Objectives of University Industry Collaboration in Nepal: Observation of Students, Professors and Industrial Leaders

Dr. Dhruba Raj Pokharel[1], Dr. Ganesh Prasad Pathak[2]

[1,2] Professor, Faculty of Management, TU

Abstract

The collaborative relationship between university and industry is becoming crucial research phenomena for professors, students, industrial leaders, government and the general public in the advanced developing as well as underdeveloped economies. It has become more imperative to the management schools and institutes and research centers. In the prevailing knowledge economy universities are called to produce innovative and creative manpower ready to job in the organizations. This research was conducted in Nepalese business management schools operating under the three leading universities, namely Tribhuvan University, Pokhara University and Kathmandu University. Apart from the students and professors, the perception of business community leaders also has been included in regard to attainability of the objectives of university industry collaboration in Nepal. The objective of the study was to find the perception of students, course facilitators and industrial leaders about the level of attainability of the stated objective of UIC. With some differences all respondents found the objectives of UIC are attainable in Nepal. Such kind of research is important to the universities, especially business management educators, the industries and the government to frame education policy and curriculum.

Introduction

The contemporary economic world is highly competitive. Companies, small or large, cannot achieve high performance without leading to the production of innovative products, rewarding customer needs and rapidly responding to the market demand. Therefore, industries are seeking help from stakeholders like universities. As

---

[1]*Corresponding email:* dhruba_pokharel@yahoo.com

important providers of knowledge, universities are essential partners in the creation of inventions and the development of innovations. Thus, in this era of knowledge-based economy, universities are called upon to exercise a mission focused on the value creation and economic development. Most of the states in the contemporary world attempt to generate economic development based on the latest scientific and technological discoveries by involving universities in their initiatives in order to promote the growth of technological knowledge (Genger and Sa, 2008).

In the world of extraordinarily rapid development in technology, firms cannot afford to innovate in a vacuum. As a result, in view of Spiltover and Knockaert (2012) and Bjerregaard (2010) research and development (R&D) collaborations between university and industry have become significant development avenues.

The relationship between university and industry is considered as important innovation tool that connects the generation of technology and knowledge from the university with the potential or economic value development in the firm through innovative product, process and practices (Steingraber and Gonclaces, 2015). They further explain that firms do not have all the innovative capabilities needed, and they need to search for a partner who can help them to make success in innovation. In another hand, by the side of universities, the capabilities are engaged in research and development of knowledge but are not dedicated to the economic development of these ideas into products and services by means of innovation in products, processes and organizational system. The meeting points of the need of firms as well as universities interactions and collaborations can be the better solutions. This is because universities formulate the social capital i.e. human resources which are capable of highlighting the theories and practices of innovations.

The classic role of university is a knowledge developer contributing to the development of human capital. Currently, Universities are regarded as one of key institutional actors in innovation process. Universities are the center of knowledge processing in the society. The accumulated knowledge in universities is absorbed when firms and other institutions are ready to apply them. Therefore, a combined effort with the development of network of diffusion of social capital and technological knowledge has been the thrust of present knowledge-based economy. It has been observed that the relationship between university and industry and with other social actors can build and utilize the channel of technological expertise for the betterment of human beings (Putnam, 2001).

Veillex and Queenton (2015) conceive university industry collaboration as a relationship between private enterprise and a university, characterized by a mutual commitment to achieve a common research and development objective, either by pooling their resources or by coordinating specific research activities. They further explain the current complexity of problems and the need of multidisciplinary approaches requiring an interaction of ideas and exchange of knowledge. In view of Putnam (2001) university-industry collaboration is the process of collective learning between and among the different stakeholders. This type of collaborative learning prepares people ready for their job with a perfect blend of explicit and implicit knowledge. To transfer the codified knowledge is easy work in comparison to implicit knowledge. Feldman (2003) opines universities as an open social system and assumes to support and work for desired changes in the society through the application of research and innovation in order to create economic values collaborating with business activities. For Antonelli (2008) the university has become an institution with structure and hierarchy in specialized technological knowledge should go with industries. It is because the relationship between university and firm is established by the sharing in same knowledge in the market.

