

**COMMERCIALISATION OF ACADEMIC RESEARCH IN HIGHER
EDUCATION INSTITUTIONS OF PAKISTAN**

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COMMERCIALISATION OF ACADEMIC RESEARCH IN HIGHER
EDUCATION INSTITUTIONS OF PAKISTAN

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ABSTRACT

Universities are complex and diversified institutions. Besides education and research, universities have now been assigned a new role of academic research commercialisation. Universities are pressurised to act as a bridge for transferring of knowledge to industries and generate resources. Commercialisation of academic research is still a new phenomenon for universities in Pakistan. Universities are facing challenges and difficulties in managing commercialisation activities along with teaching and research. In order to overcome these challenges, some support structures have been introduced in the form of Office of Research, Innovation and Commercialisation (ORIC). The core rationale of this study is to explore the commercialisation activities in universities of Pakistan. Pakistani universities have support structures in the form of ORIC but still lacking behind in commercialisation activities. Qualitative research strategy and semi-structured interviews technique have been adopted. In this study two vice chancellors, higher education commission director, fifteen academic researchers and five ORIC managers were interviewed in five leading universities of Rawalpindi and Islamabad, Pakistan. Content analysis has been used to analyse the data. The results shows that major obstacles in academic research commercialisation in Pakistan are applied and basic research culture, research budgetary constraints, immature industry, unstable political condition of the country and lack of qualified staff in ORIC. Based on the finding of the research, some recommendations have been proposed for successful commercialisation. A best practice model has been proposed for ORIC, Pakistan to follow.

ABSTRAK

Universiti adalah institusi yang kompleks dan kepelbagaian. Selain pendidikan dan penyelidikan, universiti kini telah diberi peranan baru pengkomersialan penyelidikan akademik. Universiti menerima tekanan untuk bertindak sebagai jambatan dalam pemindahan pengetahuan kepada industri dan menjana sumber pendapatan. Pengkomersialan penyelidikan akademik adalah masih menjadi fenomena baru untuk universiti di Pakistan. Universiti menghadapi cabaran dan kesukaran dalam menguruskan aktiviti pengkomersialan bersama-sama dengan pengajaran dan penyelidikan. Untuk mengatasi cabaran ini, beberapa struktur sokongan telah diperkenalkan seperti Pejabat Penyelidikan, Inovasi dan Pengkomersialan (ORIC). Rasional utama kajian ini adalah untuk meneroka aktiviti pengkomersialan di universiti-universiti di Pakistan. Universiti di Pakistan mempunyai struktur sokongan dalam bentuk ORIC tetapi kurang dalam aktiviti pengkomersialan. Strategi penyelidikan kualitatif dan teknik temubual separa-struktur telah digunakan. Dalam kajian ini, dua naib canselor, pengarah suruhanjaya pendidikan tinggi, lima belas penyelidik akademik dan lima pengurus ORIC telah ditemu ramah di lima universiti terkemuka di Rawalpindi dan Islamabad, Pakistan. Analisis kandungan telah diguna bagi menganalisa data. Hasil kajian menunjukkan halangan utama dalam pengkomersialan penyelidikan akademik di Pakistan ialah budaya penyelidikan gunaan dan asas, kekangan belanjawan penyelidikan, ketidakmatangan industri, ketidakstabilan politik negara dan kekurangan staf yang berkelayakan di ORIC. Berdasarkan hasil kajian, beberapa cadangan telah diberikan untuk kejayaan komersialisasi. Satu model amalan terbaik telah dicadangkan bagi ORIC, Pakistan untuk diikuti.

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LIST OF ABBREVIATIONS

ANBIA	-	American National Business Incubator Association
AUTM	-	Association of University Technology Manager
GDP	-	Gross Domestic Product
HEC	-	Higher Education Commission
HEIs	-	Higher Education Institutions
ILO	-	Industry Liaison Office
IP	-	Intellectual Property
ORIC	-	Office of Research, Innovation and Commercialisation
RTP	-	Research Triangle Park
RBV	-	Resource Based View
RDT	-	Resource Dependence Theory
R&D	-	Research & Development
TTO	-	Technology Transfer Office
USPTO	-	United State Patent and Trademark Office

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CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter highlights background of the study. It also elaborates the research problem related to commercialisation activities especially in the perspective of higher education institutions (HEIs) in Pakistan. It also covers the research objectives, research questions along with the scope and significance of the study.

