universities (2009), mainly by NWO.</td>
<td>Funding from abroad (2009): 40.9% government funding, 45.1% Business. Mainly OCW (3.5 billion = 73% in 2012) and EZ (862 million =18%). Universities and research institutes.</td>
</tr>
<tr>
<td><strong>Norway</strong></td>
<td>Medium</td>
<td>GERD/GDP: 1.70% (2011)</td>
<td>65% of HE R&amp;D (2009) from the General University Funds (GUF). 19% of HE R&amp;D from RCN (2009), the main source of project funding. Private / Public sector R&amp;D split 50.6 / 49.4 % in 2011.</td>
<td>EU and international funding =10% of project funding for HE sector in 2008. Seven main ministries (totalling 50% of spend). RCN the main council (7.25 billion NOK in 2011). Universities and independent research institutes.</td>
</tr>
<tr>
<td><strong>United Kingdom</strong></td>
<td>Medium</td>
<td>GERD/GDP: 1.79% (2011)</td>
<td>Provided by HEFC 2.25 billion GBP/year for the whole of the UK. Mainly provided by the research councils, circa 3 billion GBP/year.</td>
<td>31.6% of R&amp;D expenditure from Government and HE, 45.9% from Business. (2011). 17.8% of R&amp;D funding from abroad (2011) (20% of which to PROs and HEIs). BIS is the central department but some sectorial departments too. Research Council, and, TSB, HEFC. Primarily HEIs</td>
</tr>
<tr>
<td><strong>Sweden</strong></td>
<td>High</td>
<td>GERD/GDP: 3.37% (2011)</td>
<td>The Ministry for Education and Science is responsible for the overall co-ordination of research policy activities and for direct research funding with a budget of 40.1%. Provided by Swedish Research Council &amp; VINNOVA, Swedish Agency for Innovation Systems.</td>
<td>Funding from abroad amounted to some 1,017 million Euro in 2011, most of this goes to business R&amp;D but 32 million went to research in public research and higher education. The Ministry for Education and Science is responsible for the overall co-ordination of research policy activities and for direct research funding via the Swedish Research Council. Ministry for HEIs, Research Council, Private enterprise.</td>
</tr>
</tbody>
</table>

---

Table 11 Funding Arrangements, Four Countries Compared
### II.5.6. Governance of Research Funding, Four Countries Compared

<table>
<thead>
<tr>
<th>Country</th>
<th>Authority</th>
<th>Which organisations...</th>
<th>decide on funding?</th>
<th>decide on priorities?</th>
<th>Act?</th>
<th>Is there a national evaluation system?</th>
<th>‘Peer review’ or ‘indicators’ based?</th>
<th>Is it linked to funding?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Netherland s</td>
<td>Currently no information.</td>
<td>Universities (Approx. 4 billion/year) and research institutes.</td>
<td>At several levels: Government (top economic sectors), NWO (corporate) and NWO departments.</td>
<td>1) Standard Evaluation Protocol (SEP). 2) Performance contracts (individual universities or consortia).</td>
<td>1) Both, but mostly peer review. 2) Based on three criteria (flexible indicators).</td>
<td>1) Required to publish results and follow up but no direct link to funding. 2) Part of the block funding is based on results.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norway</td>
<td>Negotiated between sector ministries and RCN.</td>
<td>Mainly eight universities (80% of HE R&amp;D) and research institutes.</td>
<td>Some priorities negotiated between sector ministries and RCN, others by RCN themselves.</td>
<td>No systematic quality assurance for research. Occasional “subject-specific evaluations” though the RCN.</td>
<td>n/a</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>Government through the spending review and science budget.</td>
<td>HEIs and public research institutes.</td>
<td>Government and Research Councils.</td>
<td>Research Assessment Exercise (RAE), replaced from 2014 by the Research Excellence Framework (REF).</td>
<td>Peer review based evaluation of research excellence.</td>
<td>Yes, allocation for research by the HEFC is related to performance in RAE/REF.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweden</td>
<td>The budgetary framework for research funding is provided by the Ministry of Finance in close co-operation with the Parliamentary Committee on Finance.</td>
<td>HEIs and public research institutes, and private enterprises.</td>
<td>Carried out largely at a ministerial level, different agencies are responsible for the design and implementation of individual policy instruments.</td>
<td>Evaluations carried out by the Swedish National Agency for Higher Education.</td>
<td>The peer review groups, and the process of formulation of research policy measures (indicators).</td>
<td>Yes, funding programmes, funding agencies frequently undertake an assessment of their impact using economic potential and current Swedish position as indicators.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: the top three countries in table(11 &12) from Nedeva, et al, 2013, whereas Sweden is added by the author
II.5.7. Analysis

The analysis of the intensive data and information from the four countries is grouped into three categories which describe the universities’ positions within their external environment. These categories are: variety and flexibility of funding resources, variety and flexibility of policy drivers, and variety and flexibility of policy implementations.

II.5.7.1. Variety and Flexibility of Funding Landscapes

The data from four countries reveals that overall R&D is funded by both government and business sectors, but the larger percentage comes from the business sector. However, more than 50% of universities and higher education institutes are funded by public fund as block grants, less that 30% as project fund, and less that 20% from abroad. The rest of the science budget goes to business projects.

Therefore, it is worth saying that external science space in these cases provides a wide range of funding resource opportunities where the entrepreneurial university may benefit from and seize to maximize its income. This applied in cases where most R&D&I are performed inside universities and higher education institutes (see table above).

Moreover, the varieties of funding resources allow universities to establish strong links and collaborations with external bodies, which are considered as funding agencies (research councils and industry and private sectors).

II.5.7.2. Variety and Flexibility of Policy Making Landscapes

This category explains the readiness of countries at different levels toward ERI spaces. The prioritization of research activities is based on different drivers, such as national strategic plans, institutional and organizational visions and goals, and individual interests (academic interests or industry demands).

Therefore, it is safe to say from the four studied cases that there are three policies making patterns. The first pattern is exemplified by the United Kingdom, which are seen to operate
strategically-driven policies where the prioritization is made at national strategic level, despite the discussion and dialogues with different related government departments (see Study of Research Funding Trends and Practices of Research Funding Organisations, p. 90). The second pattern is exemplified by Norway, Sweden and the Netherlands, who can be seen to be operating a policy mix approach (Sweden, Netherlands), and annual negotiations (Norway). This means that different related bodies and funding agencies are involved in ERI policy formulation.

"General policy formulation is carried out largely at a ministerial level, different agencies are responsible for the design and implementation of individual policy instruments, and the level of autonomy and freedom to determine research directions in the academic institutions is...high" (p. 9).

“These policy measures are rather typical for Swedish governmental research policy, which has traditionally been in harmony with the demands of the business sector” (Erawatch Country Reports: Sweden, 2012, p. 8).

"The first evaluation exercises and the position of the Netherlands in the top of many of the rankings comparing the most prosperous nations world-wide suggest that the national policy mix is adequate and has adapted successfully to the hostile economic environment" (Erawatch Country Reports: Netherlands, 2012, p.12).

II.5.7.3. Variety and Flexibility of ERIE Characteristics

This category highlights the key elements in policy implementations which represents the interaction between policy instruments and ERI actors. These elements are policy instruments, ERI actors’ interactions, and ERI critical mass and infrastructure. According to Erawatch Country Reports, (2012), Norway, United Kingdom, the Netherlands, and Sweden in order to create better policy coherence, have applied a variety of policy instruments. Notably, these instruments highlight the interactions between related ERI space actors, in addition to supporting human and physical critical mass. These instruments can be seen from the different ERIE programs, such as enhancing the interaction between academia and the private sector, the commercialization of research activities, increasing private R&D investment, increasing provision of venture capital, especially in the early
stages of the innovation processes, strengthening of the Intellectual Property Rights (IPR) system, establishing ‘innovation offices’ at the universities, the Strategic Research grants program, the open research grants program, strengthening the research environment in prioritized areas, establishing innovation programs, increasing the availability of testing and simulation facilities, facilitating academic spinoffs, as well as supporting SMEs in joint R&D projects with academia, academy-industry interaction, and innovation-based entrepreneurship.
The following table illustrates the coherence between internal organizations’ environments and external funding and policy spaces for the four case studies:

<table>
<thead>
<tr>
<th>Country/University</th>
<th>Entrepreneurial University Ideal Types</th>
<th>ERIE Funding Spaces</th>
<th>National ERIE/ Fund and Policy Landscapes</th>
<th>ERIE Characteristics/Process and Mechanisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norway/ Norwegian University of Science &amp; Technology</td>
<td>Fully-fledged entrepreneurial organization</td>
<td>Variety of funding &amp; collaboration opportunities that allow universities to maximize their income</td>
<td>Coordinated strategy</td>
<td>Wide range of Policy instruments Flexible actor negotiation and interactions Sufficient ERI critical mass and infrastructure</td>
</tr>
<tr>
<td>Netherlands/ Twente</td>
<td>Fully-fledged entrepreneurial organization</td>
<td>Variety of funding &amp; collaboration opportunities that allow universities to maximize their income</td>
<td>Coordinated strategy</td>
<td>Wide range of Policy instruments Flexible and harmonious actor interactions Sufficient ERI critical mass and infrastructure</td>
</tr>
<tr>
<td>United Kingdom/ Strathclyde</td>
<td>Blended technology organization</td>
<td>Variety of funding &amp; collaboration opportunities that allow universities to maximize their income</td>
<td>Centralized strategy</td>
<td>Wide range of Policy instruments Flexible actor interactions Sufficient ERI critical mass and infrastructure</td>
</tr>
<tr>
<td>Sweden/Chalmers</td>
<td>Fully-fledged entrepreneurial organization</td>
<td>Variety of funding &amp; collaboration opportunities that allow universities to maximize their income</td>
<td>Coordinated strategy</td>
<td>Wide range of Policy instruments Flexible and harmonious actor interaction Sufficient ERI critical mass and infrastructure</td>
</tr>
</tbody>
</table>

Table 13: The Coherence between Entrepreneurial Organizations and Entrepreneurial Environment for the Four Case Studies
II.5.8. Coherence between the Entrepreneurial University and its Entrepreneurial Environment

Noticeably, the analytical data and information from the four case studies above (Table 10) has revealed a crucial interrelation between establishing an entrepreneurial organization/university and creating an entrepreneurial environment. This interrelation can be seen as a soft causality; evidence of full causality would need more empirical case studies.

The variety of opportunities and a flexible selection process within the entrepreneurial environment is represented by three key elements, as mentioned earlier in Chapter Four. These are: the National ERIE Fund and Policy Landscapes, ERIE characteristics/process and mechanisms, and the interactions between related ERIE actors (academia, government, industry, and private sectors). Therefore, building a coherent interaction between these three key elements and the entrepreneurial university’s dimensions is seen to be a fundamental dynamic to establish a sustainable entrepreneurial organization/university.

In this context, it can be argued that first, the availability of a variety of funding agencies and funding streams offer a flexible income platform that allows universities to maximize their income for a better development in their ERIE programs and activates: Norway - Norwegian University of Science & Technology, the Netherlands - University Twente, the UK - Strathclyde University, and Sweden - Chalmers University of Technology evidently exemplify this characteristic, as the four universities have been empowered by this platform.

Second, the variety of ERIE policy space that aligns with a clear national strategic agenda, knowledge organizations’ roles and activities, and national economic development offers a flexible policy spaces platform that allows harmonization between different ERIE related actors in terms of discussion, negotiation, and contributing to identifying policy drivers and policy formulations. Elder, et al. (2012), articulate this fact, “is a key role for evaluators to become involved in co-learning and co-evolution of these policy instruments in a manner analogous to the relationship between evaluation and policy development that characterised the emergence of collaborative R&D support programmes”. It is worth mentioning that the cases of the Netherlands and Sweden provide an excellent example of this platform by empowering the policy mix that facilitates a flexible and strategic interaction between ERIE actors.
Third flexible ERIE Selection process characteristics facilitate the role of entrepreneurial universities by providing a wide range of policy instruments and actors’ interaction channels, in addition to empowering ERIE critical mass and infrastructures, where universities are allowed to select different programs based on different policy instruments by balancing organization agendas and national agendas, and perform based on clear measures and indicators. The four European cases clearly exemplify this characteristic.

In light of the above analytical discussion it is important to highlight some crucial policy implications. First, the availability of the three flexible platforms is seen to be essential, as well as changes within the five organizational dimensions for successful and sustainable entrepreneurial transformation of universities. Second, keeping the commitments between all ERI actors is strongly linked to creating entrepreneurial coherence for national socio-economic development. Third, regular discussion and negotiation between different ERI actors (knowledge creators, funding agencies, and knowledge users) is fundamental to creating coherence between top-down strategic decision makers and bottom-up initiatives. This can cope with continuous socio-economic changes and demands, and to prioritize and maintain them.

**PART II: CONCLUDING REMARKS**

The purpose of this part was to test and examine the entrepreneurial university framework and entrepreneurial environment framework.

The validity of the entrepreneurial university framework has been evident through the analysis of the four European universities that have an entrepreneurial history and are recognized as entrepreneurial universities nationally and internationally. As elaborated in Chapter Four of this thesis, all four universities have made considerable changes at different levels. The four cases show the importance of re-structuring university infrastructure with the influence of strong leadership and professional management. The case of NTNU and Twente are excellent demonstrations of the way in which strong leadership can transform a university from a failing organization into a successful entrepreneurial university with a strong reputation. In addition, the four cases illustrate the importance of a mixture of funding from public, private and industrial projects, where strong leadership plays a vital role in generating more income and allocating it efficiently.
Chalmers, NTNU, and Twente also provide evidence for the importance of entrepreneurship education and high quality entrepreneurship courses and programs. Moreover, the four universities implement to some extent project-based teaching and research programs. The strong industry and private linkages and partnerships are also revealed to be a vital dimension in university transformation. Finally, despite the fact that cultural behaviour and beliefs are to some extent difficult to measure, they have a role in setting up a flexible and attractive entrepreneurial environment for the university students, the academic researchers, top management, and external entities.

In addition, an analytical framework of national ERI funding and policy spaces has been adopted in order to explore this coherence in four countries: Norway, the Netherlands, the UK, and Sweden. The results of testing the coherence between the entrepreneurial university and its entrepreneurial environment reveal a soft causality between creating fully-fledged entrepreneurial organization and an entrepreneurial environment that offers a variety of funding opportunities, varieties of research and innovation platforms, and flexible coordinated strategy. Thus, in order for an entrepreneurial university (described in part one) to achieve its missions of Education, Research, and Innovation and Entrepreneurship (ERIE) and successful performance based on national R&D&I measures and indicators, a constructive external environment is crucial sustaining element. Three flexible platforms can be shown to be key pillars for this.

These are as follows: First, a flexible funding platform, where universities are allowed to maximize their income and build strong linkages and collaborations with funding agencies. Second, a flexible policy spaces platform where there is alignment between the strategic level, intermediate level, and organizational level in formulating policy spaces with the involvement of different ERI actors. Third, the ERI Characteristics platform, where varieties of and flexible policy programs and instruments are offered as clear measures for university performance sustaining critical mass, infrastructure, and strategic interaction between the knowledge communities, funding agencies, and policy-making bodies.

Moreover, three policy implications are revealed from this analytical discussion need to be taken into consideration: the availability of the three flexible platforms, keeping the commitments between all ERI actors, and regular discussion and negotiation between different ERI actors.
Now the thesis turns away from established European entrepreneurial universities to implement the tested framework in a different context: the GCC countries and in particular the Sultanate of Oman.
PART III

Implementing the Entrepreneurial University Framework to Emerging Countries- Case of Oman

It is agreed that for a knowledge-based society and knowledge-based economy, human resource development is a vital pillar. Educational institutions, especially universities, play a key role in developing skilled human resources in order to fulfil their responsibility within the era the socio-economic development.

Etzkowitz (2008, p. 27) states that “the capitalization of knowledge is the heart of new mission for the universities, linking universities to users of knowledge more tightly and establishing the university as an economic actor in its own right”.

Etzkowitz’s point of view demonstrates the importance of creating relationships and linkages between knowledge creators and knowledge users. In addition, the universities are considered to be at the heart of this approach, as they produce the knowledge and provide it to the end users (marketplace) through what we call the technology transfer process.

Moreover, today’s policy think-tanks, economic development organizations, higher education institutes, and governments nationally and internationally are striving to become entrepreneurial economies. This is seen through conferences, summits, policy documents and national strategies.

Generally speaking, there is a growing body of entrepreneurship all around the world, which links entrepreneurial activities with economic growth, and demonstrates the contribution of new firms to job creation and innovation. Consequently, more people are choosing to follow their own dreams rather than stay in paid employment.

The sultanate of Oman, as a part of this movement, is also fostering the shift towards an entrepreneurial society and culture. This can be clearly seen from the directions of His Majesty. In 1995 His Majesty the Sultan directed that a conference should be set up to consider the future direction of the country’s economic and social development. This conference, entitled “Oman Economic Vision 2020, The Vision Conference for Oman’s Economy” convened in July 1995. The resulting conference report recognised that the world we are living in today is changing at a faster rate and in more fundamental ways than
ever before. The acquisition of global knowledge, information, technology, and the development of advanced human skills are becoming essential prerequisites for progress.

In view of the above and in order to contribute to a better understanding of the Sultanate of Oman’s academic organizations perspective with regards to entrepreneurial policy, activities, and culture, this part demonstrates the data collection findings through the methodological approach that has been designed based on the theoretical framework that has been developed in part one of this study, to explore and analyse the entrepreneurial university’s organizational structure, its external environment, and the interrelation between them.

Generally speaking, studying entrepreneurial universities requires the investigation of internal aspects as well as external aspects which play a vital role directly and indirectly in university transformation towards entrepreneurial culture. Therefore, in-depth and semi-structured interviews have been set up to involve all levels of stakeholders who might engage in taking actions and play a role in this nationally important issue for Oman. These include: decision makers, university board members, university council members, active researchers, and industry stakeholders. Forty-four interviews have been conducted, each lasting for sixty to ninety minutes.

This Part therefore addressing the following research questions:

1. How can entrepreneurial universities play a role in socio-economic development in GCC/Oman which are oil-based economies?

2. What STI policy framework support GCC/Oman in order to foster the entrepreneurial university approach?
Chapter Six: Research Design and Methodology

III.6.1. Introduction

The research design is an essential tool for achieving the research objectives and answering the research question(s). The selection of an appropriate research method that can be either qualitative or quantitative, is based on several elements. These are: the aims of the research topic, the research questions, the epistemological approach, time availability, and validation and liability concerns.

This chapter covers: the epistemological foundation of this research; its research design and approach; the research methodology, the unit of analysis, data collection methods, and analysis techniques. In addition this chapter addresses the trustworthiness of the study by providing the measurements that have been used.

III.6.2. Research Philosophy

As mentioned earlier, enormous focus has been placed on how different approaches can convey knowledge. These approaches are linked with the research philosophy assumptions that are used to justify the use of specific research methodology suitable for the research aims.

The literature from the social sciences and business studies offer different philosophy choices. The main research philosophies that have been conveyed are positivism (Pugh and Hickson, 1976), pragmatism (Howe, 1988), critical realism (Bhaskar, 1998), interpretivism (Schwandt, 2000), philosophical hermeneutism, and social constructionism (Ritchie and Lewis, 2003). It has been argued by these studies that positivism is associated with quantitative methods, while constructionism is most often associated with qualitative methods.

It has also been argued that intensive and extensive research can be treated as qualitative and quantitative research respectively. The following table by Bryman (2001, p. 20) summarises both the ontological and epistemological roots of each approach.
### The Entrepreneurial University and the Entrepreneurial Environment: Organizational Analysis and Policy Considerations

<table>
<thead>
<tr>
<th>Principal orientation to the role of theory in relation to research</th>
<th>Quantitative/Extensive</th>
<th>Qualitative/Intensive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deductive; testing of theory</td>
<td>Inductive; generating of theory</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Epistemological orientation</th>
<th>Natural science model, in particular positivism</th>
<th>Interpretivism</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Ontological orientation</th>
<th>Objectivism</th>
<th>Constructivism</th>
</tr>
</thead>
</table>

**Table 14: Quantitative/Extensive & Qualitative/Intensive Research**

Source (Bryman 2001, p. 20)

Furthermore, Danermark *et al* (2002), Easterby-Smith *et al* (2002), and Bryman (1988) support the above argument. They agree that quantitative research is rooted in logical positivism and qualitative research is rooted in interpretivism. In addition, they advocate that qualitative research is concerned with generating theory, which makes it inductive in orientation. However, quantitative research is concerned with testing theories, which makes it deductive in orientation.

Since it has been agreed that there is acceptance in the literature that methodologies are associated with research philosophies, this study has used the qualitative method, which is viewed as appropriate for addressing the research aims, which seek actors’ opinions (academics from two Omani universities, policy makers, and industry stakeholders from Oman) about entrepreneurial universities and their entrepreneurial environment. This method is associated with interpretivism, constructivism, and critical realism (Bryman, 2001, and Sayer, 1992).

Approaches in professional research depend on the purpose of the research, which can be exploratory, descriptive or explanatory. According to Robson (2002) there is a significant relationship between the purpose of the research and the different research approaches. For instance, exploratory research needs a qualitative approach, whereas a quantitative approach is more appropriate for descriptive and explanatory research. Furthermore, Anderson and Arsenaux, (1998) points out that the type of research questions which address the research purpose, suggest the appropriate approach with regards to the research. He also adds that the "*research methods are the approach to examining research questions... where there a numbers of those approaches*” (Ibid).
The study seeks to establish from the research questions the opinions and reactions of individuals from top management and strategic levels, and academic researchers from Omani universities regarding entrepreneurial transformation, both as individual researchers or as a part of the university’s academic staff. In addition, the study seeks the perspectives of Omani decision and policymakers regarding the same transformations of these universities. In this context, using qualitative methods is appropriate (see III.6.2) for addressing the research questions.

However, it is important to select the appropriate qualitative method. This is because qualitative research has various different types, and each type is suitable for specific participants and specific research topics. It has been argued in social science literature that there are a wide variety of methods that are common in qualitative measurement (Cassell and Symon, 1994).

Therefore, in order to explore different aspects of the research topic, the appropriate research methods for this study are varied. The first is an electronic questionnaire for the purpose of conducting a pilot study to gather general information on the various aspects and practices relating to entrepreneurial changes. No previous studies have been done in Oman in this area. Second, the data from the first stage has been used to design the question for semi-structured interviews and in-depth interviews, which are appropriate for this study as will be discusses in this chapter later on (III.6.4). Third is documentary analysis. This strategy is supported by critical realism, which stresses representations of social reality, with empirical, actual, and real causal powers (Smith and Elger, 2013).

The following Figure (12) illustrates the research design process that includes three stages. Detailed explanations of each stage are provided in the following pages of this chapter.
Stage 1: Pilot Study
General Information & Context Identification

Research Method:
- Electronic survey

Population: Full population - seven universities
- Public and private universities

Analysis: Qualitative analysis

Validation

Results have been presented and discussed in a workshop conducted in Oman where related universities were invited

Stage 2: Actual Empirical Study
University’s profile

Research method:
- Semi-structured interviews and documentary analysis/official university documents
- University A & B have good linkages and partnerships with the oil companies
- University A entrepreneurship courses for undergraduates and post graduates
- University B have technology based teaching activities
- Universities A & B have mature infrastructure and critical mass

Findings lead to selection of two universities

Followed with exploration on Omani external environment landscapes

Stage 3: Policy Landscapes
Omani Environment Profile

Research method: In-depth interviews and documentary analysis/official policy documents


Analysis: Qualitative using template analysis

Results have been presented and discussed in a specific symposium in Oman, where related universities and related policy makers were invited

Figure 12: The Research Design Process
III.6.3.1. Unit of Analysis and Case Study Selection

One of the important issues when participating in research is determining the population that the study will focus on; this population is called the research sample. Research cannot deal with the whole of the population because of time, expense, and accessibility issues; therefore, defining a suitable sample and sampling process for the research is essential (Cohen et al., 2000).

