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A Quest for Viable Economic Model for Peshawar Pakistan- Using Etzkowitz Conceptual Framework of Triple Helix Model

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ABSTRACT

The study aims to explore existing university-industry-government (U-I-G) linkages in Peshawar, Pakistan and study the factors that determine these linkages. Furthermore, the research examines the extent to which university-industry-government collaboration can address regional industrial problems and promote economic growth. Hence, the quest is to seek a viable economic model that not only enhances innovation in the region but also improves industrial competitiveness. Therefore, Etzkowitz's Triple Helix model, based on academia-industry-government collaboration, provides the intellectual context for this research. The study uses semi-structured interviews and a narrative approach; with descriptive and analytical approaches to investigate the nature of university-industry and government linkages in Peshawar. A single case study approach is employed, where Entrepreneurship Development Centre (EDC) at Institute of Management Sciences Peshawar (IMSciences) was selected for research purpose. This is because the centre had already initiated U-I-G linkages to some extent in Peshawar. Research findings suggest that university-industry-government linkages are too weak. The Triple Helix model, which is considered a suitable conceptual framework for regional development (Etzkowitz and Ranga, 2010) needs structural changes to make it work in a developing region like Peshawar (Dzisah and Etzkowitz, 2008). The original spiral model of innovation worked well in the developed world because that industry hosts multi-nationals that can afford industry-academia joint ventures. Their governments not only facilitated interactive networks but also designed such policies' frameworks that supported high growth firms (HGFs) (Mason and Brown, 2013). Whereas Peshawar is not only a traditional and developing economy but also a war and crisis-ridden region, due to which it cannot attract multi-nationals headquarters. The findings of the research can be treated as an asset that can easily be reused by other developing region for knowledge transfer and economic development.

Keywords

Inclusive education, Household-based Education index, Inequality coefficient, Inclusion coefficient, Socioeconomic determinants

JEL

Classification

C00, C21, I24, I29

1. Introduction

The Triple Helix model, as envisaged by Etzkowitz, (Etzkowitz, and Zhou, 2018) has emerged as a common thesis globally. It is believed enables numerous nations to enhance and

accelerate their development form This is due to the fact that countries and regions believe that innovative environment and entrepreneurial culture can only be attained if they opt for this specific model. These regions' common objective is to generate an academic spin-off with the help of university research groups and establish tri-lateral networks for economic development (Afzal et al., 2018). Therefore, the underlying model regards the university as a significant partner in knowledge-based economy and entrepreneurship (Leydesdorff et al., 2017; Etzkowitz and Leydesdorff, 2000; Jones et al., 2014) because knowledge firm cannot be produced by a single entrepreneur due to the lack of technical expertise. Hence, the need for collective entrepreneurship, i.e. collaboration of individuals and related institutions emerges. This institutional collaboration for collective entrepreneurship takes place at three phases (Etzkowitz, 2001). In the first phase, university-industry-government collaborates for innovation while retaining their traditional identity. Thus, when the three helixes enter into reciprocal relationships to enhance the performance of each other, the first step towards the Triple Helix is taken. For example, industry-academia-government initiates dialogue on improving the local economy and for this purpose the three helixes take their concern responsibilities, such as that university helps in producing graduates relevant for the industry; government supporting new plant construction as well as financing industry research. Industry may seek help from both the helixes in regard of starting a new cluster. In the second phase of Triple Helix, when the quest for intellectual capital becomes important, modification in the role and performance of university and other knowledge producing institutions gets priority (Etzkowitz and Dzisah, 2007).

The more university R&D capabilities and training facilities are needed by industry, the more the influential role of academia emerges in the local economy superseding the dominance of industry and government laboratories. This is because university knowledge and research has a competitive advantage over other R&D institutions. In this phase, industry and governments get involved in establishing research centers and, in order to speed up academic research production, they provide additional funds and resources to academia (Etzkowitz, 2001; 2002). Once collaboration on a reciprocal basis is established among the three helixes for economic growth, while retaining their primary role and distinct identities, they take the role of each other to ensure innovation (Etzkowitz and Zhou, 2007). Such role-taking comes in the form of university transmitting education to youth as well as spinning new venture (Sarpong et al 2017) and doing industrial research - this was previously the task of industry.

Hence, today's model of innovation is different from its predecessors where statist models emphasized governments' dominating and controlling industry and academia or the three spheres working independent and separate of each other as in *laissez faire* (Etzkowitz, 2003). The new model of innovation evolves when interaction and interdependence among the three spheres is increased to the point that hybrid institutions, invention and innovation takes place (Dzisah and Etzkowitz, 2008). Therefore, the new Triple Helix in current industrial society is perceived as a spiral model (Figure 1) that is based on mutual and reciprocal public-private and

academic partnership for knowledge economy. Here, hybrid institutions results in the form of R&D, e.g. U-I-G research consortia; science parks; business incubators; financial support institutions, such as venture capital firms; angel networks seed funds and technology transfer offices (Etzkowitz, 2003).

This paper presents the detailed analysis of MPhil research work's Triple Helix Model, based on Etzkowitz's framework. The model is commonly perceived as a road towards innovation and economic development in the developed world. The purpose of the study was to search for a viable U-I-G model that could contribute to the economic growth of Peshawar, Pakistan. Initially, economic models, i.e. Porter's Diamond model, Mode 1 and 2 (Kashani and Zarghami, 2019) and the Triple Helix of university-industry-government (U-I-G) were explored. As academia's role was observed in the above approaches, therefore university's role from an evolutionary perspective was investigated; the purpose was to identify the factors that transformed the academic traditional role, i.e. teaching and scholarship into an entrepreneurial university. Hence, study of the university transformation revealed that academia's third mission, i.e. to generate new knowledge, emerged due to global tendencies towards knowledge-based economies (Sarpong et al 2017). Therefore, the pursuit of innovative knowledge led the US Government to adopt Mode 1 since 1945 to 1988 and then Mode 2 (Etzkowitz and Leydesdorff, 1997, 2000) to achieve innovation in different sectors. Hence, the US Government funded basic academic research since 1945 until 1988 under Mode 1 and multi-disciplinary or trans-disciplinary research under Mode 2 in the early and late twentieth century (Etzkowitz, 1997). Mode 2 was a pluralistic approach involving a "networked" innovation system (Sampat and Mowery, 2004). Moreover, the academic crucial role in industry is also highlighted in Porter's model. It is because competitive advantage (Porter, 1998) is achieved due to new knowledge generation which is possible due to academic research capabilities. However, where the Porter model regards all factors involved in value chain equally important (Gulbrandson, 1997; quoted in Etzkowitz and Leydesdorff, 2000), Etzkowitz's model focuses on industry-academia-government linkages for economic growth. As the focus of study was on U-I-G linkages in Peshawar region, therefore the Triple Helix model, which in fact is the further development of the Porter model, was considered for research.

