



RESEARCH PAPER

**The Emerging Concept of Entrepreneurial University: A Case Study
of Public Sector Universities in Pakistan**

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Universities are the most important source for knowledge generation, technology development and its transfer. It is widely known that for innovation integration of different factors e.g. policy matters by Government, needs by society and economic development by Industry, are required. The main objective of this research is to determine the absence of some mechanisms that hinder the process of commercialization for academic research. The study has adopted quantitative and qualitative research methodologies. For quantitative data the close ended questionnaire based on Likert scale has been designed, for qualitative data semi structured interviews conducted by officials i.e. professors, associate professors, researchers, practitioners. The units of analysis for this research are universities in Sindh. Three main actors of commercialization process has been focused i.e. university, industry and government. Further, this study investigates various mechanisms and platforms for technology transfer. The factors related to the process of commercialization have been evaluated in 3 universities of Sindh. The study come up with some causes that hinder the commercialization of academic Intellectual property furthermore it propose some loopholes to overcome the challenges

Introduction

The economic survey of Pakistan showed that during the year 2016-17 the literacy ratio of Pakistan has declined from 60 to 58 %. In the budget of 2017-18 government of Pakistan has allocated comparatively low budget for education Rs: 902.7 billion which is not sufficient for a highly populated country like Pakistan. In total there are 46 higher education degree awarding institutions or universities out of

which 28 are privately owned and only 18 universities are in public sector. This paper is focused on public sector universities to create a healthy combination the population for this study has been selected from 3 different universities. One pure science based university second is social science based university and third is an agriculture university.

Commercialization is the process of converting the ideas, research or frameworks into viable products that can fulfill the desired functionality or utility. Commercialization is the process or cycle which introduces a new product or a procedure into the market (Mirowski & Horn, 2005). Commercialization can also be defined as the process of turning an invention or creation into a commercially viable product, service or process. The exploitation of academic research or the commercialization of university based technology or knowledge is now days the prominent issue for the policy makers (Wright, Lockett, & Franklin, 2003). History says that universities that have greater support of an innovative culture use to have a stronger association between traditional mechanism of universities for knowledge transfer and academic innovation performance in comparison of the universities with low support for an innovative culture.

Literature Review Framework

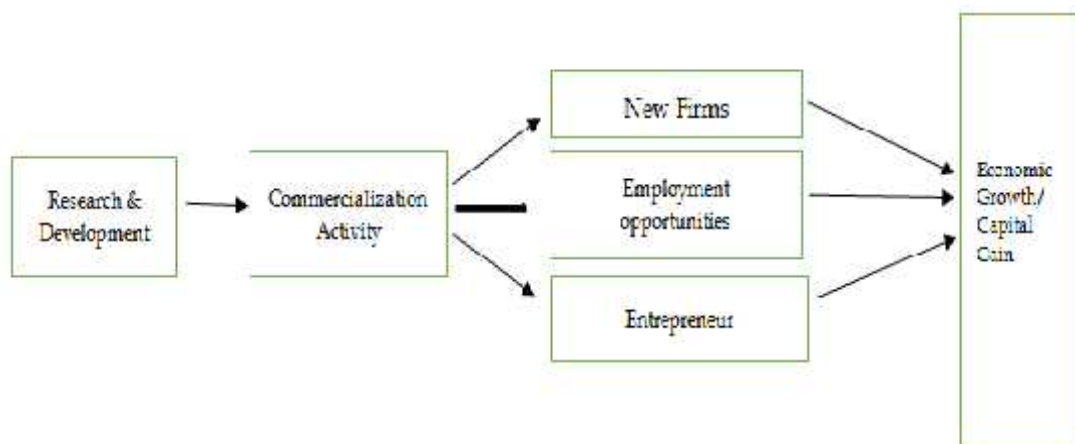


Figure: 01 Research Framework

Literature Review

Granstrand, Håkanson, and Sjölander, (1993) suggested that in order to look into the status of commercialization activity of any country the R&D taking place there is the first and most important barometer, not only this but research and development is an input ingredient of Commercialization process. Granstrand et al., (1993) further argued that For the sake of creation of new businesses and firms'

commercialization activities are critically important. Creation of new firms will cause to create new employment opportunities. According to Reedy and Robert, (2011) employment opportunities will enhance ways for utilization of the available human resource (Raphael and Rice, 2002). Entrepreneurship is an activity of pulling synchronously all the economic actors to induct them in a productive demeanor for healthy outcomes. All mentioned steps are propulsive to economic growth. Researchers have adduced, a new aim of universities is to become entrepreneurial universities so that they can endow to national economic development to obtain a financial advantage through the commercial and industrial application of research (Etzkowitz & Leydesdorff, 2000; Martin, 2003).