The sampling decision should come early in the research plan, because there are many factors which need to be taken into consideration while defining the suitable sample.

Brown and Dowling (1998) and Cohen et al. (2000) discuss two approaches to sampling. The first approach is probability sampling, which is needed to identify the sampling frame. This involves selecting a random sample using certain statistical techniques, such as numbering the whole population and then randomly selecting the sample using a computer program. This approach will give every member an equal chance of being selected.

The second approach is non-probability sampling. This approach does not need the sampling frame. The research focuses on building theory or gathering opinions. For example, the researcher can interview any person in the field willing to answer his/her questions. Another method is selecting particular parties that have knowledge about the study topic, such as experts (Oliver, 2002).

However, Oliver (2002) points out that in some situations the researcher may collect data from the whole population without using samples. Considering the above discussion and the aims of this research, the sample has been selected based on the pilot study findings. The pilot study targeted all Omani universities (seven universities) and based on the results, two universities have been selected, as they have been seen to be more advanced in terms of entrepreneurial activities (see Figure 13).

For the purpose of addressing the current situation of Omani universities in relation to entrepreneurial practices, with permission from the Research Council of Oman (TRC), and with the help of a team of colleagues, a survey has been conducted of the all seven Omani universities using an electronic questionnaire (see Appendix 8: this survey has been used as a pilot study). The survey was conducted during February and March 2012. Seven universities were involved in the survey; these are the only Omani universities, and include
one public university and six private. The universities in question are Sultan Qaboos University (SQU) in Muscat, the German University of Technology in Muscat (GUTech), the Arab Open University Oman Branch in Muscat, Al-Sharqiya University in Ibra, Nizwa University in Nizwa, Dhofar University in Salalah, and Sohar University in Sohar.

Accordingly, the sample of the investigation, based on the pilot study results, is two universities: A and B. The selection of these two universities is based on several factors. Firstly, they are the most mature in the group in terms of infrastructure and availability of research centres and labs, high-tech research equipment, and capacity building, such as the availability of highly qualified research staff, research assistants, and technicians. Secondly, they both have a focus on technology transfer, especially within the oil and gas field, and have strong collaborations with oil and gas companies in Oman. Thirdly, they have the strongest linkages and partnerships with TRC, oil and gas companies, the industry sector, and regional universities, such as those in the UAE and Qatar. Fourthly, they are both located in the same city (Muscat, the Capital of Oman), which provides a similar cultural and external environment.

In addition, a sample of decision makers at strategic level who deal with STI national policies has been included in the population to be interviewed. The decision makers are those from ERI-related organizations. More detailed explanation can be found in the in-depth interview section of this chapter.

II.6.3.2. Ethics Considerations

In order for the research to be trustworthy, valid, and accepted, some very important ethical issues should be taken into consideration, both related to the researcher and to their organizations. Oliver (2002) has suggested the key ethical issues should include informed consent, anonymity, and data protection, meaning that the researcher should take permission for using secondary data from those involved in publication of the findings, as the research then moves from being private to being public. The following outlines the ethical issues that have been taken into consideration and the actions taken:

1. Receiving the ethical approval from the University of Manchester Business School.
2. Permission granted from SQU, GuTech, and TRC to study the research topic and obtain all required approvals.

3. Permission granted to gain access to SQU, GuTech, and TRC and execute the interviews.

4. Official informing of the participants about the purpose and the nature of the research.

5. The anonymity and privacy of the participants is preserved by not including names.

6. Setting up of clear instructions for the participants, explaining what kind of data is needed and how to complete the interviews by sending information and consent forms in advance.

7. Accurately referencing all the official documents that were used as documentary evidence and to whom they belong, in this case the SQU, GuTech, TRC, and official policy bodies.

III.6.4. Research Methodologies

As mentioned earlier in the research design section of this chapter, the project consists of three stages. This section demonstrates the research methodologies that have been used in order to address the research questions in this part. The following explains each stage in detail.

III.6.4.1. First Stage: The Survey - Pilot Study

In general, questionnaires are used to gather reasonably valid quantitative and qualitative data; therefore, in this pilot study qualitative data has been collected in order to obtain sufficient general information about the research topic, taking into consideration the amount of time available (Bell, 1999). In addition, this initial data is important for identifying the context of Omani universities, where no studies have previously been conducted (Modell, 2009). An electronic questionnaire has been used for the pilot study in order to collect data from all Omani universities. Anderson and Arsenaut (1998, p. 170)
confirm that "the questionnaire is one of the most used tools of collecting data, the questionnaire permits the collection of reliable and reasonably valid data...it is motivated by need to collect data from a large number of respondents who may be in one or several locations". Therefore, an electronic questionnaire has been used in order to collect data from seven Omani universities, both public and private. The electronic survey has been sent via the universities’ official email addresses, following an official letter to the universities’ administration for access approval. The questionnaire focuses on five major organizational aspects: university governance, external linkages, staff development, academic curricula and facilities, and student environment. This stage was followed by the second stage, consisting of actual empirical work. The findings from stage one led to the selection of two universities in which to conduct this empirical work.

III.6.4.2. Semi-Structured Interviews

Interviews are the most widely used qualitative method in organizational research. Interviews are highly flexible, and allow researchers to gather in-depth data. According to King (in Cassell and Symon, 1994, p. 14) the objective of an interview "is to see the research topic from the perspective of the interviewee and understand how and why he/she comes to this particular perspective". Therefore, the interview approach is an appropriate method to explore Omani academics’ opinions about the entrepreneurial transformation of Omani universities. It is worth noting that there are different types of interviews. However, for the purposes of this study a semi-structured, "structured-open-response interview" (King, in Cassell and Symon, 1994, p. 15), has been used, where the participants’ opinions about the entrepreneurial university in Oman are unknown and uncertain, and cannot be quantified. In addition, there is no hypothesis to be tested in the research topic (King, in Cassell and Symon, 1994).

Two Omani universities have been selected, as mentioned earlier, based on a pilot study (see Figure 13). Forty participants were involved in the semi-structured interviews, from different organization levels, in order to explore their opinions and perspectives relating to entrepreneurial practices and potential in their organizations, based on five organizational dimensions. The selection of the interviewees was based on their involvement in entrepreneurial activities, both at top strategic management level, and at academic and
operational level. The management level includes university board members and university council members, whereas the academics and researchers have been selected from colleges/schools that are performing entrepreneurial activities. Those in question are the colleges of Engineering, Science, Medicine, Economy and Commerce. Interviewees from these colleges include college deans, deputy deans, heads of department, professors, and active researchers who are involved in developing and practicing entrepreneurial activities. An official letters has been sent to the universities’ administration seeking access approval with brief information about the research topic and aims. In addition, individual letters and phone calls have been used to identify the place and time for conducting the interviews, which were in interviewees’ offices at their convenience. The interviews were in English, although the researcher made it clear that it was their choice to select which language they preferred (Arabic or English). The interviews have been recorded and none of the interviewees had concerns about this. Each interview lasts between sixty and ninety minutes. The interviewees were assured that findings and direct quotations would not be attributable to them personally.

The data has been saved on more than one device and securely stored. The data was then analysed using the template analysis technique. More details and data analysis is given in section III.6.4.1.2.

This stage was then followed by the third stage, in-depth interviews with policy makers and industry stakeholders.

III.6.4.3. In-Depth Interviews

In-depth interviews are one-to-one conversations between the researcher and the interviewee. In this dialogue the researcher investigates more deeply, to explore new evidence, uncover new scope within the topic, or access detailed information based on the personal experiences of the interviewees (King, 2004).

Accordingly, the advantages of the in-depth interview approach are that complex issues can be explored, answers can be clarified by the interviewee, and some sensitive information might be acquired. On the other hand, the disadvantages of this approach are
that the data is voluminous, highly time consuming to gather, and difficult to analyze (Cassel et al., 2004).

This approach has been used to interview seven policy and decision makers, and four industry stakeholders. As the number of interviewees is not large, the analysis was manageable. However, their in-depth points of view and opinions help to provide an overview of Omani policy landscapes regarding the entrepreneurial approach, and the challenges facing Omani universities. The interviewees have been selected based on their role and position in relation to entrepreneurial activities. These interviewees consist of members of the State Council related to higher education policy, the Minster of Higher Education, the Minister of Oil and Gas, the Minister of Industry and Trade, the Secretary General of the Research Council, the Undersecretary of Higher Education, and the Assistant Secretary General of the Research Council, in addition to members of the Industry Innovation Center. An official letter with brief information about the research topic and its aims was sent to each individual policy maker’s office in advance of the study. The place and the time of each interview was set up in advance. The in-depth interviews were conducted in English, based on the interviewees’ choices. The interviews lasted sixty to ninety minutes each. The data has been securely stored, and template analysis has been used to analyse the data. The interviewees were assured that the findings and direct quotes would not be attributed to them personally.

III.6.4.4. Documentary Analysis

This study deals with advancing a new approach (entrepreneurial universities) in Oman, which is already practiced successfully in many other countries. Therefore, in order to get an accurate answer about Omani policy in relation to the entrepreneurial movement, the documentary analysis approach has been selected as an appropriate method to analyze the interviews. The official documents to be analyzed have been identified after developing the research design.

It is important to mention that there are two kinds of documents, primary and secondary. Primary documents are defined as “those which came into existence in the period under research” (Bell, 1999, p. 108). However, secondary resources are defined as “those which
are written by someone who was not a direct observer or participant in the particular events” (Anderson and Arsenault, 1998, p. 96).

The focus of analysis in this study is official primary documents available from related Omani organizations. These include ‘Oman Vision 2020’, His Majesty’s speeches, two selected university strategies, national research strategies, and industry regulation frameworks of selected cases in Oman. In addition, national studies about entrepreneurial potential in Oman have been analysed.

Documentary analysis helps to validate and triangulate the finding from the in-depth interviews with decision makers and industry stakeholders. Some of the documents were in Arabic; however, they have been translated by a professional translator to English for the purpose of analysis. A template analysis approach has been used to analyze the abovementioned document; more explanation is provided in chapters seven and eight.

**III.6.5. Data Analysis Approach**

Data analysis is viewed as a crucial phase in social research, as selecting the appropriate data analysis approach is a crucial part of qualitative research. There are different data analysis approaches that have been used for qualitative research. The purpose of the study and the nature of the data that has been collected during the empirical work provide guidelines for selecting the analysis approach. Therefore, two approaches have been identified for data analysis based on the data collection method and the nature of the data and information. These are analysis of company (organization) documentation, and template analysis.

Template analysis has been used to analysis data that was collected from in-depth interviews semi-structured interviews, and documents. It is worth mentioning that these analytical approaches have been used in a complementary manner, where the data from different approaches support each other in order to enhance the reliability and the validity of the analyses. This is referred to as ‘method triangulation’, and refers to the use of two or more research analysis methods to investigate the same research topic (Forster, 2006).
III.6.5.1. Analysis of Documentation

The documentary analysis method has been used widely in the social science since the 1930s (Forster, 1994, 2006). It refers to the analysis of documents that contain information on some aspect of the research topic. According to Bailey (1994) and Payne and Payne (2004), the documentary analysis method is a technique that can be used to classify, investigate, and interpret data, and verify data of other sources, such as interviews, observation and surveys. One can argue that using the documentary analysis approach can sometimes be more cost effective than other approaches, since the information is already there in the documents, and there is no need to dedicate avoidable time, resources, and effort to collect the same type of data using other methods (Forster, 1994).

The principles of managing documentary sources are the same as other approaches in social research. In all approaches, data must be dealt with systematically. According to Scott (1990) and Forster (1994), there are five criteria for handling the documentary analysis approach: accessibility, authenticity, credibility, representativeness, and meaning. It is worth defining each criterion for a better understanding, based on Forster and Scott’s formulation. Accessibility refers to "who we need to access in order to obtain the documents", authenticity refers to "whether the evidence is genuine and from impeccable sources", credibility refers to "whether the evidence is typical of its kind", representativeness refers to "whether the documents consulted are representative of the totality of the relevant documents", and meaning refers to "whether the evidence is clear and comprehensible" (Forster, 1994, p. 154).

**Accessibility:** For the purpose of accessing the genuine documents from their original sources an official request for permission to access policy documents (Oman Vision 2020, His Majesty’s speeches, industry regulation frameworks in both languages, Arabic and English) was sent to the Supreme Council for Planning. Furthermore all of official documents from the two universities were accessed from the vice chancellors offices with approved permission.

**Authenticity:** All documents that have been collected for the purpose of the research topic are genuine, primary documents. They are copies of the originals and the data and information are related to the research project.
Credibility: All documents that have been used in this analysis have been published independently before the request for access. None were produced especially for this thesis, and, therefore, they were not changed for its purposes.

Representativeness: All related documents from the two universities and from the Omani official policy authorities have been examined.

Meaning: Understanding the documents and what they contain is crucial. "The ultimate purpose of examining documents is to arrive at an understanding of the meaning and significance of what the document contains" (Scott, 1990, p. 28). It is, therefore, worth noting that policy documents contain different aspects related to educational policies and entrepreneurial dimensions. In addition, the universities’ official documents cover different organizational aspects related to the research topic.

II.6.5.1.2. Template Analysis

According to King (2012) the underlying principle in selecting this method is the ability to balance relatively high degrees of structure in the process of analysing textual data, with the flexibility to adapt it to the needs of a particular study. It is also worth noting that template analysis is compatible with all epistemological positions.

The template analysis method has been used to analyze different types of qualitative research. For example, different research has used template analysis to analyze data from interviews, focus group interviews, observations and diaries, and open questions from questionnaires (King, 2012). This is because template analysis allows flexible analysis of extensive and complex textual data.

In this context the justification for using template analysis is that when it is compared with approaches, such as grounded theory, interpretative analysis, and discourse analysis, it is more conducive to a wide range of epistemological positions, more flexible, with less precise procedures, able to be tailored to meet different data collection and analysis requirements, helps to develop conceptual themes and group them into broader categories, which allows cross-case analysis to produce key themes, is less time consuming, and manages large amounts of data smoothly, which suits the purposes of this project (King, 2012, Crabtree and William, 1992).
This technique strongly focuses on coding structure. This can be varied, from a very simple template coding allowing in-depth interpretation, to a complex coding that can be difficult to manage, based on individual aggregation of themes. This might lead to excessive focus on the details of themes and neglect of the development of the themes. It can tend to fragment the data, destroying its coherent phenomenological quality. However, Crabtree and William (1992) argued that this can be managed by adopting a subsequent interpretative phase in the analysis, in which the units or categories are connected to form a comprehensive framework.

The next section illustrates the selection process and procedure for using this technique.

### III.6.6. Data Analysis Procedure

Based on the literature review, the conceptual framework, the research questions, and the findings from the pilot study, a template analysis as an initial template with initial themes was designed. However, during the actual field work (in-depth interviews and semi-structured interviews) new themes materialized which were incorporated into the final template (see Appendix 10).

Selecting this analysis technique began at an early phase of the research design, when developing the interview protocol. This was linked with the research framework to simplify the data in certain themes. Five broad themes emerged, each consisting of three sub-themes which accumulate to fifteen themes. Consequently each sub-theme was elaborated at a third level by three or four sub-themes. This produces a hierarchical coding of three levels (King, 2012). This type of categorization, which is driven by the research framework, has been described by Patton (2000) as "Analyst-constructed typology".

The template analysis coding has been displayed as two types: the mind-map style (see Appendix 9) and the three levels hierarchical styles (see Appendix 10). The mind-map helps to present the lateral links between thematic categories. In addition, it is possible to convert this to the list style (King, 2012). During the interviews none of the participants saw the template categories. All questions were asked freely to avoid imposing themes, in order to seek their perspective and opinions freely. This is why some sub-themes have emerged and led to revision of the initial template and development of the final template.
The final phase of the template analysis procedure is interpretation. The presentation approach is an essential stage where the meaning and the value of the data should address the research topic and provide answers to the research questions.

II.6.7. Trustworthiness

A quantitative approach to qualitative research faces huge challenges in addressing the validity and reliability of the qualitative research, which depends mostly on contextual data and can be affected by researcher subjectivity in the interpretation of the data (Merriam, 1988, King, 2012).

Data interpretation and explanation are the responsibility of the analyst, and it is the researcher’s duty to develop meaningful and sufficient results. Several measures have been implemented in order to enhance the trustworthiness of this research, including cross-checking of the interview questions by the research team (supervisors), and consulting two experts in the field of entrepreneurial studies. The validity has been enhanced by the triangulation of the data analysis approach, which consisted of incorporating documentary analysis of universities’ official documents with the interview analysis, and using quotes from the interviewees’ answers, in order to allow the voice of the participants to offer their own perspectives as evidence (Dey, 1993).

Furthermore, the reliability of the data interpretation has been enhanced through increasing the consistency of data from more than one source (pilot study, official documents, and multiple interviews). Providing an in-depth explanation of how the results have been achieved, and applying ethical conduct, as mentioned earlier, have helped to increase the trustworthiness of the research. It is worth mentioning that there were mismatches between the ‘well-written strategies’ (university official documents) and the opinions of participants about how practical those strategies are. This is explained in detail in chapters eight and nine.
III.6.8. Reflexivity

Reflexivity, discusses the researcher’s position whether he/she is an insider or outsider. According to Creswell (1994) and Patton (2002) it is important for social science researchers who are utilising qualitative methodologies to clarify their personal motives for their research. The researchers can position themselves as either ‘insiders’ or ‘outsiders’ to their research domain. According to Kanuha, (2002), insider researchers are those who conduct research with participants who are from the same expertise of the research domain, while outsider researchers do not belong to or share the same expertise as those within the research domain.

In this case, the researcher is considered to be an insider, as she is a Senior Research Analyst for the Research Council of Oman, and so belongs to the Omani system and culture. This, however, has advantages and disadvantages. According to Kanuha (2002), the key advantages of being an insider to the research domain are that it provides a better understanding of the participant culture, the ability to interact naturally with the participants, and more rapid and complete acceptance by the participants, so a greater depth of data may be gathered. The disadvantages are outlined by DeLyser (2001) and Kanuha (2000). First, there may be a loss of ‘objectivity’, as the researcher may making assumptions based on their prior knowledge and experience (the researcher here is familiar with the Omani education system and has contributed to the developing of national research and innovation strategy). Second, insider researchers are often confronted with ethical issues, such as the sensitivity of the gathered data. Third, insider researchers often struggle to balance their professional role with issues such as loyalty to organizations, and any information that might affect the organizations’ processes. However, being an insider maximizes the advantage of the meaning and richness of the research topic. Several data resources have been used in triangulation, and the results presented in advance in a national symposium\textsuperscript{16} to a large audience consisting of Omani academics and policy makers, who challenged and questioned the data thoroughly. During the symposium none of the participants contested the findings as inaccurate; rather, positive feedback was received for the rigorousness of the study. The researcher’s experiences influenced the approach to this topic. However, the careful research design and implementation

\textsuperscript{16} Entrepreneurial Higher Education in Oman: Towards a Harmonized National Plan 26th -27th March, 2013, Muscat, Sultanate of Oman
documented above at least allows readers to assess the degree to which the research results are independent and rigorous. Finally, one of the huge advantages of being an insider in this research is that the researcher fully understands the language, the culture, and the policy context of Oman. This offers a huge advantage in interpreting the findings.

III.6.9. Conclusion

This chapter highlights the research methodology that has been applied for conducting the empirical work in order to explore the research topic in emerging GCCs, and Oman in particular. A qualitative research approach has been designed to address the research questions of this investigation. Semi-structured interviews, in-depth interviews and documentary analysis have been selected as appropriate research methodologies. Based on the theoretical framework and research questions, template analysis and company analysis approaches have been used for analyzing data gathered from the abovementioned sources, and thematic presentation has been seen to be an appropriate approach for presenting and displaying the data findings.

For the purpose of enhancing the trustworthiness of this qualitative research several actions have been taken to assess truth value, applicability, consistency, neutrality, and ethical conduct.
Chapter Seven: Data Collection - Case study of Oman

III.7.1. Introduction

The data cannot be meaningful unless it is analysed and utilized for the purpose for which it was collected. Therefore, the aim of this chapter is to highlight the data collection approaches mentioned in the previous chapter. Three phases have been selected to work in sequence, namely: an electronic survey, for the early data collection, which is used to shape the other two phases, namely, in-depth interviews and semi-structured interviews. A fourth approach seen to be appropriate as a triangulation measure is documentary analysis.

It is worth noting that the analysis of the data has been approached differently based on each phase and each type of data. For example, documentary analysis of the official documents are analysed by using the documentary analysis approach, whereas the in-depth interviews and semi-structured interviews have been analysed by the template analysis approach and using the thematic approach based on the theoretical framework in order to investigate the internal organization of two selected Omani universities and external environment and policy space.

The chapter concludes with a summary of the three stages.


The first phase focuses on gathering the early data about Omani academic organizational potential of entrepreneurship. An electronic questionnaire was used in order to reach all Seven Omani universities within the targeted timeframe.

The survey focused on five categories, these are: the university’s governance, external linkages, professional development, academic curriculum, and student environment.

It is worth mentioning that the analysis approach of this phase is presented holistically, including findings from all Omani universities rather than each university individually, as it’s The purpose is to gather general information of Omani Universities and identify the Omani context with regard to entrepreneurship. (See Figure: 12, in Chapter Six)
Therefore, with permission from The Research Council Oman (TRC), and with the help of a team of colleagues, a survey was conducted of the six universities using an electronic questionnaire (see Appendix 8). The seven universities involved in the survey are: Sultan Qaboos University (SQU) – the only public university in Oman, German University of Technology (GUTech), Arab Open University Oman Branch, Al-Sharqiya University, Nizwa University, Dhofar University, and Sohar University.

In general, the major common finding in the case of all seven universities reveals that in spite of eagerness and a passion to undertake serious steps towards entrepreneurship, they are lacking in organizational strategy, and there is an absence of policy with regard to innovation and an entrepreneurial approach. However, each university has some key characteristics which explain their internal environment efforts that have been made in this context.

As the purpose of this phase is to explore the Omani academic institutes’ potential with regard to entrepreneurial activities, the exploration provides some general evidence that Omani academic institutes are lacking in comprehensive organizational strategies. In addition, a significant observation is the absence of policy with regard to innovation or entrepreneurialism. The Omani universities’ efforts to undertake entrepreneurial activities are seen not to be policy-driven, but rather they are internally driven processes.

Overall, the weak organizational governance and lack of a clear strategy reveals a misalignment between the top-down steering process and the bottom-up activities. This affects the efficiency of funding allocation regardless of its amount. The general observation of the funding category is that the largest percentage of the funding for the SQU (the only public university) comes from the government, and for the private universities it comes from government subsidies in addition to student fees.

While there are some good initiatives in entrepreneurship education, such as the entrepreneurship courses for undergraduates and postgraduates in SQU and GuTech, there are absences of entrepreneurial awareness and culture.

However, there are some good linkages and partnerships with some industrial sectors, companies (mainly the oil companies), and local and regional universities, namely Saudi Arabia, Qatar, and the United Arab Emirates. SQU and GuTech seen to have the strongest
partnerships, and the reason behind this is their mature infrastructure and qualified staff. The following pages highlight the findings on the five categories.

