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Exploring the Constraints in Establishment of University-Industry Collaboration in Punjab

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Abstract: Universities and industry are in need of cooperation and communication with each other for the social and economic development of the country. The purpose of this study was to explore the constraints in the establishment of university and industry collaboration in Pakistan, specifically in Punjab Province. This study also provides some suggestions to strengthen this linkage. Quantitative and qualitative methods were used to explore the University-Industry (U-I) collaboration constraints and strengthening mechanisms. The total sample of the study for the quantitative part has consisted of 1070 faculty members of the universities of the Punjab province. Qualitative part of study consisted of 11 ORICs member and 12 industrialists. Data were analysed by using descriptive statistics for quantitative data and thematic analysis for qualitative data. The findings of studies shows that various constraints identified in establishment of linkage between university and industry, including paucity of infrastructure, low motivation, trust deficit, lack of interest and missing policy regarding linkage. It has recommended that to strengthen this connection, it is necessary to provide research and development funds from the government and cooperation agencies, and industry co-funding will be encouraging.

Key Words: University-Industry, Collaboration, U-I Collaboration Constraints

Introduction

University is one of the institutions in which theories, ideas and innovations can be explored and developed. Universities can improve our individual and common ability to choose and apply ideas in all areas of social, cultural, technological, and economic activity. These functions of universities could be seen as adaptive and enable them to cope well with the challenges and opportunities raised by globalization, the knowledge economy and the internationalization of Higher Education (HE). Universities and higher education systems must be in a favourable position to survive and develop in order to cope with the multiple challenges faced by higher education in the dynamic changes of the global environment (Jiang, 2005; Hou et al., 2021).

The main focus of all industry-university associations is on research. Although many associations have an impact on learning and teaching, this logic is based on cooperation. University professors participated in a program within a commercial company, and researchers agreed to hold lectures and conduct effective continuous exchanges or exchanges to help update the latest courses (Laursen, Reichstein & Salter, 2011; Dutse, Bayero, Musa & Jibrin, 2021).

In fact, a university plays at least two important roles in a knowledge-based economy, namely research work and the training of high-quality talents. Therefore, universities are not only the main source of “knowledge workers” but also the key production factor of the knowledge economy- the producer of knowledge itself (Wolfe, 2016). The changes in the environment and the nature of the innovation system have put forward new requirements and pressures for universities to play a key role. As with research and training of graduates, another key area of university activity is continuing education and training. Simons,

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Haverhals, and Biesta (2007) put forward two views on knowledge production: the extreme view is that it is a new type of industry based on information and communication technology (ICT), in which knowledge is a commodity, and higher education is therefore presented as one kind of capital investment. The moderate view holds that the production of knowledge is a transition from an industrial economy to a post-industrial economy, the latter being based on social forces rather than simple information and communication technologies. Delanty (2001) emphasized that knowledge is shaped by various social forces seeking to challenge the truth rather than a goal pursued by scholars outside society.

Constraints in the Establishment of U-I Linkage

Academia and industry have produced two different mentalities because they are born with different intentions and goals. There are differences in intentions and mindsets, which create friction and limit restrictions (Ashraf et al., 2018). In a survey conducted by Joseph & Abraham (2009) on the relationship between universities and industry, the determinants, and the influence of certain selected industries in India, they explored the reasons why the industry does not interact with universities. They divide these factors into company-specific, cultural, transaction costs and other factors (Abebe Assefa, 2016; Hoc & Trong, 2019).

According to Goedhuys's research (2005), multinational companies are not interested in investing or cooperating with the local academic community because they believe that they are insufficiently prepared to deal with the challenges and skills required by the current knowledge economy. Ssebuwufu, Ludwick and Beland (2012), when determining the constraints of U-I in Africa, believe that because some universities have laboratories, they lack joint research work for financial support, but teachers have no incentive to engage in contract research. Many university teaching staff are limited to teaching. Due to a lack of funds, they cannot contact the industry. Teachers are busy with administrative work. Due to limited time, collaboration does not work.