1.2 Research Background

Universities are the instrumental source of knowledge and human capital responsible for providing higher education and spreading knowledge among large pool of societal members. Universities facilitate research activities and nurture the quest of knowledge. Moreover, with education and research a new task of commercialisation of academic research has emerged as a recent trend in universities by collaboration and linkages with other institutions and industries (Mayer, 2003). Due to this process universities contribute towards economic development of country and expansion of businesses and industries. However, this new role of commercialisation and knowledge transfer is dissimilar from the normal role of teaching and educating. Universities are organisations, where research and teaching

activities goes hand in hand for cultivating better and admiring civilisation (Braunerhjelm, 2007). In HEIs, where research and development is not at equal status with teaching are only fulfilling their primary commitment of teaching. Moreover, universities of developed countries where R&D has an equal status with teaching are successful in producing millions of jobs and generating revenue in billions (Kenny & Patton, 2012). Commercialisation of knowledge results in quality of life improvement. It is a worldwide phenomenon that entrepreneurship is a foundation for exchange of the information or ideas into successful goods or services that is the result of commercialisation activities (Dahl & Sorenson, 2011).

Von Proff (2012) stated that impact of commercialisation activities in many universities resulted as copyright, licensing, investment in incubators and science parks. Moreover, researches highlighted that university education plays a remarkable role in overall progress and development of the country via academic research commercialisation (Kenny & Patton, 2011; Kenny & Patton, 2012). However, universities are in need of prospective students and capital in order to establish themselves in competitive market structure (Merrill & Mazza, 2010; Bianchi et al., 2011). Furthermore, research commercialisation activities by universities plays an important role in serving the businesses, generating the revenues and overall economic development of the country (Bathelt et al., 2010).

Contemporarily, universities are required to collaborate with industries in order to ensure their long term sustainability and to increase their effectiveness (Mintrom, 2008). Salter and Martin (2001) opined that universities are developing these linkages with the industry for commercialisation in line with the direction provided by policy makers. It is necessary for the universities to consider commercialisation along with other activities due to government and society pressure. The phenomenon of commercialisation is comparatively new for universities as they are facing several challenges in commercialisation activities (Braunerhjelm, 2007). Power and Mc Dougall (2005) explains apart from government funds, fees and research grants, universities are pressurised for academic research commercialisation as a new source of income generation. Academic research commercialisation is a way of transferring the academic knowledge and

research to industrial segment (Cohen, 2002; Link, 2005). However, another reason due to which universities are moving towards commercialisation activities is reduction in funding from the government side that compelled them to follow entrepreneurial approach (Dahl & Sorenson, 2011). Moreover, many HEIs still follows traditional philosophy regarding universities main role that teaching and research has no business at market place (Bernstorff & Gissler, 2012; Kuratko, 2007; Browne, 2010; Ejeremo et al., 2011).

Etzkowitz (2003) explains that the universities are taking up entrepreneurial activities like commercialisation in order to meet the challenges and to contribute actively towards regional and economic development of country. Universities have human capital in the form of students and teachers that acts as a natural incubators for initiation of new ventures. However, an integrated system of commercialisation is required to utilise this human capital. Furthermore, in order to achieve the third mission of universities development of innovation centers, incubators and patenting offices are needed to fulfilled research commercialisation task (Rasmussen, 2003). Traditionally, universities are involved in two roles that is teaching and research which are complimentary to each other. Therefore, investigation about offices responsible for commercialisation activities is important as they are providing facilitation for academic research commercialisation.

Academic Research Commercialisation is the phenomenon of nineteenth century, however in developing country like Pakistan it is in embryonic stage. Universities are involved in training of workforce and development of offices responsible for commercialisation. Pakistan being a developing nation cannot over emphasised the requirement and importance of knowledge transfer and flow of knowledge base input for financial and societal growth (HEC Annual Report, 2012). In Pakistan, unfortunately the IPRs have not protected by law until 2012 when government of Pakistan enacted Intellectual Property Organisation Act 2012. The main purpose of this act is to administer and coordinate all government systems for the protection and strengthening of intellectual property laws, rules and regulations in Pakistan (www.na.gov.pk). According to Global Competitiveness Index GCI (2013) Pakistan ranks 133th overall. Its performance continues to deteriorate in some of the most critical and basic areas of competitiveness like public institutions (126th