III.7.2.1. University Governance

This category reveals that governing boards are dominated by government officials who are appointed to be members without clear criteria, and in the case of private universities, university corporate owners are representing the boards. Moreover, there is no comprehensive entrepreneurship strategy; finally, there is a general reluctance among decision makers to take entrepreneurial initiatives without some explicit directions and committed support from higher authorities. This, therefore, leads to a top-down approach, contrasting with the bottom up entrepreneurial-driven cultural approach.

III.7.2.2. External Linkages

In general, there are some Omani universities with mature infrastructure and qualified professionals, such as SQU and Gutech that have to some extent strong linkages and collaborations with local oil companies. In addition, there are good collaborations with regional GCC universities, such as Saudi Arabia, Qatar, and the United Arab Emirates. Some private universities lag behind in building linkages with industry sectors and international networks. They fail to attract industrial contracts because of their inadequate capabilities and infrastructures and limited critical mass.

III.7.2.3. Professional Development

Professional recruitment and promotion vary from one university to another. However, the overall academic salary is low compared with neighbouring countries, which prevents attraction of highly qualified professionals. In addition, the heavy teaching workloads fear of failure, and motivation to make easy money without taking risks (publication, selling their patents to companies, or just working for certain company for short term to solve its
industry problems), prevent the professionals from following their entrepreneurial activities.

III.7.2.4. Academic Curriculum

The curricula in Omani universities are accredited by the government. Even the private universities must obtain approval from the Ministry of Higher Education. This process takes a long time and is reliant on a bureaucratic system in Oman. In addition, there is no activity related to campus-wide entrepreneurship awareness, entrepreneurship training programs, or inter-disciplinary problem-based learning approaches is also not followed at most university departments. However, recently there have been some very modest initiatives introducing some elective entrepreneurial courses at SQU.

II.7.2.5. Student Environment

Student learning environment is Omani universities is affected by the country being an oil-based economy, that provides a free education for all and a secure job after graduation. This cultural attitude affects the education system as a whole, and university education programs in particular. Therefore, despite the clear desire from national authorities to move towards a knowledge-based economy, where education plays a vital role, the learning environment is seen to be memorizing-driven rather that knowledge–driven. Moreover, the universities’ extra curricula activities focus on sport, art, and traditional culture rather than entrepreneurial activities.

In this context the students’ desire is to get higher degrees in order to get prestigious governmental jobs. In general, most Omani students are unwilling to practise self-employment as a career option; rather they prefer to be government job seekers. This attitude puts huge pressure on national authorities to provide secure jobs for increasing numbers of graduates every year.

This exploration phase provides us with a basic observation of the Omani universities’ current situation with regard to entrepreneurial activities.
The next part of the investigation focuses on two universities: A and B. The selection of these two universities is based on several factors as mentioned in Chapter Six (Figure 13). Firstly, they are the most mature in the group in terms of infrastructure and capacity building. Secondly, they both have a focus on technology transfer. Thirdly, they both have the strongest linkages and partnerships. Fourthly, they are both located in the same city (Muscat, the Capital of Oman), which provides a similar cultural and external environment.

A series of semi-structured interviews have been used for this further investigation, with a focus on exploring the five entrepreneurial dimensions at strategic level as well as at operational level. The interviewees include university board members, top administrators, faculty deans, active researchers, and some private and industrial members with whom the university has links. In addition, an analysis of secondary data has been undertaken. The secondary data include university strategy documents and annual review reports, as explained previously in Chapter Six.

III.7.3. Phase Two: Data from Semi-Structured Interviews

As mentioned earlier, semi-structured interviews have been conducted with two Omani universities; one is the only public university in Oman and the second one is a private university. The specific quotes from interviewees from the two universities will not be attributed during my analysis for the purpose of confidentiality. The two cases will be named case (A) and case (B).

There will be a brief overview of each case. It is worth noting that the analysis focuses on the thematic approach rather than on the cases as a case studies work; in other words the rationale of the analysis is built up on the framework’s themes rather than the case itself. This is because the two selected universities are representing the entire Omani universities population.
III.7.3.1. Case (A)

University A is the realization of the promise announced by His Majesty Sultan Qaboos Bin Said during the 10th anniversary of Oman’s National Day in 1980. Construction started in 1982 and the first University A, students were enrolled in 1986. In accordance with the Royal Directives of His Majesty, the university commenced with five colleges; Medicine, Engineering, Agriculture, Education, and Science. Furthermore, the College of Arts was established in 1987, followed by the College of Commerce and Economics which was developed in 1993. The College of Law joined the University in 2006, and finally the College of Nursing was established in 2008.

The design and construction of the campus was carried out with great attention to the fulfilment of these objectives, with the overall appearance of the buildings carefully planned to accommodate the physical, intellectual, and spiritual needs of students, faculty, and staff.

University A is the oldest and only public university in Oman. Having between fifteen and twenty-thousand students with eight colleges, it is by far the largest. It is also the most diverse in terms of its curriculum variety, six established research centres as well as its postgraduate programs.

III.7.3.2. Case (B)

The university is the result of long-standing co-operation between RWTH (Aachen University) Aachen University in Germany and the Sultanate of Oman based on some archaeological work of Professor Dr. Michael Jansen, an urban historian at RWTH Aachen University. This archaeological project led to a Memorandum of Understanding between the authorities in Oman and RWTH Aachen University. The Memorandum was signed in 2000.

Three years later Prof. Jansen and an Omani sponsor considered the idea of a Germany university based in Oman. Following this idea, the Omani sponsor approached RWTH Aachen University in 2003 asking for support in establishing a high quality university of technology in Oman. As a first step, a private company, Oman Educational Services LLC
(OES) was established and registered at the Ministry of Commerce and Industry of the Sultanate of Oman on 27th of August 2007, for the purpose of running a university. On 27th of December 2006 a Collaborative Agreement between RWTH Aachen University and OES was signed describing the responsibilities of both sides for the establishment of an “University B of Technology”, which came into existence by means of the Ministerial Decision No. 9/2007, issued by the Ministry of Higher Education of the Sultanate of Oman on 17th of March 2007.

To prepare the students for their Bachelor degree programme, the first batch of sixty students started their Foundation Year Study Programme at the (B) Beach Campus in Al Athaibah in autumn 2007. In 2009, all BSc programs were internationally accredited by ACQUIN, a Germany based accreditation agency.

Due to the increasing number of students the capacity of the Beach Campus was expanded with porta-cabins. The limitation in space at the Beach Campus made it necessary to open an additional campus. This second university (B) campus, the so-called Airport Campus, located close to the main highway and beside Muscat International Airport, was inaugurated in October 2010.

In 2010, university (B) added two new Bachelor of Engineering programs to its program portfolio, Process Engineering and Mechanical Engineering. Two years later, a part-time Master of Science programme in Petroleum Geoscience was established. In 2011 the Bachelor of Engineering in Environmental Engineering was introduced.

Nearly seven-hundred students are now studying at university (B). In September 2012 university (B) moved to its new campus, which is the first Green Campus in Oman. The first phase of the new campus is designed to accommodate about one-thousand eight-hundred students and staff. At a later stage, the campus will expand to hold approximately ten-thousand people. University (B) established recently a consultancy Company providing consultancy services.
III.7.3.3. Data from Semi-structured Interview and documentary analysis- (University A & B)

The data has been collected based on the template code in Appendices (8 & 9) as discussed earlier in Chapter Six.

III.7.3.3.1 Managerial dimension: overall strategic level of power can be viewed as:

- Strong leadership, executive strategy, and decision making.
- Re-structuring university governance to adapt to entrepreneurial changes.
- Clear strategic plan toward entrepreneurship.

According to most interviewees, in addition to the official documents, university (A) and university (B) seems both have well written strategies with clear vision and goals towards innovation and entrepreneurial transformation:

"I’m within a team that was appointed to develop university’s long-term plan for 2013-2025, which is almost ready to be published. Its main focus is to transform some departments into entrepreneurial units" (Professor, A).

"Yes, the university has developed clear strategy that is focused on research for innovation, however, it is just on paper; when we come down to the practice, we as professors are facing lots of barriers and challenges because there is not a clear operational system to implement the strategy vision and goals" (Professor, Head of Department, A).

"A university aspires to become one of the three best universities in the region by the year 2013 and achieve an international reputation that is a source of Omani pride" (Strategic plan 2009-2013, p.11, A).

However, these strategies are seen to be unclear in terms of implementation process and practical activities towards entrepreneurship, especially in teaching and research activities:

"The strategy is there and well written, but what is in practice is different. I’m not sure if this strategy and vision is suitable for the university now, we need to focus on research
because research and innovation are interlinked; I believe some of the strategy points are not applicable currently" (Associate Professor and Head of Section, A).

"Since three years ago we have heard that there are changes towards innovation and entrepreneurship, yet up to this point nothing has happened in practice" (Associate Professor, A).

"Yes, on papers all is well, but in real life I'm not sure it will happen; there are some elements that need to be focused on, especially research policy" (Associate Professor, A).

"Frankly speaking, really I'm not sure how clear the strategy in practice is, as the university performance with regards to research and innovation is still way behind" (Professor, College Dean, A).

"We do have clear vision that focus on three pillars, education, research and innovation, it is clear for all of us what is the direction of the university" (Professor, B).

“Our university strategy focuses on three elements: education, research, and innovation, as our university is technology-based and affiliated with well-known international universities” (Deputy Rector, B).

"The university strives to become a leading university of technology in Oman and the wider region, thus defining the highest standards in education, research, and innovation" (Quality Audit Portfolio, 2012, B).

However, the university’s short history is preventing confirmation of how good the university’s strategy is in practice.

"The strategy is there and well-written as I said, but what is happening in practice is still uncertain as the university’s history is short, and the university’s performance yet to be evaluated” (Active Researcher, B).

"The university strategy is usually developed with co-ordinated efforts between our university and the affiliated well-known international university, where each year an evaluation body from both sides update the strategy. I believe this process is giving the university strategy strength based on international standards” (University’s Board Member, B).
Decision Making Process

In general, Universities (A) and (B) accommodate a fair representative policy of shared governance, where each university board consists of academic members, high level government officials, and private sector stakeholders, in addition to student representatives. Nevertheless, the decision making process is viewed to be unbalanced, as the decisions are mostly made by the internal members (academic council) and the external members just have to approve them.

"The university board has representatives from different sectors, high government officials, industry, private sector, lawyers, experts from oil and gas fields, and from higher education institutes, however, the decisions are made by insider members and the outsiders simply have to approve" (Deputy Vice Chancellor, A).

"The decisions are mostly made by the academic council, which consists of college deans, then the university board members have to approve what is offered" (Professor- College Dean, A).

University (B) operates under shared governance, where each university board consists of academic members, high level government officials, private sector stakeholders, and international advisors from the affiliated university, in addition to student representatives. However, the decision making process is viewed to be unbalanced, as the decisions are mostly made by the internal members (Owner of University (B)).

"I believe that the decision-making process is mostly done in collaboration with local university owners and international investors from the affiliated university" (Professor, B).

"The decisions are mostly made by the university owners and the investors, who are part of the academic community, however, any financial decision needs to be approved by the board of the directorate and any academic issues need to be discussed by the board of governance" (Deputy Rector, B).

Executive Leadership

A summary of the leadership for University (A) and University (B) is:

- Influencing national innovation and research policy.
Seeking new income.

Generally speaking, university (A) can be seen to have strong executive leadership, as high level government officials and vice chancellors have the power to contribute to national innovation and research policies, and seek new income for their universities, yet they are not using this power in favour of universities’ needs to change. This may be a result of an unclear appointing system of university board members by the cabinet (Ministerial Council), especially in the public universities.

"It is not clear to me what the standards are for appointing university board members by the Cabinet. We see some very high government officials but they are not using their power in favour of university needs and demands" (Deputy Vice Chancellor, A).

"I have no idea who is on the university board and how the decisions are made. I know they have power to seek more income, but am not clear on the procedure" (Deputy Dean, A).

“I’m not usually invited to all university board meetings, therefore some of the university decisions I’m really not aware of” (External University Board Member, B).

Professional Management

Overall professional Management in University (A) and University (B) can be summarised below:

Balancing between academic values and strategic direction.

To some extent most interviewees express that the academic voice has clear input and is welcomed by top level management, where the academic council has strong decision-making power. However, the active researchers are not totally satisfied with this power as the university’s direction is not clear to them.

"As far As I know the researchers’ suggested ideas are welcomed by the top management as the university academic council representing the academic community. However, as the university’s direction is not clear to us we are not sure to what extent our suggestions are applied" (Active researcher, A).
"We have different meetings to assure that all staff and students are reflecting the university vision and goal, so there is a meeting for all board members at directorate level, meetings at the board of governance level, and annual transparency meetings that involve all staff, including students, for the purpose of ensuring that everybody is on the same page" (Deputy Rector, B).

III.7.3.2. Funding Resource Dimension: The diversification of funding resources:

Resource funding & incomes:

Oman as an oil-based economy has no huge challenges in providing sufficient government fund (block funding) either for public organizations as a main funding resource, or for the private organizations as a government subsidy (O.R 17 million for each new private university). In addition, a percentage of student fees are paid by the government to support private universities.

The new directions of His Majesty the Sultan (2012) to support higher education institutes can be seen as an opportunity to seek new income by establishing new research projects and teaching programs that focus on innovation and entrepreneurship. However, that top-down system for allocating and releasing the funds is seen to be a strong challenge for researchers and the promoting of new research projects. In addition, the unclear standards of fund competition between departments are also seen to be a barrier to active researchers:

"I believe that there is sufficient money for research but the allocation system is not clearly standardized, which leads to an unfair situation between departments" (Active Researcher, A).

"I know that there is His Majesty’s Grant for strategic research at the university, but I’m not aware what they mean by strategic research and how it is evaluated" (Active Researcher, A).

Moreover, the establishment of the Research Council (TRC) provides a new government funding stream for both public and private universities in Oman (project fund), however the lack of critical mass prevents universities benefitting from this resource to the maximum.
“I have a research project that was approved to be funded by the research council more than two months ago now, however I haven’t received the funds yet, which is explains the complexity of the fund releasing system at the university; the fund goes into the university’s account and not into the research team’s account” (Active Researcher, A).

Looking at the private fund resources for both universities it is dominated by large oil companies only, and most projects focus on oil and gas. This means that only specific university departments can benefit from this stream. Moreover, the small companies and SMEs seem to have a lack of trust in the academic sector, and most SMEs in Oman are not knowledge-based firms, so there are very limited funds allocated for research and knowledge-based projects.

“We have several joint projects with large oil and gas large companies like PDO, where our research project focuses on oil and gas fields” (Active Researcher, A).

“The small companies and SMEs in Oman have no research unions or research budget, and, therefore, they don’t trust the academic sector to do any joint projects with them” (Active Researcher, A).

“Most of us are frustrated from the fund allocating and releasing system, where there is no clear justification system and a long processing system which leads to delayed research activities” (Active Researcher, A).

"The government sponsor a percentage of our students, which is good; however, the government only pay students' tuition fees, which prevent us from offering high quality standards in education and research. Besides this there are some government regulations providing challenges and barriers to us seeking new income” (Deputy Rector, B).

“Most our collaboration projects are with the large oil and gas companies, such as PDO, and most researches are limited to oil and gas fields” (Active Researcher, B).

“SMEs are not in a position to do any joint projects with us as they are not knowledge-based firms and they have no interest in collaborating with our university” (Professor, B).

**Availability of Infrastructure and Fund Opportunities**

As a result of weak network and collaboration attitudes and direction between Omani universities and other funding entities, universities in Oman (A & B) seem not to be
seizing the availability of different infrastructures and funding opportunities, either among higher education institutes and/or other funding resource entities locally and regionally.

"We are facing challenges to sharing some infrastructures, such as labs, research centres, and scientific equipment because of trust gaps between departments and organizations, and this is I believe a result of weak networking and collaboration attitudes among the academic community and between academics and their external environment" (Active Researcher, A).

"Shared infrastructures, such as labs, research centres and scientific equipment in many cases is not an option for us as researchers because it depends on the availability of specific equipment at specific times. The weak collaboration and networking between related entities is affecting the flexibility of sharing infrastructures" (Active Researcher, B).

III.7.3.3. Mission Dimension: The orientation of teaching and research activities to the external environment demands.

**Entrepreneurship-Driven Teaching Activities**

Despite well-written strategies towards entrepreneurial approaches and availability of adequate infrastructure in some Omani universities, universities (A) & (B), based on the interviewees’ opinions, is lacking clear entrepreneurship education programs. One or two courses have just introduced an elective entrepreneurship course for all university students in all departments, without any specific direction of the outcomes of this kind of course.

“Based on a recent survey about the role of the university, the external environment is putting lots of pressure on us to continue as a teaching university and play a societal role meeting the needs of the growing young Omani society” (Deputy Vice Chancellor, A).

“Despite the high-tech facilities, such as labs and centres, there are no technology-based programs or any full entrepreneurial programs in our scientific colleges” (Active Researcher, A).
"We have introduced some entrepreneurial courses as electives for all university students to spread awareness and encourage the mind-set towards entrepreneurship education within the university environment" (Vice Chancellor, A).

“The university strategy focuses on three elements: education, research, and innovation. Therefore, we are trying to orient our teaching and research activities towards innovation, but it is too soon to say that we are a totally technology-based university. Omani students are still affected by a weak education system” (University President, B).

Entrepreneurship-Driven Research Activities

According to most interviewees at top level and academic level, prioritizing research focusing on applied research and the establishment of innovation office is seen to be a trigger for entrepreneurial-driven research activities. However, that lack of critical mass, a insecure promotion system for researchers that focuses on article publication mostly, an uncompetitive salary system, absence of active incubators, and a wobbly IP system are the main reason for Omani universities not fostering entrepreneurial university characteristics.

"We established an innovation office recently in order to facilitate and motivate our researchers towards quality research and innovation projects” (Vice Chancellor, A).

"The government fund should be changed and directed to research that focuses on socio-economic development” (Deputy Vice Chancellor, A).

“I'm the head of a research project and I'm in charge of a research centre where I have only one staff member working with me as an assistant; we are really lacking in critical mass, such as technicians and research assistants” (Professor, Head of Research Centre, A).

“To be honest I’ve been working at this department for more than twenty years now and I'm still not a full professor, and that’s because I have lots of teaching and administration issues that prevent me from doing research activities, so how can I innovate?!“ (Associate Professor, A).
"Even though the establishment of the research council helped to accelerate capacity building, the absence of clear research and innovation policy means that most research projects are interest-oriented and not policy-oriented" (Assistant Dean, A).

“Our focus is applied research where we aim to produce some applicable industry solutions, however, as I mentioned earlier, the field of oil and gas is the only sector benefitting from our research, so we are yet to be entrepreneurial-oriented researchers” (Active Researcher, B).

"There is no national agenda or even national policy towards entrepreneurship; therefore researchers are not encouraged to move towards this" (External Board Member, B).

"The IP system at the university, as well as across the entire country is very complicated. I have been waiting for more than one year now to register my patent and I'm giving up. I might just give the project to a company that might benefit from the product" (Active Researcher, Professor, B).

**Entrepreneurial Activities**

In view of the weakness in entrepreneurial-oriented teaching and research programs, university (A) and University (B) are still in a modest position in relation to entrepreneurialism. This is because university (A) has an insignificant number of quality published research articles and journals, an insignificant number of patents and licences, and no start-up or spin-off companies. In addition, most of its research projects are interest-driven and not policy-driven.

"In our department I believe we have zero entrepreneurial activities such as research commercialization, despite the number of research publications" (Assistant Dean, A).

“Looking at innovation and entrepreneurial KPIs I believe Omani universities – public and private - are still way behind in this regard” (Decision Maker - Board Member, A).

"I believe we are still way behind with regard to entrepreneurial activities; we are a teaching and Research University and our postgraduate programs are not mature” (Professor, B).
III.7.3.3.4. **External Collaboration Dimension:** To be responsive to the complexity and uncertainty of the external environment.

**Collaboration Purposes**

Generally speaking, the main purpose of external collaboration was seen by most interviewees as to solve industry problems and knowledge generation in oil and gas fields; the financial aim comes second. Technology transfer and research commercialization, were the least important, after student training arrangements and shared infrastructure:

"I'm a professor in the engineering college and most of our joint projects with oil and gas companies is to provide industry solutions in the field of oil and gas" (Head of Section, A).

"There are very limited opportunities for student and academic staff mobilization with industry" (Deputy Dean, A).

"Personally I have faced some complexity regarding sharing infrastructure, as the attitudes towards sharing scientific equipment and labs between departments is really a big challenge for academics" (Active Researcher. A).

"Yes, the main aims of collaboration with oil and gas companies are solving problems and financial reasons" (Deputy Rector, B).

"There are very limited opportunities for mobilization of students and academic staff within industry. However, we have what we call the ‘fly professor program’ and we give some public lectures from time to time" (Deputy Rector, B).

"To be honest, most of the collaboration programs are either for financial reasons or to solve oil and gas problems, and it is very rare that we share facilities or conduct student training" (Active Researcher, B).

**Nature of Collaboration**

The nature of the collaboration is viewed by most interviewees to be formal, with some informal cases, especially with international organizations. Moreover, the collaboration focuses on project–oriented programs with large oil and gas companies, and mostly with a
single partner. The collaboration with the research council is seen to be both for resource funding and knowledge brokering between the academic and industry sectors.

"We have an external relations department which helps to facilitate and support any kind of collaboration with local, regional, and international organizations, as we do have joint research projects with neighbouring countries Qatar, Saudi Arabia, and the UAE, in addition to some American universities such as Texas University etc." (Vice Chancellor, A).

"We have formal channels for collaboration; however, we allow our staff to start their own collaborations informally with their academic networks" (University President, B).

"We are allowed to collaborate informally with our personal academic networks with the support of the university channels" (Active Researcher, B).

"Our role at the industry innovation centre is mainly to provide collaboration opportunities between industry and the academic community; we believe that Omani industry and SMEs need to see the opportunities from academia that can help them find industry solutions and foster the innovation approach inside their firms" (Knowledge Broker Advisor, IIC).

**Collaboration Outcomes**

Investigating collaboration outcomes between Omani universities and their external environment reveals the following: Collaborations with oil companies are mainly for industry solutions and knowledge application. Collaboration with the research council is for knowledge generation and accredited publications; 3) Collaboration with regional universities is for knowledge generation and diffusion.

"As I said earlier the main purpose of our collaboration with oil and gas companies is to provide solutions to any problems they might face in the oil and gas field, which of course leads to knowledge application of the research project’s results" (Deputy Vice Chancellor, A).
“Several research projects in our department have been lucky to be funded by the research council via Open Research Grants and lead to new knowledge and new contributions in our field of chemical engineering” (Active Researcher, A).

"Yes, in my department we collaborate with GCC universities on common areas such as water, health, and environmental issues, which leads to generating the knowledge we share in the region" (Professor, Head of Section, A).

“The outcomes from collaboration with industry sectors is production of industry solutions mostly, however, with other research organizations locally and internationally collaborations result in sharing of knowledge and knowledge diffusion” (University President, B).

"I believe that the support of the Research Council helped me in getting the funding for my research project, in addition to facilitating the diffusion of the research results through several programs, such as publication programs that help us to publish our research results" (Active Researcher, B).

III.7.3.5. Cultural Dimension:

University Autonomy

Despite strong directions from His Majesty the Sultan to review and reform all education policies and programs, universities are still failing to seize full autonomy and flexibility in designing their teaching and research programs and re-structuring their organizational environment. According to most interviewees the Omani universities are still operating opaque bureaucracy and government control in terms of funding allocation and release systems.

"We do not have the full freedom to redesign our teaching and research programs and it takes a long time and many procedures to do so" (University Council Member, A).