For Barbilla and Corredera (2009) and Lai (2011) the exchange of information between universities and industries is bi-directional. It is because industry problems and market needs are fundamental to research objectives in the university environment. Basically, this relationship is a knowledge sharing process. According to Lai (2011) and Ceviello (2011) the process of transferring knowledge between the university and an industry is carried out through multiple channels. This transfer of knowledge is defined as a process by which technology and knowledge developed in a given environment by a university, are adapted and applied to another context to support the development of an innovation to meet the requirement of the firm (Wu, 2010). The three transfers of knowledge channels most often referred to in the literature are collaborative research, research contracts and consultation (Perkmann and Walsh, 2009). Furthermore, the collaborative studies are formal agreements entered into for the purpose of conducting joint research and development (R&D), generally supported by public funds. Research contracts are defined as research studies directly mandated by firms and conducted by a university. Lastly, consultation refers to a service provided by a researcher, on an individual basis, for a firm (Wu, 2010).

Guimon (2013) explains collaboration between universities and industry is critical for skills development, the generation, acquisition and adopt of knowledge and promotion of entrepreneurship. Ankrah and A-Tabbaa (2015) view industry-university collaboration as an established long tradition in several countries worldwide. Universities play crucial roles in achieving economic growth in contemporary knowledge-based societies (Pinheiro et al. 2015a). In a study, Perkmann and associates (2013) indicate the ambition of policy makers and universities to develop the third mission in addition to traditional core missions e.g. research and teaching. The third mission as they proposed is to commercialize academic knowledge through continuing education programs, patenting, technology transfer offices, science parks or incubators. In this scenario the roles of universities are expanded to economic development through enterprising activities.

University as Principal Actor of Knowledge Economy

The modern universities explore, create, and diffuse knowledge and innovation and industry apply these academic outcomes in the practical world. Hu and Mathews (2009) conceive that with the rapid development of knowledge-based economies, universities, at present, have become the critical source of flow of the national innovation system. Perkmann and others (2011) denote the private companies in various industries have increasingly recognized the importance of scientific knowledge creation and technological opportunities and they are seeking help from collaboration with universities in order to enhance their knowledge base.

Researchers like Bruneel and friends (2010) and Huang and Chen (2016) show the importance of innovative climate in the university to support the knowledge-based economy. As they believe, to facilitate the discussion and sharing of technological knowledge in UIC projects, an innovative climate in the alliance encourages positive and result oriented interactions among the partners. According to them universities with innovative climates have vigorously established programs, courses and workshop in entrepreneurship and sponsored venture competitions not only demonstrate their technical capabilities but also encourage more participation in UIC projects. It has been seen that the innovative climate in the university and partner organization helps to promote economic activities through knowledge creation and transfer.

Towards Entrepreneurial University

The idea of the entrepreneurial university as the third mission across the world has broadened from teaching and research to encompass on active focus on academic knowledge transfer and commercialization. This paradigm has attracted policy makers and scholars at universities during the last several years. Binaccorsi and friend (1994) summarized that national and regional governments across the world, along with actors such as organization for Economic Cooperation and Development (OECED) and European Union (EU), have sought to pave the ways for stronger university-industry relationships through formal rules, regulations and reforms so that higher educational institutions can be entrepreneurially oriented.

In views of Guerrero and Urbano (2012) university with a strong entrepreneurial mission would stress the function of economic and social development by linking research and teaching activities more tightly to the perceived needs of university. Further they expected the academicians in universities with pronouncedly entrepreneurial mission on average to be more oriented towards problems of contemporary industrial relevance. Iorio et al. (2017) have signaled that the extent to which academicians perceive that their university embraces knowledge transfer activities affects their industry activities. Thus, it can be said that entrepreneurial orientation of the universities has become the basis to the industrial initiation, growth, diversification and success. Wu and Zhou (2012) expect more positive attitude is likely to reduce some of the mismatches between university research and industry demand. In addition to academic research, the quality concept of and entrepreneurial university has been emphasized to support the commercialization of university's technology and business idea innovations (Rolthaermel, et al. 2007).

In the views of Klofsten et al. (2019) modern universities have contributed significantly in promoting innovation and entrepreneurship in their location and are evolved as major actors in entrepreneurial environment. Audretsch (2009) and Nonaka (1994) emphasize on connecting people with ideas, partners, and other resources to join the dots to create the sustainable entrepreneurial eco-system. It has been highlighted that entrepreneurially oriented universities contribute to making the foundation of entrepreneurial society which in turn becomes key factor for the economic growth.

