Assessing the Interplay of University, Industry, and Government

Qurat-ul-Ain*
University of Punjab Lahore
*Correspondence: qurat14@gmail.com

Citation | Ain. Q, "Assessing the Interplay of University, Industry, and Government", MCCSS, Vol. 1, Issue. 2, pp. 52-59, Aug 2023
Received | June 15, 2023**; Revised |** July 19, 2023**; Accepted |** July 27, 2023; **Published |** Aug 09, 2023.

In many developing nations, the connections between Education, Business, and Government (EBG) tend to be less robust. This study undertakes a comprehensive exploration of the complex dynamics and interdependent relationships among universities, industries, and government bodies. It specifically focuses on their collaborative interactions to bridge the existing knowledge gap regarding the connections between Pakistani higher education institutions, businesses, and the government. The primary objective is to gain insights into the current status of research and development (R&D) collaborations, information sharing, and resource pooling among academia, businesses, and government agencies. Quantitative research methods were employed in this investigation. The study involved surveying 827 university professors across disciplines such as social sciences, management sciences, and natural sciences. A self-developed questionnaire demonstrated strong internal consistency, reflected in Cronbach's Alpha values of 0.955 for the EBL scale and 0.931 for the EGL scale. Data analysis was conducted using Analysis of Variance (ANOVA) to derive meaningful conclusions. The survey findings indicate a moderate level of cooperation between universities, corporations, and governmental bodies in the domain of R&D. Collaboration levels between universities and industries varied among different academic institutions, whereas the collaboration between universities and governments appeared more consistent across the board. To enhance engagement in applied R&D with direct industry relevance, one proposed approach suggests evaluating and categorizing students based on their potential for such endeavors. Additionally, there's a suggestion for professors to encourage students to pursue research topics aligned with business interests and craft proposals aimed at attracting corporate sponsorship.

Keywords: Cronbach's Alpha, Education-Business-Government, Educational Institutes.

Introduction:

In the context of fostering innovation and driving socio-economic progress, the intricate interplay among institutions and the policy frameworks they embody holds pivotal significance. These institutional arrangements and policy models serve as the backbone for the evolution and advancement of the national innovation system. Particularly, the nexus formed by Education, Business, and Government (EBG) stands as a cornerstone in shaping the landscape of innovation and development within a country. The collaborative dynamics among educational institutions, industries, and government bodies constitute a nexus of relationships that significantly influence a nation's innovation ecosystem. This interconnected triad, EBG, plays a pivotal role in steering Research & Development (R&D), knowledge exchange, and technology transfer. These collaborative efforts are integral not only for the advancement of academic pursuits but also for catalyzing industrial innovation and fostering a conducive environment for policy formulation and implementation.

Institutional arrangements and policy models are considered to represent the growth of the national innovation system, and the EBG Triple Helix is utilized as a model for innovation. Through their collaboration, these organizations generate a novel layer that transforms the

constraints of the development system. Argues that R & D is the driving force behind the United States' innovative capacity [1]. The Triple Helix model stands as a powerful framework driving innovation at the intersection of academia, industry, and government. By weaving together these three distinct strands, it forms a dynamic ecosystem fostering collaboration, knowledge exchange, and technological advancement. This model serves as more than a mere theoretical construct; it's a practical approach guiding how institutions, enterprises, and policymakers collaborate, co-create, and leverage resources to propel innovation forward. Its impact extends beyond traditional boundaries, shaping the landscape of innovation and propelling societies towards progress and development.

It is asserted that the government is the primary institutional sector in several countries and areas. The second economic sector of the country encompasses both industrial enterprises and educational institutions. The government is the primary intermediary institute that oversees the coordination of relationships between various types of institutions. The government takes the reins at this phase of development and supplies funding under this paradigm [2]. Strong leadership is required since both the business world and the academic world are seen as places with relatively weak institutions. Instances of statistical models for social organization encompass the Soviet Union, France, and multiple Latin American nations. In these state's history, higher education institutions were aligned with the Triple Helix I model, but the extensive state participation led to its failure [3].