Bhutto and Lohana (2018) identified some barriers to U-I links from the perspective of universities. Lack of mutual trust, lack of industry interest, lack of funds, lack of knowledge and industrial demand are the barriers that have a great impact. However, from an industry perspective, the lack of a mechanism to promote connections with universities, ignorance of the university's existing facilities, and the lack of experience of universities in commercialization research are very influential obstacles. This clearly shows that the main obstacle to establishing the link between universities and industry is the absence of some promotion agencies. These agencies can establish systematic links between universities and industries, provide universities with knowledge of industry needs, and share their opinions and knowledge of the university's available funding channels and Invention projects. According to Ashraf et al. (2018), scholars believe that the most important constraints include the lack of time due to heavy workload, lack of proper procedures, lack of research culture, few opportunities to enter the industry, no U-I liaison office, and useful cooperation structure. From the perspective of the industry, the main obstacles to the U-I interaction cited by the industry are the lack of appropriate procedures and mechanisms, the low commercialization potential of university research, and the lack of interest among scholars to cooperate with the industry.

The Objective of the Study

The objective of the current study was:

1. Explore the constraints in establishing university-industry collaboration.

Hypothesis

H₀: There is no significant difference between the mean scores of faculties on university-industry linkage constraints.

Methodology

Quantitative and qualitative methods were used to explore the U-I collaboration constraints and strengthening mechanisms. The quantitative sample consists of 1070 faculty members of universities. The qualitative part of the study consisted of 11 ORIC members and 12 industrialists. The Scale of University-



Industry Linkage Constraints (UILC) questionnaire included research-related, awareness, and resource-related items. A five-point Likert scale was used for UILC: Strongly Agree (SA)=5, Agree (A)=4, Undecided (UD)=3, Disagree (D)=2 and Strongly Disagree (SD)=1.

What are the constraints in the establishment of university and industry linkages?

Table 1

Constraints in the establishment of linkage between University and Industry about research

S#	Statements	SA	A	N	D	SD	X	SD
1	University research is not relevant to the industry.	13.6	28.6	26.8	22	9	3.16	1.17
2	The university does not feel confident in conducting relevant industry research.	15.5	25.3	28.8	19.8	10.6	3.15	1.21
3	Faculty members lack motivation towards research.	16	29	21.3	25.1	8.5	3.19	1.22
4	The choice of research topics is limited if the university collaborates with industry.	17.9	31.5	23.6	18.7	8.3	3.32	1.20

Table 1 presents the responses of faculty members about constraints in the establishment of a linkage between university and industry. Research-related constraints include no relevance of research (Mean=3.16), the university not feeling confident to conduct industry-relevant research (Mean=3.15), and lack of motivation towards research (Mean=3.19). Mean values 3.32 to 3.15 show that faculty members somehow agreed that university-industry linkage is not as strong due to research-related limitations. However, a high SD level shows response variation.

Table 2

Constraints in the establishment of linkage between University and Industry about awareness

S#	Statements	SA	A	N	D	SD	X	SD
1	Faculty members lack time due to teaching and administrative workloads.	22.8	31	23.2	14.6	8.4	3.45	1.22
2	Faculty members are unaware of the possible channels for sponsored research and consultancy by industry.	16.8	32.8	26.7	16.3	7.4	3.35	1.15

Results presented in Table 2 show a lack of awareness among faculty about linkage benefits. Faculty members (53.8%) strongly agree that they lacked time due to teaching and administrative workloads. The mean value of 3.35 depicts that faculty members are unaware of the possible channels for sponsored research and consultancy by industry. A high SD level shows variation in faculty members' responses.