"The government regulations are complicated, and that prevents us from re-structuring our organization, especially given fund raising issues" (Deputy Rector, B).
Values and Goals

Regardless of well-written university strategies with clear visions and goals towards entrepreneurialism, most interviewees express their concerns that Omani universities are still way behind in terms of putting forward the organizational priorities and individual recognition and incentives systems in order to become entrepreneurial universities.

"Yes, it is a well-written strategy, but I’m not aware of the university’s direction towards the entrepreneurial approach and I don’t know what my role is here” (Professor and Active Researcher, A).

"There is transparency about university direction and goals, as we have regular meetings with university staff and student representatives” (Deputy Rector, B).

"The university’s direction is clear for all staff and students and the regular discussion meetings help to familiarize everybody with the university vision and goals; however, it is still too soon to see the outcome because of our university’s short history” (University President, B).

Reputation and Identity

Apart from all the accredited programs at international standards, Omani universities are way behind in being identified as entrepreneurial universities; they are still trapped in teaching organizations in order to provide societal demands and produce skilled and educated graduates.

"Our university is well known in the region, and our rank is thirteen among Arab universities, however, our plan and ambition is to be in the top three universities during the coming few years” (Vice Chancellor, A).

“I’m not satisfied with our reputation internationally but this is obviously the result of the university’s performance, especially in research and innovation; we are still way behind and we are working on this now” (Deputy Vice Chancellor, A).

“Among GCC region yes our University is one of the top but comparing with international standards we are way behind” (Professor, A).
"Internationally our university is still way behind, but it is one of the top universities in Oman and the GCC region” (University President, B).

III.7.4. Phase Three: In-Depth interviews – Policy and Decision Makers

The first phase focuses on the external forces that can be seen as either supportive of entrepreneurialism or obstacles to it. This translates the availability and effectiveness of policy instruments and regulations with regards to entrepreneurial approach in Oman.

In this phase in-depth elite interviews have been conducted with the following decision and policy makers: the Minister of Oil and Gas, the Minister of Trade and Industry, the Minister of Higher Education, the Secretary General of The Research Council – Oman, the Under Secretary of Higher Education, the president of the Education Sector at the State Council, and two university presidents. It is worth mentioning that the above are members of either the Cabinet, the Supreme Council for Planning, the State Council, or the National Education Council. The analysis of the in-depth interviews are associated with analysis of official Omani Policy documents, namely, Oman Vision 2020, His Majesty’s annual speeches, 2011, 2012, Oman National Fifth Year’s Plans, and Oman: the Development Experience and Investment Climate, 2008. As discussed in Chapter Six

The appendix (11) shows the themes and the questions that have been set up to explore the external forces (external environment) that affect universities’ transformations.

II.8.4.1. Political Will towards Entrepreneurship

The main documents that highlight political will regarding the role of education in socio-economic development in Oman are the Oman vision, 2020 and H. M.’s speeches (2011, 2012).

"Development of human resources and upgrading the skills of Omani nationals – to keep abreast of technological changes, to meet the demands of knowledge-based economy and of increasing globalization – has been and continues to be a policy area of highest importance in Oman’s developmental planning. In the ringing words of H.M. Sultan
Qaboos – “we have always affirmed....that the human being is the ultimate goal of the development process and its instrument and means at the same time” (MONE, 1995).

“As education is the basic pillar of progress and development, and in order to produce a responsibly aware generation with expertise and skills, and aspiring to a higher level of knowledge, it is necessary to conduct a comprehensive assessment of the educational march in order to achieve these aspirations and benefit from the available job opportunities in the public and private sectors” (H.M.’s Speech, 2011, p. 4).

“The state, with all its civil, security, and military institutions, cannot continue to be the main source of employment, as this calls for a capacity beyond its reach and a mission that the state cannot sustain forever. The citizens have to understand that the private sector is the real source of employment in the long run” (H. M.’s Speech 2012, p. 5).

“Hence one of the priorities of the current stage of development and the next stage which we prepare for is to revise the educational policies, its plans and its programmes, which need to be developed to keep pace with the changes that the country is going through. More attention should be accorded to the requirements imposed by scientific and cultural development towards the evolution of a generation armed with awareness, knowledge, and the abilities required for worthwhile work” (H. M.’s Speech 2012, p. 6).

The above official documents can be seen as directions for developing polices that align with Oman’s vision. The documents also highlight that seeking secured jobs for young Omanis within the government sector is not a choice any more, as 60% of the Omani population are job seekers (working age). This means that alternatives are needed and job seeker’s need to be job creators instead. Therefore, the need for reviewing the education system (policies and programs) has become essential. As a result, His Majesty Sultan Qaboos has issued the Royal Decree No 48/2012 that established the Education Council, which is authorized to review, monitor, and develop national education strategy, policies, and programs. Consequently, higher education institutes, and specifically universities, are facing huge challenges in order to catch up with the socio-economic demands. Omani universities, therefore, are required to re-think and re-structure themselves internally and externally in order to transform from the traditional approach of focusing on teaching and research to the entrepreneurial approach that allows more engagement with external environments, especially industry and private sectors.
However, the in-depth interviews with policy makers reveal that there is no clear national strategy of how to diversify the Omani national economy and what the role of universities towards a knowledge-based economy should be.

"There is no education law in Oman yet, so we in my committee are working on the Omani education law framework that will guide all education sectors towards the same national direction, I hope" (State Council Member for Education).

"It is not clear to us as higher education authorities what the market and industry sector demands; there is no clear national direction" (Decision Maker).

In addition, there is misalignment between sectorial strategies, absence of research and innovation policies, and the gap between education system outcomes and industry demands, as a result of unclear national strategy. This is why His Majesty has issued the Royal Decree No 85/ 2012 to establish a Supreme Council for planning, which is tasked with developing national strategy and supervising the alignment of sectorial strategies.

"We have noticed that there is a misalignment between sectorial strategies in translating His Majesty’s direction, therefore, it is our role at the Supreme Council to supervise all sectors and find communication channels between them" (Decision Maker).

The absence of national strategy leads to fragmented sectorial strategies which cause a misalignment on translating His Majesty directions. Therefore the SCP has the responsibility to tackle this issue

### III.7.4.2. Education, Research and Innovation Policies

The current situation in Oman, the desires of the Omani people for diversification of the national economy, and the shift towards a knowledge-based economy suggest that research institutes and universities should focus mostly on applied research, however, the absence of research and innovation policies leads the researcher to perform interest-driven research activities rather than policy-driven activities.

"We are aware that up to now all research activities have been interest-driven in the absence of clear research and innovation policy, however, the establishment of the
Research Council will guide the research institutes and universities in a new national direction, we hope" (Decision Maker).

"The focus during this period is to complete the basic infrastructures for economic diversification, such as tourism, agriculture and fishing, and SME y support. Moreover, the knowledge and research sector is in the national agenda for the coming years" (Decision Maker).

The absence of research and innovation policies in addition to uncompleted research and innovation infrastructure is seen to be a hold-back constrain toward entrepreneurial approach.
III.7.5. Phase Three: In-Depth Interviews - Industry Stakeholders

III.7.5.1. Omani Industry Size

The Industry sector is where the main shift is expected. The non-oil industry sector’s contribution to GDP is expected to rise from 8.4 percent in 1995 and 14.2 percent in 2006 up to 29 percent in 2020 (MONE, 2008, p. 19).

The percentages that are mentioned above have not been achieved, and based on the interviewees’ responses there are three main reasons for this:

"1) Oman is still establishing the necessary infrastructure for such movement; 2) These changes still depend on oil and gas revenue; 3) The lack of skilled human resources in this area” (Decision Maker).

According to the above observation, industry in Oman is not yet ready to absorb the universities’ research and innovation outcomes:

"The Omani industry is still too small in size to absorb universities’ research projects, which does not encourage the academic sector” (Decision Maker).

"The industry in Oman is not aspiring to innovative products; it still cannot accommodate research and innovation outcomes, and most industry firm have no research unions” (Active Researcher).

III.7.5.2. Knowledge-Based Industry Capabilities

Regardless of the strong support at national level for establishing an SME body in order to promote and foster industry capabilities that focus on knowledge and innovation, the industry sector is seen to be unsteady because the large companies are still focusing on oil and gas, the sustainability of industry depends on oil and gas availability rather than knowledge and innovation capabilities, and SMEs are mostly focusing on the local value chain.
"We are aware that the absence of clear industry policy towards knowledge is considered a key factor in industry failure to become knowledge-based, however, we have the research performance as a key indicator in evaluating the industry firms' performance at national level, and this, we believe, will soon lead to the establishment of a clear national industry policy towards knowledge and innovation" (Decision Maker).

"The oil age culture is still causing the industry sector not to be ambitious about expanding their value chain from local values to the global market, and I believe that innovation is the key factor for sustainability of the industry sector" (Decision Maker).

In addition, the Intellectual Property (IP) system is not mature in Oman, and there are long procedures and challenges which prevents researchers and the industry sector from looking for innovative products. Therefore, most industry firms are lacking research and innovation unions and facilities, as there is no national policy to reinforce this issue.

"I personally believe that the IP system in Oman is still complicated and challenging for both industry and academic sectors when it comes to registering their patents and project outcomes. We are now working with WIPO in order to resolve this issue" (Decision Maker).

III.7.6. Documentary Analysis

As discussed in Chapter Six, the documentary analysis helps to validate and triangulate the finding from the in-depth interviews with decision makers and industry stakeholders. The following Omani official document quotes explain the desire of the Omani government to diversify the economy and no longer totally rely on oil and gas.

“The private sector is one of the basic pillars of development, both in the economic concept, which represents commerce, industry, agriculture, tourism, finance, and the economy in general, as well as the social concept, which denotes human resources development, training, the upgrading of scientific and practical skills, the offering of new employment opportunities and incentives to take up jobs in the private sector” (H.M.'s Speech, 2012, p.4).
This highlights the importance of increasing the private sector contribution to socio-economic development.

“The economy will no longer be an oil-reliant economy in 2020. It is envisaged to be a diversified economy with higher levels of savings and investment. The sources of national income will be diversified with the non-oil sector assuming the primary role” (MONE, 2008, p. 18).

It has been recognized at national level in Oman that relying on oil and gas to dominate national revenue is not an option for Omani future generations.

“The areas with considerable potential for domestic and foreign private investment in Oman include natural gas based projects - petrochemicals, fertilizers metallurgy; privatization areas – telecommunication, power, water, development & management of ports; tourism; information technology & Arabic software; mining; fisheries; industry and manufacturing including automobiles components, drilling equipment, electronics, pharmaceuticals, processed foods & fast moving consumer goods” (Ibid p. 58).

“PEIE is positively enhancing Oman’s position as a leading centre of manufacturing excellence, business innovation, and entrepreneurship” (Ibid p. 104).

There is no doubt that Oman has great potential for economy diversification, with several areas, such as information technology (IT), tourism, agriculture and fisheries, mining, oil and gas all seen to be promising avenues that can contribute significantly to national economy development and consequently GDP of Oman.

“The Innovation and Support Centre envisages creating a local ICT center with world-class capabilities, managed and operated by highly trained local Omani talent. It is based on the following value proposition of creating new jobs and incubating innovative ICT projects to promote growth within this sector. The center’s housing experts in selected knowledge domains will support knowledge transfer to Omani nationals and promote innovation in public sector service delivery and enable government leverage for their investments” (Ibid p. 64).
The ICT sector in Oman is well-known regionally and internationally, and huge initiatives have been accelerated recently in this sector. However, the weak collaboration with the academic sector is the main obstacle preventing more knowledge-based innovation.

“The Sultanate is a country with a rich cultural heritage and ancient history that goes back thousands of years. Scenic beauty and variety is a special natural attribute of Oman. A visitor can enjoy a vast range of activities ranging from beach-sports to camping in beautiful mountains or just exploring the adventures in the sands of the desert” (p. 65).

“Tourism opens up rich vistas for domestic and foreign investment in hotels, resorts, and tourism-related services in Oman” (p. 66).

Omani cultural heritage and natural geography of Oman is recognized as one of the most attractive venues in the Arab Peninsula region, which is highly promising for the tourism industry.

III.7.7. Conclusion

The data findings and analysis that have been collected from interviews with two Omani universities, policy makers, and industry stakeholders, reveal interesting results that highlight a push-and-pull effect in moving Omani universities towards becoming entrepreneurial organizations. As this study investigates the organizational and external environment entrepreneurial approach, two clustered powers can be identified: internal organizational power and external power, both which have the role of push-and-pull forces.

The data shows that the external powers effecting universities on their path towards entrepreneurialism are national policy framework and industry capabilities. Despite the clear directions from His Majesty for empowering the educational system and focusing on quality education that links the education outcomes with socio-economic demand, unclear national strategy is pulling this approach back, and there is no clear indication of the direction in which the universities need to move.
In addition, the misalignment of sectorial strategies for implementing His Majesty’s directions is also a hindrance. Moreover, the unsteady industry capabilities and immature IP systems are not helping to absorb universities’ outcomes (graduates and research and innovation output).

However, there is a promising approach to the entrepreneurial culture shift that focuses on SMEs at national level and establishes SME authorities to support young Omani entrepreneurs.

The internal powers inside the university that reflect the five dimensions also demonstrate some contradictory behaviour with regards to the entrepreneurial shift of Omani universities.

The data that has been collected from interviews reveals the following. Firstly, the managerial dimension reveals that Omani universities, both public and private, have well-written strategies with clear vision and goals, strong executive leadership, and fairly shared university governance. However, they face a unsteady implementation process and unclear decision making processes, in addition to unclear appointing systems for university board members.

Secondly, the funding dimension is problematic in terms of the systems for allocating and releasing funds. Thirdly, the mission dimension, despite the availability of adequate infrastructure, is very limited in terms of initiatives for entrepreneurial education, and suffers from a lack of critical mass, a insecure promotion system, absence of research and innovation policy, and an uncompetitive faculty salary system. Fourthly, the external collaboration dimension, which is seen as the key trigger for entrepreneurship, is problematic in that most collaboration is with large oil and gas companies, which aim to solve problems specifically in their field. In addition, Omani universities are lacking technology transfer programs, commercialization programs, expert mobilization programs, and strong collaboration programs with industry, especially SMEs. Fifthly, the cultural dimension is problematic because Omani culture is too bound up with oil at individual, institutional, and industry level. This creates in many cases an unskilled work force, a weak education system, unsteady industry capabilities, and a wobbly institutional ecosystem, with significant trust gaps.
Nevertheless, the Omani people at all levels, individual, organizational, and national, despite current gaps and challenges, are keen to make the changes for a better future for the current and coming generations, and seek to move towards a highly developed Omani culture.

The thesis now goes to Data analysis, Chapter Nine in order to synthesize the Omani universities profiles based on the implementation of the entrepreneurial university framework in Oman.
Chapter Eight: Discussion of the Research Findings - Case of Oman

III.8.1. Introduction

This chapter addresses the research questions which belong to the second part of the research project. The entrepreneurial university dimensions framework has been applied in order to explore two Omani universities in terms of their entrepreneurial potential.

Therefore, the chapter discusses the results that has been gathered by the semi-structured interviews and has been analysed by template analysis using the thematic approach. Each organizational dimension will be discussed as a standalone dimension in order to position Omani universities’ organizational dimensions based on the entrepreneurial university framework that has be described in Part I (see Chapter Two on this thesis).

The chapter concludes by highlighting Omani universities’ profiles with regards to entrepreneurialism.

III.8.2.Discussion of Entrepreneurial University Organizational Dimensions

III.8.2.1. Managerial Dimension

According to data that has been presented in Chapter Eight, the results appear to be the follows:

Omani universities have developed well-written strategies with clear visions towards the entrepreneurialism described in His Majesty directions. However, there are unsteady implementation processes. There are several reasons behind this, which we can distil from the interviewees’ opinions: the top-down decision making process, unbalanced decision-making processes between internal members and external parties, despite a balanced selection of board members (decisions are mostly made by the academic council), imbalance between academic values and university strategic desires, and unclear university strategic direction for most of the academic departments. This data suggests, based on managerial dimension’s characteristics (Figure1), that Omani universities are still
centralized management style, despite a propensity to be to some extent both university (A) and university (B) - option 2: hybrid management style.

II.8.2.2. Funding Resource Dimension

The availability of funding is not seen to be a major concern for the interviewees. The allocation and release of funds are problematic, as seen by them. This can be explained by the fact that a large percentage of the funds for public universities comes as a block fund from the government, while the private universities get most of their funds from student fees, government subsidies, and some consultancy services. However, public universities in particular are not convincing the government to allocate more funds to them. This is because of universities’ lack of critical mass and unsteady performance in research and innovation on KPIs. The project-fund that comes from the Research Council and large oil and gas companies is also open, with an unlimited cap for both public and private universities. This fund is allocated based competitiveness (the Research Council spends only 10% of its total budget, SCP, 2012). Yet, universities are not yet able to maximize the income from this stream for the same reasons (lack of critical mass and weak performances). In addition, the third funding stream/ private fund provide a very limited contribution, as it is based on weak linkages and collaboration between academia and industry and private sectors. However, there has recently been encouragement from His Majesty to increase the private sector contribution.

In view of the above and based on funding resource dimension’ characteristics (Figure 2) university (A) is a Block Fund- oriented. However, it has the potential to position itself in option 1: to the maximum, as long as it genuinely justifies the funding allocation, increases its critical mass, and increases the quality of its performance in order to attract all funding agencies, including industry sectors. On the other hand, university (B) is a Private Fund- oriented, but can be positioned in option 2: project-oriented, where it can maximize its income from Research Council grants and oil and gas companies only.
III.8.2.3 Mission Dimension

In light of the interviewees’ opinions regarding teaching, research, and innovation/entrepreneurship, one can say that Omani universities are still largely seen as teaching universities. There is only one public university (SQU). This university is seen to be the most mature university in terms of infrastructure and a long education history compared with the other five universities. Therefore, teaching/education is seen to be the core mission of Omani universities. However, as Oman’s desire is to foster entrepreneurship education based on His Majesty directions, some Omani universities introduced entrepreneurship courses across all departments as elective courses. The aim of this is to spread entrepreneurship awareness across all universities. In addition, despite the availability of highly equipped infrastructures in both study cases, there are no technology-led programs that can be seen as a pathway towards entrepreneurial education.

The second mission - research activities, is seen to be a second core mission in both cases, yet this mission is lagging behind in terms of performance and quality standards. The main reasons for this are as follows: Firstly, a lack of critical mass, despite the availability of funds from first and second streams: block grants and project-funds, especially from the Research Council’s funding programs with unlimited caps (strategic, grant, open research grant, innovation support programs, research commercialization programs, and publication programs) (TRC, 2013). One of the main reasons behind the lack of critical mass is the weak salary system in Omani universities, which is not internationally or regionally competitive, and consequently not able to attract highly qualified researchers. Secondly, there is a insecure promotion system for academic staff that focuses on paper publications regardless of the quality of the research. This is a very de-motivating factor for academic staff. Thirdly, there is an absence of mature innovation offices/technology transfer offices (TTO) that can help to facilitate innovative research activities. Fourthly, there is an absence of clear research and innovation policies at both national and organizational levels; most research activities are interest-oriented rather than policy-oriented. This affects negatively the national need for applied research activities for the socio-economic development of Oman. Fifthly, there are unsteady and complicated IP systems at national level and at organizational level, which decelerate innovative research activities.

In sum, the third mission/entrepreneurship in Omani universities is seen to be lagging behind.
In view of the above and based on mission dimension’s characteristics (Figure 3) one can say that both university (A) and university (B) are still perform traditional teaching and research activities. They both have the potential to function within option 2: Hybrid Technology, as this dimension has the support of funding and infrastructure availability, and is working to increase the qualified critical mass through the new initiative from His Majesty’s sponsorship award, which has enabled two-thousand Master’s and Doctoral degree scholarships per year (MOHE, 2011).

III.8.2.4 External Collaboration Dimension

One can say that this dimension is the reflection of how strong the entrepreneurial-led organization is, as via this dimension the interaction between internal organization and external environment takes place.

In this regard, Omani universities have weak linkages and collaboration networks. The main collaborations are with the large oil and gas companies, in order to provide oil and gas solutions. It is important to highlight that this collaboration is mostly project-driven, in order to explore the extraction of crude oil in the very complex Omani geological environment, therefore the collaboration is not to produce technology for oil and gas fields in downstream or upper stream industry. Therefore, this collaboration leads mostly to knowledge application rather that technology transfer or technology application. On the other hand, the collaboration with Omani SMEs is seen to be insignificant, as most SMEs are not knowledge-driven firms and they lack R&D unions. However, the establishment of the Industry Innovation Centre (IIC) by the Research Council (TRC), in order to facilitate the collaboration between the industry sector, specifically SMEs, and the academic sector shows promise in accelerating this collaboration. In addition, there is weak interaction and collaboration between all related actors (knowledge producers - universities and research centres, funding agencies - public and private, and knowledge users - industry and society) regarding the prioritizing of education programs, research activities, and innovation/entrepreneurial activities. The establishment of the Supreme Council for Planning (SCP) at national level is a promising approach towards creating coherence between all related actors and agencies. In this regard and based on external collaboration dimension’s characteristics (Figure 4), both university (A) and university (B) have
unsustainable External collaboration. However both have potential to position themselves in option 1: Strategic Collaboration, with oil and gas companies and The Research Council if SCP and IIC/ TRC give them the required support. However, this is not yet the situation in Oman.

III.8.2.5 Cultural Dimension

Oil-Age Syndrome - Drivers for Change

The cultural dimension appears to be the most challenging dimension to be investigated in any particular area around the world. The reason behind this observable fact is that culture needs at least one generation (thirty to forty years) for its effects on a society’s attitudes and behaviours to be seen. Therefore, since the oil age in Oman is approaching forty-three years, how Omani culture at all levels has been affected by it can be seen (Oil-Age Syndrome). Three interrelated points have been identified: Individual, Institutional, and Industry (the three levels).

In this regard, the interviewees’ perspectives of change drivers starts with the first, Individual attitude, where free service, and secure jobs for all Omani people has led to an absence of desire for discovering new income sources, and affected work quality, in addition to life-style. These attitudes also affected individual desire for seeking innovation-based knowledge, and consequently the entrepreneurship mind-set. These individuals are part of university communities as researchers, students, and top level managers.

"The new young generation, as a result of living in the oil age, are used to having free services and secured government jobs, which leads through the years to attitudes of sluggish work habits and avoiding taking risks; this need to change as the government no longer can provide a secured job for all" (Decision Maker).

"The lifestyle of the oil age generation, at home with all kind of comforts, has also unfortunately translated into work habits" (Active Researcher, B).

The second level, is institutional environment, is also affected by the oil-age and the outcome of individual attitudes. Therefore, the higher education institutes are seen to be lacking an eco-system that provides clear strategies with clear visions, goals and core
processes. This results in the top-down decision making approach, and consequently the trust gap between the strategic level and the operational level in the same organization.

"There is a trust gap which obviously be seen through the seeking of solutions from the 'top man' in the organization for every single detail" (Decision Maker).

"I believe that the absence of a clear eco-system is the key reason for such attitudes, in many cases it is not clear to me what my role really is, and what I am supposed to do and with whom" (Active Researcher, A).

The third level, the Industry sector, is affected by a weak education system that produces mismatched graduates with industry and market place demands. This leads extra challenges for Omani culture, known as ‘Hidden Trade’, where all SMEs in Oman are contorted by foreigners and labelled with Omani names. This cases work against the knowledge-based economy which Oman seeks.

"I believe the Omani education system is lacking quality, especially at school level/pre-university level, which leads to unskilled graduates mismatched with market and industry demands" (University President).