rank) are plagued with inefficiency, corruption patronage, and lack of property rights protection. The macroeconomic situation (145th rank) also is worrisome with inflation in double digits and public deficit near to 10 percent of GDP. Pakistan infrastructure (121st rank) especially electricity (135th rank) remains in dire state. Furthermore, the country shows the lowest enrollment rates in the world and basic education is poor (137th rank) while in higher education it ranks 129th. However, in innovation it ranks 78th which shows that country is progressing in research and development but stands at 109th position in Intellectual Property. The capacity of the research institutions and private sector spending on scientific research and development has been stagnant for the past three years causing country to lose its competitiveness by not being able to create mechanisms for the citizens to protect their intellectual properties.

Furthermore, the university-industry collaboration is also a matter of grave concern as more emphasis is being put on non-research initiatives or research in isolation from the industry. This shows that the businesses are not benefiting from the R&D activities being done in academic and research institutions resulting in lack of indigenous solutions to challenges faced by the industry (Jahangir, 2013). Since the establishment of HEC as initiatives carried out and it resulted in more patent filings than in the history of the country. However, lack of expertise of the intellectual property organisation Pakistan has hampered the IPR activities in the country (HEC Annual Report, 2011). According to HEC Annual Report (2005), Commercialisation is the procedure of changing thoughts, information and discoveries into assets for individuals and expansion of business as this capital comes in different forms: new goods, services and production prospect which meet the public's desires as well as potential payback for research institutions. As the industries in the developed countries are strengthened by academia-industry linkage after industrial revolution.

Higher education cannot function alone as remote island of knowledge, need of hour is requirement of an incorporated, inter-reliant research and development system for academic-industry linkages in order to drive the commercialisation activities. It is very important that apart from excellence in teaching, research activities must be acknowledged and research culture must be introduced in higher

education institutions that leads to remarkable contribution in socio economic development of country (HEC Annual Report, 2012). However, for developing countries this is relatively new and emphasis has been put on to develop strong academic research commercialisation in order to bridge the gap between higher education Institutions and business. Pakistan like other Asian countries is far off in making this connection of academia and industry. Commercialisation of academic research is still a new phenomenon in developing countries like Malaysia, Korea, China, India , Singapore etc. However, these countries are striving for the production of new items and services by using the innovative approaches. Most of the Universities in aforementioned countries have established Technology Transfer Offices (TTO's) dedicated towards commercialisation and building linkages with industry sector, for the establishment and utilisation of patent policies and strategies (HEC Annual Report, 2012).

However, it is very important that all activities and organisational structures responsible for commercialisation of academic research should be managed in such a way that enhance commercialisation with minimum negative effect on education and research. Moreover, improvement in universities overall capability to carry out diverse functions in the need of hour. In this regard, commercialisation of academic research is a big challenge for the universities as education system of each country is different and every university has its specific environment, organisation and support structures responsible for commercialisation (Braunerhjelm, 2007). The present study is being conducted in the perspective of HEIs (Public & Private) of Pakistan, as commercialisation of academic research is a new phenomenon in Pakistan.

1.3 Purpose of the Study

The core rationale of this study is to explore the issues and challenges that Pakistani HEIs are facing in commercialisation of academic research. The specific purpose is to investigate how HEIs are managing research commercialisation

activities and what are major obstacles in Academic Research Commercialisation in Pakistan.

1.4 Gap of Knowledge

Most of the researches are in developed countries and very few can be found in the context of developing countries as commercialisation of academic research is new phenomenon (Ismail et al., 2013). Researches highlights that Technology Transfer Offices (TTOs) staff and the incentive policies for researchers lead towards successful commercialisation (Boh et al., 2012; Audio ,2007; Hughes et al., 2010; O'Shea et al., 2005; Von Proff et al., 2012). Moreover, searches through known data bases resulted no study in context of Pakistan as commercialisation of academic research is a new phenomenon in Universities of Pakistan. According to Crespi, D'Este, Fontana, & Geuna (2011), the role of Technology Transfer Offices (TTOs) is enhancing the academic entrepreneurial activities.