Furthermore, Peshawar major economic sectors consist of traditional small and medium enterprises. MNCs are nominal in Peshawar and exist either as franchises or branches. No official MNC headquarters have been established in Peshawar due to its law and order situation. In such scenarios, the chances for the economic growth of Peshawar can only be bright if an interactive institutional network approach is adopted. Therefore, Etzkowitz's thesis of university-industry-government was selected for systematic study (Tranfield et al., 2003) so that a more practical institutional set-up could be adopted for economic growth in Peshawar, Pakistan. A case study of the Entrepreneurship Development Centre (EDC); Institute of Management Sciences (IM Sciences) Peshawar, Pakistan, is presented in a quest for a suitable

academic partner that can collaborate with the local industry and government. To provide an in-depth view of the study, this article briefly discusses the Triple Helix model, the literature review findings and primary data results. The analysis of literature review discusses the success and issues of the Triple Helix model that are identified by empirical studies worldwide. The analysis of the primary data collected, presents a picture of how EDC IM Sciences can contribute to economic development in the Peshawar industry. Since the focus of the study is Etzkowitz's Triple Helix model and its implications worldwide, an attempt was made to infer suitable measures from the model for Peshawar, Pakistan. In the end, conclusions are drawn from the theoretical and practical research conducted



Figure 1: The spiral model of university-industry-government interaction for innovation

Source: Etzkowitz (2007), <http://ethiopiantriplehelixassociation.org>

2. The three institutions in the spiral model

The new model of innovation evolves when interaction and interdependence among the three spheres is increased to the point that hybrid institutions, invention and innovation takes place (Dzisah and Etzkowitz, 2008). Therefore, the new Triple Helix in current industrial society is perceived as a spiral model (Figure1) that is based on mutual and reciprocal public-private and academic partnership for knowledge economy.

1. Here hybrid institutions result in the form of R&D, e.g. U-I-G research consortia; science parks; business incubators; financial support institutions, such as venture

capital firms; angel networks; seed funds and technology transfer offices (Etzkowitz, 2003).

As discussed above, tri-lateral ties among academia-industry-government results in mutual benefits for each spiral (Figure 2). For example, Massachusetts Institute of Technology takes entrepreneurship as its academic mission for regional economic development, whereas the government acts as venture capital for academic spin-offs and finances industrial research centers at MIT. Furthermore, industry takes up the education role of academia when it gets involved in the training and development of its employees (Etzkowitz, 2002). Also, Swedish new universities and regional colleges have made knowledge creation as an important part of their academic program that has led to the creation of science parks; research centers; joint student training projects for firm formation and entrepreneurship training programs. Here, the Swedish Government act as a public venture capitalist that instigates and finances new firms based on new technology (Etzkowitz, 2007).