"In my opinion the factor most affecting Omani socio-economic development is ‘Hidden Trade', which prevents young Omani people from starting their own SMEs" (Decision Maker).

"Our final projects are not accepted by the industry sector because the results do not attract them to support us for further developments” (Final Year Engineering Student).

As was mentioned earlier in Chapter Two of this thesis, the cultural dimension is the most difficult dimension to be measured and examined.

Therefore, in view of the interviewees’ opinions and perspectives on the cultural dimension in Oman, and how it has been influenced by the oil age, it appears that at the individual level, Omani individuals before the oil age were seen to be entrepreneurs, and most Omanis had their own business or family business, especially in agriculture, fishing, and handicrafts, where Omani products gained an international value chain overseas. However, the oil age provided secure jobs and free services for all Omnis, which led to a change in the Omani lifestyle. Individuals left their businesses to be tended by expatriates that knew nothing about Omani agriculture, fishing culture, and environment. This led
through the years to Omanis losing their values and knowledge in these fields. The easy lifestyle with housemaids and servants created a dependent generation, and this is reflected in their learning and working habits.

Secondly, at intuitive level, before the oil age, Oman had certain institutional systems that administered life in villages and cities via collaborative networks between all community members. This helped to create a very innovative irrigation system named the “Falaj System”, which was designed to be economically and user friendly in the field of agriculture. The fishing tradition was also created in a manner that did not harm the marine resources. This created an ecosystem where each individual knew exactly where and when to use the irrigation system without any conflict between the individuals. In addition, each individual had a specific role towards preserving these systems. All Omani communities were designed to be environmentally friendly and save energy (city planning). However, during the oil age the communities became larger, and there was a need for more facilities for the expansion of modern lifestyle. There were also shortages of water, for which there is no other alternative. All this left the Omani farms and Omani family businesses under the control of expatriates with few skills in these fields. In addition, the expansion of infrastructures to accommodate the increasing population led to unfriendly city planning systems, and people consuming a huge amount of energy in their modern buildings.

Finally, there is the industry level. Before the oil age most Omani people were entrepreneurs with SMEs, owning individual businesses or family businesses, such as markets, farms, handicraft factories, and fishing boats. However, during the oil age Omani entrepreneurs disappeared and were replaced by expatriate entrepreneurs.

The following table (14) summarises the author’s observation about the cultural changes during the oil age (one of future research avenues suggested to this):

<table>
<thead>
<tr>
<th>Levels</th>
<th>Before Oil Age</th>
<th>During Oil Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual</td>
<td>Individual/family business</td>
<td>Secured job from government</td>
</tr>
<tr>
<td></td>
<td>Hard working individual</td>
<td>Lazy work habits</td>
</tr>
<tr>
<td></td>
<td>sustainable lifestyle</td>
<td>Modern lifestyle- high consumption</td>
</tr>
<tr>
<td>Institutional</td>
<td>Co-operative network within small communities with simple ecosystem</td>
<td>Top-down systems</td>
</tr>
<tr>
<td></td>
<td>Environmentally friendly city planning</td>
<td>Weak co-operation between large institutions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unfriendly city planning with more energy consumption</td>
</tr>
<tr>
<td>Industry</td>
<td>Omani entrepreneurs with high skill Omani SMEs</td>
<td>Expatriate entrepreneurs with few skills</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Expatriates SMEs and ‘hidden trade’</td>
</tr>
</tbody>
</table>

Table 15: The Oil-Based Cultural Changes in Oman
Consequently, the quality of Omani education has been affected. The quality of research and knowledge-based activities has also been affected, and thus there is a mismatch between education and research activity outcomes and national socio-economic demands. This has led the government of Oman and policy authorities to re-think and evaluate all the related consequences. This was clearly stated by His Majesty in his national speeches of 2011 and 2012, reviewing and evaluating all education policies and programs, and linking education outcomes with market demands and national socio-economic development visions and goals. This shows that both universities with regard to cultural dimension on figure (5) are still traditional-based.

III.8.3. Discussion of Entrepreneurial Environment Policy Spaces

A flexible environment with a variety of policy spaces and policy instruments is arguably the most supportive platform for boosting entrepreneurial transformation within universities. However, this atmosphere is facing huge challenges in Oman based on the data that has been revealed: “From a policy perspective while the importance of private sector development and entrepreneurship are acknowledged in the eighth five year plan (2011-2015), there is no separate policy framework drawn up for promoting entrepreneurship culture or SMEs in Oman” (Buckley and Rynhart, 2011, p. xiv).

These challenges emerge from the following: 1) A weak education system, especially at basic/general level, where there is no national education law yet in Oman (the Education Council and State Council are working on developing the education law framework for Oman); 2) The absence of national innovation systems (TRC is working on developing national innovation strategy); 3) A immature IP system (Oman is now working with WIPO to improve national IP systems for Oman); 4) The absence of clear research and innovation policy and policy instruments (most research and innovation activities are interest-driven); 5) Weak collaboration between R&D institutions; 6) The absence of clear national ERIE funding spaces/ systems (limited contribution from the business sector in R&D); 7) Misalignment between sectorial strategies, as there is no clear national strategy that translates His Majesty’s directions (mismatch between education outcomes/graduates and research activities, and industry and market demands).
His Majesty, in his annual speeches (2011 and 2012), called for urgent action to review and evaluate all education policies and programs which identify gaps and propose solutions to bridge these gaps. The focus in this procedure is to concentrate on producing highly skilled citizens that are able to cope with knowledge-based society in order to contribute to a knowledge-based economy. In addition, he emphasized the importance of increasing the private sector’s contribution to socio-development.

Furthermore, His Majesty declared the establishment of the Supreme Council For Planning (SCP) that authorized development of a national strategy that aligns with Oman Vision 2020 and beyond, with the involvement of all related actors, in addition to facilitating all sectorial strategies to ensure coherence with the national strategy. “Oman’s political system is centred on Sultan Qaboos... All important decisions are made by the Sultan – he retains the positions of head of state and prime minister and formally also the positions of head of defence, finance and foreign affairs” (Buckley and Rynhart, 2011, p. 1).

All these initiatives are still to take place in Oman; however, they show the strong desire of the Omani people and the political authorities to move towards knowledge and entrepreneurial culture for a better future for the Omani nation.

Now we go on to discuss the Omani external environment. This includes industry readiness and Omani NERIE-FPS.
III.8.4. Discussion of Oman Industry Readiness

The industry sector acts as a funding agent on the one hand, and as a knowledge user and technology transfer agent on the other. It is seen to be the strategic partner of and actor in the era of entrepreneurship economies and the national ERI systems.

Nevertheless, Omani industry is not yet ready to be a strategic contributor to the ERIE system, because industry size and industry capability in Oman is not ready to accommodate the research and innovation outcomes. There are several factors relevant here: 1) The Oil and gas industry is dominant, with few large companies managing this industry. Omani socio-economic development is heavily dependent on oil and gas revenues, and most R&D contribution in this field is project-oriented, seeking to find solutions for exploring and extracting crude oil and gas from the tough Omani natural environment. Therefore, technology transfer is yet to take place in this field; 2) The non-oil industry also depends on oil and gas revenues, and most revenues are going to complete the basic infrastructure of Oman; 3) The global oil price is affecting the national income; 4) Lack of skilled human resources in the field of industry because of the mismatch with education outcomes; 5) The SMEs are not knowledge-based firms and are mostly owned by expatriates practicing “hidden trade” (the SME is registered by an Omani agent, but the actual owner is an expatriate, meaning that all revenues are transferred outside Oman and so do not help the Omani economy); 6) Weak collaboration between academics and SMEs based on mismatched interests; and 7) Absence of clear national industry policies.

In order to meet the above challenges, His Majesty called for a national SME symposium (2012), which evaluated and assessed all SME aspects and developed with an SME strategy that included public funding support programs, private support programs, and national SME policy spaces. The symposium outcomes have made several key decisions relating to support for young Omani entrepreneurs in their path to establishing their own SMEs. For example, four dimensions have been set to take place by no later than 2014: 1) Accelerate entrepreneurship culture; 2) SME support programs and opportunities; 3) SME laws, regulation, and policies; and 4) Funding and investment support programs (SMEs 2012, Oman). These decisions are also supported by the private and business sector. “The Omani Government is also focusing on promoting growth sectors, such as tourism, power generation, and infrastructure development in the hope that this will create business opportunities.”
“Moreover, the Research Council in collaboration with related stakeholders/the Ministry of Agriculture and Fisheries has established a family farms support program in different regions in Oman in order to accelerate and facilitate family businesses in the field of agriculture” (Interviewee, Policy Maker).

The Omani path of diversifying of the national economy, besides oil and gas revenues has invested heavily in initiating “Mega-Projects” in order to expand the thorium industry in different parts of Oman, such as the capital, Muscat, Khasab, north of Oman, and Salalah and Doqum, south of Oman. In addition, it has accelerated the free zone trade in Sohar in order to attract more FDI. The following statement highlights Oman’s potential with regards to expanding industry and diversifying national income.

"The areas with considerable potential for domestic and foreign private investment in Oman include natural gas based projects- petrochemicals, fertilizers metallurgy; privatization areas – telecommunication, power, water, development & management of ports; tourism; information technology & Arabic software; mining; fisheries; industry and manufacturing including automobiles components, drilling equipment, electronics, pharmaceuticals, processed foods & fast moving consumer goods” (Oman, 2008 p. 58).

With the above initiatives taking place in Oman’s industry sector it will soon be ready to play a significant role in the Omani ERIE system. Until then the industry sector still has challenges to face.

III.8.5. National ERI Funding and Policy Space in Oman

In Part I an entrepreneurial university framework has been developed that can be applied in any culture. In Part II this framework has been examined and applied to four European case studies. In Part III the framework has been empirically applied to an emerging country, the Sultanate of Oman, where it has revealed missing links. This necessitated the exploration of the type of relationship and interactions between Omani universities and the external environment of Oman. This section explores the relationship between universities’ roles and their performance with external environment funding and policy spaces, in order to provide examples that offer crucial lessons for Omani policy makers.
The in-depth interviews have enabled the construction of a NERI-FPS framework that has been used to further investigate the Omani external environment in comparison to the four European cases in Chapter Five.

The following table (16) highlights the Omani case in relation to the NERI-FPS framework. The framework is applied to Oman according to the findings.
### III.8.5.1. National ERI Funding and Policy Spaces

<table>
<thead>
<tr>
<th>Level</th>
<th>Modality</th>
<th>Origin</th>
<th>Actors</th>
<th>Authority rights: Which organizations… decide on funding?</th>
<th>Evaluation: Is there a national evaluation system?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Project based</td>
<td>Public-private</td>
<td>Government/ministries</td>
<td>Ministry of Finance and Research Council in addition to national oil company PDO.</td>
<td>Government through the five years plans.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Block grants</td>
<td>National-international</td>
<td>Funding agencies</td>
<td>Main funders of public research: Ministry of Finance, research councils, national oil company.</td>
<td>No clear strategic plan. Based on organizational agenda (interest driven).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NA</td>
</tr>
</tbody>
</table>

#### In 2011 the Oman GERD was 27.975 billion OR, corresponding to 0.13% of GDP. This was below the EU-27 average of 2.03%. Provided by the research councils, circa 10.7 million OR/year. Government and higher education combined represented (27 million) 75% of R&D expenditure in 2011 against 25% from business. Business (8.5 million).

<table>
<thead>
<tr>
<th>Research performers</th>
<th>Act?</th>
<th>Is it linked to funding decisions?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primarily HEIs, Oil and Gas Ministry, and government research institutes.</td>
<td>Primarily HEIs, Gov. research institutes.</td>
<td>NA</td>
</tr>
</tbody>
</table>

Table 16: National Funding and Policy Space, Oman
Oman is an emerging country which lacks a comprehensive Funding and Policy Space.

The following illustrates the ERI Funding & Policy Space situation in Oman.

**ERI Funding Arrangement:** The ERI funding level in Oman is low; it is only 0.13% of Omani GDP. Oman has limited ERI funding resources. Most ERI for universities comes from the government (Ministry of Finance). The private and business sectors are very weak in terms of ERI funding. In addition, there are no international funds coming to Oman due to international collaboration.

The main ERI funding actors are HEIs, the Research Council, the Ministry of Oil and Gas, and government research institutes, such as the Ministry of Agriculture, and the Ministry of Health.

**ERI Governance:** The authority rights body is the government who decide on the overall level of funding through the national five years plans. There is no clear national strategic plan for research priorities, however, each institute prioritises its own research activities based on His Majesty’s direction for strategic grants and the rest of the research activities are interest-driven. This represents Fragmented National Strategy. More details can be found in Appendix (7).

The main ERI performers are HEIs and public research institutes, such as the national oil company, the Ministry of Agriculture and the Ministry of Health.

There is no national evaluation system; each organization provides its own annual review report, and it is not linked to funding.
A - ERI - Funding Arrangement

<table>
<thead>
<tr>
<th>Country</th>
<th>Block grants</th>
<th>Project grants</th>
<th>Public/private</th>
<th>National/international</th>
<th>Government/Ministries</th>
<th>Funding agencies</th>
<th>Research performers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oman</td>
<td>Low 0.31 (2011)</td>
<td>Provided by the Ministry of Finance for public universities and HEI.</td>
<td>Provided by the research councils. No accurate data.</td>
<td>In 2011 government &amp; HEI combined was 75% of R&amp;D expenditure against 25% from business.</td>
<td>NA</td>
<td>No clear strategic plan. Based on organizational agenda (interest-driven)</td>
<td>Ministry of Finance, Research Council, National oil companies.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Country</th>
<th>Authority rights: Which organisations decide on funding</th>
<th>decide on priorities</th>
<th>act</th>
<th>Is there a national evaluation system? Is it linked to funding?</th>
<th>‘Peer review’ or ‘indicators’ based?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oman</td>
<td>The Ministry of Finance through five years plans.</td>
<td>No clear plan - mostly interest-driven. HEIs and public research institutes.</td>
<td>No</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

Table 17: ERI Funding Arrangement - Oman

B – ERI - Governance

Table 18: ERI Governance - Oman
III.8.5.2. Analysis

III.8.5.2.1. Variety and Flexibility of Funding Landscapes

The data from the tables (17 &18) above reveals that overall, 75% of R&D in Oman is funded by the government, and 25% by the business sector. However, more than 50% of universities and higher education institutes are funded by public funds through block grants. There is no international fund for Omani R&D. Most of the R&D is undertaken in public universities and government oil and gas companies. Unlike the four European cases in Chapter Five, Oman has very limited funding opportunities.

III.8.5.2.2. Variety and Flexibility of Policy Making Landscapes

The case of Oman, where there is no clear national plan/policy toward ERI spaces, can be considered as a ‘Fragmented Strategy Pattern’, where most research activities are based on researchers’ interests or industry-project oriented (Interviews with Omani policy makers).

III.8.5.2.3. Variety and Flexibility of ERI Characteristics

Unlike the four European cases in Chapter Five, Oman has very limited research and innovation programs. The programs that it does have are as follows: Strategic Research Grants (SRG), Open Research Grants (ORG), Educational Innovation Assistant Programs (EIAP), Academic Innovation Assistant Programs (AIAP), Community Innovation Assistant Programs (CIAP), and recently the Faculty Mentored Undergraduate Research Award Program (FURAP) (TRC, 2013).

The above programs, besides the interactions between ERIE actors, have been seen to enhance the professionalism in innovation and entrepreneurship activities inside universities and support highly qualified critical mass development (researchers, assistant researchers, and highly skilled technicians), in addition to enhancing the mobilization between academia and industry sectors, and aiding physical capacity building by sharing ERIE infrastructures.
To sum up, it is worth comparing the coherence between the Omani universities and the Omani external environment with the four European cases, in order to position Omani National ERI-EFPS. The following table shows the four European cases from Chapter Five, in addition to the case of Oman.
The following table (19) illustrates the coherence between internal organizations’ and external funding and policy spaces for the five case studies:

<table>
<thead>
<tr>
<th>Country/University</th>
<th>Entrepreneurial University Ideal Types</th>
<th>ERI Funding Spaces</th>
<th>ERI Policy-Making Landscapes</th>
<th>ERI Characteristics/The Rule of the Game</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norway/Norwegian University of Science &amp; Technology</td>
<td>Fully-fledged entrepreneurial organization</td>
<td>Variety of funding &amp; collaboration opportunities that allow universities to maximize their income.</td>
<td>Coordinated strategy.</td>
<td>Wide range of policy instruments. Flexible actor negotiation and interactions. Sufficient ERI critical mass and infrastructure.</td>
</tr>
<tr>
<td>Netherlands/ Twente</td>
<td>Fully-fledged entrepreneurial organization.</td>
<td>Variety of funding &amp; collaboration opportunities that allow universities to maximize their income.</td>
<td>Coordinated strategy.</td>
<td>Wide range of policy instruments. Flexible and harmonious actor interactions. Sufficient ERI critical mass and infrastructure.</td>
</tr>
<tr>
<td>United Kingdom/ Strathclyde</td>
<td>Blended technology organization.</td>
<td>Variety of funding &amp; collaboration opportunities that allow universities to maximize their income.</td>
<td>Centralized strategy.</td>
<td>Wide range of policy instruments. Flexible actor interactions. Sufficient ERI critical mass and infrastructure.</td>
</tr>
<tr>
<td>Sweden/Chalmers</td>
<td>Fully-fledged entrepreneurial organization.</td>
<td>Variety of funding &amp; collaboration opportunities that allow universities to maximize their income.</td>
<td>Coordinated strategy.</td>
<td>Wide range of policy instruments. Flexible and harmonious actor interactions. Sufficient ERI critical mass and infrastructure.</td>
</tr>
<tr>
<td>Omani Universities (A&amp;B)</td>
<td>Classic universities.</td>
<td>Public fund is the mail resource and very limited other opportunities.</td>
<td>Fragmented strategy.</td>
<td>Limited policy instruments. Lack of actor interaction. Lack of ERI critical mass and infrastructure.</td>
</tr>
</tbody>
</table>

Table 19: The Coherence between Entrepreneurial Organizations and Entrepreneurial Environment the Five Case Studies
III.8.6. Conclusion

This chapter has discussed the empirical findings of applying the Entrepreneurial University Framework in Oman. The discussion reveals that the two university cases of Oman can be identified as Classic University Types; however, they may have the potential to make some changes towards entrepreneurialism and to become Hybrid Technology University Types based on the degree of variety and flexibility in Omani universities as organizations.

This can be explained through the five organizational dimensions results. In the managerial dimension the two cases seen to have the same potential for option 2: hybrid management style. Regarding the funding resources dimension, one university, (A), has the potential to position itself within option 1: to the maximum, while the second university, (B), has the potential to position itself within option 2: project-oriented. Furthermore, in exploring the mission dimension in the two Omani cases it appears that both have the potential of positioning themselves within option 2: Hybrid technology, as teaching is still seen as the key core mission of Omani universities.

Regarding the fourth dimension, despite the weak collaboration and linkages between Omani universities and their external environment, the two cases have the potential of positioning themselves within option 1: strategic collaboration, based on their clear vision and desires, as long as they can manage to increase research and innovation capacity building. However, the cultural dimension presents the biggest challenge for both cases, as this dimension is highly affected by Omani oil-age culture, and it will take time to see the outcome of the transition towards entrepreneurial culture.

Considering the variety and flexibility of the external environment that represents the funding and policy spaces on the one hand, and the contribution of the industry sector as a key actor on the other hand, both are very limited and need significant effort from all related parties in order to offer a clear strategy and national direction for the future of Oman. The ERIE Funding and Policy Spaces System of Oman is lacking the variety of funding resource opportunities, and the national strategy is seen to be a ‘Fragmented Strategy’, based on the weak interaction between ERIE related actors. Despite the fact that the Omani government is focusing on creating business opportunities by promoting growth sectors, such as tourism, power generation, and infrastructure, the lack of a clear national
strategy with clear entrepreneurial policies is affecting the capability of Omani universities, Omani firms, and SMEs to create entrepreneurial culture.

Therefore, the SCP is facing pressure and challenges in its mission to develop a clear national strategy that satisfies all related actors and addresses His Majesty’s directions for the Oman vision 2020 and beyond. It is safe to say that Oman encounters significant issues in this regard, especially with limited co-operation and interaction between the key ERI actors.

PART III: CONCLUDING REMARKS

Despite the Omani nation’s desire to promote entrepreneurial culture at all levels: national level based on His Majesty’s directions, sectorial level, which is represented by an intermediate government body, and organizational level by fostering entrepreneurial education at Omani universities, this mission is facing some serious challenges.

The empirical data reveals that the Omani universities are ‘Classic Universities’ despite the efforts that have been made in both cases. The analysis shows that this situation may be due to several factors. These factors can be summarized as follows: 1) Absence of a clear National ERIE strategy towards entrepreneurship; 2) Limited ERIE funding opportunities, regardless of the availability of financial support at national level, due to weak funding allocation and releasing systems; 3) Mismatch between ERIE related agency strategies, which creates ‘Fragmented Strategy’; 4) Weak collaboration between ERIE related agencies, such as academic-industry collaboration, except for the oil industry; 5) Weak interaction between ERIE key actors. These factors result in limited variety and opportunities, and an inflexible ‘selection process’. Therefore, for Omani universities to transform into entrepreneurial organizations, an ‘entrepreneurial environment’ needs to be put in place, which is not there yet. Therefore, one can argue that the will is there but not the means.

The above five factors are seen to be vital for Oman in its path toward entrepreneurial transformation, despite that fact that they are beyond the ERIE-FPS framework which focuses on funding and policy spaces as rationalized in Part I (I.3.2.2). This makes using Oman as an empirical case a novelty of this thesis as it adds new values.

Now the thesis goes on to the final part. Part IV: Synthesis, Conclusion and Implication
Part IV: Synthesis, Conclusion and Implications

The key purpose of this chapter is to present the research results with the ultimate aim of addressing the research aims and questions. In addition, we will reflect upon the implications of the study for theory, science and policy spaces highlight the study’s limitations, and outline suggested future research avenues.

Chapter Nine: Synthesis, Conclusion and Implications

IV.9.1. Introduction and overview

The study has analytically demonstrated that the characteristics of the entrepreneurial university phenomenon have been under theorized during the last two decades. Therefore, three research aims have been developed: 1) To contribute to a better understanding of the organizational dimensions of the entrepreneurial university; 2) To contribute to a better understanding of the entrepreneurial-led external environment and how it align with the entrepreneurial-led university; and 3) To contribute to a better understanding of the importance of creating coherence between organizational changes and external environment in terms of funding and policy spaces.

The study, therefore, has offered a comprehensive framework for the entrepreneurial university (Part I of this thesis), which characterizes five organizational dimensions: managerial, fund resources, mission, external collaboration, and cultural. The study has used a deductive approach in order to build the entrepreneurial university framework/theory.

The framework has then been verified analytically by using four European universities seen to be entrepreneurial organizations. These four universities are from different countries, Sweden, the Netherlands, Norway, and the United Kingdom, in order to provide different landscapes.

The study argues that in order to create a comprehensive conception of entrepreneurship inside the organization/university, as well as in the external environment, and create
coherence between entrepreneurial university and entrepreneurial environment, two key elements are essential: variety of opportunities and flexibility of mechanisms.

The study has analytically demonstrated by further developing the funding and policy spaces framework (Nedeva et al., 2013) the soft causality between entrepreneurial organization/university and entrepreneurial environment. The study argues that for a total causality, more case studies and a wider range of landscapes are needed.