Table 3

Constraints in the establishment of linkage between University and Industry about resources

S#	Statements	SA	A	N	D	SD	X	SD
1	Industry and universities are not interested in collaborating with each other.	14.5	28.4	30.4	14.9	11.8	3.19	1.20
2	University has inadequate resources to bridge the collaboration between university and industry.	18.5	29.7	26.4	16.3	9.1	3.32	1.20
3	The university has no plans or policies regarding the collaboration between the university and the industry.	19.7	32	25.6	15.7	6.9	3.42	1.17
4	The university has a lack of funds.	19.6	31.9	27.4	14.6	6.5	3.44	1.14
5	Low commercialization of research and innovation by the university.	15.2	32.5	30.7	14.9	6.7	3.34	1.11
6	University-industry collaboration influences negatively on the pedagogic mission of the university.	17	23.2	22.4	22.9	14.5	3.05	1.31

Table 3 shows the resource-related constraints to the establishment of a linkage between university and industry. Mean values 3.44 to 3.05 depict that faculty members somehow agreed that the university and industry are not interested in collaborating with each other. Respondents agree that the university has inadequate resources (Mean=3.32), no plan and policy (Mean=3.42), lack of funds, low commercialization (M=3.44) and negative influence on pedagogic mission (3.05). SD high level shows a variation of responses.

H₀: There is no significant difference between the mean scores of faculties on university-industry linkage constraints

Table 4

Faculty descriptive statistics of University-Industry Linkage Constraints

Variable	Faculty	N	M	SD
Constraints	Social Sciences	455	3.30	.77
	Management Sciences	113	3.27	.70
	Sciences	356	3.25	.68
	Total	924	3.28	.72

Table 4 reflects that social sciences faculty respondents have a mean score of 3.30, and management sciences faculty respondents have a mean score of 3.27 on constraints in the establishment of linkage between university and industry. At the same time, the mean score of science faculty respondents was 3.25. The total respondents' mean score is 3.28.

Table 5

One-way ANOVA for the Difference of Faculty on University-Industry Linkage Constraints

Constraints	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.580	2	.290	.544	.580
Within Groups	490.224	921	.533		
Total	490.804	923			

Table 5 reveals that there is no significant difference in groups. University-industry linkage constraints are not different among the groups of faculties $F(2,921) = .544$ $p = .580$. The significance value is greater than alpha $p < .05$, so there is no need to move further towards the *Post hoc* Tukey HSD test.

Qualitative Data Analysis

The researcher interviewed eleven (11) assistant directors and academia-industry linkage managers of ORIC as actors of the university and twelve (12) industrialists as actors of the industry.

Opinion and Reflections of ORIC Team Members

The following were the main themes of the interview:

1. Challenges
2. ORIC role
3. Recommendation

Challenges

Challenges are categorized into three aspects: finance, infrastructure and policies, in accordance with the reflections of ORIC members. Most of the respondents agreed that lack of funding, laboratories, equipment and the latest technology are the major challenges. One of the respondents stated, "Lack of funding. Research policies only target the number of publications, instead of research with the solutions of local problems in particular and global in general."

Another respondent said, "One of the main challenges our research is faced with is the sustainable research funding. Currently, the research work is financially supported by national and international funding agencies. The contribution of the corporate sector is negligible. More linkages need to be developed in this regard, and there is a need to bridge the gap between the stakeholders."



ORIC Role

The researcher explored the ORIC role in four major areas: research funding, reach to market, market-ready product launch and intellectual property. Some respondents state that it is active but needs to gear up more. ORIC play a vital role in grabbing funds and promoting research by assigning small projects to researchers or faculty. One of the respondents states, “Previously, our ORIC was not well established and recognized. But now we are moving towards the HEC recognition process. Furthermore, ORIC is going to announce research funding for faculty. This research funding will purely focus on the market and development of products.”

One more respondent said:

“Provide information to faculty about various available research grants, help, guidance, in-house preparation and filing of provisional patents/IP applications, funding for patent applications, data management, administrative support, research management and operations, policy analysis and development, incubation and interface between faculty and the commercial sector.”