Academic Commercialization

According to Powell and Smith, (1998) academia is in need to accept that they have to succeed in commercialization along with education. Learning institutions of any country are the center for economic development process, involvement of industry and academia is increased and numerous policies have been designed to stabilize the university industry linkages (Giuliani & Arza, 2009). Universities can be the centermost of economic systems (Kitagawa, 2004). Universities need to elude their conventional methods of Teaching and research to enter in an entirely new dimension, which is aimed at direct interaction with industry and direct contribution to the market place (Etzkowitz and Leydesdorff, 2000). Increased accentuate for academic commercialization is the major reason to develop the commercialization and outrun the traditional focus on licensing of innovations (Thursby and Thursby, 2002). Academic commercialization is the constituent for economic prosperity. The developing economies of the world currently depend on human capital and knowledge-based societies (Mahrous, Ismaili, bdelazim, & Rashwan, 2018).

We know that universities are the most important sources for knowledge generation, for technology generation but also know at the same time that innovations does not take place in isolation there are various other factors which make it feasible or non-feasible i-e policy matters (Government) society and economy (Industry). That's why it is very important to create a liaison among University, Industry and Government for economic development, especially in developing countries like Pakistan. National Innovation System (NIS) is a network of different sub systems i-e policies, institutions (public as well as private), supporting technologies (Crow & Bozeman, 1998; Furman, Porter, & Stern, 2002; Nelson & Rosenberg, 1993; Porter & Stern, 2001). Studies have indicated that collaboration among three institutional spheres, namely industry, academia, and government, can be a critical factor for success in improving regional and national innovation systems (Etzkowitz and Leydesdorff, 2000; Gibson, Bell, Aparicio, & 2006; Motohashi, 2005).

Research and Development

Before going to evaluate the impact of commercialization activity on economic growth of any country we have to see how strong its R&D is, because this is basic research which establishes the foundation for applied research and then commercialization. We can see that the countries having strong innovations are investing sufficient percentage of their GDP into the R&D like Israel 4.21% of total GDP, South Korea 4.15% and Japan 3.47% whereas Pakistan's GDP contribution to its R&D is very meager that is 0.5% of total GDP (Javed Shahid, March 10 2016, Dawn.com). As much huge and wide research and development activities will take place in a university as greater its commercialization process will be (Anderson, Daim, & Lavoie, 2007).

Commercialization

Eto, Rogers, Wierengo, & Allbritton, (1995) defined the term commercialization as a reforming process information. Colyvas, Crow, Gelijns, Mazzoleniz, Nelson, Rosenberg, and Sampat, (2002) argue that those policies and practices will augment the revenue of university which are associated with the maximization of commercialization. Different policies are being used by universities in this regard. Two mechanisms are principally important from governments and policy maker's perspective for commercialization i.e. spinouts and licensing (Wright, Birley, & Mosey, 2004). When we talk about the development of national economies then it needs to be accentuating on transfer of the knowledge which is generated within universities (Cohen, Florida, Randazzese, & Walsh, 1998).

Spinoffs

One of the most important indicators of economic growth and sustainability is the creation of new firms (Bercovitz and Feldman, 2006). University spinoffs are a significant source of economic growth because they create noticeable market value through innovative products and services. Besides, such spinoffs create job opportunities and the funds they generate can be used by universities for further technology enhancement (Shane, 2004).

Mustar, Renault, Colombo, Piva, Fontes, Lockett, Wright, Clarysse, & Moray, (2006) suggested that there are two types of academic startup ventures, first one are based on university research that exploit the intellectual property developed within the university. Secondly those spin-offs which have established on the basis of joint ventures of university and industry.