Hayter (2013) work provides the detail overview/ role of Technology Transfer Offices (TTOs) that how they are facilitating in the process of commercialisation and better success of university. Academic Research Commercialisation is a big challenge and it is a third mission assigned to universities apart from traditional role of teaching and research (Braunerhjelm, 2007). The present study has been conducted in the perspective of HEIs (Public & Private) of Pakistan and analysed the overall commercialisation efforts and major obstacles in the field of academic research commercialisation in Pakistan. The HEC initiative of establishment of Office of Research, Innovation and Commercialisation (ORIC) is a recent phenomenon which is only three years old (started in year 2011) in higher education institutions in Pakistan. This study aims to suggest the best practice model for academic research commercialisation. Moreover, it will increase the body of knowledge and fill the gap of the knowledge.

1.5 Problem Statement

The traditional role of academic institutions has expanded incorporating both education, research and development to cater the needs of industry and the country as a whole. It is a relationship between pure and applied research that stresses on the third mission of HEIs that is academic commercialisation (Leydesdorff & Etzkowitz, 2001). Mowery and Nelson (2004) stated that academic research commercialisation is not a new phenomenon in developed countries like USA. At university level in USA they have practical work projects such as the US land grant universities dealing with local business. This results in generation of high income from academic research commercialisation (Perkmann, 2011).

Commercialisation of high technology products becomes possible through strong Technology Transfer Offices (TTOs) (HEC Annual Report, 2005). Ambos (2008) stated that the TTO is the most well-known twin structure in research oriented universities. Its role is to facilitate in transferring of knowledge, compilation of licensing agreements and intellectual property rights. Business incubators, startups companies and science parks are also included in commercialisation structures of universities (Siegel, 2003). Powers and McDougall (2005) highlighted that Technology Transfer Offices enhances the probability of successful commercialisation and the outcome of the research.

Martinez (2010) suggests that the emphasis on the public universities has also affected the perception of public about universities that is independent for debate and criticism for their new financial role of championing the commercialisation and economic development (Martinez, 2010; Swank, 2010). However, it leads towards similar shift in capital requirement due to sheer decline of funding resources in line with public expectations; commercialised technology can earn income for the university (Boehm & Hogan, 2012; Merrill & Mazza, 2010; Ismail et al., 2012). Martin (2007) explains that the university culture has its own tradition of academic freedom and there is no restriction on subject matter explored and research results reported as it is different from business community.

On the other hand, authors like Zgaga (2007) also argue that entrepreneurial activity in university can be beneficial for administration as this have negative effect on the excellence of education as the dimensions of education are different from the ordinary money-making services. Commercialisation of university researches and innovations are an essential part of higher education institutions. This process is linked with its own risks and reservations and the interest of executive officer is always in growth and development of new innovations to compete with their competitors (Li 2005; Lumpkin & Dess, 1996; Ismail et al., 2011).

Commercialisation of higher education institutions and research institutions innovations depends on direct investment of the companies. Research Commercialisation is the focal point of urbanised nations (Hitt, 1996). Hence, research institutions and industries must work together with HEIs so that education sector get the know how about importance and need of research required. It gives an immense picture to academia that how to properly utilise the resources on the basis of precedence (Zahra & Nielsen, 2002). Academic research concept in universities is shifting from community good knowledge to academic entrepreneurship (Slaughter & Rhoades, 2004). Generally, the concentration of university in commercialisation activities is considered to be a winning strategy for great contribution towards development of trade and industry and revenue generation, expansion of funding sources and incentives for faculty members participating in this entrepreneurial activity (Etzkowitz & Leydesdorff, 1997).

However, there are significant perspectives regarding the effect of academic entrepreneurship on academic research, that is the nature of the university as a social institution has been changed to seek commercial interest (Etzkowitz & Leydesdorff, 1997). HEIs is a place for knowledge exchange, where research and teaching goes on side by side. Research and teaching are parallel and complementary to each other of the overall learning process in universities. Therefore, higher educational institutions where R&D is not at equivalency with teaching usually compromise on the quality of education and performing only half of what they must to do to accomplish their main commitment. Moreover, commercialisation of academic research is the key for better life standard. Entrepreneurship is major source of knowledge and ideas conversion in

to thriving products or services worldwide (HEC Annual Report, 2012). Pakistan being a developing nation cannot over emphasised the requirement and importance of knowledge transfer and flow of knowledge base input for financial and societal growth. Pakistan is far behind in commercialisation of academic research and have insufficient R&D base as well as fragile innovative potential as compared to other countries (GCI, 2013).