Another respondent said, “ORIC is formulating policy shifts to encourage and guide the faculty members to carry out commercialized research in addition to the basic/academic research”.

One of the respondents stated ORIC’s role in detail:

“ORIC can play a vital role in this regard. It can generate an enabling environment to achieve this milestone and can change the direction of research from mere lab innovation to commercialization. The proposed role of ORIC in the concern probes is research funding, and our University remains among the top-notch for winning research grants from HEC and other organizations in successive years. Now, ORIC can facilitate a meeting place for the concerned industries and researchers to explore new horizons of mutual benefits resulting in lab income in a sustainable way. Research to Market: As a developing nation, the main challenge we are facing is taking the research from the lab scale to the manufacturing scale with the feasibility of marketing. This requires not only personal or institutional contribution but also the national level drive. ORIC of HEIs can sit together with the government, industry (especially small scale) and then HEIs policy makers to pave the way towards this goal. Market-Ready Product Launch: Since BICs are already established in many ORICs, we are also among the ones to establish them with the help of HEC. This platform needs to be made more and more effective with the new business ideas and with the new stream to launch the market-ready products. This goal can be achieved with the basic education of establishing their own business for all the students of various disciplines and changing their minds from education for jobs to education for business in modern ways. Intellectual Property Rights: ORIC can play a key role in the protection of researchers’ intellectual property rights. This needs policy formation not only in general but according to the nature of innovation as well as production.”

Recommendations

The participants’ recommendations regarding strengthening the university-industry collaboration are based on three categories: research potential, linkage improvement, and ORIC’s role. Most of the participants recommended that industry and academia linkage may boost research, regular training of faculty and researchers, a better environment to promote research, and handsome funding. This way, we can come up with better innovations. One of them said,

“My suggestion is that we need to focus on both aspects, not only on innovations but also on local manufacturing of the imported items in all concerned fields. The research projects need to have a share of these reverse-engineered to domestically engineered products. The innovation should be judged by the market feasibility before the start of the project so that once the lab product is ready, it can be taken into the pilot project without any delay.”

Another participant recommended that “Research policy is the key where faculty needs to understand that their basic/academic research needs to be blended with outcome-based research, i.e. product development/commercialization”.

Participants recommended the improvement of the linkage, stating that there is a need to build confidence between industry and academia. Industry-related problems should be focused on.

One of the participants said, “The knowledge-based economy is the need of the time. It is required to boost informal relationships between the concerned industry and the relevant academicians. More open and honest talks are required to accept our strengths and improve upon our shortcomings. Different zones should be marked, like the power sector, pharmaceutical sector, textile sector, mechanical sector, food sector, and services sector. In all zones, a facilitation centre needs to generate academia-linkage parks, where all concerned institutions of that zone, along with their respective industries, are members. The lists of problems are presented over there, taken by the institutions, and the process is monitored there.

Another participant said,

“A new initiative has been taken at the M Phil level where students will visit local industries to inquire about their problems and design their projects accordingly to offer something to the industry. It would be great if the industry also sponsors these projects for their execution and to offer something concrete to the industry in return.”

Recommendations regarding the ORIC role given by most of the participants were: ORIC needs to rope in industry, government and public-private partnerships to cope with challenges and produce better outcomes. One of the participants said,

“The idea of a triplex helix is of importance, but we will suggest that it should be a quadruple helix, with university, industry, government and society. Outcome: If all the stakeholders of the triple helix sit together and start working together, it will have a vast effect on the educational and business structure of our country. Currently, our public sector educational institutions are dependent on the Government only, but this helix of working by sharing the burden with their own income, and they can facilitate more and more for their faculties. Similarly, the industry can survive and boost them up with new projects and improvement of the existing ones. The government, as a facilitator, will benefit from the revenue in the end. Challenges: All three stakeholders are facing several challenges to develop this helix. There are some challenges that need urgent consideration, and some will improve over time. The one that requires urgent consideration is the incentive from the government to both academia and industry to develop this linkage. The government should come up with strong policies to make this helix a sustainable relation. A sort of national emergency should be imposed to come with the local manufacturing of all items quenching our revenue, and all institutions should be bound to deliver their best to achieve this objective. Challenges of manufacture like electricity and gas will resolve prioritized only if the working on the chartered our items. This seems hard, but all of us can make it happen.