Qureshi and Main (2020) emphasize the transfer of innovation in business school led entrepreneurship education best practices to engineering and technology

school setting while operating in a sphere of limited resources. As they found, such transfers can consolidate through a long-lasting relationship between the sender and receiver institutions based on trust, collaboration and mutual benefits. Their study highlights the relationship between the business schools and engineering and technology is crucial for the innovation and entrepreneurship development in Pakistan. An indigenous knowledge-based innovation transfer has been more successful than the borrowed ideas in developing the enterprising society.

Statement of the Problem

The interaction between the university and the industry has existed for decades, and throughout all this time, it has been a very interesting research area. Over a few years, interest of researchers in this area has been amplified, which can be substantiated by the vast number of research and professional papers published in various journals. There are numerous reasons for the increase in interest among the general public. The initial reason is the development of new forms of links between universities and industries primarily caused by evolution of universities business models (Thumbas et al. 2016). They observed universities are altering their vision and mission statements as well as their strategic goals. Universities have adapted to changes in external environment and stakeholders' requirements. Several new models supersede traditional teaching university models such as research universities and commercialized type of entrepreneurial universities. In view of Clark (2011) instead of merely being producers and transmitters of knowledge, universities are strived to achieve a third mission in society by understanding the commercial value of knowledge. As depicted by Etzkowitz (2004) entrepreneurial university missions are focused on fulfilling teaching research and entrepreneurial activities simultaneously and on their contribution to social development and economic growth (Schuelke,2013). Further, Rapke (1998) envisaged, entrepreneurial universities additionally need to become entrepreneurial organizations, their members need to become potential entrepreneurs and their interaction with the environment needs to follow entrepreneurial patterns.

In addition to the above-mentioned business models, several researchers put their views in establishing a model of developmental university characterized by the joint practice of three missions; teaching, research and cooperation for development with other institutions and collective actors (Brundenius et al., 2011). Based on their

explanation, it can be said that the development model is not primarily focused on commercialization and profit making but rather on the contribution to social and economic development. The collaboration model of university and industry depends on the country specific environment and level of its socio-economic development.

There are various ways of collaboration between university with industry. According to D'este and Patel (2007) the categories of collaboration can be: meeting and conferences, consulting and contract research; creation of physical facilities and in-kind support; teaching and training; and joint research. They have also proposed the organizational arrangements for successful collaboration in the name as center for university-industry, collaboration council, collaborative research center, and university industry research center etc.

Based on above elucidation, such research is equally important to Nepalese universities and their management schools. Since a long time more than one-and-a-half-decade Nepalese management schools and colleges have adopted case method of teaching, industrial visit, internship, and industry academia dialogue in their regular course curriculum. University industry collaboration research in Nepal will open the new horizon for exchange and sharing of the knowledge. Industries will find a way to participate in the university curricula and university will find opportunity to be the part of economic value creation for the nation. In the other hand, it will contribute in the improvement of curriculum and delivery pedagogy in the universities, so that industries may get ready for job talent in the market. Therefore, this research attempts to address the issues relating to forms of UIC, objectives to strengthen the UIC practices in Nepal. This paper attempted to answer the question like whether Nepalese students, Professors, and the business leaders find the objectives of university industry collaborations are attainable in Nepal.

Research Objectives

This study being a part of the original research intitled University Industry Collaboration in Nepal (UIC) aims to find the perception of students, course facilitators and industrial leaders about the basic objectives of university industry collaboration in Nepal. It also aims to show the differences and similarities relating to the perception among the different sectoral respondents showing the relative levels of attainment of different objectives UIC objectives.

Justification of the Study

Various researchers and thinkers are devoting a considerable amount of time and effort to establish and sustain the university-industry interactive relationship and collaboration. In view of Morandi (2011) investments in research and university-industry collaboration generate new and innovative products and processes, which in turn result in high returns and a positive impact on the labor market. Further, international competition, changes in and the increasing complexity of technology, human behavior as well as tight development time frame and relatively shorter product life cycle have been encouraging the large number of firms to work in collaboration with universities for their successful research and development efforts. According to a survey conducted by Lee (2000) most important reasons for collaboration with universities are access to new research and knowledge, the development of new products and a desire to maintain relationship with university researchers.

It is shown that technological SMES mainly use links with universities to solve problems, relate it to the firms essential and core activities, whereas larger firms mainly use those links to develop competencies in other related fields also. For Wright and others (2008) collaboration contract between university and industry represents a real tool that allows for effective two-way transfer of knowledge. Zukauskaite (2012) claims that the desire to reap profit from R&D funding also constitutes a motivation for a firm. Johnson (2008) asserts collaboration with university by a business organization will receive government support in matters related to tax and also funding. Further, he notes that such collaboration enhances the reputation of industry and gets help in finding competent human resources for recruitment.