Employment Opportunities

The process of commercialization has been an antecedent for the creation of diversify employment and career opportunities, it will also strengthen the human resource. Increased employment opportunities will not only result in the exertion of

human capabilities to novitiate them into capital but will also increase the per capita income (Raphael and Rice, 2002).

Tether and Massini, (1998) found that the newly established small firms are one of the major sources creating the jobs. During the decade of 80 multiple technology based and innovative small spin offs have constituted thousands of new jobs. Association of University Technology Managers (AUTM) reported that American Academic Institutions have generated 280,000 jobs during 1980 and 1999 to the U.S. economy which is 83% per spinoff.

Entrepreneurship

Entrepreneurship is the process of wealth creation through capitalizing the technologies and knowledge. This result in increased per capita income an upward change take place in the economy and overall economic growth occur. We can say entrepreneurship is the key to economic development particularly in the developing countries like Pakistan. An Entrepreneurial economy is great source to create opportunities for its member to explore and exploit new opportunities and knowledge to promote new entrepreneurial phenomena that have never been visualized (Guerrero, Cunningham, & Urabano, 2014). The nature of universities have become entrepreneurial now-a- days not only to compete and to be more productive and creative but also to establish links between education and research (Kirby, Guerrero, & Urbano, 2011). The patterns of industry and markets of various countries like Taiwan, Korea, Singapore and Japan have notoriously altered the direction of national economy by entrepreneurs (Mitchell, Busenitz, Theresa, McDougall, Morse, & Smith, 2002). An entrepreneurial economy can do much for the country: it can provide employment opportunities to huge masses of people, it can contribute towards research and development system of the country, and furthermore it can create wealth for the nation and for individuals as well.

Material and Methods

The study lies in the realm of social science which follows the explanatory research design. It has been conducted with the help of quantitative and qualitative data collection methods.

Sample and Procedure

Data for this study were collected from professional researchers i.e. professors, associate professors, assistant professor, researchers, practitioners, those academics who are involved in different projects either with the collaboration of industry or without the collaboration of industry . The units of analyses for this research are public sector universities of Sindh.

Table 1
Data Segmentation: Demographics

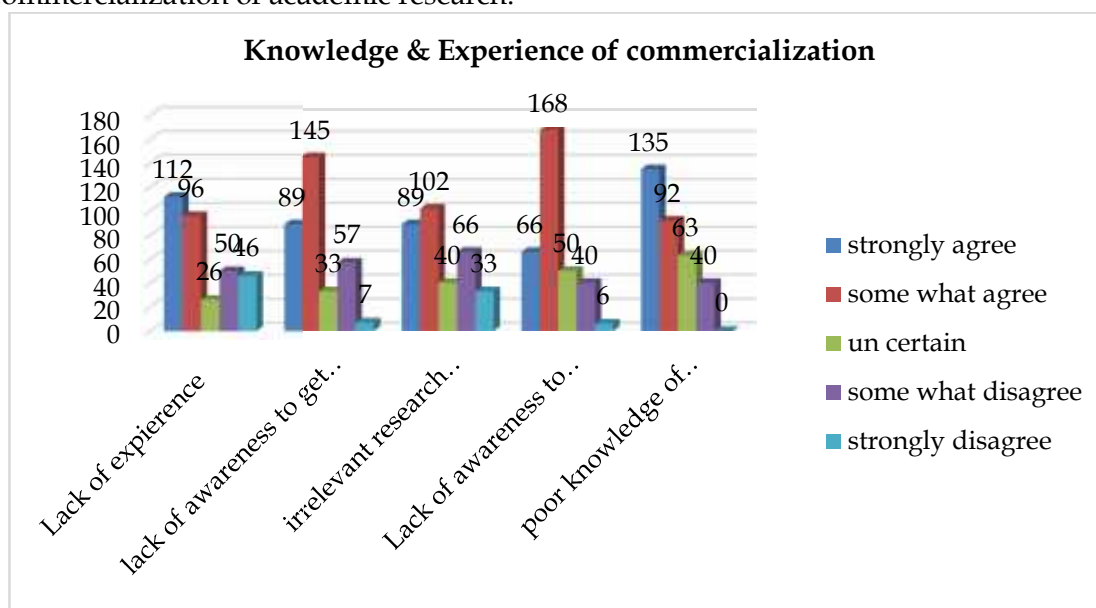
Designation	University of Sindh	MUET	Sindh Agriculture University	
Professor	50	18	10	78
Associate Professor	75	20	15	110
Assistant Professor	100	22	20	142
Total				330