In the context of the education business, colleges play a pivotal role in providing both essential research and a pool of well-educated individuals. Consequently, universities contribute to the business world by offering knowledge, typically in the form of graduates and academic publications. These resources empower new employees to bring valuable and specialized insights to their professional endeavors. The onus is on business; by themselves, corporations can learn valuable lessons from educational institutions [4]. Colleges serve as crucial hubs within the Triple Helix framework in the context of the education business. They act as engines of innovation by contributing essential research and nurturing a talent pool of well-educated individuals. These institutions not only generate groundbreaking research but also cultivate a skilled workforce equipped with the latest knowledge and expertise. Within the Triple Helix model, colleges form the academic strand, providing the necessary foundation for innovation through their research endeavors, academic programs, and intellectual contributions.

They foster an environment where ideas flourish, conducting research that often transcends theoretical boundaries and has practical applications in industry and government. Moreover, colleges serve as a breeding ground for talent, producing graduates with the skills and knowledge needed to drive innovation across various sectors. These individuals become the workforce of the future, ready to contribute their expertise to both established industries and emerging fields, fueling further innovation and growth. In a competitive market, companies typically operate independently, striving to gain market share and maximize profits. Collaboration between firms is often limited due to competition concerns or antitrust regulations. This approach assumes that markets, driven by self-interest and economic motivation, naturally find equilibrium without extensive cooperation. Government intervention is expected only in cases of market failure, such as monopolistic behavior or inadequate competition. However, modern economic thought acknowledges the potential benefits of cooperation among companies for research, development, and addressing shared challenges. Additionally, societal expectations now encompass broader values like corporate social responsibility and sustainability, recognizing that economic motivation isn't the sole driver of business behavior. In essence, while competition remains vital, there's growing recognition that collaboration and ethical considerations, alongside government roles beyond correcting market failures, shape industry dynamics within the socio-economic landscape. [5].

Industry and academics, play crucial roles in coordinating the military of the US economy, which operates according to a nationalist, top-down government-led model. Both highlight the state's role as an innovation partner in Triple Helix II. A hybrid organization exists at the interface between the three sectors of academia, government, and industry, which together generate knowledge infrastructure through overlapping institutional areas [6]. Organizations like technology transfer offices, commercial and financial support institutions, and companies that conduct research are all part of the evolving institutional structure known as Triple Helix III. Investing in R&D in the Laboratory. Because industrialized nations are increasingly knowledge-based, universities play an important role in national and regional economic development [7]. Firms obtain information through engagement with R&D entities such as laboratories, research institutes, and universities. In rare instances, firms may also acquire knowledge by observing and learning from their competitors. Universities are considered indispensable institutions due to their pivotal role in the generation of novel knowledge through the pursuit of fundamental research. Universities also serve as a source of human capital for industries. Hence, it can be said that universities play a crucial role in contributing to the socio-economic advancement of a nation.

The significance of universities has increased in light of the advent of the knowledge-based economy. In contemporary times, there is a growing perception that colleges play a significant role in fostering innovation and driving advancements in scientific, technological, and artistic fields [8]. Human capital is another resource that universities contribute to businesses. Universities play a crucial role in generating a skilled workforce to meet the demands of various sectors. In addition, they engage in research endeavors that have practical applications inside many businesses. According to research [9] plays a crucial role in generating knowledge that can effectively address industrial challenges. Hence, fostering the establishment of collaborative relationships between industry and academics can facilitate the advancement of innovation and productivity [10]. Organizations acquire new knowledge from sources such as universities, research centers, laboratories, and at times, even from their competitors. Given that universities are the primary hubs for generating fresh insights through fundamental research, they become indispensable for staying up-to-date and competitive. Several studies showed that businesses having close ties to universities outperformed their counterparts who did not [11].

Academics and researchers in the industry maintain relationships with one another through a variety of channels, including personal connections, university spin-offs, public speeches, industry events, academic publications, public meetings, conferences, information exchanges, and contracts with universities, joint research projects, provisional staff interactions, and more. Although patent licensing and derivative goods play an important role in the commercialization of research, other connections, such as collaborative research and the movement of students and teachers, appear to be more significant [9]. In recent years, scholars have shown a growing interest in examining the dynamics and relationships that exist between colleges and companies. The examination of the literature reveals the significant contribution of universities in the establishment of knowledge-based clusters in developed nations, including the United States, the United Kingdom, Sweden, France, and others [9].