However, along with the bright side of UI collaboration, numerous challenges exist which wait for effective solution (Thune, 2007). Focus on secrecy of knowledge is a prominent challenge in this relationship building. In most general case university focuses on knowledge creation that is public in nature and accessible to everyone for benefit of public at large. Contrary to this, industry aims to take ownership of new knowledge. It wants to gain competitive market advantage (Zukauskaite, 2012) by making knowledge as their private property. In the other hand, universities focus on long term research based on academic objectives, whereas firms face a fast-changing environment, which requires them to focus on short term research outcome (Kyoung, 2011). Therefore, it has become a major challenge for researchers to find logical

solutions to this problem.

In view of Christiansen and Vendelo (2003) instilling a climate of trust between two partners who operate in different realities, namely world of academia and private enterprise also seems to be a hurdle. Different outcomes sought by each party create tensions regarding intellectual property rights, dissemination of knowledge, issues of confidentiality, trade secrets and the sharing of knowledge that may be exclusive to all parties. Thus, the degree of trust between partners is a significant factor in collaborative R&D projects, especially in the situations where each partner knows little about the other.

Another issue may be the commercialization of university research. It is a significant aspect of knowledge-based economy. For this to happen, new practices are to be sought which shall enable academic researchers to dedicate time for such collaborative works. In order to make collaborative efforts fruitful, it must be institutionalized. By doing so, the work shall be recognized as a part of their academic achievement (Mowery and Sampat, 2006). Furthermore, keen attention is required for structuring UI collaborations to make them productive for generation of expected results by commercialization of knowledge.

In nutshell, Nepal has also become the actor of knowledge-based economy as other competing countries. Our Schools of Management are highly strived to be attached with corporate houses for practical hands in knowledge. In the other hand, corporations in Nepal are also attempting to recruit employable people. Further, they are also willing to go together with the university members to solve the day-to-day operational problems and to get help in regard to the vision the strategic issues of their business to bring timely changes. Therefore, study in this topic is equally justifiable for society, universities and the companies in Nepal.

Limitation of the Study

This study has included the teachers and students of three major management schools operating under different universities of Nepal as the research participants. Therefore, findings cannot be claimed to be generalized to other management schools including institutions and faculties of respective universities. Information for study was collected from limited sampled people. Therefore, it may not represent the views of all students and teachers of management schools and universities. In the other hand

entreprenurial corporate leaders' views were also collected from the sampled people. Therefore, their views also cannot be generalized. Use of simple descriptive statistics to analyze the data and reach the findings can also be the limitation of this study.

Literature Review

There are many reasons for industry-university collaboration, companies benefit from highly qualified human resources such as researchers or students (Myoken, 2013). Barnes and others (2002) opined that industry gain access to technology and knowledge from such collaboration. Further, industry can use and enjoy well equipped and expensive research infrastructure (Ankrah and Al-Tabbaa, 2015). Bekkers and friends (2008) estimated up to 10 percent of new products or processes are based on the contribution of academic researchers. Bekkers and friends talked about the benefits to university also. They stated universities benefit from additional funding provided form access to industry equipment or from licensing of patenting income. According to OECD (2015) collaboration with industry has become an inevitable part of university funding and the funds from international organizations and business enterprises for research and development in higher education sector has become the major sources of income.

Hall with others (2003) and Cyert and Goodman (1997) stated a central motivation for universities to research company partners is related to their financial situation. The push for collaboration is caused by increasing constraints in universities research budgets that may not be sufficient to carryout adequate research and teaching activities, through collaboration universities get access to empirical data so that the research may be more closely related to real life problems. A knowledge sharing process will be effective when company representatives act as visiting faculties, take part in workshops and seminars, or do their studies. According to Teece (1998) universities cooperating with business can easily commercialize its inventions in additions universities can benefit from the training and different course assignments. The immediate results of the collaboration practices are employment opportunities for graduates and improved reputation and competitiveness of universities (Azaroff, 1982)