Hence, industrial succession in developed countries is due to academia and industry linkage, unfortunately Pakistan is lacking behind in this regard. Moreover, Pakistan has only 1064 patents grants in last five year. The patent grant has shown a turn down due to various reason like accretion and black of chemical products that were planned to be used in agriculture and medicines. However, another major reason is the unstable political condition of the state (HEC Annual Report, 2013). Hence, higher education cannot function alone as remote island of knowledge, need of hour is requirement of an incorporated, inter-reliant research and development system for academic-industry linkages in order to drive the commercialisation activities. It is very important that apart from excellence in teaching, research activities must be acknowledged and research culture must be introduce in higher education institutions that leads towards remarkable contribution in socio economic development of country (HEC Annual Report, 2012).

Unfortunately since independence higher education institutions in Pakistan have been engaged in teaching aspect of the education only and research has been completely ignored in Pakistan. Since the establishment of Higher Education Commission (HEC) in 2002, the focus has been shifted in respect of research. Now the universities are under pressure from the HEC to perform vis-à-vis research and innovation. HEC has also put in place the necessary infrastructure like providing applied research based funding to researchers and establishment of Offices of Research, Innovation and Commercialisation (ORIC) in all higher education institutions. The HEC initiative of ORIC is a recent phenomenon which is only three years old (since 2011) in higher education institutions in Pakistan. The main problem that is still being faced by the HEIs in Pakistan is that the research culture is still in nascent form and there are not enough qualified researchers who could take up

applied research projects with commercial worth (HEC Development Framework, 2012). Pakistan basically an importer of technology and manufacturing products. Its local industry either assembles the imported parts to end product or makes the low-tech products. In order to grow its local industry there is a need of ground-breaking and innovative knowledge. According to HEC, the solution of this issue is releasing the academic powers of research institutions to cater the industrial needs. This industrial linkage will not only go together with the efforts being made in the focus areas, as it will also turn Pakistani universities into local resource centers (HEC, 2012). Keeping in view, lack of study which investigate how Pakistani HEIs are managing the challenges of commercialisation in educational environment of Pakistan with traditional functioning of universities. This study is particularly conducted in the context of higher education institutions located in the twin cities of Rawalpindi and Islamabad, Pakistan.

1.6 Significance of the Study

The present study is significant for higher education system in Pakistan in many ways: Firstly, in Pakistan the commercialisation of HEIs research is a new phenomenon as compared to many other developing countries. Thus, the results of the study will be helpful in analysing the overall commercialisation efforts of HEIs in Pakistan and to increase the body of knowledge and fill the gap of the knowledge. Secondly, the study will also highlight the strengths and weaknesses of the support structures that are present in the HEIs for commercialisation of research. This will help the university officials and policy makers to work on areas that are highlighted by the study as weak and make recommendations to strengthen them for successful commercialisation efforts. Thirdly, as the researchers/practioners are the key to commercialisation efforts of the university, therefore the results will also highlight what researchers think about commercialisation in context of Pakistan. This will also help the university administration to look into the areas that are highlighted by the researchers/ practioners to be most important in terms of commercialisation. Fourthly, the present study will add to the existing body of knowledge especially in

terms of a developing country's effort to commercialise university research as this phenomenon is a new for the Pakistani universities.

1.7 Research Objectives

Following are the objectives of research:

- (i) To investigate the role of institution and support structures available for commercialisation of university research in Higher Education Institutions in Pakistan.
- (ii) To study the resources and capability of the commercialisation activity of Higher Education Institutions in Pakistan.
- (iii) To explore how Pakistani Higher Education Institutions are developing and maintaining the industry linkages and identifying specific industry partners for the ongoing research, development and commercialisation.
- (iv) To analyse the networking and strategy adopted by HEIs in Pakistan for commercialisation activities.

1.8 Research Questions

Based on the research objectives following research questions have been formulated that will guide the study.

- (i) What are the role of institutions and support structures available to higher education institutions of Pakistan engaged in commercialisation activities?
- (ii) What types of resources and capability that HEIs of Pakistan are focusing upon for commercialisation activities?