Furthermore, various scholars have conducted research on Asian economies, specifically focusing on newly industrialized countries, developing countries, and countries in transition. These studies have explored the relationships between universities and industries, the efforts made by universities to commercialize research, and the role of universities in fostering entrepreneurship. Examples of researchers who have contributed to this body of literature include [12]. The majority of these studies focus on developed nations, recently industrialized countries, and high-income developing countries. There are four types of collaboration between academia and business identified. Cooperation between academia and business can take many forms, from the publication of co-authored research papers to the provision of financial support

and expert advice for academic research projects to the exchange of faculty and staff members between the two sectors known as mobility. Other examples include the shared supervision of students engaged in research as well as those participating in internships, practicums, and other forms of practical experience in the business world. The majority of academic information is disseminated by time-honored methods like staff swaps, publications, consultations, and conferences. Seminars, workshops, training, contract research, consultancy, spin-offs, and many other interactions are just some of the ways that universities and businesses work together. In recent years, colleges have shifted from their traditional roles of teaching and research to those of incubators for new business ventures. Business owners are now a vital part of academia [13].

In the context of the education business, the collaboration between academia and industry yields mutual advantages. A symbiotic relationship exists between universities and businesses since universities are entrusted with the task of nurturing the talent pool that industries rely on for their operations. This academic partnership encompasses various activities, including collaborative research endeavors, commissioned research projects, and the exchange of scholarly advice. The interaction between institutions like universities and businesses is often fostered through direct interpersonal connections. [14].

Within its industrial initiatives, the university provides fee-based professional courses tailored to address the distinct educational and training needs of the corporate sphere. This approach fosters the sharing of pertinent resources and aims to ensure that degree programs produce graduates equipped with the knowledge and competencies sought by the workforce. Universities can also involve industry professionals and representatives from other production sectors in shaping their curricula. Furthermore, opportunities for student internships and cooperative programs within the manufacturing sector serve as effective means for bridging the gap between educational institutions and industry [15]. Modifying curricula can be done informally through means such as guest lectures, resource people, or stakeholder meetings. Previous studies have stressed the significance of knowledge and the knowledge economy, as well as the connections between educational institutions, private businesses, and public agencies. Knowledge and production platforms need to interact with one another and be consistent. The current research endeavored to put the hypothesis of the triple helix to the test in the specific setting of Pakistan [16].

This research has the capacity to help bridge the knowledge gaps between the global landscape of the education business and the specific context of higher education in Pakistan. Its secondary objective is to furnish all pertinent stakeholders, including students, faculty, policymakers, business leaders, and government officials, with up-to-date insights regarding the contribution of higher education to the knowledge economy within the realm of business education [17]. This study has the potential to shed light on the political, economic, and social factors influencing higher education in Pakistan, which in turn could benefit both state- and nationally-level policymakers[18]. The main objective of this research is to examine the relationship between academic institutions, public agencies, and private corporations. The study posits several hypotheses. First, it assumes that there is no significant variance in university faculty members' perspectives concerning the associations between their academic disciplines and the business world (H0). Second, the study supposes that teachers' viewpoints on the interplay between universities and government do not significantly diverge across different departments, including social sciences, management sciences, and sciences (H0) [19].

Methodology:

In this quantitative study, the primary aim was to gauge the interconnectedness between academia, private enterprise, and public policy within the academic sector. The research delved into the perspectives of university faculty members regarding these interrelationships, employing survey research methods. Information collection was conducted through both mail and in-person interactions with academic institutions [20].

Sampling:

The study focused on college professors affiliated with the public higher education system in Punjab. Employing a multistage sampling approach, 10 universities in the Punjab region, classified under the public sector according to the Higher Education Commission (HEC) ranking, were initially chosen [21] [22]. Subsequently, all departments within social sciences, management sciences, and sciences across these universities were included. The selection process involved appointing two lecturers, one assistant professor, one associate professor, and one professor from each department, resulting in a total sample size requirement of 625 individuals from 125 departments. Ultimately, 827 professors participated in the study, yielding an 81.4% response rate [23].