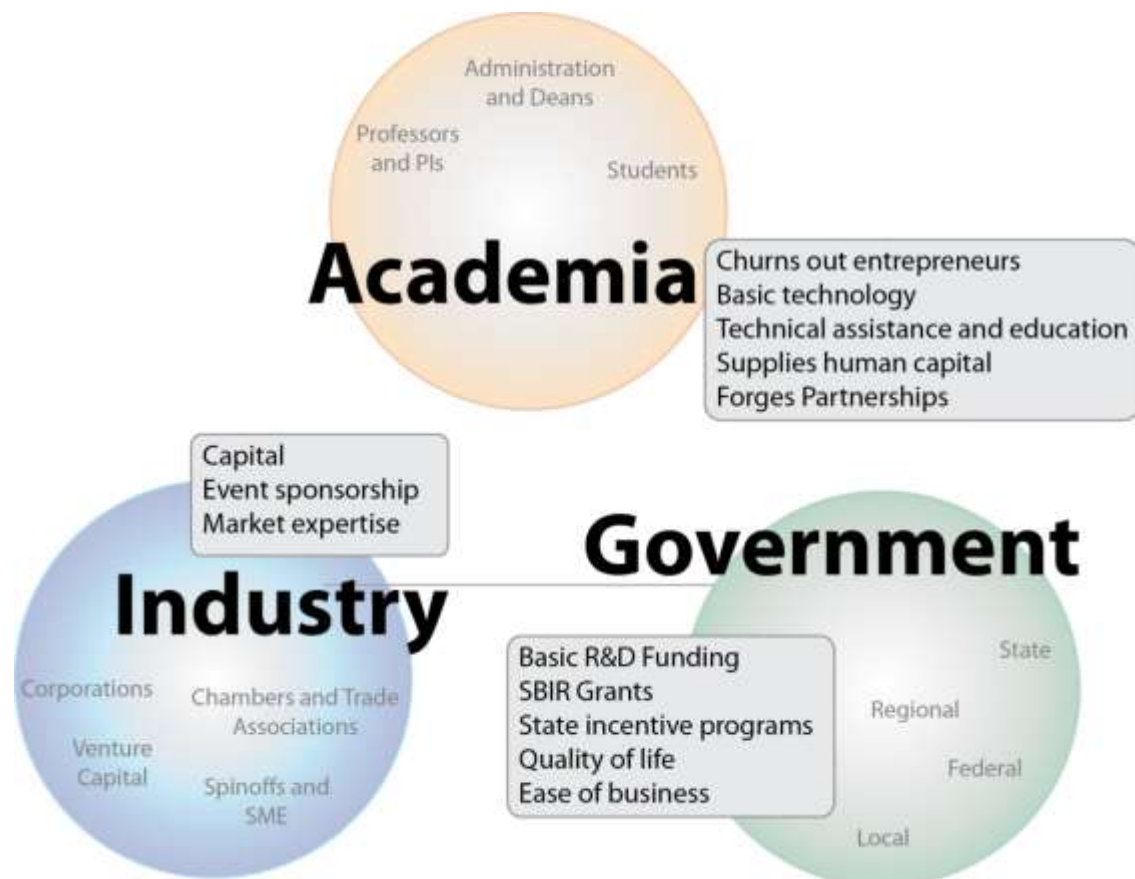


Figure: 2 Each spiral benefiting from U-I-G linkages

Source; www.matthwierut.com

From the above discussion, the new roles of academia, industry and government in the Triple Helix model are:

2.1 Government

The government not only accepts academic role in industry but also in finance and support research centers at academia. It acts as a venture capitalist to provide the seed funding for technology firms. Hence, it provides R&D funds to academia and establishes entrepreneurial universities in the region. Furthermore, it enacts mutually agreed policies on patent and research commercialization; cultivates entrepreneurial culture in academia by funding enterprise events and formulating enterprise friendly policies for graduates (Etzkowitz, 2007; 2003). Hence the government not only facilitates university and industry interaction, such as patenting regulation (Leišytė & Fochler, 2018) it has a strong role in the development of triple helix model (Yoda and Kuwashima, 2020).

2.2 Academic

The academic role comes in the form of establishment of entrepreneurship research centers that produce knowledge based spin-offs and conduct industry specific research. The centers in return provide consultancies to industry; commercialize research and provide training and development facilities to industry. Furthermore, it acts as a help desk for industry; introduces entrepreneurship curriculum in education that produces industry specific graduates. Hence, these centers cultivate entrepreneurial culture; generates hybrid institutions (Etzkowitz and Ranga, 2010), such as technology and business incubators, science parks, R&D and mentors entrepreneurs (Etzkowitz, 2007).

2.3 Industry

Industry funds industry specific research centers at academia accepts and recognizes academia's potential for industrial collaboration and designs patent laws agreed by academia.

Moreover, industry benefits from academic research commercialization; human resource development and academic expertise for industrial solutions. U-I-G linkages are mutually beneficial for all; therefore, industry accommodates academic spin-offs; collaborates with government to establish science parks and incubators at academia. It also mentors graduates on business issues; sharing their real life business stories with them; arranging talk shows, open discussions and seminars on business opportunities as well as giving internships to students at industry for practical exposure other industry contribution required by the model (Etzkowitz, 2007).

3. Institutional theory and spiral model of innovation

As the new spiral model is set up on institutional theory therefore university-industry-government relations are based on institutional network (Leydesdorff et al 2017). Hence reciprocal relationship among the three institutions can only emerge if planned, structured and substantial plan for their cooperation is developed. Moreover, if institutional barriers, i.e. resistance to change exist among the three institutions, long term cooperation among the three cannot be form (Brundin et al., 2008). Thus, hybrid institutions (mentioned above) cannot be

developed. Furthermore, people from academia-industry and government require well-developed rules and regulations for routine activities. A proper feedback process should be developed that can put pressure on the three institutions to meet their mutual goals. The institutions involved need to synchronize their activities and identify their mutual objectives. For example, if government is only interested in policy formulation while ignoring implementation, industry doesn't show interest for mutual cooperation while academia research is not benefiting industry, Triple Helix is likely to fail. Institutional barriers, such as diverse organizational goals and objectives; structure and resistance to change might hamper the process of economic growth and innovation (Brundin et al., 2008). Furthermore, if the three institutions are subject to mimetic, coercive and normative pressure; triple helix from an institutional perspective cannot foster economic growth and innovation (DiMaggio and Powell, 1983; Brundin et al., 2008). University, industry and government in the Triple Helix model are forced to resemble each other in their institutional set-up; hence, the model leads to isomorphism (DiMaggio and Powell, 1983). However, academia and government are subject to institutional isomorphism, while industry is forced to competitive isomorphism (DiMaggio and Powell, 1983; Brundin et al., 2008). In this regard, when taking the role of each other in the new spiral model of innovation, the three institutions are required to adopt new beliefs, goals and objectives as well as accept new environment pressure, i.e. technical and institutional control (Meyer and Scott, 1991; Brundin et al., 2008). For example, academia which is not subject to competitive isomorphism has to compete in the new institutional set-up by taking advantage of its research capabilities. The government can utilize its regulatory pressure on the two institutions to meet their set goals. The industry, controlled by technical pressure, should comply with institutional pressure as well to foster economic growth and innovation (Brundin et al., 2008).

Hence, all the helices in the model have common areas that they can mutually develop and strengthen by collaborating with each other without compromising on their independent domain. Therefore, they have to recognize their mutual interests and design policies that can ensure their long-term collaboration for economic growth. Even though the three spheres have a common interest and have a valid reason to integrate and support each other, there are still issues involved that create barriers in bringing academia, government and industry to a platform from where they can materialize the true nature of Triple Helix model. These issues were identified during the systematic literature review (Macpherson and Holt, 2007; Tranfield, 2003) that was conducted to check the practical implications or validity of the Triple Helix model in Peshawar, Pakistan.

4. Literature review

The literature review explored in-depth academia-industry-government collaboration in factor-driven (developing); innovation-driven (highly developed) and efficiency-driven (newly

developed) countries (Jones et al., 2014). A total seventy-eight research articles on the Triple Helix model, published during 2000-2020, were selected for the literature review on the basis of their research rigour. Finally, four themes were derived: Triple Helix and R&D; Triple Helix and innovation; Triple Helix and economic development, Triple Helix and industrial growth.