Another participant made the following recommendations:

“Forming of entrepreneurial universities, proactive and accessible bureaucracy, development of Science Parks, interest and activeness of political leadership, knowledge spillovers, governance in the universities, sandwich courses and industry placements by academia, incentives for research students and supervisors, the establishment of linkages and networks, incentives for industry to build an academic liaison, incentives for technology led production and training and education of the industry.”

Opinion and Reflections of Industrialists

The following were the main themes of the interviews:

1. University-industry collaboration
2. Research challenges
3. Recommendations

University-Industry Collaboration

With reference to the views of participants' university-industry collaboration is divided into three categories: policy regarding linkage, knowledge sharing and resource sharing. Some participants stated that there is no specific policy to create a linkage between university and industry. One of the participants said,

“The company has a management trainees program in place, which eyes freshly qualified graduates with the unique talent and diversified skill set to groom and polish them to become future leaders.



Similarly, the company participates in job fairs hosted by various universities to answer professional queries and encourages students to apply.

Another participant states that,

“No, we do not have a specific policy as to how we should create a linkage with the universities. However, all companies in the industry do make efforts to create linkages with academia to transfer knowledge as well as to assist the students in getting exposure to the industry and help them strengthen their professional skills and develop their networks.”

Most of the participants state that they create a linkage between university and industry through knowledge sharing. Knowledge is shared through students' projects, reports, electronic media, joint venture platforms, and seminars.

One of the participants said,

“For our industry, students who intern with us or choose to perform their industrial projects with us and interview us for their research projects, much like your own, if we send our employees for an educational degree, are the major source of knowledge transfer from the industry to the universities and the academia. Other than that, when we send our employees to attend trainings conducted by these universities, we also expect them to not just learn, but also share their own knowledge and experiences with the participants and also the instructors for it to be an equally informative and conduct productive sessions for all participants.”

Another participant states that:

“Industries should be encouraged to establish R&D departments within their premises. The industry can share information about real-time industrial issues with academicians. You can hire academicians as consultants to train personnel in these R&D centres. When working on industry projects, skilled young and enterprising undergraduates in the industry may fund their future studies. ”

The researcher asked about resource sharing, and some of the industrialists replied that through training and the provision of scholarships, they collaborate and also provide the facility of visits. One of the participants states that:

“If we talk about knowledge resources, then we are open to sharing information with academia or students who actually approach us unless the information is very sensitive and we are legally not allowed to share it. In terms of monetary resources, we provide scholarships to students as both talent acquisition as well as Corporate Social Responsibility (CSR) initiatives but not for conducting research so far.”

Research Challenges

According to participant responses, research challenges are divided into three categories: funding, emerging needs of industry and productive and novel work. Participants state that there are various challenges to the provision of funds by the government, including funds for research, industry-required skills, supply and demand analysis, curriculum revision, innovative work, research on current issues, and implementation of research studies.

One of the participants states,

“Pakistan is far away in academia-industry linkage. The reason is the lack of a coordinated effort to undertake incorporated targeted research, which leads towards supporting only research to produce research papers and taking no practical implication for the industry. Due to the current revolution, the academic industry is trying to develop a strong relationship on the basis of globalization and advancement in the quality of products. The interactive best practices in university-industry linkages are a strong tool for creating a pleasant environment for technological innovations and improving global competitiveness, eventually promoting the interests of the firms and academia across the globe.”