Table 02
Data Segmentation

Designation	Male	Female
Professor	45	33
Associate Professor	70	40
Assistant Professor	80	62
Total	195	135

Analyses

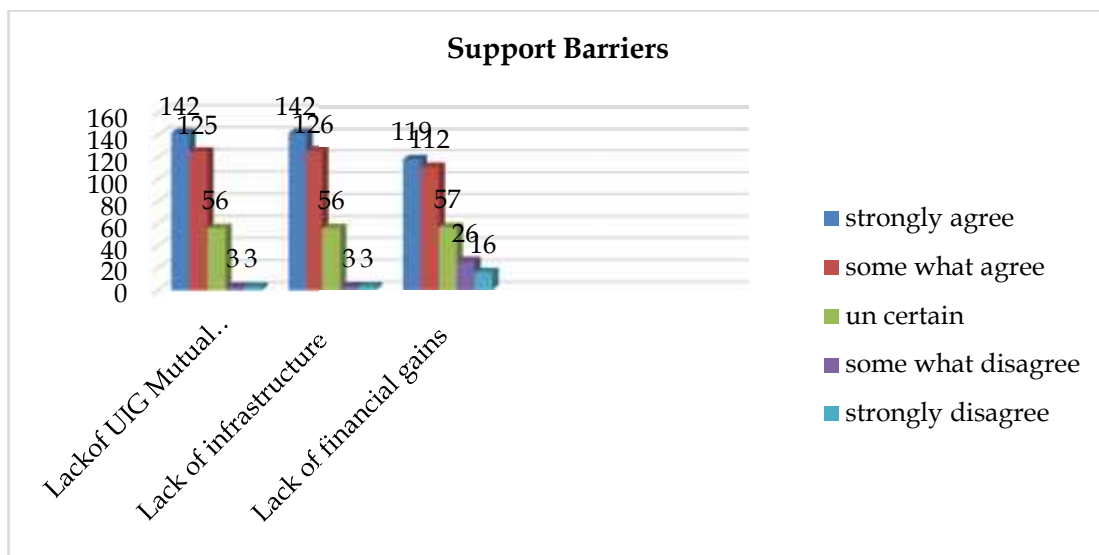
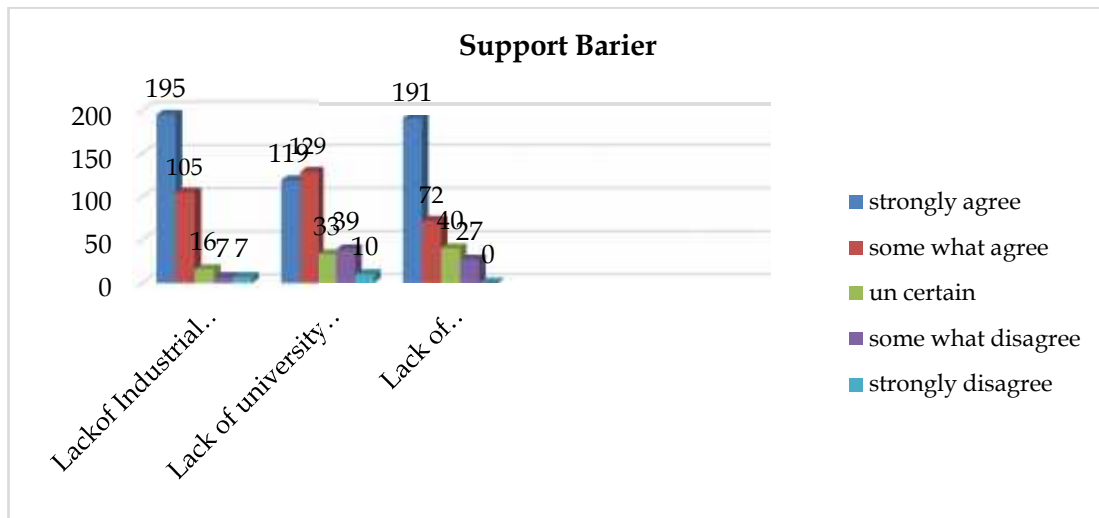
Major data of this paper have been collected through qualitative method which consists on detailed discussions with academics of public sector universities of Sindh. Following are the imperial data through which these extensive areas came under discussion regarding the hurdles in commercialization of academic research.