This review was restricted to publish peer reviews; academic articles held within the following databases: ISI Web of Knowledge; Business Source Premier; Science Direct; Scopus and Google scholar. These were chosen from amongst others as providing the largest number of returns using a basic keyword search of the Triple Helix model and developed* Developing* Newly industrialised countries* and empirical studies. Each database was interrogated by the search strings listed above. Research interest was limited from the years 2000 to 2020. Titles, keywords and abstracts that were published during year 2000 to 2020 were searched, where more than 150 studies were retrieved and exclusion criteria were included in order to refine the search. For example, studies on Medical Sciences were not included since the concept of Triple Helix carries other meaning in Medical Sciences. Therefore, inclusion criteria were limited to Social Sciences, Business Studies, and Computer Science. The total number of potentially relevant studies retrieved using search strings was 150. These were exported to Refworks, a referencing database where they were further reviewed against the inclusion and exclusion criteria in using key word, searches, year of publication and title analysis. Also, duplicate studies were removed. At this stage, a thorough review of the abstracts alone was conducted and the articles that were relevant to the year of publication, title, search strings were selected for review (Macpherson and Holt, 2007).

5. Analysis of literature review

Analysis of systematic literature review revealed that due to academic R&D potential, industry and government has benefited in innovation, industrial and economic growth worldwide. However, research found that issues do exist in regions where Triple Helix is not practiced in its true sense. The main issues confronted worldwide while practicing the Triple Helix model are:

5.1 External funding

Financial grants are essential for academic R&D activities (Acosta et al., 2009); therefore, the government is required to develop a mechanism where the universities can receive research grants without any vested interest. Because research funds received from external sources by academic research councils come with strings attached, this affects research practices in the developing and developed world alike. For example, in the US, Etzkowitz (2003) and Sweden's (Benner and Sandstrom, 2000) external research funds directly affect norms of their research councils and influenced research as a whole. Hence, the government is required to allocate industrial-academia research funds through fiscal budgets and on a continuous basis without any pre-determined consequences so that unbiased results can be attained.

5.2 Policy level support

Countries where political and economic conditions (Nwagwu, 2008) are not stable, such as Nigeria or policy level support is not provided (Langford et al., 2006); the innovation process is either slow or cannot take place. Policy-level support includes governments providing R&D funds to academics; establishing research centres (Shapiro, 2007; Boardman and Corley, 2008; Boardman, 2009); strengthening inter-institutional linkages between academia and industry; design clear, flexible and consistent policies for R&D activities in their regions. Research found that countries, which do not meet these basic requirements of the Triple Helix model, the process of innovation and industrial growth is slow in their regions. For example, Malaysia, due to inflexible, rigid, vague and inconsistent government policies, Razak and Saad (2007), and Nigeria's (Nwagwu, 2008) unstable economic conditions, institutional linkages for economic growth cannot be developed. The countries which want to achieve innovation and economic growth need to follow the precedents of the US; Mexico (electronic cluster) (Vargas, 2010) and West Germany (Mueller et al, 2005) where high-tech cluster development is possible because their governments have sincerely supported the integration of academia and industry. Whereas, Portuguese progress on the creative use of technology (de Castro et al., 2000) and Lithuanian high-tech development (Chlivickas et al., 2009) is slow because government support is not present in these regions.

5.3 Foreign research collaboration

The countries where there is less trust in local academic research expertise, means there are chances that the local industry and government will turn towards foreign research collaborations. In such circumstances, universities' expertise is not employed in local industrial research. For example, Japan (Sun and Negishi, 2010); Thailand (Liefner and Schiller, 2008) and Malaysian industry (Razak and Saad, 2007) trust in foreign research or MNC's expertise for quick industrial solutions has weakened academic role in industrial research. Unless regional governments and their industries recognise local academic capabilities, such as research, teaching and technology transfer potential, academia cannot play a strong role in innovation and economic development.

5.4 Industry and academia's willingness for innovation

Innovation largely depends on industry and academia's willingness to collaborate i.e. if industry is willing to collaborate with academia (Acosta et al., 2009), innovation-based research can be carried out. Whereas countries where industry or academia show lack of interest in innovation or are reluctant to collaborate cannot achieve success. For example, due to Malaysian (Razak and Saad, 2007) and Australian (Gunasekara, 2004, 2006) industries' lack of willingness for technological innovation, strong and effective university-industry interaction could not be developed in these regions. However, the US's leading position in the bio-tech sector; information technology and new media is possible because of the active contributions of academia in the knowledge economy. The reason why the US achieves this success in these sectors is: 1) Government support for involving academia in the innovation process of the

country; 2) A strong academic desire for industrial collaboration (Mayer, 2006). Hence, these factors have led to the establishment of research centres in Portland and Washington. Once industry, academia and government realise the mutual gains by collaborating with each other, there are chances that each Helix will happily support each other in R&D, innovation and economic growth. The industry needs to realise that by integrating with academia it can save time and money on in-house R&D and will focus more on business while academia can gain financial help from industry and the state can achieve economic growth and a competitive edge.

5.5 Research commercialization and patent rights

Research commercialization, intellectual property rights and patent policies are not clearly designed in the developed and developing world. Due to which, confusion over ownership exists between research partners or innovation groups. These common issues are found in Finnish universities and industry (Tuunainen, 2002); Argentinean public research organizations and firms (Arza and Lopaz, 2011); European universities (Acosta et al., 2009) and Malaysian universities and industry (Razak and Saad, 2007). To overcome such issues, a more conscious approach by the government is required while designing commercialization and patent policies and procedures in these regions.

5.6 Other

In developing countries, especially Malaysia (Razak and Saad, 2007), universities lack industry specific research expertise and equipment; timely solutions to industry problems by academia, i.e. academic staff's full-time research commitment for industry problems and the Malaysian Government's inflexible, rigid, vague and inconsistent policies creates barriers for successfully implementing the Triple Helix model. In European regions, Triple Helix cannot take roots due to the absence of a homogeneous legal system that protects industry and university property rights (Acosta et al., 2009).