There is a fourth aim of the study, namely, to test the entrepreneurial university framework in an emerging culture occurring in Gulf countries with oil-based economies, in order to contribute to a better understanding of university roles in socio-economic development. Gulf counties with oil-based economies have the desire to diversify their economy and have seen that a knowledge–based economy could be one of the best options; therefore, the framework has been applied in two Omani universities and the opportunities and gaps relating to entrepreneurial transformation in Omani universities as well as the implications of their external environments have been identified.

The following pages illustrate the synthesis and conclusion of the ultimate results and the implications in two categories: first, the development of the theory, and second, the application of the theory in Oman as a case of emerging culture.

IV.9.2. Contribution to the Theory

This research has made theoretical contributions to the entrepreneurial university and entrepreneurial environment literature by providing a comprehensive framework of entrepreneurial organizations’ dimensions. The study has also made contributions towards verifying the soft causality between internal entrepreneurial-led organizations and external entrepreneurial-led environments. Moreover, the study has introduced several new theoretical constructs in the entrepreneurial university and the entrepreneurial environment literature that have not been yet discussed. These are as follows:

The *coordinated management style; hybrid management style; and strong influence for success* are characterizing the entrepreneurial university’s management style at strategic level, more explanation in next section (IV.10.2.1).
Furthermore in the literature of entrepreneurial environment, the three theoretical constructs are ‘centralized strategy’ which exemplifies the To-down authority-right actors; the fragmented strategy which exemplifies scattered and disjointed between authority-right actors; and the coordinated strategy which represents the coherence between all related authority right actors. In addition, ‘variety and flexibility’ concepts have introduced as key elements for entrepreneurial coherence. This is a novel way to understand the Entrepreneurial University and its Environment, and it also a novel development of the NERI-FPS framework.

The following section explains the study’s contribution in filling the theoretical gaps that have been identified in the related entrepreneurial university literature.

IV.9.2.1. Entrepreneurial Organizational Dimensions

Part I of this study consists of two chapters, (two, and three), which are concerned with addressing the first three research questions and seek to fill the gaps in the literature concerning characteristics of the entrepreneurial university’s dimensions, and entrepreneurial environment. The three questions addressed by these chapters are as follows:

1. How can we characterize the entrepreneurial university?

2. How does an entrepreneurial university manage to balance the tension between internal proactive activities and external reactive demands?

3. What is the coherence between an entrepreneurial university and the entrepreneurial environment?

3(a) how can policy spaces support entrepreneurial activities inside universities?

3(b) how does the entrepreneurial university seize policy spaces in its process of transformation?

Part I provides a comprehensive framework of the entrepreneurial university’s dimensions as an organization. The framework of five organizational dimensions has been thoroughly
analysed and verified, and thus offers a basic platform to different universities in different countries that will enable them to examine and measure their entrepreneurial activities and mechanisms.

The five dimensions have been discussed as separate dimensions, but in reality they are interlinked. Before discussing the integrated framework, each dimension is summarised below, see (Part I Chapter Two) to recap.

**Managerial Dimension**

The managerial dimension is defined based on its role as “the strategic level of decision making, executive leadership, and power that can be viewed as strong executive leadership, executive strategy and decision-making, where the power should be linked to the formation and use of strategic choice”. Three different elements characterize this dimension: shared governance, strong executive leadership, and professional management. In addition, this dimension offers three possible options for entrepreneurial-led management:

**Option 1: coordinated management style** - suggests that the three elements of managerial dimension, shared governance, strong executive leadership, and professional management, work in a completely harmonized mode: balanced power between a variety of representatives and flexible decision-making mechanisms.

**Option 2: Hybrid Management Style** - suggests that the three elements of the managerial dimension work in a synchronized mode where both executive leadership and professionals are given an equal weight of the management, and more than the external entities, with members from each area equally represented (internal and external), and appointed in appropriate positions at the strategic level: balanced power between top management and professional actors, and flexible decision making mechanisms.
Option 3: **Strong Influence for Success** - proposes that the three elements of the managerial dimension work to some extent in a harmonized mode; however, it gives executive leadership more of the management power than the professional management and external entities. This said, members from each area (internal and external) are equally represented and appointed in appropriate positions at the strategic level: flexible decision making mechanisms.

*Fund Resource Dimension*

This dimension focuses on “the diversification of funding resources by promoting different stream incomes through teaching and research programmes, and not depending solely on government funds”. Three different funding streams exemplify this dimension: block fund, project fund, and private fund. This dimension offers three different possibilities for universities to increase their income:

**Option 1: To the Maximum** - proposes that the university seizes sustainable income from all three streams to the maximum. The advantage of this Type is its ability to efficiently allocate block funds to improve capacity building, teaching, and research programs in a manner that attracts both private and industry sectors to establish strategic relationships.
**Option 2: Project-Oriented** - underlines that some universities may choose to maximize their income from one stream, the project fund stream. In this case the university chooses to focus on certain fields, aiming to attract specific project fund agencies, such as local and international research councils, and maximize their income by improving research capacity in the areas that catch the attention of project fund agencies.

**Option 3: Private-Oriented** - highlights the fact that some universities may choose to maximize their income from one stream, the private fund stream. In this case the university chooses to focus on certain fields, aiming to attract specific private companies or specific industry fields both locally and internationally, and maximize their income by improving their research capacity and facilities in the areas that catch the attention of private and industry sectors.

**Mission Dimension**

This dimension relates to “orientating the university’s centre (teaching and research activities) in order to create coherence with external environment demands/socio-economic demands”. The three elements of this dimension are teaching activities, research activities, and entrepreneurial activities/3rd mission.

Two different possibilities emerged for this dimension:
Option 1: Extremely Entrepreneurial - suggests that the university chooses to specialize in entrepreneurship education by teaching entrepreneurial courses as a main discipline, and endorsing entrepreneurship skills in other subjects. In this case, teaching entrepreneurship becomes a core mission for the university. On the other hand, research activities (mostly applied research) are strongly linked with teaching and third mission activities as an expected result of adapting to the entrepreneurial teaching approach.

Option 2: Hybrid Technology - suits the university that focuses on technology disciplines, such as engineering, medicine, and agriculture. The university chooses to adopt two streams: the first stream focuses on basic research, and the second stream focuses on applied research. Therefore, some research and teaching will be directed to third mission activities, while the rest will be directed to basic research. As a result, the university will achieve a hybrid technology approach.

External Collaboration Dimension

This dimension focuses on “building strong bridges and linkages with the external environment in order to flexibly respond to the complexity and uncertainty of socio-
economic demands”. Three elements characterize this dimension: organization capacity, links and bridges, and responsiveness.

In addition, this dimension offers two different possibilities for universities to position themselves within:

**Option 1: Strategic Collaboration** – suggests that the university attracts all three funding agencies and knowledge-using agencies and has successfully built strong and sustaining strategic collaborations with all related actors.

**Option 2: Project-Driven** - suggests that the university chooses to attract a specific knowledge user, such as a specific industry firm or a specific private company in a certain discipline, and, therefore, builds strong linkages and bridges for sustaining collaboration in a project-driven manner.

**Cultural Dimension**

This dimension mostly focuses on values, beliefs, attitudes, thinking approaches, and behaviours. Therefore, an organization’s culture is viewed as the vital transformation
dimension towards entrepreneurialism. It has been argued that there is a degree of difficulty in examining this dimension, but three elements have been developed in order to simplify it: autonomy, shared values and goals, and reputation and identity.

There are two different possibilities offered by this dimension:

**Option 1: Entrepreneurial Culture** – where the university achieves high self-directed autonomy, balanced alignment between top-down administration and bottom-up activities, and responds flexibly to external environment demands.

**Option 2: Sustainable Culture** - reflects strong strategic collaboration with the external environment in addition to a balanced strategic choice process between internal proactive values and external reactive demands.

Repeated from Figure: 5 for ease of reading
IV.9.2.2. Entrepreneurial University Ideal Types

Part I concluded with two possible ‘Ideal Types’ for entrepreneurial universities. These Ideal Types have been developed based on the soft causality between the variety of funding resources, funding agencies, and teaching and research programs on the one hand, and the flexibility of management style, decision making processes, and collaboration mechanisms on the other hand. These two ideal types (Figure 6) are presented below in summary in order to recap:

**First Type: The Fully-Fledged Entrepreneurial Organization**

A fully-fledged entrepreneurial organization, where all five organizational dimensions are working together towards entrepreneurial transformation:

1) Flexible management style that accommodates balanced power between all representatives and actors at the strategic level, flexible decision making processes, and interactions with related actors, and maintains total alignment between top-down and bottom-up levels.

2) Maximum sustainable income from all three streams (block, project, and private funds) through attractive teaching and research activities with highly qualified academic professionals.

3) Strongly linked teaching and research activities with third mission activities as an expected result of adapting to entrepreneurial teaching and research programs.

4) Strong linkages and collaboration with external environment actors seeking of collaboration opportunities through project-based programs, joint ventures, strong networks and alumni, and sharing of research centres, science park facilities, experts and professionals.

5) High degree of self-directed autonomy, balanced alignment between top-down administration and bottom-up activities, and a balanced strategic choice process between internal values and external demands, which leads to high socio-economic credibility, and highly commended organization’s responsibilities working towards entrepreneurial transformation.
Second Type: The Blended Technology Organization

This represents the minimum fundamental requirements for any university that has an ambition to earn label of ‘entrepreneurial’. All five dimensions must work simultaneously:

1) Strong executive leadership to secure sustainable income and balance between the university’s values and external demands, where both professional and external bodies are heavily involved in the decision-making process.

2) Maximizing university income by attracting at least one resource fund (project or private) besides that from the state, by improving teaching and research programs to meet a funding organization’s interests and demands.

3) Establishing teaching and research programs that focus on technology and applied outcomes in certain fields.

4) Building strong strategic collaboration with at least one external body that guarantees more third mission activities and more sustainable income.

5) The organization’s culture reflects the alignment between top-down strategy and bottom-up core processes, with a committed administration team and responsible individuals.

IV.9.3. Entrepreneurial Environment

Part III of the study addressed aim four: “to contribute to a better understanding of the importance of creating coherence between organizational changes and external environment landscapes.” The exploration has been conducted by adopting the “National ERI Funding and Policy Spaces Framework” (Nedeva, et al, 2013) using five case studies: the Netherlands, Norway, the United Kingdom, Sweden, and Oman.

To recap the results demonstrate the following:

1. There are three patterns of national ERI funding: block grants, project funds, and a mix of the two. The universities’ ERI is dominated by block funds.
2. There are three patterns of authority and fund prioritizing: Centralized Strategy, Fragmented Strategy, and coordinated Strategy.

3. Research spaces require three elements: a variety of policy instruments, flexible actor interactions, HR infrastructure, and physical infrastructure.

4. The entrepreneurial environment offers a variety of ERI funding resources and policy instruments, in addition to a flexible ERI selection process and mechanisms.

5. There is soft causality between entrepreneurial university performance and entrepreneurial environment:
   a. In all five cases the universities are experiencing the same domination of block grants in the ERI spaces.
   b. The entrepreneurial universities from Sweden the Netherlands, and Norway are more advanced, as they take advantage of the availability of a variety of funding resources and ERI programs and flexible actor interactions, and implement a flexible coordinated strategy (policy mix, and persistence dialogues).
   c. The entrepreneurial universities from the United Kingdom is less advanced, as they face the challenge of an inflexible centralized strategy, despite the availability of funding resources and ERI programs.
   d. Oman is lagging behind due to an absence of a clear strategy. It is viewed as having a somewhat ‘fragmented strategy’ in addition to absence of other factors (see section Part III Concluding Remarks).

**IV.9.4. Implications of the study**
This section now draws out the implications for entrepreneurial university organization and policy makers especially for those developing countries with emerging culture, by applying the theory. It then goes onto applying theory to the emerging culture in the case of Oman. This is one of the contributions of the thesis. (See Part I, and Part II- Chapter Five- sections II.5.5- II.5.7).
IV.9.3.1. Implications for the Entrepreneurial University - Organizational Analysis

The study has revealed some interesting results regarding entrepreneurial university dimensions. It has been demonstrated that creating harmony between all five dimensions is an essential factor in successful organization. In addition, the study has shown that the availability of a variety of programs and activities is associated with the flexibility of processes and mechanisms; misalignment has a negative impact on organizational performance. For example, flexibility of management style is aligned with the availability of different related actors, and flexible decision making processes lead to a balanced managerial dimension between internal academic values and external socio-economic demands. Here are some implications:

**Implication 1: Variety of Opportunities & Flexible Processes**

![Diagram of Implication 1]

The entrepreneurial management style is facilitated by co-ordinated management style, where there is balance between top-down and bottom up strategies, an availability of a variety of related actors, both insiders and outsiders with balanced decision making power, and strong executive leadership via a strong voice from the university’s vice-chancellor.

The university is able to seek more ERI income based on the availability of a variety of funding resources (block grants, project funds, and private funds), and flexible interaction mechanisms between related actors (knowledge creators, knowledge users, and fund agencies), via entrepreneurial management style.

The university’s entrepreneurial-led performance can be facilitated by the availability of a variety of entrepreneurial-led teaching and research programs, and flexible interaction...
mechanisms between knowledge users and fund agencies via entrepreneurial management style.

The university can develop strong entrepreneurial collaboration with its external environment via establishing a variety of ERI programs and activities that attract knowledge users, especially industries and private companies, and build strong strategic bridges that are facilitated by flexible interaction mechanisms.

The university’s culture is seen to be the platform of the organizational pyramid, which is characterized by its degree of autonomy. Therefore, the university’s reputation, and clear goals and vision towards entrepreneurship are seen as indicators of this. The university can gain a strong entrepreneurial culture via maintaining high organizational autonomy, and clear entrepreneurial visions and goals, through entrepreneurial management style that facilitates high entrepreneurial performance.

The cases of Chalmers University of Technology and University of Twente are best representing this implication (See Part II – Chapter Four).

**Implication 2: Variety of Opportunities & Inflexible Processes**

Failing management on the entrepreneurial path can be a sign of a centralized management style that is applying top-down strategy and ignoring the bottom-up initiatives, despite the availability of different active actors at management level, and strong executive leadership.

The university can be affected negatively by a centralized management style, which may lead to de-motivating academic actors, and consequently result in unstable ERI income,
despite the availability of a variety of fund resources and flexible interaction mechanisms with related actors.

The university’s performance with regards to entrepreneurial activities can be affected negatively by centralized management style and centralized interaction processes with related actors. This steers academic culture away from entrepreneurship and limits opportunities to attract funding agencies, despite the availability of different entrepreneurial-led teaching and research programs.

The university may limit its opportunities for attracting knowledge users, and consequently funding agencies, via centralized management style and centralized interaction processes with related actors, which leads to unstable entrepreneurial-led performance, despite the availability of a variety of ERI activities.

However, high organizational autonomy can be affected by centralized management style and unclear vision towards entrepreneurialism, and consequently lead to unstable organizational entrepreneurship culture and weak entrepreneurial performance.

In light of the above implications it is recommended that for highly sustainable entrepreneurial performance, universities need to create harmony between flexible management style (top-down strategy), which involves all related actors having balanced power in decision making and a variety of entrepreneurial ERI programs and activity initiatives (bottom-up operations), and flexible mechanisms of seeking more income, in addition to creating strategic collaborations with funding and knowledge-using agencies.

**IV.9.3.2. Implications for Entrepreneurial Environment**

The study results (From Part II Chapter Five) have revealed with several entrepreneurial environment implications as well, to recap; these can be explained as following:

1. The availability of a variety of funding resources and agencies, facilitated by nationally co-ordindated strategies using flexible interaction mechanisms for related ERI actors. This leads to advanced entrepreneurial organizations that are able to seek more income from different streams and seize different ERI program opportunities.
2. The availability of a variety of funding resources and agencies managed under a centralized strategy that leads to inflexible interactions between related actors, causing an unstable entrepreneurial organization where seeking more income can be challenging. In addition, attracting different knowledge users and funding agencies will be difficult because of mismatched demands.

3. The availability of a variety of funding resources and agencies which are managed under a fragmented strategy that causes rigid interactions between related actors and creates an unstable entrepreneurial organization where seeking more income can be challenging. In addition, attracting different knowledge users and funding agencies will be difficult because of mismatched demands.

Therefore, it is recommended that building national ERI strategy should involve persistent interactions between related actors (Funding Agencies, Knowledge-Creator Agencies, knowledge-user agencies, and Authority-Right bodies) in prioritizing national ERI spaces.

IV.9.3.3. Implications for Policy Makers

The study also offers some implications for policy makers with regard to creating coherence between entrepreneurial universities and entrepreneurial environments. Based on the analytical evidence of the soft causality between internal organization performance
and external environment landscapes, it is recommended that policy-making processes at different levels (stated, written, or enacted) take into consideration the following:

a. The fact that seeking entrepreneurial changes inside organization is aligned with the availability of external environmental opportunities and flexible mechanisms in allocating funding and prioritizing ERI spaces.

b. Creating a co-ordinated strategy is interrelated with persistent interaction and meetings between all related actors: knowledge creators, knowledge users and funding agencies.

c. This entrepreneurial university framework and the entrepreneurial environment framework can be used to create inclusive dialogue between related actors for a better national policy formulation agenda. Two issues are important here: how to establish an entrepreneurial-led organization/university, and how to create an entrepreneurial-led environment/culture.

IV.9.5. The Implications for Theory in an Emerging Country - Oman

Part II of this study addressed two research questions concerning Omani universities’ positioning within the entrepreneurial university era. The Omani government’s desire is to diversify its economy by considering the knowledge-based economy as a good option for sustainable socio-economic development. Omani universities are seen to play a vital role in this ambition.

Thus, the findings of Part III result from an empirical investigation in two Omani universities using semi-structured interviews, and have revealed the following results:

1) Both universities have the potential to be positioned within hybrid management style, however, the success of this depends on: a) replacing the centralized management style with a more flexible management style that involves interaction with all related actors; b) developing clear criteria for the selection of board members appointed away from the Cabinet’s influence; and c) adopting the strategic choice approach as a decision-making mechanism in order to balance university values and external environment demands.
2) The public university has the potential to be positioned under the *to the maximum* category, and the private university under the *project-oriented* category. However, the success of this option depends on increasing capacity and critical mass by: a) changing the salary system to be more regionally and internationally competitive, in order to identify Omani researchers and attract highly qualified regional and international researchers, b) changing the hiring and promotion system so that it is more closely linked with high research and innovation performance, and c) allowing flexible mobility and sharing infrastructure between the university and external related agencies in order to improve the university’s capacity.

3) Both universities have the potential to be positioned under the *hybrid technology* category. The success of this option depends on: a) introducing technology-based teaching programs at all study levels in specific disciplines, b) introducing project-based, multi-disciplinary programs, and c) changing research policy into a research for innovation policy.

4) Both universities have the potential to be positioned under the *strategic collaboration* category. This dimension is heavily linked with: a) the ability of the university to increase its critical mass, as mentioned in point (2) above; and b) create strategic interactions with all related actors with the support of the Supreme Council for Planning (SCP).

5) Despite the clearly-written visions and goals towards entrepreneurship, both universities are affected by the culture of the oil age. Therefore, both are still lagging behind in terms of entrepreneurial reputation and identity. However, as young institutions Omani universities have strong potential to catch up and re-structure their organizational culture towards entrepreneurial transformation, with the support of the national vision of His Majesty to guide them.

### IV.9.5.1. Implications for Oman

This study offers several recommendations for Oman as an oil-based economy with the desire to diversify its economy and invest in a knowledge-based economy. Omani universities should play a vital role in this nationally important issue. These recommendations apply at both organizational level and national level:
At Organizational Level:

A) Existing Universities

First: Omani culture, that has been influenced by the oil age, needs to embark upon an awareness campaign at individual, organizational, and national levels, where national media, persistent scientific seminars, and conferences stress the importance of a knowledge-based society for a better future for Oman.

Second: Changing top-down management style to collaborated management style by involving all related actors in prioritizing and decision-making processes.

Third: Increasing ERIE critical mass, both human and physical, is essential. The two-thousand scholarships for postgraduates offered by His Majesty each year are a huge initiative, yet Oman needs highly qualified and experienced researchers and scientists that can accelerate the entrepreneurial activities inside organizations. Moreover, it is essential that Omani universities improve their salary and hiring systems to be internationally competitive, and adapt their promotion systems to be more entrepreneurial-based in order to improve their capacity building and to attract international researchers.

Fourth: Introducing entrepreneurial-led teaching and research programs in order to attract knowledge-user agencies, especially in scientific departments such as engineering, agriculture, medicine, and business.

Fifth: Establishing TTO or innovation offices and improving the IP systems inside organizations is needed to increase researcher incentives and facilitate academic-industry collaborations.

B) Newly Established University

The entrepreneurial university framework from this study offers a tool/compass to the newly founded Oman University for Technology, which is under establishment by the order of His Majesty to be an entrepreneurial university. The authorities concerned can build upon this framework and create a fully-fledged entrepreneurial organization by applying the five organizational dimensions successfully. However, it is important to identify the areas that this university should focus on based on the national priority agenda (national co-operated strategy):
At National Level:

First: Omani culture, that has been influenced by the oil age, needs to embark upon an awareness campaign at individual, organizational, and national levels, where national media, persistent scientific seminars, and conferences stressing the importance of a knowledge-based society for a better future for Oman.

Second: Since there is no clear ERI national strategy, it is recommended that Omani authorities establish national collaborated strategy that involves all related actors: knowledge creators, funding agencies, both public and private, knowledge users/industry, SME authorities, private sectors, and related policy makers. This can be facilitated by the Supreme Council for Planning, the Education Council, and the Research Council. This can be developed via a foresight programme that can be repeated every two years.

Third: Increasing the R&D&I budget based on the national co-ordinated strategy up to 2% of GDP of Oman; currently it is only 0.13%. This can be facilitated by the Research Council (TRC) as it is the national authority of RDI activities. More funds can be generated by His Majesty’s Research & Innovation Grant, regional and international collaboration with research organizations, international business companies and firms, local and international venture capitalists such as banks, youth funds, the Alrafd fund, and SME funds.

Fourth: Establishing industry and SMEs sectors’ policies to be knowledge-based in order to facilitate and increase the academic–industry collaborations.

Fifth: Establishing a persistent dialogue and discussion platform between related ERI actors through the support of SCP and TRC.