Need based Research.

Universities highly need to compatible their research capabilities to the needs of industry (Hong and Walsh, 2009). Our universities do have potential researchers and they are producing quality research but when it comes to the productive outcome, there is bi-fold problem; some of them are rigid to their lines of directions

and do not do the need based work and others type of researchers are those who does not know how to get their work commercialize or generate rent from it (Bhutto, Rashidi, & Abro, 2012). This is important for academic researchers to conduct the research allied with industry and publish their findings because the dissemination of knowledge is the essence of academic research. Due to dormant interaction of university industry researchers are quite unaware of industrial needs of research areas, lack of knowledge of the issues industry is facing, what sort of innovation they are looking for. There is high need of university industry collaboration for the sake of mutual success. Hence, the academia should galvanize their researchers to contribute in terms of the literature which address the indigenous issues and the industry can be benefitted.



Lack of Support Mechanism by Government

The government's role as a facilitator for university industry linkages is notably accentuated in literature (Jacobsson, Dahlstrand, & Elg, 2013). The government plays an agency role for the rigorous employment of publicly endowed research. Without the intervention of government there is huge gap between academia and industry. Government need to design some programs and policies to create more opportunities for the interaction of university and industry for the success of both the sectors and economic development.

The example of Russia is in front of us where the intervention of Russian government has commutated the innovation infrastructure. Russian universities have became serious about academic innovation in 1999, after few years in 2005, the government established science and technology parks throughout the country. Furthermore government has passed legislation in order to support academic innovation in 2009, and government issued federal grant for the establishment of entrepreneurial universities.

Lack of Collective (UIG) Support

Mutual efforts of all three actors of commercialization i.e. university, industry and government are required for the successful exploitation of academic research. Rogers, Takegami, & Yin, (2001) suggested that some researchers may have the knowledge of the intellectual property protection but they might be lacking in support mechanisms by any of the actors of process government, industry or university. These three are the pillars for economic development of any under developing country, in that regard if we are concern about the economic prosperity its furthestmost important to all these three sectors i.e University, Industry and Government to work equidistant. Government need to establish some research centres where knowledge, human and other resources could be devoted by academia, technical expertise and market needs should be exploited through industry where as financial resource may contributed by government. There is a high need for the government support to assure the success of UIG linkages in Pakistan. The government entails to carry on with soft as well as hard infrastructure and funding that is necessary for making UIG linkages more effective for the innovation and sustainable economic development. Normally, in under developing countries like Pakistan the greatest hurdle for strong UIG relations is their conventional values and institutional design. The intervention of Government is necessary for the creation of conducive working environment and coordination among the all three actors of commercialization i- e University, Industry and Government.

“There is hardly any pressure from government to devise a policy for any kind of collaboration with industry. This results in the lack of interest from academician to go into applied research” (R3).