Figure 3: Thematic findings of the literature review
Diagram created by author

6. Validity of the model in Peshawar

The Triple Helix model, which is considered a suitable conceptual framework for regional development (Etzkowitz and Ranga, 2010) needs structural changes to make it work in a developing region like Peshawar (Dzisah and Etzkowitz, 2008). The original spiral model of innovation (Figure 1, above) worked well in the developed world because that industry hosts multi-nationals that can afford industry-academia joint ventures. Their governments not only facilitated interactive networks but also designed such policies' frameworks that supported high growth firms (HGFs) (Mason and Brown, 2013). These HGFs not only speed up productivity growth but also create new jobs; increase innovation and promote business internationalization (Mason and Brown, 2013). Peshawar is not only a traditional and developing economy but also a war and crisis-ridden region, due to which it cannot attract multi-nationals headquarters. Therefore, it has to depend on its natural resources and local talent or human capital to develop its economy. Once Peshawar's local industry starts developing, it will ultimately lead to innovation and increased productivity (Reinert, 2007). As economic and political conditions do not fit Triple Helix's requirements, it is suggested that the model should be modified to fit the local sub-dynamics (Dzisah and Etzkowitz, 2008). The modified model of innovation is provided in Figure 4.

7. Research methods

As recommended above in the policy level measures, research centres can promote innovation and knowledge transfer through R&D activities. Therefore, the role of the Entrepreneurship Development Centre's (EDC) IM Sciences Peshawar, Pakistan is taken as a case study for industry-academia linkages for economic growth in the local economy. For this purpose primary data was collected through researchers personal account and semi-structured interviews taken from EDC's current coordinator, regional head of Small and Medium Enterprise Development Authority (SMEDA) and vice president, women chamber of commerce Peshawar, Khyber Pakhtunkhwa (KPK).

7.1 Population and the sample

The units of analysis (Benbasat et al., 1987) of the study comprise of three groups; since it is a case study, from the academia Entrepreneurship Development Centre (EDC) IM Sciences was selected to investigate how an entrepreneurship centre can contribute to regional economy under the framework of the Triple Helix model. Hence, EDC's first coordinator's personal account is considered while the second coordinator was selected for in-depth interview; vice president of Women Chamber of Commerce and Industry of Peshawar was selected from the industry and SMEDA's Regional Head in Peshawar was chosen as the third party who is actively involved in the process. The initial contact was made with the respondents through telephone calls and a request for informal interviews was made. The respondents agreed with the research objectives and its importance for the local economy was explained. Through a telephone conversation, the participants were informed about timescale; data collection

technique and the ethical considerations of the study. Dates were agreed upon for the semi-structured interviews and written confirmation was sent.

7.2 Data analysis

Hence, to explore first-hand accounts of the respondents involved, I employed in-depth semi-structured interviews (Kajornboon, 2005). However, the data collected from interviews was a challenging task to interpret. Initially, an inductive approach (Gray, 2013) was used to familiarize with the data collected (Roper and Shapir, 1999). As the data collected was based on written words, it needed to be coded in descriptive labels and then into analytical labels. Hence, the coding process started with marking the data that could potentially address the research question. At the second level of simplification, the data was minimized to a manageable size. In the third phase, categories were identified and once descriptive labels were grouped into smaller sets, themes were developed and finally a conclusion was drawn (Saldana, 2009).

The centre, established in 2008, was meant to perform the same functions as reflected in the USA and UK enterprise research centers. Unlike the Centre for Enterprise; the Business School of Manchester Metropolitan University and Enterprise Centers worldwide (Jones et al., 2008), EDC IM Sciences could not pursue its goal of industry-academia integration due to the lack of funds. MMUBS Centre for Enterprise, established in March 2001, secured funds from external sources, such as European Regional Development Funds (ERDF); ESRC (£364,000) and soft structural European funds (Jones et al., 2008), while EDC IM Sciences could not find such avenues to secure funds. Hence, in its initial stage it could not perform activities that were performed by enterprise centers in the developed world. Again, MMUBS Enterprise Centre bids for funding were a team effort that involved the Director and external project expertise (Jones et al., 2008) whilst the EDC Head had no other expertise available that could provide expertise for securing funds.

Other problems identified by primary data collected through semi-structured interviews from Small and medium Enterprise Development Authority (SMEDA) Head's current EDC coordinator; the Vice-President of the Women Chamber of Commerce Peshawar and from the founder of EDC personal account, was the lack of institutional context (Jones et al., 2008) and policy level support for the Triple Helix model in the Peshawar region. A personal account from the EDC coordinator revealed that it was never taken seriously by industry-academics and government. A policy-level support was absent which made the centre ineffective to perform its activities properly. Although the coordinator was successful to revitalize EDC, no further support was provided to her in the shape of R&D funds and training and the development of EDC staff. Unfortunately, EDC could not generate income to meet its expenses due to the availability of funding agencies, such as ESRC and European Regional Development Funds (ERDF) (Jones et al., 2007). Unlike the Centre for Enterprise, at Manchester Metropolitan University where they have generated £9m since 2001, from regional development funds and other sources (Jones et al., 2008), EDC could not explore such avenues because such funding agencies were not present in Peshawar. However, one recent

development regarding securing funds is that EDC can seek funds from ORIC (Office for Research Innovation and Commercialization) which were recently established by HEC (Higher Education Commission) at IM Sciences for giving research funds to its internal research centers. Earlier, the only support EDC received from its own institute was in the shape of student internees; coordinator allowances; separate offices; some funds for refreshments during awareness sessions and seminars arranged at the institute, and travelling allowances for networking. In such circumstances, materializing the Triple Helix model in the region was far from reality. It needed a lot of effort to bring the three helixes to one platform; convince them to collaborate as well as retain their independence in their own sphere.