Drawing on the above analysis of organisation dimensions and funding and policy spaces, it is possible to identify options for the development of university in Oman. These are summarised in Table (19), bellow.
The following table highlights five university scenarios for Oman:

<table>
<thead>
<tr>
<th>University Type</th>
<th>Organizational Dimensions’ Characteristics</th>
<th>Enabled Environment Pattern Funding &amp; Policy Spaces - Characteristics</th>
</tr>
</thead>
</table>
| Scenario Zero: Classic University | 1- Central Management Style  
2- Block grant-oriented/main income  
3- Traditional teaching & research activities - core mission  
4- Unsustainable external collaboration  
5- Traditional–based university culture | 1- Fragmented National ERIE Strategy  
2- Limited ERIE funding resources  
3- Inflexible selection process  
4- Weak interaction between ERIE related actors  
5- Fragmented national evaluation system |
| Scenario One: Basic Research University | 1- Hybrid Management Style  
2- Block grant and project fund – main income  
3- Basic research in certain fields – core mission  
4- Strong external collaboration with specific organizations - e.g. TRC  
5- Research-based university culture | 1- Centralized national ERIE strategy  
2- Variety of ERIE funding resources  
3- Flexible selection process  
4- Strong interaction between ERIE related actors  
5- Centralized national evaluation system |
| Scenario Two: Applied Research University | 1- Hybrid Management Style  
2- Block grant and private fund – main income  
3- Applied research in certain industry fields – core mission  
4- Strong external collaboration with specific industry companies/firms - e.g. petrochemical, agriculture, renewable energy etc.  
5- Research-based university culture | 1- Centralized national ERIE strategy  
2- Variety of ERIE funding resources  
3- Flexible selection process  
4- Strong interaction between ERIE related actors  
5- Centralized national evaluation system |
| Scenario Three: Blended Technology University | 1- Synchronized Management Style  
2- Max income from all three streams  
3- Technology–based teaching, research & innovation activities – core mission  
4- Sustainable external collaboration with technology-based organizations  
5- Technology-based university culture | 1- Coordinated National ERIE Strategy  
2- Variety of ERIE Funding Resources  
3- flexible Selection Process  
4- Sustainable interaction between ERIE related actors  
5- Coordinated national evaluation system |
| Scenario Four: Full-Fledged Entrepreneurial University | 1- Synchronized Management Style  
2- Max income from all three streams  
3- Entrepreneurial–based teaching, research & innovation activities – core mission  
4- Sustainable external collaboration with variety of knowledge funders & users  
5- Entrepreneurial-based university culture | 1- Coordinated National ERIE Strategy  
2- Variety of ERIE funding resources  
3- Flexible selection process  
4- Sustainable interaction between ERIE related actors  
5- Coordinated national evaluation system |

Table 20: University Scenarios for Oman
Based on Table (20) above, the five scenarios can be characterized as follows:

**Scenario Zero:** The Cantered Management Style reflects the top-down approach, where there is weak collaboration and alignment between the top strategic level and the academic operational level. The university depends exclusively on the block grant as the main university income, and there are no other options provided by the external environment. Traditional teaching and research activities are seen as the core mission in order to meet social national demands for increasing high school graduates seeking higher education. External collaborations with knowledge funders and knowledge users are not successful as the university fails to meet the industry and private sector demands. The university’s culture is seen to be traditional.

**Scenario One:** The Hybrid Management Style reflects to some extent the collaboration and alignment between the strategic level and professional management to balance the university’s strategic plan and academic values. The university’s funding comes from block grants and project funds from the Research Council and oil and gas companies. Basic Research in certain areas, such as oil and gas, are the core missions, in addition to teaching, and strong external collaboration with specific organizations, such as TRC and PDO. The university’s culture is seen to be research-based.

**Scenario Two:** The Hybrid Management Style reflects to some extent the collaboration and alignment between the strategic level and professional management, to balance the university’s strategic plan and academic values. The university’s funding comes from block grants and private funding from Omani business SMEs. Applied research in certain industry fields, such as petrochemicals, agriculture, and renewable energy is seen to be the core mission in addition to teaching and strong external collaborations with specific industry companies. The university’s culture is seen to be applied research-based.

**Scenario Three:** The Synchronized Management Style reflects total alignment between top-down and bottom-up, and internal and external entities. The university maximizes its income from all three streams, block grants, project funds (the Research Council and large oil and gas companies), His Majesty’s Grant for Science and Technology Research, regional and international project collaboration funds, and Omani SMEs. Technology–based teaching, research and innovation activities are the core university missions, and sustainable external collaboration with technology–based organizations, national, regional, and international, and technology-based culture is seen to characterise the university.

**Scenario Four:** The Synchronized Management Style reflects the total alignment of top-down and bottom-up, and internal and external entities. The university maximizes its income
from all three streams, block grants, project funds (the Research Council and large oil and gas companies), His Majesty’s Grant for Science and Technology Research, regional and international project collaboration funds, and Omani SMEs. Entrepreneurial–based teaching, and research and innovation activities are viewed as the university’s core missions. Sustainable external collaboration with a variety of knowledge funders and users (national, regional and international), and the university’s reputation reflects an entrepreneurial-based culture.

Figure (13) demonstrates how Omani Universities can move from *Scenario Zero: Classic University* to *Scenario Four: Fully-Fledged Entrepreneurial University*. The diagram illustrates (vertical axis) the transformation of university organizational dimensions from classical organization to entrepreneurial organization. In addition the horizontal axis illustrates that an enabling environment for this transformation is needed that provides a variety of entrepreneurial opportunities (funding, policy spaces, and entrepreneurial programs and activities). The other three scenarios are positioned between the two extreme scenarios (zero and four); each position depends on the readiness of the organization to make changes and seize ultimate external environment facilities. The diagram is not proposing a timeline, as the desire of the Omani people is to take immediate action.
Figure 13: Omani Universities' Scenarios

**Scenario Zero:** Classic University
- Fragmented NERIE Strategy
- Limited ERIE FR
- Inflexible selection Process
- Weak interaction between ERIE related actors
- Fragmented National Evaluation System

**Scenario One:** Synchronized Management Style
- Max income from all three Streams
- Entrepreneurial-based Teaching, Research & Innovation activities- Core mission
- Sustainable External Collaboration with variety of knowledge Funder & Users (local & international)
- Entrepreneurial-based University Culture

**Scenario Four:** Full-Fledged University
- Synchronized NERIE Strategy: involving all related actors (Gov. A, I, B&P, civil society)
- Variety of ERIE FR (increasing ERIE fund from 0.13% to 2% of GDP of Oman, Block, private, project, local, regional, international fund)
- Flexible Selection Process (variety of ERIE policy instruments, variety of industry & business opportunities)
- Sustainable interaction between ERIE related actors (via SCP & TRC)
- Coordinated National Evaluation System (independent peer review body)
IV. 9.6. PART IV CONCLUDING REMARKS

IV.9.6.1. Overall Contribution of the Thesis

The overall thesis can be synthesised as three main contributions. First contribution is the novelty of developing an organizational framework of five organizational dimensions that can be used as a compass to characterize ‘The Entrepreneurial University’ regardless of the national and cultural context. The framework has been tested in four European universities as cases of developed counties and successfully applied into emerging countries such GCC countries.

In addition, this framework is analytically driven unlike the exiting literature that has focused on case studies, this framework that characterise entrepreneurial universities with context neutral dimensions would take the field of entrepreneurial university forward.

The framework and testing results has been presented in a two conference: ‘EU-SPRI Early Career Research Conference: Early Career Researcher Conference University of Twente 9th-11th May 2012’, and ‘EU-SPRI Early Career Researcher Conference (ECRC), Science dynamics and research systems: The role of research in meeting societal challenges, Madrid, 8-9 April 2013’.

The second contribution is the novel development of the NERIE-FPS framework which has been adopted from Nedeva et.al, (2013) that can be used to explore the coherence between the entrepreneurial university and the entrepreneurial environment regardless of national and culture context as well as interrogate ERIE related actors and actions. The NERE-FPS has been tested in four European counties with different landscapes and reveals a soft causality between an entrepreneurial university and its entrepreneurial environment.

Third, the thesis successfully implemented the entrepreneurial university framework in the emerging country case of Oman, (the use of Oman as an empirical reference is seen as novelty) and was able to identify the two Omani universities’ profiles as classic universities. It also implemented the NERIE-FPS to characterize the current Omani external environment funding and policy spaces as a constraint towards an entrepreneurial approach. The thesis drew out five different scenarios for Omani universities and suggested a pathway for Oman to transform from classic universities toward fully-fledged entrepreneurial universities.
IV.9.6.2 Limitations of the Study and Future Research Avenues

There are a few limitations to this research project that can be addressed by future research. These limitations are described in the following:

First: although the framework has been analytically developed from published literature worldwide, the validation took place in European universities (European context), therefore, it will be worth applying to different cultures, such as North America.

Second: this framework is appropriate for universities of a certain size that have seven to ten departments and accommodate twenty to thirty-thousand students, thus it worth applying to larger universities.

Third: Some published articles that have been used for the four European cases to test and verify the entrepreneurial university framework are dated between 2006 and 2008, and we assume there is updated data and information. However, any changes, it has been argued are not significant for the ultimate results. In addition, using secondary data can sometimes have limitations of accuracy (Anderson and Arsenault, 1998). However, the analysis and results of have been presented at a conference ‘Eu-SPRI Early Career Researcher Conference (ECRC): Science Dynamics and Research Systems: The Role of Research in Meeting Societal Challenges (Madrid, 8-9 April 2013), where a large number of academic professionals provided thoroughly in-depth feedback.

Fourth: The causality between the entrepreneurial university and entrepreneurial environment can only be described as a soft causality, as only five cases have been examined. Therefore, we need more cases in order to ensure total causality.

Furthermore, there are several future research avenues that would be advisable from this study. First, an in-depth comparative study cases between GCC members in order to investigate the entrepreneurial activities within GCC universities. Second, one of the most difficult dimensions to measure is the cultural dimension and its impact, especially in oil-based cultures. Therefore, and in-depth study of the oil-age syndrome/culture, its impact on building knowledge culture, and the integration of the national innovation system in GCC is one of the strongest research avenues. Third, an empirical study applying the NERIE-FPS in different national and cultural contexts in developed and developing countries is advisable for examining the causality between entrepreneurial universities and
entrepreneurial environments. Finally, an in-depth study exploring the effect of providing a variety of opportunities and flexibility mechanisms from entrepreneurial eco-systems inside organizations and external environments would be enlightening.
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Appendix 1: NERI-FPS Framework Elements Definitions
(Nedeva, et al, 2013)

**Funding Arrangements**

The first of these two dimensions, funding arrangements in ERI spaces, we can further subdivide into level, modality, origin, and actors.

**Level**

There are two principal approaches to the level of public funding for research within an ERI space: absolute amount and/or relative. The most straightforward approach is relative categories: high, medium or low. Looking at statistics ERI spaces where the share of public funding for research is below 1% of GERD (gross domestic expenditure on R&D) ought to be treated as ‘low’; similarly, ERI spaces where the share of public funding for research is between 1 and 2% would be classed as ‘medium’, and anything above that would be classed as ‘high’ (there are of course various caveats one could introduce at this point).

The level of funding in Switzerland is indisputably ‘high’. Other national ERI spaces we have included in this study have either ‘high’ or ‘medium’ public funding.

**Modality**

The modality of research funding is also important, i.e. how it is allocated. Generally (e.g. according to (Braun, 2003; Slipersæter, Lepori, & Dinges, 2007) three possibilities emerge:

- Predominantly block grant funding (i.e. allocated directly to organisations, and can be selective);
- Predominantly project and/or programme based funding (i.e. competitive grants allocated to institutions, individuals or groups); and
- A mixture of these two.

In European countries block grant funding appears to be giving way to project-based funding. There are only two countries where research funding is still predominantly block grants allocated to large organisations (Italy and Spain) and two further countries (Poland and France) recently changed their primary funding modality by establishing project funding organisations (research councils and equivalents).

The dominant ‘modality’ of an ERI space affects its organisation and governance arrangements. Countries where the dominant ‘modality’ of funding is block grants to research organisations are unlikely to have strong, dedicated research funding agencies (i.e. it can be expected for ministries will be the main distributor of funding). Were there to be dedicated research funding organisations, these are highly likely to express still the
‘republic of science’ and to operate predominantly on the logic of scientific excellence criteria. Furthermore, whilst block grants may be selective they are rarely competitive.

On the other hand, ERI spaces where the dominant modality is project-based grants to individual researchers and/or teams, the research funding organisation is likely to be an executive agency of government with considerations beyond excellence and the logic of knowledge development, incorporating concerns such as usefulness, application, and wealth creation.

Funding modalities also fit with particular research performing arrangements and conditions. A block grant dominant modality is more likely to fit with the majority of research being carried out by large research organisations (e.g. CNRS in France, and similar) although there are exceptions.

**Origin**

ERI spaces differ according to the proportions of public/private, and national/international funding flowing through them. This aspect therefore links directly with characterisation of the funding agencies in different ERI spaces. Within this study, however, we are primarily referring to major actors in public research (and not, for instance, ‘innovation’ support).

**Actors**

Last but not least, ERI spaces can differ considerably depending upon the level of diversity of funding organisations present. ERI spaces can include the following: ministries, research funding agencies (singular and composite), charities, NGOs, private funders, and industry.

It is also important to consider the kinds and mix of research performers present, such as research institutes, universities, think tanks, national labs, and academies. Research spaces vary considerably in terms of organisational setup for research. Since this dimension is not included in the framework for this study we will not discuss it further.

**Governance**

The second aspect of the framework governance in ERI spaces, as shown in the right-hand column of Table 1 above, where we have subdivided ‘governance’ into ‘authority rights’ and ‘evaluation’.

**Authority Rights**

Authority rights are the distribution of power vested in different funding and research organisations to:

- Decide on funding;
- Decide on research priorities (including infrastructure issues); and
• Act (e.g. to distribute grants).

More than one kind of authority can be vested in the same organisation or alternatively organisations can have partial authority rights, with some overlap in authority rights within the same space.

The distribution of authority rights is linked to governance in several different ways. It is the mechanism through which priorities are set for the space as a whole and determines what types of evaluation are possible. Authority rights may be distributed or centralised. The more distributed the authority rights (multi-level governance) the more open the landscape is to external stakeholder influence (this form is usually characterised by a range of different funding sources in a given space and priority setting in parallel via these various sources).

Evaluation

Evaluation is an important element of governance. The governance of ERI spaces can be distinguished by the degree to which they are steered through evaluation. The types and nature of evaluation are not as important as the degree to which governance of the system is implemented via evaluation.

Previously evaluation was a very small element of research funding governance. In almost all contexts it was more or less used to award project or programme funding. Governance was achieved through setting targets and financial audits. Increasingly public authorities are now relying more on governance through evaluation, as evidenced by the introduction of national level evaluation systems (Whitley, Glaser & Engwall, 2010).

To address this aspect of ERI space characterisation, one must address the link(s) between evaluation and the funding arrangement ‘modality’. Block grants can be linked to evaluation in different ways, one of which is the implementation of a national evaluation system of the kind currently operating in the UK (the 2014 REF exercise). Competitive project/programme-based funding is less controversial since it is almost always associated with peer review-based evaluation.
Appendix 2: List of documents used for four European cases-data analysis

<table>
<thead>
<tr>
<th>Document</th>
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<tbody>
<tr>
<td>Chalmers Strategy 2010-2020</td>
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<tr>
<td>Chalmers 2011/2012 Facts</td>
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<tr>
<td>Chalmers University of Technology official website: <a href="http://www.chalmers.se">http://www.chalmers.se</a>.</td>
</tr>
<tr>
<td>NTNU strategy 2010-2020</td>
</tr>
<tr>
<td>NTNU Annual review report 2011/2012</td>
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<tr>
<td>Norwegian University of Science and Technology (NTNU), April 2010</td>
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<tr>
<td>NTNU official website: <a href="http://www.ntnu.edu">http://www.ntnu.edu</a></td>
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<tr>
<td>Strategy vision 2009-2014</td>
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<tr>
<td>Kees Eijkel (2012 ) From Entrepreneurial University to Entrepreneurial Region</td>
</tr>
<tr>
<td>P. van der Sijde and A. Ridder (2008) Entrepreneurship Education in Context: A Case Study of the University of Twente</td>
</tr>
<tr>
<td>University of Twente official website: <a href="http://www.utwente.nl">http://www.utwente.nl</a></td>
</tr>
<tr>
<td>Clive Alderson &amp; John Burke (2007-2009) A Case Study of Business &amp; Community Engagement (BCE) at The University of Strathclyde</td>
</tr>
<tr>
<td>Peter W A West (2008) How can an entrepreneurial Mindset be stimulated amongst Students?</td>
</tr>
<tr>
<td>William A. Lucas and Sarah Y. Cooper (2004) Enhancing self-efficacy to enable entrepreneurship: The case of CMI’s Connections Strathclyde</td>
</tr>
<tr>
<td>The Strathclyde University official website: <a href="http://www.strath.ac.k">http://www.strath.ac.k</a>.</td>
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Appendix 3: Netherlands – National Funding & Policy Space
(Nedeva, et al, 2013)

A. Funding Arrangements

Level

GERD/GDP: 1.83% (OCW, 2012, p. 56)

Modality

Project based: In 2009, NWO provides about 400 million Euros for project research at universities, corresponding to 10% of university research funding (OCW, 2012, pp. 36–37).

Block grants: In 2009, an estimated 2.5 billion Euros were provided as block grants for research at universities, corresponding to 64% of research funding for universities (ibid.).

Origin

Public-private:

R&D expenditure by source in 2009 (OCW, 2012, p. 56):

- Government: 40.9 % of GERD
- Business: 45.1 % of GERD

Public R&D financed by companies in 2009 (OCW, 2012, p. 25):

- Higher Education: 8%
- Research inst.: 32%


- Higher Education: 9%
- Research institutes: 4%

National-international:

International funding as share of all research funding in 2009 (OCW, 2012, pp. 25, 56)

- Total: 10.8%
- Universities:  5%,
- Research institutes: 11%
- Companies: 16%
Actors

**Government/Ministries:** Coordinated at the cabinet level of the Dutch government by the Economics, Labour and Innovation (REWI) council and the corresponding CEWI council at the level of ministries (OCW, 2012, p. 15). The Ministry of Education, Culture and Science (OCW) plays the central role in research policy and with a budget of 3.5 billion Euros/year (2012), provides 73% of government research funding. The Ministry of Economic Affairs (EZ) has a research budget of 862 million Euros, or 18% of government spending (2012) (OCW, 2012, p. 29). Other ministries each account for less than 5% of government R&D spending.

**Funding agencies:** The NWO is the main funding agency for public research (see above). Mainly NWO (741 million Euros in 2010) with grants for universities, NWO institutes and support for infrastructure (one six priorities (NWO, 2010)).

**Research performers:** Public research is primarily carried out by the Higher Education sector, including fourteen publicly funded universities, eight university medical centres (UMCs) and forty-one universities of applied sciences (‘hogescholen’). Higher Education accounts for 4.2 billion Euros, or 40% of GERD (2009). Research institutes (including NWO institutes) account for 1.3 billion Euros, or 13% of GERD (2009). (OCW, 2012, pp. 25–26; VSNU, 2011)

B. Governance

**Authority Rights: Which organisation(s) in the space:**

**decide on funding?** Government, through the Strategic agenda for Higher Education, Research and Science Policy, published every four years (OCW, 2011a, 2012, p. 19).

**decide on priorities?** The Dutch government has traditionally not been effective at steering research priorities (Dawson et al, 2009) but is doing more. The 2011 strategy defines top areas and also stresses alignment with (and influence over) EU grand challenges (OCW, 2011b). NWO has their own strategic programme, currently with six priorities, trying to relate them to the government’s ‘top areas’ (NWO, 2010). New performance contracts between universities and the government involve incentivising universities to prioritise research. One of the aims of new performance contracts between universities and the ministry is “continued development of research profiles and priority areas in order to
strengthen the international position and the scientific and societal impact of Dutch research” (VSNU, 2011, p. 1).

Act? Mainly universities and research institutes (see above).

Evaluation:

National evaluation system:

Two mechanisms identified:

1) Evaluation of research at universities and institutes, six-year cycle according to the Standard Evaluation Protocol (SEP) (VSNU, KNAW, & NWO, 2010).

2) A performance contract between the state and the universities (individual or consortia) covering both education and research, to be concluded before July 2012. Universities are evaluated on three criteria with some flexibility (VSNU, 2011).

Is it ‘peer review’ or ‘indicators’ based?

1) Both, but mostly peer review.

2) Indicator-based: “In drafting their description, universities will have to use the indicators. The indicators do allow room for a tailored approach to reflect the local situation. […] The universities will render account for the realisation of the agreements through their annual reports and the information systems concerning the indicators” (VSNU, 2011, pp. 10,11).

Is it linked to funding?

1) As far as I can see, they need to publish the results and follow up, no direct link to funding.

2) A part of the ‘first stream’ funding is conditional on living up to the results of the agreement (VSNU, 2011, pp. 11–13).
Appendix 4: Norway –National Funding & Policy Space  
(Nedeva, et al, 2013)

A. Funding arrangements

*Level*

In 2011, GERD was 1.7% of GDP (below the EU 27 av. of 2.03%). GERD per capita was € 1205, (having increased from € 980 in 2007) compared to an EU average of € 511. GOVERD was 0.28 % of GDP in 2011, (EU 27 av. was 0.26%). HERD was 0.55 % of GDP in 2011 - in the EU 27 average was 0.49%.

In 2009 GOVERD was 46% of GERD, within which HERD was 32%. Business enterprise R&D (BERD) was 43% rising to 46% in 2011. Business R&D increased by 7% in 2011. Business invested 0.86% of GDP in R&D, while the EU 27 av. was 1.26%. Between 2005 and 2010 GERD grew annually by 3.9% and publicly funded R&D by 6.8%.

Private/Public sector R&D split 50.6 / 49.4 % in 2011.

In 2011, the national research budget was set at 23 billion NOK, an increase of 550 million NOK, a nominal increase of 2.4%, or zero real growth.

*Modality*

*Project based:* The predominant source is the Research Council of Norway (RCN), which is a unitary council, funding all fields of study. The council operates a mix of programme funding within priority areas and independent research grants “for independent, researcher-initiated basic research that is not associated with any specific research programme or infrastructure measure”. These two funding approaches accounted for 56% and 11% respectively of the Council’s 2012 expenditure, with the balance going on Infrastructure and Networking.

Several Ministries have large research portfolios and each ministry is responsible for research related to its own sector. In addition to the Ministry of Research and Education, the main ministries funding research are the Ministry of Trade and Industry, the Ministry of Health and Care Services, the Ministry of Oil and Energy, the Ministry of the Environment, the Ministry of Agriculture and Food, and the Ministry of Fisheries and Coastal Affairs (Scordato & Langfeldt, 2011). Information on this funding is not readily available and Ministry websites typically refer to programmes funded by the RCN or
jointly with the RCN. Additionally, EU and international funding accounted for about 10% of project funding for the HE sector in 2008 (ibid.).

**Block grants:** In 2009 65% of HE R&D came from General University Funds (GUF), block grants allocated by the Ministry of Education and Research (ibid.). Allocations by the Ministry of Education and Research to universities and university colleges are divided into four parts: basic funds for research and teaching, based on incremental changes to historically set levels (on average about sixty percent of institutional funding), a performance-based funding of teaching (twenty-five percent), a performance-based funding of research (ten percent), and strategic funding of research (ibid.). GUF income declined from 70% to 65% between 1995 and 2005. Relatively few changes took place in the composition of funding between 2005 and 2008 (Scordato & Langfeldt, 2011). Between 2009 and 2011 it increased by about 5%, a little less than the sector as a whole (NIFU STEP, 2013). The exact block grant proportions are not visible in English on the ERA watch or Ministry of Education and Science websites.

**Origin**

**Public-private:** Business enterprise funding rose slightly to 46% of GERD in 2011, but only 4% of HERD came from the business sector in 2011 (NIFU STEP, 2013). The Private Non Profit (PNP) sector is weak in Norway but significant PNP funding goes into medical research, especially for cancer research through the Norwegian Cancer Society (Kreftforeningen), which provides 25% of cancer research funding, and for heart research through the National Association (Nasjonalforeningen). In addition, funds for research come from private individuals, for example from Trond Mohn, one of Norway’s most high profile businessmen, who has given considerable funds to the University of Bergen, Haukeland University Hospital, and the Nansen Centre.