- (iii) How HEIs in Pakistan are developing and maintaining the industrial linkages and identifying their industry partners for research and commercialisation activities?
- (iv) Are the developed networks and strategy adopted for research and development helpful for commercialisation activities in Pakistan?

1.9 Scope of the Study

The present study primarily focused on the commercialisation of university research and the obstacles in the field of commercialisation in Pakistan. The study has employed qualitative research design and the sample is limited to the higher education institutions of Rawalpindi/Islamabad twin cities of Pakistan. Commercialisation of academic research is very broad area and have several stakeholders involved like government, society, industry, researchers and universities. The present study focused on managerial issues of commercialisation from researchers and university perspective only. Commercialisation of academic research is new phenomena in Pakistan as compared to other developing countries. In Pakistan, commercialisation of academic research is in embryonic stage as the universities having Office of Research, Innovation and Commercialisation. However, still lacking success stories and track records to manage the commercialisation activities. Therefore this research is based upon the existing managerial practices, policies and challenges in the path of commercialisation in Pakistan.

1.10 Limitations of the Study

Following are few of the limitations that have been encountered during the course of study: The focus of the study is HEIs of twin cities of Rawalpindi and Islamabad, Pakistan due to financial cost and time constraints. The present study is limited to institutional perspective only. It has addressed the role of support

structures/common managerial issues of commercialisation and major obstacles in the field of commercialisation. However, commercialisation aspect from industry perspective and economic development issues are not discussed in detail. This study is based upon existing managerial practices, policies and information provided by support structures of Islamabad/ Rawalpindi Higher Education Institutions. The sample size is limited to Managers ORIC, Academic Researchers, Board of Directors (HEC) and Vice Chancellors of the selected HEIs.

1.11 Research Framework

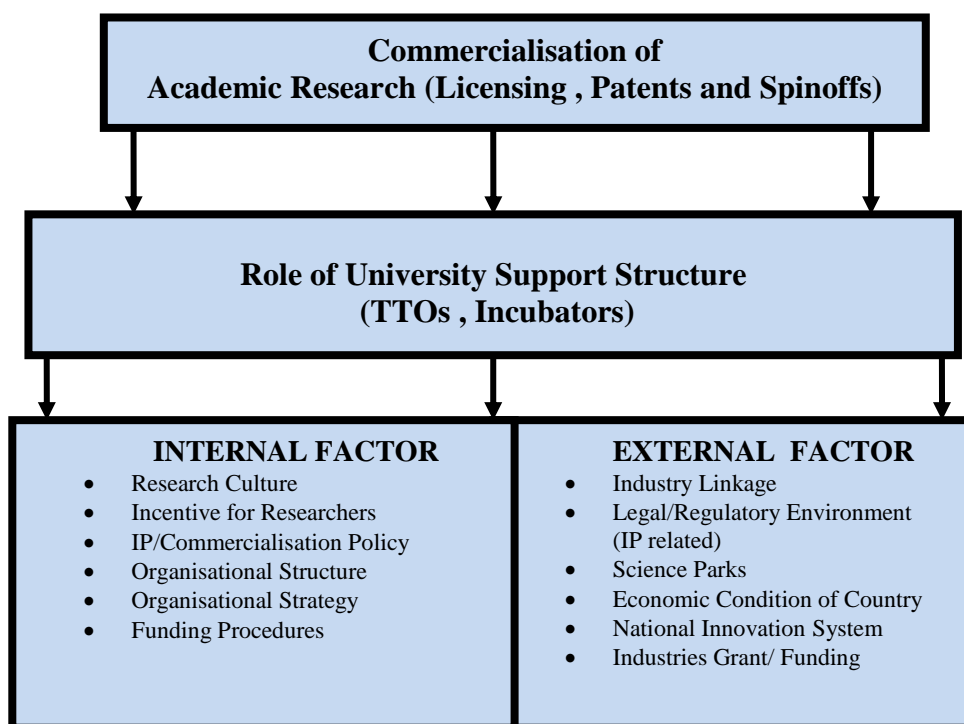


Figure 1.1 Conceptual Framework of the study

Knowledge is not created in a vacuum; environmental, individual, and organisational variables all exert forces in knowledge creation and transfer (Lockett, 2005). In order to elaborate the theoretical framework of the study following key variables are emphasised as mentioned in Figure (1.1) Commercialisation of Academic Research plays an important role in overall economic development of

country. This study is exploratory in nature as commercialisation of academic research is a new phenomenon for developing country like Pakistan. Moreover, in research commercialisation internal (organisational) and external factors plays an important role. Furthermore, performance of Technology Transfer Office depends upon the organisational structure, strategy, funding procedures, research culture and incentive plans for researchers. Commercialisation of Academic Research is directly linked with organisational internal and external factor and university supports structures (TTOs & Incubators).