Companies aim to have the benefits form collaboration include getting access to scientific frontiers increasing and utilizing the predictive power of science, delegating selected development activities and compensating potential lack of

resources (Bonaccorsi and Piccaluga, 1994). Cohen and Levinthal (1990) advocated that companies can enjoy the advantage of first and second mover through basic research gained from collaboration with university. In the views of Bloedon and Stokes (1994), state-of- the- art information and knowledge provided by universities may be crucial to companies. Further, new product ideas, improvements to product quality or manufacturing processes and solutions to technical problems can benefit the collaborating companies. Finally, in their view the company can make better decisions by sharing the knowledge to minimize the uncertainty. The access to expertise and laboratories, libraries data bases etc. saves time and money to both the parties. In addition to the above-mentioned motivational collaboration with universities may enhance the completion of long range project, improve the image of the company and provide relations to students that eventually help the company to meet future development needs (Azaroff, 1982).

Barbeiri and friends (2018) found creating spin off has a negative effect on collaborating with industry while collaboration has no significant effect on patenting. They further noted that there is a substitutional effect between spin off engagement and co-publication with business firms. Beaudry and Kananian (2013) has opined the centrality of network position in co-publication has positive impact on patent quality limited by a U shape. They further found having been contracted by a firm in the past was positively influencing patenting and quality. D'Este et al. (2019) studied the effect of interdisciplinary research on academic engagement with industry and concluded interdisciplinary research has positive influence on various types of academic engagements. According to them the effect was stronger for academic entrepreneurship and licensing compared to research and development partnership and contract/ consulting.

In a study Goel and Goktepe-Hulten (2013) concluded, both collaboration and consulting have positive effect and patenting with the magnitude of collaboration being larger. Gulbrandsen and Thune (2017) have posited that non-academic experience was positively related to academic engagement and asserted there was no effect on academic productivity of the collaborating faculty members. Mindruta (2013) found the publishing capabilities of the firms and university scientist were complementary for innovation but substitute patents. According to study, more specialized individual firms create more value by teaming up with more knowledge diversified partners. A

study by Perkmann et al. (2015) observed that independent patenting amount to 30% of overall academic patenting and independent consulting covers about three quarters of overall consulting whereas the independent entrepreneurship is about 90% of overall funding activity by academics at the universities covered in the study. Tartari and Breschi (2012) studied the expected benefits and cost of university- industry research collaboration and noted while access to financial and non- financial resources was the most important factor spurring academic researchers to collaborate with industry. According to them, the perception that collaboration will limit a researcher's freedom was the main hindering factors.

For Lavie and Drory (2012), collaboration by scientist with fellow scientists facilitates knowledge creation, and collaboration with industry facilities knowledge application in preliminary studies, prototype testing, and commercialization. Lawson (2019) researched the impact of university-industry collaboration on academic patenting and investigated, researchers with large share of research grants from industry filed more patents even small dissemination grants also resulted in positive effect.

The benefits of university- industry linkages are wide reaching: they can help coordinate research and development agendas and avoid duplication stimulate additional private research and development investment and exploit synergies and complementary of scientific and technological capabilities. Further, university-industry collaboration can also expand the relevance of research carried out in public institutions, foster the commercialization of public research and development outcomes, and increase the mobility of labor between public and private sectors (Guimon, 2013)

A study in Chile and Colombia showed collaboration with universities substantially increased the propensity of firms to introduce new products and patent (Marrota et al., 2007). Thus, the significance of university-industry partnership is not only beneficial to developed countries, it is equally beneficial to developing countries.

Firms and universities are increasingly finding it mutually beneficial to collaborate. Private firms are progressively adopting open innovation strategies to better access and integrate external sources of knowledge, leading to stronger interest in collaboration with universities (Perkmann and Walsh, 2007). As noted by Seppo and Roohalt (2012) a study report of European university-industry cooperation revealed that universities and academics regard the benefits of cooperation for students as the higher the personal benefits to researchers were rated the lower.

For Seppo and Roohalat (2012) the enterprise will cooperate with university in case it cannot achieve its goal alone, or quicker or cheaper to do it in collaboration with university. Research and development cooperation with universities makes it possible to develop through new products, service or processes competitive advantage of the firm and thus raise its competitiveness in the market. Pervious researchers like Barnes and others (2002) denoted that cooperation makes it possible to firm to access the valuable resources like knowledge, technology, equipment and laboratories in university. Elmuti and others (2005) opined in some cases such cooperation is funded by government thus doing research and development collaboration with university may lower the cost of research. In the views of Santro and Chakrabarti (2002), cooperation with universities and industry can influence the development of human resources according to needs of the industry. By taking part in the curriculum development and delivery the curriculum development and delivery, the industry can shape future employees and thus access to highly trained students is one of the most acknowledged benefits from the industry. Moreover, university and business gain a high image from collaboration.