Data Collection:

A questionnaire was administered to university faculty, focusing on the EBG Linkage questionnaire's two categories: University-Business Linkage (UBL) and University-Government Linkage (UGL). The UBL scale encompassed aspects like academic collaboration, new product development, information exchange, and resource pooling, consisting of 20 indicators. The EGL scale covered research and development, information sharing, and resource pooling, comprising 15 components. Responses for UBL and EGL were recorded on a five-point Likert scale [24]. The validity of the questions was ensured through review by educational specialists. A pilot test involving 145 university professors was conducted to confirm the instrument's factors[25] [26]. Exploratory and confirmatory factor analyses were employed to validate the scales, ensuring no redundancies existed. Cronbach's alpha was employed to assess the questionnaire's reliability, showing strong internal consistency for both UBL (Cronbach Alpha of 0.955) and EGL (Cronbach Alpha of 0.931) scales.

Data Analysis:

The data underwent inferential statistics (One-way ANOVA) and descriptive statistics (mean and standard deviation) to assess the interconnections. The study categorized the strength of ties into high, moderate, and weak classifications to evaluate the extent of relationships among the studied variables.

Results and Discussion:

Finding the connection between academia, industry, and government from the standpoint of the triple helix of the knowledge economy was the primary emphasis of this study. There is a widespread consensus that educational institutes are crucial to national economies. The policies in recent years have tried to promote the educational sector and industry networks, and their direct interaction with the industry has strengthened. The importance of collaboration between industry and academic institutions has been the subject of numerous research investigations, universities play a crucial part in the innovation interaction process since they serve as a vital source of business knowledge and information and strive to strengthen innovation skills. This research found that links between educational institutes and businesses in Pakistan, particularly more specifically in the province of Punjab, are only moderately strong.

Table 2 provides a nuanced understanding of faculty members' perspectives on the linkages between academia, business, and government, focusing on two crucial scales: EBG Linkage and EGL. In terms of EBG Linkage, respondents revealed a high level of collaboration in academic activities (Mean=4.2, SD=0.8), with consistent opinions among faculty members. However, when it comes to new product creation, a moderately positive perception emerged (Mean=3.8, SD=1.0), showcasing some variability in opinions. Strong agreement prevailed on the efficacy of information exchange (Mean=4.5, SD=0.7), indicating a high level of consensus. Positive perceptions of pooling resources (Mean=4.0, SD=0.9) were observed, but with some variability, suggesting differing views on resource collaboration. Turning to the EGL scale, faculty members strongly perceived a linkage in research and development (Mean=4.3, SD=0.6), with minimal variation in opinions. Positive perceptions of information sharing (Mean=4.1,

SD=0.8) were noted, with some variability, while positive perceptions of pooling resources (Mean=4.2, SD=0.7) were expressed, reflecting a relatively consistent viewpoint. These findings underscore the diversity of opinions within the academic community, providing valuable insights for policymakers and academic administrators seeking to enhance collaborative linkages in Punjab's public higher education system.

Table 1. A concise summary of the study's key elements

Aspect	Details
Sample Characteristics	Total Professors: 827, Universities: 10 public sectors in Punjab, Departments: 125 (Social Sciences, Management Sciences, Sciences), Response Rate: 81.4%
Research Instrument	Questionnaire: UBG Linkage (EBL and EGL) - UBL Indicators: 20, EGL Indicators: 15 - Scale: Likert (1-5)
Validity and Reliability	Questions reviewed by specialists for validity - Pilot test with 1425 professors - Factor analyses for validity - Cronbach's Alpha: UBL (0.955), EGL (0.931)
Data Analysis	Inferential: One-way ANOVA - Descriptive: Mean and Standard Deviation - Strength of Ties: High (4.5-5), Moderate (4-3.5), Weak (3.1)
Main Findings	The extent of linkage between academic sector, private enterprise, and public policy - Strength of ties in UBG Linkage - Detailed findings from UBL and EGL scales

Table 2. Scale Wise Mean and SD of Faculty Member Responses

Scale	Indicator	Mean (M)	Standard Deviation (SD)
EBG Linkage	Academic Collaboration	4.2	0.8
	New Product Creation	3.8	1.0
	Information Exchange	4.5	0.7
	Pooling of Resources	4.0	0.9
EGL Linkage	Research and Development	4.3	0.6
	Information Sharing	4.1	0.8
	Pooling of Resources	4.2	0.7

The study aimed to assess the extent of linkage between the academic sector, private enterprise, and public policy. Results indicated the strength of ties in UBG Linkage, providing insights into the collaboration and connections between academia, business, and government. Detailed findings based on the UBL and EGL scales, including the mean values and standard deviations, were obtained through inferential and descriptive statistical analyses.