**National-international:** Internationalisation is a Government and RCN priority. By March 2012, the Norwegian success rate in FP7 was around 23%, well above the EU average though the funding secured was less than the country’s investment in the program. In 2011, 2.3% of Norwegian HERD came from foreign sources, with 1.6% (226 million NOK) coming from European Commission sources. The proportion of researchers with foreign citizenship was 13% in 2007, up from 9% in 1997. The figure for the HE and institute sector was 16% (RCN, 2011).
**Actors**

The RCN is the largest single provider of research funding, with its budget being provided by the Ministry of Education and Research. The RCN budget ‘for R&D related activities’ was 7.25 billion NOK in 2011, up from 6.9 billion in 2009. In 2009 the RCN provided 19% of Higher Education R&D (RCN, 2011). Between 25 and 30% of all Government R&D funding is channelled through the RCN. Seven Ministries provided 50% of the Council’s budget in 2012. Other ministries funding research are the Ministry of Trade and Industry, the Ministry of Health and Care Services, the Ministry of Oil and Energy, the Ministry of the Environment, the Ministry of Agriculture and Food, and the Ministry of Fisheries and Coastal Affairs. Outside of cancer and heart research, there are few PNP research funders in Norway.

An unusually high proportion of HERD in Norway is delivered by independent research institutes, which account for about twenty-five percent of Norway’s R&D expenditure. The sector encompasses about one-hundred and thirty institutions, differing according to size, field and degree of R&D. Of these, approximately sixty are institutes with research as their primary focus. The RCN has a specific strategic responsibility for the research institutes which receive public basic funding. The Research Council also gives advice on the framework and objectives for various forms of regulations and funding with a view to promoting a cohesive policy for the whole institute sector.

**B. Governance**

*Authority Rights: Which organisation(s) in the space:* decide on funding? The RCN website makes it clear that the council’s budget is the subject of annual negotiations with sector ministries, as well as within the envelope of the Ministry of Education and Research, of which it is formally established as an agency. For example, the Ministry of Industry and Trade provided 23% of the RCN budget in 2010, and the Ministry of Oil and Energy 10% (Arnold & Mahieu, 2012).

Between 1999 and 2011, the research budget of the Ministry of Education and Research was supplemented from the income from the Fund for Research and Innovation (FFN), which was established to provide stability for the RCN budget and increase its longer–term strategic capacity. The Government added capital to the fund on a regular basis and the income was made available to the council. Since 2006 the FFN provided the third largest
source of income for the Council, peaking at 20% in 2007. The Fund was discontinued in 2011 because of the uncertain financial climate and the funding built into the annual baselines.

**decide on priorities?** Some of the RCN’s priorities are set as part of the negotiations with sector Ministries. These sometimes complicated negotiations also provide the framework within which the council decides on its own broad themes for its managed programmes. The council is also required to put forward its priorities for the coming year as part of the budget setting process – for example, its 2014 proposals include active health, climate change, bio resources, and renewable energy and petroleum. Within the budget setting framework, the council still has considerable latitude to determine the specific directions and objectives of the individual programmes, which now make up the largest proportion of its funding. The council’s published strategy includes a commitment to “ensure greater openness and dialogue on research-policy input and priorities”. For their part, Ministries will obviously bring to the table their own sectorial objectives, and seek to have them supported by RCN programmes.

**Act?** Norway’s eight universities are the main research actors, delivering about 80% of the research in the HEI sector, but there are also thirty-one university colleges, a few of which are research active. Additionally, Norway has an unusually high proportion of research institutes, to which reference has already been made. Outside of the public HEI sector, approximately half of the research expenditure in Norway is contributed by the private sector.

**Evaluation:**

**National evaluation system:** Norwegian universities are funded by the state. Pedagogical quality assurance is the responsibility of the Norwegian Agency for Quality Assurance in Education (NOKUT), whose primary responsibility in this regard seems to be the monitoring and checking of each university’s internal evaluation procedures. NOKUT decides on the recognition of the institutions’ internal quality assurance systems and carries out checks to see if their educational provision meets national quality standards. There is no equivalent quality assurance for research, though the RCN conducts occasional “subject-specific evaluations” of fields and disciplines. For example, the evaluations of climate change research, sports sciences and basic research in ICT are currently underway will stop these evaluations contain assessments of individual departments and research
groups, which include “suggestions” for improvement but seemed to have no connection to resource allocation.

The RCN itself has been the subject of two major evaluations, in 2001 and 2012, both conducted by Technopolis. These are probably the most extensive valuations of any research council - the most recent one runs to one-hundred and eighteen pages, together with ten background papers. Because of the council’s central role in the Norwegian science, technology, and innovation system, the 2012 report is in some ways an evaluation of the whole system as well as of the council, and makes recommendations accordingly.

**Is it ‘peer review’ or ‘indicators’ based?** n/a

**Is it linked to funding?** No
Appendix 5: United Kingdom – National Funding & Policy Space
(Nedeva, et al, 2013)

A. Funding arrangements

Level

In 2011, the UK GERD was 27.4 billion GBP, corresponding to 1.79% of GDP. This was below the EU-27 average of 2.03% (ONS, 2013, p. 1).

Modality

Project based: Provided by the research councils, circa 3 billion GBP/year (BIS, 2010).

Block grants: Provided by the Higher Education Funding Councils (HEFCs) in the form of institutional funding for universities. In 2011, R&D funding from HEFC amounted to 2.26 billion GBP (ONS, 2013, p. 10).

Origin

Public-private: In 2011, 8.7 billion GBP was public (incl. government and higher education), 31.6% of total expenditure, compared to 12.6 billion GBP from the business sector, 45.9% of total expenditure (ONS, 2013, p. 9).

National-international: Funding from abroad amounted to some 4.9 billion GBP, representing 17.8% of expenditure in 2011 (ibid, p. 9). Most of this goes to business R&D but 1.05 billion went to research in public research and higher education (ibid. p. 10). A large part of funding from abroad for public research comes from the EU framework programmes, reportedly 876.9 million Euros (approx. 745 million GBP at 0.85 pounds/Euro) in 2011 (Commission, 2013, p. 97).

Actors

The Department for Business, Innovation & Skills (BIS) funds the research councils and HEFCE. The Departments for Health, International Development, and Environmental Protection, as well as the developed governments of Scotland and Northern Ireland also provide significant funds for R&D (BIS, 2013, p. 10).

B. Governance

Authority Rights: Which organisation(s) in the space:
**decide on funding?** The government decides on the overall level of funding through the Science budget (BIS, 2010) within the framework for the multi-annual Comprehensive Spending Review (CSR). Scotland the SFC receives a ‘Letter of Guidance’ from the responsible government minister,

**decide on priorities?** Some priorities are identified directly by government departments. The Innovation and Research Strategy for Growth (IRS), (BIS, 2011), which is the “central guiding document for UK innovation policy” (Cunningham & Sveinsdottir, 2013). The research councils define their own priorities within the framework given by the government strategies (BBSRC, 2010; STFC, 2009) and align their implementation with the spending review period (BBSRC, 2011; STFC, 2010a). Cross-council programmes are coordinated between the councils.

**Act?** In public research, the main research actors are HEIs as well as public research institutes (ONS, 2013, p. 10).

**Evaluation:**

**National evaluation system:** Institutional R&D funding from HEFC is allocated on the basis of a quality review. The main method from 2008 was the Research Assessment Exercise (RAE), to be replaced from 2014 by the Research Excellence Framework (REF).

**Is it ‘peer review’ or ‘indicators’ based?** It is based on ‘peer review’.

**Is it linked to funding?** Yes
Appendix 6: Sweden –National Funding & Policy Space: Sweden
A. Funding arrangements

*Level*

“Based on recent trends, Swedish progress towards the national R&D - 3.37% in 2011 is above EU-27 average of 2.03% (Deloitte, 2013, p. 2).

*Modality*

**Project based:** Provided by the Swedish Research Council - SEK 5 billion annually (fact and research, 2013), and VINNOVA, Swedish Agency for Innovation Systems SEK - every year about SEK 2 billion (2013, VINNOVA).

**Block grants:** the Ministry for Education and Science is responsible for the overall co-ordination of research policy activities and for direct research funding with a budget of 1,4 billion SEK, direct fund 40.1% (Swedish research, main funding body, p. 4).

*Origin*

**Public-private:** Sweden’s expenditures for R&D total 3.6% of GDP. The business sector accounts for around three-quarters and the higher education sector for 21% of this spending. Companies largely fund their own research, but receive some contributions from the central government and abroad (Swedish research, main funding body, p. 4).

In addition the public sector finances R&D through grants paid directly to higher education institutions (HEIs) and through support for research councils and sectorial research agencies

"*Universities consume over 90% of the governmental appropriations for R&D*" (Erawatch Country Reports 2012: Sweden, p. 7).

**National-international:** Funding from abroad amounted to some 1,017 million Euro in 2011, most of this goes to business R&D but 32 million went to research in public research and higher education (Swedish research, main funding body, p. 13).

*Actors*

Research councils, governmental agencies, innovation support agencies, private, enterprises, foreign research funders (Erawatch Country Reports, 2012, p. 10).
B. Governance

Authority Rights: Which organisation(s) in the space:

decide on funding? The general policy formulation is carried out largely at a ministerial level, different agencies are responsible for the design and implementation of individual policy instruments, and the level of autonomy and freedom to determine research directions in the academic institutions is high (Erawatch Country Reports, 2012, p. 9).

decide on priorities? The public research policy system is characterized by broad decentralization. The dominating role of the academic sector on the performer side has led to a diverse and pluralist landscape with a high degree of autonomy and self-governance on individual, group, department and institution levels (Erawatch Country Reports, 2012, p. 9).

act? The public R&D system is dominated by the academic sector. The universities, in total fifteen, consume over 90% of the governmental appropriations for R&D and are in principle responsible not only for basic research but also applied and strategic research programs (Erawatch Country Reports, 2012, p. 7).

"...in 2012; all relevant actors in the system have evidently been offered the privilege of contributing, by advance input, to the content of the research bill" (Erawatch Country Reports, 2012, p. 24).

Evaluation:

National evaluation system: evaluations carried out by the Swedish National Agency for Higher Education, a new agency responsible for quality assurance Jan 2013.

Is it ‘peer review’ or ‘indicators’ based? It is based on ‘peer review’ and indicators.

Is it linked to funding? Yes.
Appendix 7: Oman –National Funding & Policy Space
A. Funding Arrangements

Level

In 2011, the Oman GERD was 27.975 billion OR, corresponding to 0.13% of GDP. This was below the EU-27 average of 2.03%.

Modality

Project based: Provided by the research councils.

Block grants: Provided by the Ministry of Finance 16.4 million OR/year for the whole of Oman based on national five years plans.

Origin

Public-private: In 2011 the government and higher education combined represented (27 million) 75% of R&D expenditure against 25% from business (8.5 million).

National-international: NA

Actors

HEIs, Oil and Gas Ministry, and government research institutes.

B. Governance

Authority Rights: Which organisation(s) in the space:

decide on funding? The government decides on the overall level of funding through national five years plans.

decide on priorities? There is no clear national strategic plan for research priorities, however, each institute prioritises its own research activities based on His Majesty’s direction for strategic grants and the remaining research activities are interest-driven.

act? In public research, the main research actors are HEIs as well as public research institutes, such as national oil companies, the Ministry of Agriculture and the Ministry of Health.
Evaluation:

There is no national evaluation system; each organization provides its own annual review report.

*Is it ‘peer review’ or ‘indicators’ based?* It is based on ‘peer review’.

*Is it linked to funding?* No
## Appendix 8: Entrepreneurship Situation in Omani Universities

(TRC, 2013)

### 1. University Governance

<table>
<thead>
<tr>
<th>Makeup of the Governing Board</th>
<th>Sector</th>
<th>Board Member Name</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Government</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Academia</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Business</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strategic Priorities</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>N / A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase student enrollment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diversify the curriculum</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prepare students for local job market</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expand postgraduate programs and research</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education quality and excellence</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seek other sources of revenue</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others (specify): …………………..</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sources of Funding</th>
<th>Annual Amount</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government funds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tuition fees &amp; selling study materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Endowments &amp; donations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research contracts and consulting services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service fees for using university facilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>University/Institute owned businesses (cafeteria, bookstore, etc.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outward &amp; inward investments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others (specify): …………………..</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Setting Institutional Standards

<table>
<thead>
<tr>
<th>Setting Institutional Standards</th>
<th>Responsible Section</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Academic curricula</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Admission criteria &amp; standards</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Staff salary scale &amp; promotions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Tuition fees &amp; no. of admitting students</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Passing grades</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Others (specify): …………………….</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### University Clients

<table>
<thead>
<tr>
<th>University Clients</th>
<th>Names</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Research sponsors</td>
<td></td>
</tr>
<tr>
<td>• Receivers of consulting services</td>
<td></td>
</tr>
<tr>
<td>• Users of university facilities</td>
<td></td>
</tr>
<tr>
<td>• Others (specify): ……………………</td>
<td></td>
</tr>
</tbody>
</table>

### 2. External Links

<table>
<thead>
<tr>
<th>External Collaboration Mechanisms</th>
<th>Medium for Collaboration</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Research Centers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Science park</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Precompetitive consortiums</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Others (specify): ……………………</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Joint Research Projects</th>
<th>Type of Collaborating Institution</th>
<th>Name</th>
<th>Research Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Local and international institutions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Government research institutes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Local and international Industry</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Partnership with Sister Institute</th>
<th>Type of Partnership</th>
<th>With Whom?</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Academic programs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Accreditation and degree award</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Student competitions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Others: ………………………</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Local and International Networks and Forums</th>
<th>Network Members</th>
<th>Network Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Peers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Alumni</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Students</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Industry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• government</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Others: ………………………</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. Staff Development

<table>
<thead>
<tr>
<th>Basis of Promoting Staff/Faculty</th>
<th>Relative Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job performance</td>
<td></td>
</tr>
<tr>
<td>Students’ evaluation (Teaching excellence)</td>
<td></td>
</tr>
<tr>
<td>Paper publications</td>
<td></td>
</tr>
<tr>
<td>IP generation</td>
<td></td>
</tr>
<tr>
<td>Generating extra revenues</td>
<td></td>
</tr>
<tr>
<td>External collaboration</td>
<td></td>
</tr>
<tr>
<td>Community contributions</td>
<td></td>
</tr>
<tr>
<td>Others: ………………………</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Faculty Interchange</th>
<th>With Whom?</th>
<th>How Many?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjunct professors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sabbaticals or secondments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local/foreign universities or research institutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private sector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private business practice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal startup/spinoff firms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others: …………………</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Entrepreneurial Education and Support

<table>
<thead>
<tr>
<th>Academic Curriculum</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrepreneurship &amp; Innovation for:</td>
<td></td>
</tr>
<tr>
<td>Business/Commerce students</td>
<td></td>
</tr>
<tr>
<td>Education students</td>
<td></td>
</tr>
<tr>
<td>Science &amp; Engineering</td>
<td></td>
</tr>
<tr>
<td>Other disciplines (elective)</td>
<td></td>
</tr>
<tr>
<td>Interdisciplinary programs</td>
<td></td>
</tr>
<tr>
<td>Problem-based learning</td>
<td></td>
</tr>
<tr>
<td>Others: …………………</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Practicum Courses, Internships or Projects</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community services (social)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinics and hospitals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial/business facilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others: ………………………</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Postgraduate Programs

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sciences and engineering</td>
</tr>
<tr>
<td>Humanities and social sciences</td>
</tr>
</tbody>
</table>

### Cooperative Education

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer training</td>
</tr>
<tr>
<td>Credit-based external internship</td>
</tr>
<tr>
<td>Credit for starting a new enterprise</td>
</tr>
<tr>
<td>Others: ......................................</td>
</tr>
</tbody>
</table>

### Entrepreneurship Facilities & Services

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incubation facilities</td>
</tr>
<tr>
<td>Business labs</td>
</tr>
<tr>
<td>Coaching services</td>
</tr>
<tr>
<td>Funding and equity investment</td>
</tr>
<tr>
<td>Referral services</td>
</tr>
<tr>
<td>Entrepreneurship events</td>
</tr>
<tr>
<td>Student competitions</td>
</tr>
<tr>
<td>Others: .................</td>
</tr>
</tbody>
</table>

### 5. Students’ Environment

#### Enrollments

<table>
<thead>
<tr>
<th>Enrollments</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local students</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foreign students</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local scholarships</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foreign scholarships</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Student Exchange

<table>
<thead>
<tr>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>With local academic institutions</td>
</tr>
<tr>
<td>With international universities</td>
</tr>
</tbody>
</table>
## Extracurricular Activities

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student societies</td>
</tr>
<tr>
<td>Forums for gatherings &amp; cultural events</td>
</tr>
<tr>
<td>Recreational facilities</td>
</tr>
<tr>
<td>Social/volunteer services</td>
</tr>
<tr>
<td>On campus part-job opportunities</td>
</tr>
<tr>
<td>Others (specify): ………………</td>
</tr>
</tbody>
</table>

### 6. Desired Government and TRC Support

<table>
<thead>
<tr>
<th>Government Policy</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simpler regulations for starting up companies</td>
<td></td>
</tr>
<tr>
<td>Greater autonomy in university governance (See Section 1 above)</td>
<td></td>
</tr>
<tr>
<td>Others (specify): ………………</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Desired Support Program</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research grants to favor tech transfer</td>
<td></td>
</tr>
<tr>
<td>Seed funding for academic startups</td>
<td></td>
</tr>
<tr>
<td>Networks for entrepreneurship collaboration</td>
<td></td>
</tr>
<tr>
<td>Scholarships for entrepreneurial education, academic mobility &amp; industrial internships</td>
<td></td>
</tr>
<tr>
<td>Initial funding for setting up University entrepreneurship structures</td>
<td></td>
</tr>
<tr>
<td>Potential use of TRC’s Academic Innovation Assistance Program</td>
<td></td>
</tr>
<tr>
<td>Others (specify): …………………</td>
<td></td>
</tr>
</tbody>
</table>
Appendix 9: Template Analysis Code- Mind- Map style

Template Analysis: Coding

- Teaching activities
- Research activities
- 3rd mission/entrepreneurship activities

- Oil-age syndrome

- Purpose of collaboration
- Nature of collaboration
- Collaboration outcome

- Mission dimension

- Cultural dimension

- Managerial dimension

- Collaboration dimension

- Entrepreneurial university

- Funding dimension

- Industry potential
  - Industry size
  - Industry capabilities

- Supportive forces platform

- National Policy framework
  - Political will
  - Policies’ existence

- Block fund
- Project fund
- Private fund

- Academic policy align with national policy

- Push & pull power for Entrepreneurial Culture

- Readiness of Industry to absorb graduate, projects, demands
- Readiness of Academia to meet industry

- Shared governance
- Strong leadership
- Professional management

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## Appendix 10: Template Analysis Code for Semi-Structured Interviews

<table>
<thead>
<tr>
<th>Themes/Managerial Dimension</th>
<th>Questions</th>
</tr>
</thead>
</table>
| 1. Governance               | 1.1 The extent to which the university has:  
|                             | 1.2 university governance  
|                             | 1.3 clear strategic policy  
|                             | 1.4 Designed its vision, mission, and goals to be entrepreneurial oriented  
|                             | 1.5 Balanced decision–making between external and internal |
| 2. Leadership               | 2.1 The extent to which the university:  
|                             | 2.2 Has strong leadership that can influence national innovation and research policy  
|                             | 2.3 Has the power and influence to seek new income, allocate funding resources, and evaluate funding audits |
| 3. Professional Management  | 3.1 The academic body contributes to:  
|                             | 3.2.1 University policy discussions  
|                             | 3.3.1 Teaching & research management  
|                             | 3.4.1 External activities  
|                             | 3.5.1 Balancing academic values and managerial strategic directions |
|                             | 3.2 policy formation  
|                             | 3.6.1 Institutional context  
|                             | 3.2.2 Regional context  
|                             | 3.2.3 National policy |

<table>
<thead>
<tr>
<th>Themes/Funding Dimension</th>
<th>Questions</th>
</tr>
</thead>
</table>
| 1. Funding Resources & Incomes | 1.1 university income/fund  
|                             | 1.2 The percentage of government funding in the total university fund  
|                             | 1.3 The percentage of project funds in the total university fund  
|                             | 1.4 The percentage of private funding income in the total university fund  
|                             | 1.5 The volume of independent/innovative researchers  
|                             | 1.6 The volume of international students enrolled/graduates there are per year  
|                             | 1.7 The volume of publications there are per year (books, articles, etc.)  
|                             | 1.7 The volume of national and international awards there are per year |
| 2. Availability of Infrastructure | 2.1 Availability of critical mass  
<p>|                             | 2.2 Availability of infrastructure |</p>
<table>
<thead>
<tr>
<th>Themes/Mission Dimension</th>
<th>Questions</th>
</tr>
</thead>
</table>
| **1. Teaching & Research Activities** | 1.1 prioritization of:  
1.1.1 Teaching activity in relation to entrepreneurial activity  
1.1.2 Research in relation to entrepreneurial activity  
1.2 The kind of research prioritized:  
1.2.1 Basic-strategic,  
1.2.2 open research,  
1.2.3 applied, |
| **2. 3rd Mission Activities** | 2.1 entrepreneurship activities:  
2.1.1 Policy/strategic driven or interest driven  
2.1.2 Implemented policy  
2.2 policy formation is:  
2.2.1 Institutional context  
2.2.2 Regional context  
2.2.3 National policy  
2.3 the existence of entrepreneurially-oriented the capacity for teaching programs  
2.3.1 Incubators, TTO, science parks, spin-off companies, research centers, research consortia.  
2.3.2 critical mass (professional researchers and expertise, PhD students)  
2.4 The research production:  
2.4.1 Patents,  
2.4.2 licenses,  
2.4.3 tactic knowledge transfer,  
2.4.4 socio–economic benefit,  
2.4.5 educational benefit,  
2.3.6 institutional benefit. |
| **Themes/Ex Collaboration Dimension** | Questions |
| **1. Collaboration Purpose** | 1.1 The purpose of links:  
1.1.1 Financial, knowledge  
1.1.2 generation,  
1.1.3 student training,  
1.1.4 shared infrastructure,  
1.1.5 technology transfer,  
1.1.6 research commercialization,  
1.1.7 solving industry problems |
| **2. Collaboration Nature** | 2.1 The nature of the links:  
2.1.1 Formal or informal  
2.1.2 Project-oriented or interest driven  
2.1.3 National, regional, or international  
2.1.4 Within Higher education or industry  
2.1.5 With large companies or SMEs  
2.1.6 With a single partner or multiple partners |
<table>
<thead>
<tr>
<th>2.1.7 With research council, partner or collaborating body?</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Collaboration Outcomes</td>
</tr>
<tr>
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## Appendix 11: Template Analysis Code for In-Depth Interviews

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<tr>
<th>Themes/ Policy Space</th>
<th>Questions</th>
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| 1. Political Will towards Entrepreneurship | 1.1 Government actions of H.M directions and guidelines with regards to economic diversification away from Oil & gas  
1.2 Reviewing education programs  
1.3 Evaluating education system policies  
1.4 linking education programs with industry demands  
1.5 linking education programs with national economy |
| 2. Research and Innovation Policies | 2.1 Research policy priority:  
2.1.1 Basic research  
2.1.2 applied research  
2.1.4 strategic research  
2.2 key drivers for policy making  
2.2.1 social drivers  
2.2.2 economical drivers |
| 3. Oil-Age Culture | 3.1 the need to diversify the economy away from oil/gas revenues |
| Themes/Industry Spaces | Questions                                                                 |
| 1. Omani Industry Size | 1.1 The size of oil and gas industry  
1.2 The size of none- oil & gas industry  
1.2.1 Agriculture  
1.2.2 Fishery  
1.2.3 Tourism  
1.2.4 Mining  
1.2.5 knowledge- based |
| 2. Knowledge-Based Industry | 2.1 Industry- policy priority  
2.1.1 innovation-based  
2.1.2 entrepreneurial- based |
| 3. Oil-Age Culture and SMEs | 3.1 Type of SMEs in Oman  
3.1.1 technology- based |