1.12 Organisation of the Study

The present study revolves around five chapters as presented in Figure 1.2.

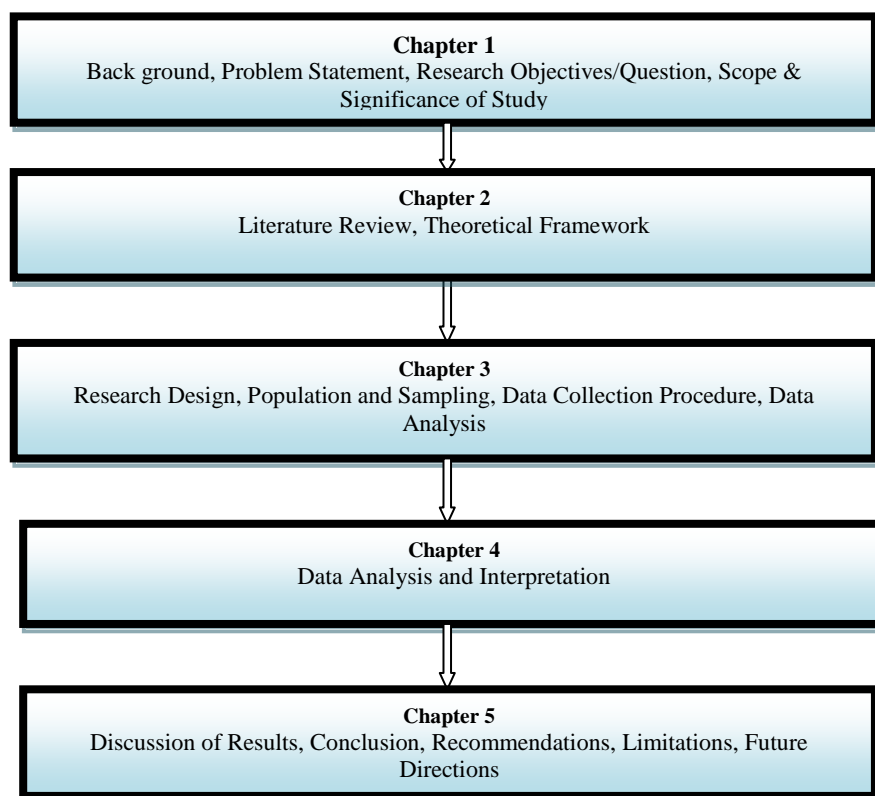


Figure 1.2 Organisation of the study

Chapter 2 highlights the previous literature regarding the variables of the study. Further, theoretical underpinnings are also discussed with gap identification especially in the context of Pakistani HEIs. Chapter 3 describes the practical methods used for data collection to build the empirical section, interviews, data processing and analysis will be discussed in detail. Chapter 4 contains practical methods used for data collection to build the empirical section. Detail discussion about the methods used for interviews, data processing and analysis. Chapter 5 presents the information collected from the respondents through semi structured interviews. The purpose is to render what was given account for in the interviews and to capture the views of the respondents as per their experiences on commercialisation of academic research.

1.13 Chapter Summary

HEIs have been assigned a new task of academic research commercialisation. Universities are pressurised for academia industry linkage in order to generate the resources. This role of commercialisation is comparatively new for the universities in developing countries like Pakistan. It is only three years old phenomena (started in 2011) so universities are facing problems in the field of commercialisation. In order to overcome the issues of commercialisation some support structures have been introduced in the HEIs in form of Office of Research, Innovation & Commercialisation (ORIC). Universities having support structures but still lacking success stories and track records to manage its commercialisation activities along with obstacles in commercialisation of research in Pakistan are the main area of investigation in this research. The present chapter has explained research background, problem statement, research objectives and research questions that has guided the study. In spite of this, scope and significance of the study and the conceptual model of the study has also been presented. The following chapter would discuss the literature review.

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