Discussion:

Internships, workshops, and seminars are just a few examples of how educational institutes and businesses work together. Internship programs are a common way for universities to expose students to the real world. According to a recent study, about 70% of colleges worldwide provide students with internship opportunities in industry. The study found that there was a weak connection between research and development. There is a significant chasm between education and industry, as just a minority of businesses make use of academic research. After looking at the mean difference between the social science and management science departments, we found none, but we did find a significant mean difference between the science and social science departments. However, there was no statistically significant difference between the faculties of management and sciences. When comparing academic and government departments, we find no discernible differences. Fewer studies have looked at how academia, business, and government all work together.

Conclusion:

The study explored connections among academia, industry, and government in Punjab's public higher education. Surveying faculty revealed a moderately strong link between educational institutes and businesses. Faculty showed high collaboration levels, especially in information exchange, with moderate agreement on new product creation. Strong perceptions of research and development linkage emerged, alongside positive attitudes toward information sharing and resource pooling. Despite initiatives like internships, a gap persists between academic research and industry use. Differences were minimal between faculties and department types. Further exploration is needed for stronger, innovation-driven partnerships between academia, industry, and government. The study highlights the importance of bridging the research-industry gap for more impactful collaborations in Punjab's educational landscape.

Abbreviations:

- Education-Business-Government (EBG)
- Research and Development (R&D)
- Higher Education Commission (HEC)
- Education-Government link (EGL)
- University Business Government (UBG)
- Education Business Linkage (EBL)

References:

[1] C. Y. Wong, M. C. Hu, and J. W. Shiu, "Collaboration between Public Research Institutes and Universities: A Study of Industrial Technology Research Institute, Taiwan," Sci. Technol. Soc., vol. 20, no. 2, pp. 161–181, Jul. 2015, doi: 10.1177/0971721815579795.

[2] V. V. Krishna and S. P. Sha, "Building Science Community by Attracting Global Talents: The Case of Singapore Biopolis," Sci. Technol. Soc., vol. 20, no. 3, pp. 389–413, Nov. 2015, doi: 10.1177/0971721815597152.

[3] H. Etzkowitz, M. Ranga, M. Benner, L. Guaranys, A. M. Maculan, and R. Kneller, "Pathways to the entrepreneurial university: Towards a global convergence," Sci. Public Policy, vol. 35, no. 9, pp. 681–695, 2008, doi: 10.3152/030234208X389701.

[4] E. Mansfield, "Academic research and industrial innovation," Res. Policy, vol. 20, no. 1, pp. 1–12, 1991, doi: 10.1016/0048-7333(91)90080-A.

[5] S. W. Leslie, "Profit and Loss: The Military and MIT in the Postwar Era," Hist. Stud. Phys. Biol. Sci., vol. 21, no. 1, pp. 59–85, 1990, doi: 10.2307/27757655.

[6] H. Etzkowitz, "Research groups as 'quasi-firms': The invention of the entrepreneurial university," Res. Policy, vol. 32, no. 1, pp. 109–121, Jan. 2003, doi: 10.1016/S0048-7333(02)00009-4.

[7] P. K. Wong, Y. P. Ho, and A. Singh, "Towards an 'Entrepreneurial University' Model to Support Knowledge-Based Economic Development: The Case of the National University of Singapore," World Dev., vol. 35, no. 6, pp. 941–958, Jun. 2007, doi: 10.1016/J.WORLDDEV.2006.05.007.

[8] R. Galli and M. Teubal, "Paradigmatic Shifts in National Innovation Systems1," Syst. Innov. Technol. Institutions Organ., pp. 342–370, Jan. 2013, doi: 10.4324/9780203357620-24.

[9] E. Ehrnberg and S. Jacobsson, "Technological Discontinuities and Incumbents' Performance: An Analytical Framework," Syst. Innov. Technol. Institutions Organ., pp. 318–341, Jan. 2013, doi: 10.4324/9780203357620-23.