Interviews with the Chamber of Commerce and Industry and SMEDA's Head, equally show the need of EDC's role in economic development because the local industry of Peshawar is based on traditional businesses that are not technology and innovation driven and the industry is full of uneducated business people who lack proper business skills and expertise. The poor conditions of the local economy demand an institutional approach towards economic growth. Firstly, because local businesses are established with no proper market research; secondly, the business community, especially female entrepreneurs lack business know-how and have no knowledge about innovation and knowledge firms, which exist nationally and internationally. They have no avenue to look for proper advice and business support help. Most of the business community has no proper direction and lack government and institutional support for starting and developing their businesses. Apart from a few entrepreneurs who are educated or are running family businesses, the rest of the industry is ignorant of the international market trends – while, if trained properly, the existing businesses can be taken at international level.

8. Enhanced role of SMEDA in Peshawar, Pakistan

The above discussion of the literature review and the primary data found that local industry in Peshawar, Pakistan, needs academic help to grow. Since Small and medium Enterprise Development Authority (SMEDA) has linkages with industry and is actively involved with local Chambers of Commerce (industry), it can act as an intermediary party (Todeva, 2013) by integrating industry and EDC on the one hand and convincing government to support this integration on the other hand. One of SMEDA's tasks is to provide entrepreneurial trainings and consultancies to new entrepreneurs; it can outsource this activity to EDC; by doing so, industry can get to know the potential of the centre. This will establish a long-lasting collaboration between industry and EDC for research and training. As SMEDA already has strong relationships with financial institutions and donor agencies, it can introduce EDC to these institutions for research funds. It can also bridge the gap between the government and EDC by convincing government to fix research funds for the centre in the budget. One of EDC's achievements is the establishment of the incubation centre because innovation and academic spin-offs in Peshawar are only possible if a technology and business incubation system is established. However, incubation is a new and complex process in this region and requires a proper organizational mechanism. EDC can involve SMEDA in getting seed funds

for technology spin-offs from government and other financial institutions. For incubators and science parks (Etzkowitz et al., 2005; Jones et al., 2014) to take roots in Peshawar, Pakistan, academia has to get involved in industrial research; establish joint ventures with the industry. The government needs to support and initiate such science and technology policies which can help in the development of the incubation industry in the region. The innovation process, as reflected in the research findings, requires policy-level support, i.e. establishment of R&D institutes (Li, X, 2009; Asheim and Coenen, 2005); a full understanding of regional industrial demands and the designing of regional base innovation policies. Therefore, government support in this regard is highly essential not only to ensure the Triple Helix and the entrepreneurial culture in Peshawar but also to understand the needs of the SME sector, so that R&D institutes can address industry specific problems. Therefore, SMEDA which already is involved with local SME's can assist EDC in getting the required information.

Since universities 'have an important role in the economic development of any region (Mayer, 2006; Liefner and Schiller, 2008), a well-defined framework for academia-industry engagement in economic growth should be outlined. From the empirical study, it is proposed that SMEDA can involve the policy makers in Peshawar to promote the rise of academic capabilities, i.e. entrepreneurial training and education (Jones et al., 2014) in accordance with the changing needs of its industry. Higher education institutions should provide knowledge input in the form of graduates and publications; direct consultancy services and establish research centers that cater to needs of local SME's. As discussed above, Triple Helix cannot be replicated in Peshawar in its original form; therefore, a modified form of the model (see Figure 4) should consist of SMEDA as an intermediary body that will act as a bridge among the three helixes for economic growth.

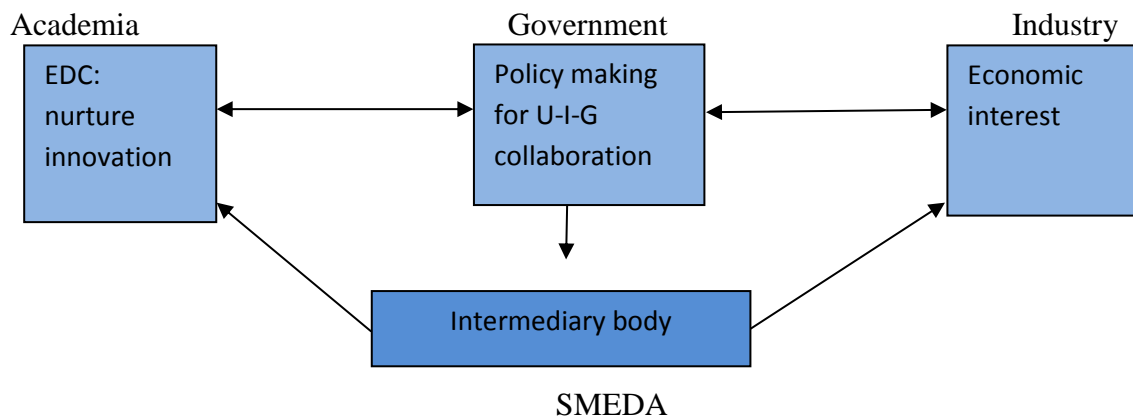


Figure 4: SMEDA as an intermediary body among U-I-G Linkages

Diagram created by author

As responses from the primary data confirmed that for an uneducated person to establish a knowledge base firm is not an easy task; therefore, SMEDA can utilise EDC's potential for the training and development of the novice entrepreneur. EDC, while utilising PHD staff's expertise of IM Sciences for industrial research and consultancies, can address industrial needs.

All the three institutes if integrated can develop a conducive environment for knowledge economy by producing knowledge firms in Peshawar. Thus, such institutional collaboration will result in the Triple Helix model that started in the US and in rest of the developed world. Due to successful results of the model, it is gradually spreading in the developing world as well. Since IM Sciences Peshawar has the potential for developing the local economy, first it has a highly educated faculty specialising in business education; secondly, it has EDC on its credit. Under the model, governments can provide funds for industrial research to the centre. With funds, the centre can offer business specific trainings to potential and existing entrepreneurs. The centre, with the help of SMEDA, can do sector mapping of all the businesses in Peshawar; identify their problems and needs and then can offer consultancies and business specific solutions to the industry.