The principal need of strong UIG is consistent grant for the materialization of

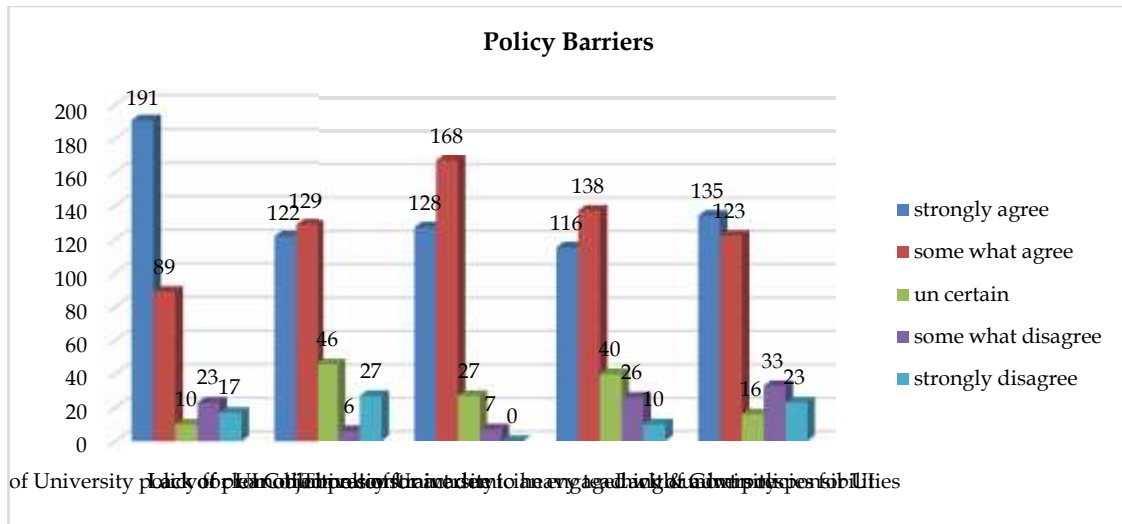
entrepreneurial universities, for that we highly need innovative firms and innovation clusters in Pakistan.

Lack of Financial Returns

Financial gains backed by commercialization process are one of the strongest motivation for researchers to get involved in. In Sweden the government has developed policies which are focused on the apportionment of funds to the entrepreneurial activities and commercialization of academic research.

Gittelman, (2002) suggests that France has not performed up to the mark of incentives for French scientists to get involved in the process of commercialization. The enticement policies of universities are not encouraging towards commercialization activities (Goldfarb and Henrekson, 2003). Monetary returns are a great source of motivation for scientists/researchers to commercialize their work (Bains, 2005). Majority of academic researchers are not satisfied from the financial gains they are getting here in our universities. It does not only mean the financial incentives but soft or non-financial incentives such as recognitions within institute, job titles or promotions etc.

To boost up and expedite the entrepreneurial culture within academia, an academic inventor needs strong incentives in the market for technology as well as in his institute. Funded research results in increased economic benefits in the form of number of patents granted by the Industrial Technology Research Institute of Taiwan (Hu and Mathews, 2009).



Time Constraint for the Faculty Members

According to Etzkowitz, (2002) the prime traditional function of universities is teaching and education. Whereas, the research is the secondary

function of our universities which has resulted in numerous exploration in different fields like biology, chemistry and physics. The most momentous discovery in that regard was recombinant DNA technology invented by Dr. Herbert Boyer. This invention became the millstone from where academic revolution took place. Because of Bayh-Dole Act (1980) became possible to diffuse the public research (university) to the private sector (industry). Burgelman, (1983) says that universities in order to increase the production of entrepreneurial outputs need to remove the existing internal barriers.

As we know that the primary business of university is to teach but literature supported that most dynamic innovations have taken place through academic research. There should not be the over burden of teaching responsibilities on academic staff that they may not concentrate on their research activities.