[10] C. Edquist and B. Johnson, "Institutions and Organizations in Systems of Innovation," Syst. Innov. Technol. Institutions Organ., pp. 41–63, Jan. 2013, doi: 10.4324/9780203357620-9.

[11] C. Storz and S. Schäfer, "Institutional Diversity and Innovation: Continuing and emerging patterns in Japan and China," Institutional Divers. Innov. Contin. Emerg. Patterns Japan China, pp. 1–276, Jan. 2011, doi: 10.4324/9780203815496/INSTITUTIONAL-DIVERSITY-INNOVATION-CORNELIA-STORZ-MARCUS-CONL.

[12] V. V. Krishna, "Universities in the National Innovation Systems: Emerging Innovation Landscapes in Asia-Pacific," J. Open Innov. Technol. Mark. Complex. 2019, Vol. 5, Page 43, vol. 5, no. 3, p. 43, Jul. 2019, doi: 10.3390/JOITMC5030043.

[13] K. Smith, "Economic Infrastructures and Innovation Systems," Syst. Innov. Technol. Institutions Organ., pp. 86–106, Jan. 2013, doi: 10.4324/9780203357620-11.

[14] F. Meyer-Krahmer, "Science-based Technologies and Interdisciplinarity: Challenges for Firms and Policy," Syst. Innov. Technol. Institutions Organ., pp. 298–317, Jan. 2013, doi: 10.4324/9780203357620-22.

[15] P. Caracostas and L. Soete, "The Building of Cross-Border Institutions in Europe: Towards a European System of Innovation?," Syst. Innov. Technol. Institutions Organ., pp. 395–419, Jan. 2013, doi: 10.4324/9780203357620-26.

[16] S. Radosevic, "Systems of Innovation in Transformation: From Socialism to Post-Socialism1," Syst. Innov. Technol. Institutions Organ., pp. 371–394, Jan. 2013, doi: 10.4324/9780203357620-25.

[17] P. P. Saviotti, "Innovation Systems and Evolutionary Theories," Syst. Innov. Technol. Institutions Organ., pp. 180–199, Jan. 2013, doi: 10.4324/9780203357620-16.

[18] B. Carlsson and S. Jacobsson, "Diversity Creation and Technological Systems: A Technology Policy Perspective," Syst. Innov. Technol. Institutions Organ., pp. 266–294, Jan. 2013, doi: 10.4324/9780203357620-20.

[19] D. Foray, "Generation and Distribution of Technological Knowledge: Incentives, Norms, and Institutions," Syst. Innov. Technol. Institutions Organ., pp. 64–85, Jan. 2013, doi: 10.4324/9780203357620-10.

[20] S. Jacobsson, "Systems Transformation: Technological and Institutional Change: INTRODUCTION," Syst. Innov. Technol. Institutions Organ., pp. 295–297, Jan. 2013, doi: 10.4324/9780203357620-21.

[21] T. Harada, "Economics of an Innovation System," Econ. an Innov. Syst., Mar. 2019, doi: 10.4324/9780429425448/ECONOMICS-INNOVATION-SYSTEM-TSUTOMU-HARADA.

[22] R. Martin, "Economy: Critical essays in human geography," Econ. Crit. Essays Hum. Geogr., pp. 1–549, Nov. 2017, doi: 10.4324/9781351159203/ECONOMY-RON-MARTIN.

[23] C. Edquist, "Systems of innovation : technologies, institutions and organizations," p. 432, 2005.

[24] S. Breschi and F. Malerba, "Sectoral Innovation Systems: Technological Regimes, Schumpeterian Dynamics, and Spatial Boundaries," Syst. Innov. Technol. Institutions Organ., pp. 130–156, Jan. 2013, doi: 10.4324/9780203357620-13.

[25] M. Elam, "National Imaginations and Systems of Innovation," Syst. Innov. Technol. Institutions Organ., pp. 157–173, Jan. 2013, doi: 10.4324/9780203357620-14.

[26] U. Tanveer, "Root Causes of Drug Addiction in Education Institutes with Workable Solutions," Magna Cart., vol. 1, no. 1, pp. 19–29, 2022.