Recommendations

The researcher asked the participants to give some recommendations to strengthen the linkage between university and industry. Most of the participants recommended that the government should provide

scholarships, develop linkage policies, build trust, share research outputs, and arrange special lectures and database sharing. One of the participants said,

“I think alignment between government/national needs and research strategy should be a core focus to have a more streamlined research process. As for universities and industries, I think industries should provide more opportunities to academia to conduct research and be more supportive of them in terms of sharing the possible information so as to facilitate the creation of a knowledge-based economy.”

Some of the participants recommended curriculum change, skills required in future, novel research topics, discussion of ideas with industry and identification of industry's problems.

Another participant said,

“Universities should not only base on theoretical knowledge but put more focus on practical implication of knowledge so it would help students in their careers. They need to have more practical curricula and practices to prepare them better to enter any relevant industry. The industry should have biased practices of selecting workforce from the top three universities but give equal opportunity to everyone to have a more balanced ratio in their organization.”

One of the participants said,

“I think it's improving day by day, but it will take time because it's not so much an old concept for us, and if the government plays a role in a true spirit and universities invest money and resources, then hopefully soon it will be possible to create a knowledge-based economy in Pakistan.

I am just giving you an example of the current situation in Pakistan to clarify your concept.

Nowadays, the telecom sector is shrinking day by day due to two reasons. The first one is technology because previously, the equipment that was installed on sites was very big and required many resources to install it on the sites, but with advancements in technology, the equipment is becoming smaller, and it requires a very small amount of manpower for installation. The second reason is that almost 95% of sites have already been deployed in Pakistan, and in future, if we have to provide 5G or 6G services to our customers, then the current workforce is enough for this work. In short, there is almost no need for telecom engineers in Pakistan, but they are still producing telecom engineers because they didn't do the proper research, and the government also didn't provide a forecast for future skill requirements.

Discussion and Conclusion

Somehow, these centres did not work properly and actively. There are various constraints to establishing the linkage between university and industry. The results of the study show that trust deficit, lack of motivation, lack of funding & facilities, no relevant policy, irrelevant research and unawareness are the major constraints. Constraints like inadequate laboratories, lack of autonomy to work with industry, inadequate infrastructure, lack of interest, low academic awareness, lack of motivation and entrepreneurial spirit, and university structures influence more (Ashraf et al., 2018).

University-industry linkage constraints are also not different among the groups of faculties. Various constraints were identified in the establishment of linkage between university and industry, including lack of infrastructure, lack of motivation, trust deficit, lack of interest and lack of policy regarding linkage (Ahmad et al., 2022).

Results of this study indicate that to improve and strengthen the UIG linkage, there is a need to develop appropriate policy, establish trust among three stakeholders, increase research relevancy, revamp the curriculum, grant aids and sponsorship and share needs and demands. Another study result supports these results: industry visits, an industrial internship in curricula, relevant research, improvement of laboratories and sponsorship (Bhutto & Lohana, 2018; O'Dwyer, Filieri & O'Malley, 2023). The qualitative finding reveals the point to strengthen the linkage between university and industry. The views of participants' recommendations regarding strengthening the university-industry collaboration are based on three categories: research potential, linkage improvement and ORIC role. Most of the participants recommended that industry and academia linkage may boost research, regular training of faculty and researchers, a better environment to promote research, and handsome funding. In this way, we can come up with better innovations. Participants gave some recommendations to strengthen the linkage between



university and industry. Most of the participants recommended that the government should provide scholarships, develop linkage policies, build trust, share research outputs, arrange special lectures and share databases.

Recommendations

1. A very effective role of industry is required in the entire scheme of things by being more receptive to the students for internship, training and placement.
2. Professionals from the industry need to be encouraged to deliver lectures in universities.
3. It is found that the degree of connection between universities and industry is very low. To strengthen this connection, it is necessary to provide research and development funds from the government and cooperation agencies, and industry co-funding will also be encouraging.

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