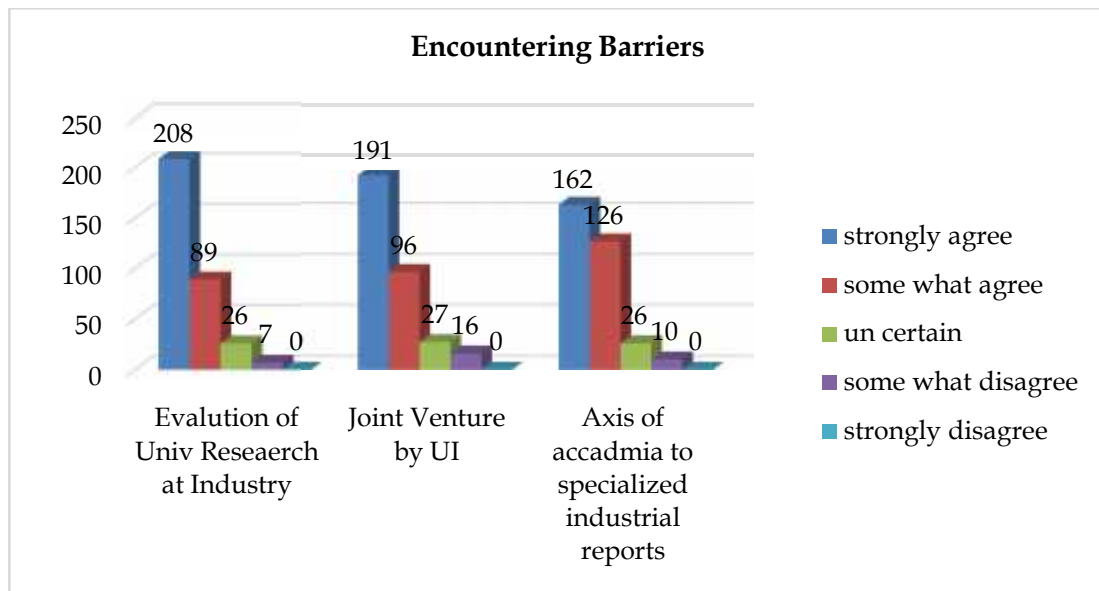
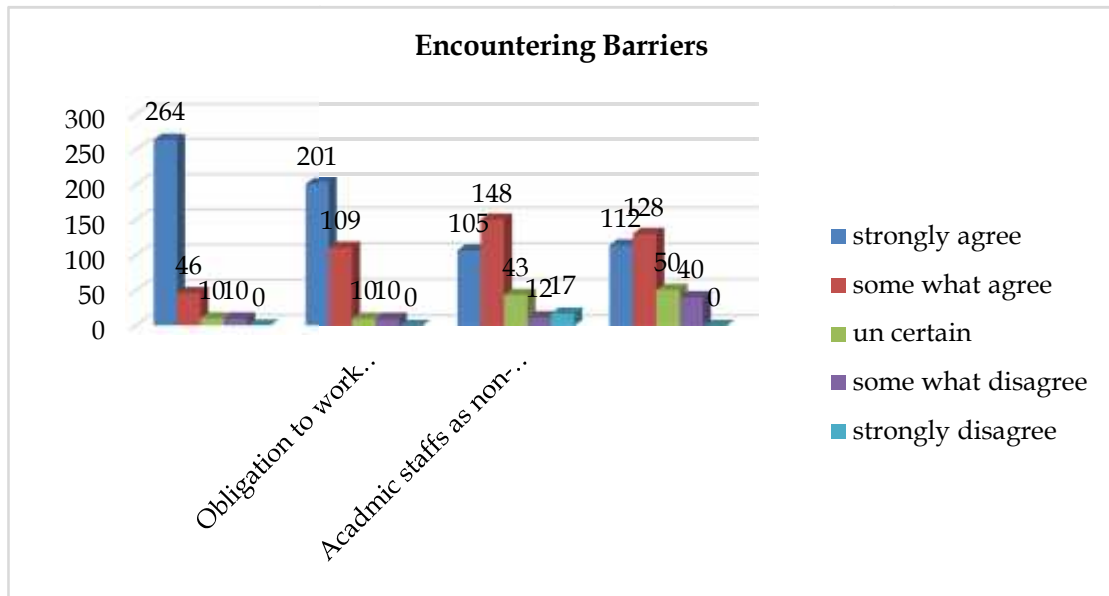
University has Lack of Clear Objectives

Debackere and Veugelers, (2005) argue that universities need to set up a clear strategy regarding to the transfer of technology, a set of guidelines in order to manage all functions, without influencing the fundamental missions of university i.e. teaching and research.

It must be recommended here that universities need to set the objectives teaching, research and then commercialization of research. In order to increase the number of academic researcher we need to focus on teaching, to produce the research & finally to exploit that research particularly in the field of natural science.

Lack of Government Policies for UI Linkages

The literature suggests that university industry collaboration is one of the effective mechanisms to convert the academic research into commercial product/service (Shane, 2004). Universities are considered to be most important factor in the economic development processes of countries and regions. In recent times, the direct involvement of university with industry has increased and policies have been designed to promote university industry (UI) networking (Giuliani and Arza, 2006). There are evidences in the literature regarding to the existence of university industry collaboration and the linkages between universities and industry (Anselin, Varga, & Acs, 2000).