Furthermore, an interview with SMEDA's Chief revealed that until a date is reached when governments overcome that they are unaware of the academic role in the economic development there is an issue; therefore, no deliberate policies have ever been developed at local and national level that will promote and facilitate industry-academia collaboration. However, the government now want to include academia by establishing entrepreneurship development centers at academia for training and industry research. Therefore, the chances are that once the process of U-I-G interaction starts, EDC IM Sciences which already exist (inspired by the UK; the USA and the European model to contribute to the local economy) will be taken as a pilot project. Hence, once successful, can be replicated in other parts of the country for economic growth. One positive outcome of interviews with the SMEDA Head and Women Chamber of Commerce Vice President was that both industry and government badly need academic expertise for industrial research; training and development of entrepreneurs and industrial specific Human Resources. Hence, if the original model cannot be replicated in Peshawar, Pakistan, due to the absence of MNCs and high-tech firms as the main actors, there are still chances that the model can be modified to suit the local dynamics. Figure 2, shows that industry actors are MNCs; the Chamber of Commerce; venture capital and SME spin-offs; academia actors are faculty, students and administration while government means local and federal. Industry and government provide research funds and sponsor events like trade fares, business ideas, etc., these two also act as Venture Capitals for academic spin-offs. In return, academia churns out entrepreneurs; produces industry specific graduates; generates knowledge firms and trains Human Resource professionals for industry (Etzkowitz, 2003; 2007). Such U-I-G collaboration in Peshawar has yet to take roots despite the fact that EDC staff have really worked hard to initiate the processes of such linkages.

The reasons for poor collaboration and the gaps identified during primary data analysis are mentioned in the following table:

Table 4: Gaps identified in U-I-G collaboration in Peshawar, Pakistan

Academia	Industry	Government
<ul style="list-style-type: none"> • Low level university-industry interaction exists in the region. • Academia-industry mutual trust is lacking. • No formal framework based on clear goals and objectives for mutual collaboration is designed for EDC-industry collaboration. • U-I-G mutual benefits in monetary term need to be identified • No mutual projects have been taken up by both. • No R&D funds have been provided to academia. • No government recognition of EDC's potential for industrial role exists. • EDC and industry needs a catalyst/coordinator for bridging the two. • EDC hybrid institutions, i.e. incubators need government support. 	<ul style="list-style-type: none"> • Industry needs academic help for consultancies, skill and capacity building and business ideas. • Industry needs a framework to collaborate with academia. • No formal linkages have been developed between industry and academia. • Industry needs to identify its benefits in developing linkages with academia. • No joint research ventures between industry and academia have started. • Industry need to collaborate with EDC Economic growth in the region. 	<ul style="list-style-type: none"> • The government never took EDC's crucial role in industry seriously. • No R&D funds were ever planned in the fiscal budget for EDC. • No industry-academia joint venture ever funded. • Not aware of the importance of hybrid institutions. • Needs a catalyst/coordinator to bridge U-I-G.

9. Critical analysis of the model in Peshawar Pakistan

The study found that initial linear linkages that can be established between EDC and industry can be service-oriented (Schiller, 2006). That would include consultancies; training of human capital and technical expertise. Producing industry specific graduates; providing interns and joint research activities can be another service provided by EDC to the industry. However, to cultivate suitable grounds for the modified model, and develop linear modes among the three, SMEDA needs to bring the three helices to the negotiating table for possible collaboration in the region. This process is not radical rather evolution-based (see Figure 5), e.g. in the first phase SMEDA will introduce the three helices to each other and EDC's potential for local economy will be acknowledged by industry and government. In the second phase, SMEDA will initiate and facilitate dialogues among the three spheres for local economic growth. At this stage, common grounds for mutual relationships and collaboration will be established. In the third stage, SMEDA's role as facilitator and coordinator will be acknowledged and a formal policy framework for future collaboration among the four partners will be designed. Finally, an action plan for reciprocal relationships will be agreed. Hence, SMEDA will act as an initiator, coordinator and enhancer (Figure 6) of trio linkages. Initially, mutual dialogues will focus on the uplift of the traditional SME sector; then gradually all the

helixes will design policies for high-tech research and knowledge firms that ultimately leads to innovative SMEs.

10. Positive impacts of the triple helix model in Peshawar Pakistan

Once the model is developed and starts functioning, it will have the following implications for all the partners:

Implication of triple helix model for the government of Peshawar

The government until now was depending on SMEDA for industrial development in the region, while SMEDA lacked expertise that could train and guide the local entrepreneurs towards innovative businesses. Furthermore, SMEDA had not enough time and resources to conduct business specific research and provide solution to the local economy. Therefore, EDC's expertise can lessen SMEDA's burden to some extent and can play an important role in the growth of local economy. The government by providing research funds to EDC will not only identify industrial problems and solve them but also can minimise the business failure rate; therefore, successful businesses can result from academia-government collaboration. Industrial research by EDC will help the government to grow and flourish the traditional businesses in a more modern and innovative manner with which these businesses can be promoted at international level. EDC IM Sciences with the help of SMEDA will establish an 'idea village', which will generate innovative business ideas that can help the local economy to develop more knowledge base firms. Moreover, government should patronise EDC for incubation and science parks that results in technology-based local businesses. The government should assist in bridging the gap between academia and industry (Jones-Evans et al., 1999) will begin a new phase of economic development where more confidence between the two will be developed. Hence, the Triple Helix model taking charge of the local economy will enable governments to focus more on the law and order situation and will be relieved from focusing on the industrial problems. In short, the model will not only contribute to local economic development but will generate new jobs. The government, in this regard, will have less worries for accommodating fresh graduates.