There should be reciprocal visits by Industry and university to support the strong relationship between UI

Much effort has been made to collude with industries through reciprocal visits of university and industry personnel as well as student. Such efforts are aimed to solve short as well as long term technical issues at industrial units. This will improve the base of the knowledge and skills, furthermore it will also bring the trust between two partners. Innovation never takes place in vacuum.

Literature supports that there should be a system of consultancy arrangements within and Industry University like the academic researchers may spend certain amount of time working for industry and they may take up some position in firm. Academic researchers should also exploit their capabilities by working with industry. Cohen , Goto, Nagata, Nelson, & Walsh, (2002) indicated that the best way for the universities to transfer their knowledge to industry is the softer channels, like publications, conferences, informal exchanges and consultancy services. By providing consultancy services to the industry the academia could be the non-executive directors of industry.

Summary of Findings

Responses	Description	Objective
.....Not particularly interested for industrial application.	Lack of awareness to exploit research.	01
Researchers are producing quality research but they are not target oriented.	Research is not relevant to the industrial needs.	01
There is a lack of industrial community to establish the trust on academia.	Lack of industrial support.	01
University support system is important. It's our first and direct support mechanism, if it does not actually support one cannot be an entrepreneur.	Lack of university support.	02
After completing PhD we are very motivated to publish our research but as we rejoin we had been given extra burden of academic as well as administrative tasks. Such practices affect our research work a lot.	Lack of clear objectives	02
The universities predominantly operates on undergraduate programmes, its ultimate focus is on teaching and conduction exams rather than research.	Time constraint.	02
Government should create more options to strengthen UI relationship.	Government policies for UI.	03
Academic experts and researchers can utilize their expertise By providing consultancy services to the industry.	Non-executive directors.	03
University research should be analyzed and tested at industry. In order to maximize the opportunities for the exploitation of academic research.	Analysis and testing of university research at industry.	03
University and industry both can achieve more success by sharing their expertise which is knowledge experience by industry.	Joint venture by UI.	03

Discussion

If we look at the history of Pakistani universities around three to four decades back, they mainly focused on knowledge transfer and basic research rather than

applied research. As the concept of entrepreneurial university emerged than along with this conventional mission of teaching and research, universities of Pakistan also adopted another mission of contributing to economic development. The UIG interaction and collaboration is the key economic drivers for innovation commercialization and the sustainable economic development. The university-industry and government interaction increase development, expedite technological advancement, and construct an environment for innovation. Bringing all these three mechanisms under one umbrella will enable the science to discover novelties, to transform these innovations into viable products and to commercialize these products through proper channels. In short, collectively this alliance will boost up the economy of country. The university is a natural incubator, the commercialization engine of research, and a source of new knowledge and technology. The Russian government encouraged universities to become active drivers of the triple helix system (Alexandera and Evgeniyb, 2012).

Conclusion

- I) The greatest challenge is to achieve imperishable change. For the lucrative formation and implementation of UIG and evolution toward an entrepreneurial university to create fundamental institutional changes that would be accepted over time, long-term and consistent government initiatives are required.
- II) By taking the example of Russia, UK and China one can firmly say that university sector of Pakistan can collectively contribute significantly to the economic development but there is an immense need of financial, infrastructural and policy advancement in universities to boost up the university industry interaction for consequent augmentation to innovation and economic development.
- III) At some levels we also need to revise our curriculum so that the tendencies of our graduates, scientists and engineers may incline towards entrepreneurship rather than their traditional goals about career.
- IV) Our universities may become able to develop links with industry, and get some leading companies to set up their offices within the campus. "The Economist" suggested by conducting a survey that knowledge-based economy portrays the university as a creator of knowledge, a trainer of young minds, and a transmitter of culture, as well as a major actor of economic growth.

Implications

The findings of this study may contribute as an effective policy instrument for the policy makers in university, government and in industrial sector of our country to devise their policies for creating entrepreneurs .intervention of government to strengthen university and industry linkages will bring all three actors closer to the collective objective which is to invigorate innovative culture of commercialization. If the teaching will not be the sole objective of our universities but to produce need based research and the commercialization of that will also be the part of university's objectives, the picture of contribution of commercialization towards economy growth of the country will be better.

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