10.1 Implications of triple helix model for the industry

The model will not only overcome institutional differences in the region but will help industry to address its problems through EDC's platform. EDC will train new business entrants in the region by teaching them business specific skills. As new businesses will be research based, this will encourage innovative businesses to sprout up in Peshawar. EDC consultancies' services will assist industry to overcome its hurdles in start-up and growth stages. EDC training and development and R&D capabilities can help industry to save its R&D budget. Hence, the industry will have more time for developing its businesses and will be relieved from financial burdens.

10.2 Implications for academia especially EDC IM Sciences:

U-I-G linkages will not only enhance EDC’s role in Peshawar’s economic development but will also increase its earnings through research funds and entrepreneurial trainings. Moreover, EDC’s image at government and industry level will be boosted on the basis of its research and staff capabilities. Therefore, it can be a pioneer in new knowledge creation in the region as well as from its incubation centre and new firms will spin-off.



Figure 5: Presents the three phases of evolution of U-I-G collaboration in Peshawar Pakistan

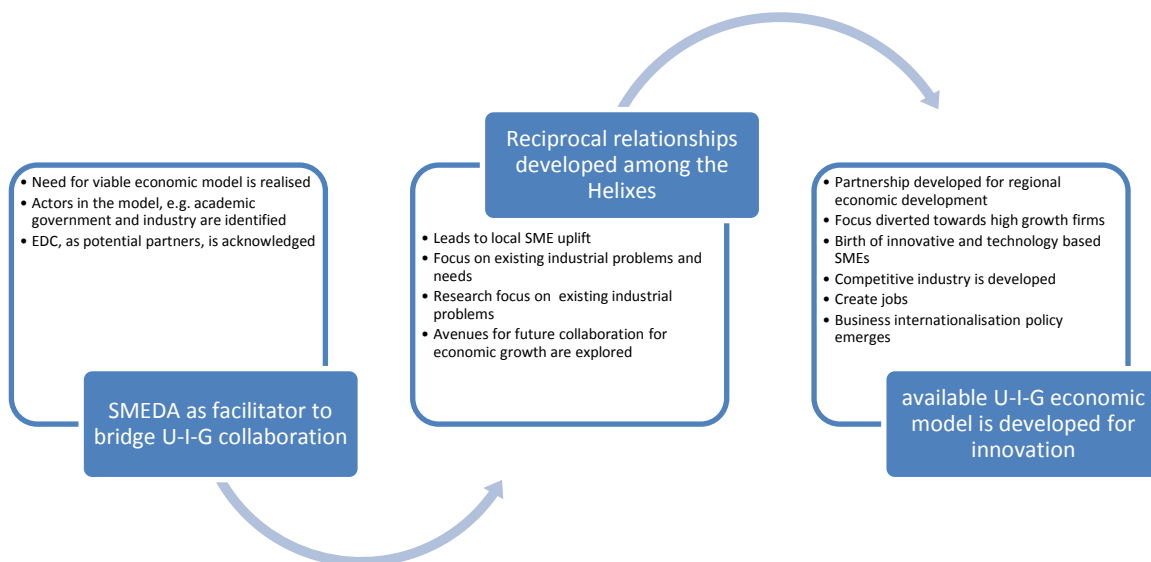


Figure 6: Illustrates phase-wise development of the local economy by Triple Helix and SMEDA as the facilitator.

Diagrams created by author

11. Conclusion

This research acknowledges the challenges and difficulties in bridging the gap among university-industry-academia (Jones-Evans et al., 1999) in Peshawar, Pakistan, for economic growth. The research has shown that there is no awareness among the three helixes about the possible collaboration that can result in the economic uplift of the region. The government role as a venture capitalist (Etzkowitz, 2003) and facilitator of the U-I-G linkages has not taken roots. Industry is not aware, neither willing to accept academia’s new role in the economy. The EDC needs governments and IM Sciences to provide funds for research and its routine

activities. One of the main issues identified during primary data was that EDC's staff are not well-equipped with the latest trends, information and knowledge required for strong U-I-G collaboration. Hence, EDC staff requires capacity building to run the centre; therefore, the institute and government should arrange for the training and development of EDC staff locally and internationally. This will update EDC staff with latest methodologies and knowledge that is practiced worldwide in U-I-G linkages. Furthermore, training and development of the staff will enable them to respond to industrial needs more effectively, because local industry needs university services for R&D; technical assistance; training and development and innovative ideas for high growth businesses in the region. Hence, the Human Resource development of EDC is strongly recommended by the study. Moreover the quest for a viable and valid economic model guided the research towards a systematic literature review of the Triple Helix model; however, the study found that although the model is practical in the West, it cannot achieve the same results in the developing region of Peshawar. Therefore, it is suggested that the model should be modified to make it valid and viable for the region (Tveit, 2011). Hence, the model should be extended to include an intermediary body (Todeva, 2013), i.e. SMEDA in the Peshawar case (as shown in Figure 4 above) which will link EDC (academia) with the local industry and government, to pool-in their common resources for economic growth in the region.

The primary data informs that EDC since inception to-date has always involved SMEDA to bring government officials and industry to its activities whether it was a business plan competition; an inauguration ceremony; seminars or university-industry discussion forums. This was because EDC could not involve industry and government in such activities without SMEDA's help. The reason was that previously neither industry nor governments were aware that EDC could be their common and equal partner in the economic development of the region. Whereas, SMEDA already had close linkages with government and industry; therefore, it can bring industry-academia and government to the negotiating table where the three can initiate dialogues for local economic growth; design a policy framework for their mutual collaboration. As there is a demand for academic expertise in the local industry, EDC can initiate IM Sciences students' ventures in idea commercialization and knowledge production. Moreover, university-industry linkage processes have already started through EDC and SMEDA: it only needs a proper mechanistic and network approach to be successful. . Furthermore, in future research, the scope should be extended to engineering universities and other management colleges in the region so that these institutes' policies towards industry-academic linkages should be investigated. This will enable future researchers to be able to adopt a more holistic view of the linkages which exist in Peshawar in the light of which the Triple Helix model can be materialized in the region.

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