Research Methodology

The research in hand is based on the opinions of course facilitators and MBA last semester students at School of Management (SOMTU), Kathmandu University School of Management (KUSOM) and Pokhara University School of Business Management (PUSOBM). It also carries the views of the industrial leaders elected as the member of Federation of Nepalese Chamber of Commerce and Industries (FNCCI). This follows an exploratory cum descriptive survey research design as explained in Krishnswamy et al. (2010, p.161). The study has explored the comparative results of the opinions of course facilitators, students and industrial leaders. Hence the present research also attempts to carry some characteristics of the comparative research design as mentioned in May (2001, p.206) and Heinn et al. (2010, p.60)

The questionnaire used to collect the data from the survey was divided into two sections. The first section of the questionnaire consists of socio-demographic information of the respondents. The second section of the questionnaire was about the objective of university-industry collaboration. The question to measure the level of attainability was based on the study of Alexander and Martin (2013).

Objectives of U-I collaboration were measured in the five points scale in terms of attainability. In order to get answer it was termed as highly attainable (5) attainable (4) somewhat attainable (3), less attainable (2), and least attainable (1). The vocabulary used in this questionnaire was developed as discussed by Schaeffer and Pressure (2003). The questionnaire mostly constitutes the unipolar scales as explained in Schaeffer and Pressure. The unipolar questions included in the survey were presented in the format of five points scale which highly positive (5) to least positive (1) as opined by Krishnaswami et al., (2010, p.263) and Heinn et al., (2010, p.162).

For the study of the objectives of UI collaboration, three major business schools among the various business management schools catering the Master of Business Administration (MBA) were selected. These three business schools were namely SOMTU, KUSOM and PUSOBM. These three business schools are operated under the faculty of management, Tribhuvan University, faculty of management, Kathmandu University, and faculty of management studies Pokhara University respectively. The logic behind the selection of these business schools was that these are the constituent schools of respective university, comparatively competitive and resourceful and preferred by the large numbers of students opting to get the admission in MBA. From these schools, students studying at the last semester were selected as a sample for the study purpose. The aim to select last semester's students was their knowledge, skills and attitudes they have developed from internship or industrial exposer program exercised by respective business schools.

Besides students the course facilitators/professors of the MBA students were also considered as the respondents in this study. The instructor's willingness to share their opinions and availability of the time were the basis to select the respondent instructor. Along with students and instructors, the elected leaders in FNCCI were also consulted to give their responses to the questions. Among the consulted industrial leaders, those who were ready to participate in the research were considered as the sample.

The demographic composition of the respondents was as follows: The total number of students responding to the questionnaire were 63. Out of 63, the number of female students were 42 (67%) and the number of male students were 21 (33%). Among the 32 course facilitators 7 (22%) were female and remaining 24 (78%) were male. From industry sector total 25 responses were found usable. Out of 25 respondents

from the industry, 6 (24%) were female and 19 (76%) were male. The total responses received from students, teachers and industrial leaders were 63 (52%), 32 (27%) and 25 (21%) respectively. In total 55 (46%) were female and 65 (54%) were male respondents from the different sectors.

Researchers in January 2020 visited the three business schools and consulted with the instructors and the MBA last semester students. The researchers were given the opportunity to share about the objectives of the study and composition of the questionnaire. The investigators also visited the office of the FNCCI and contacted the business leaders- individually and investigators got permission from the business leaders to show their responses on the questionnaire. All the students present in the class at the date were distributed the questionnaire in the respective business schools under TU, KU and PU. Course facilitators were also requested for their responses to the given questionnaire. A pilot test of the questionnaire was also conducted, and the response rate was 80 percent. Some corrections were made in the survey instrument according to the opinion of research participants.

The finalized questionnaire, updated based on the suggestions from the preliminary testing, were distributed to the students and instructors of the selected business schools. The questionnaire was also handed over to the business leaders. The printed format of the questionnaire in English language with a request cover letter was forwarded by the investigators to the individual students, instructors and the business leaders having differences in gender. The investigators were provided the opportunity to brief about the topic, objectives, and problems statements with the students of selected business schools. This process highly supported the research work. It increased students' readiness to participate in the discussion and give responses to the questions. The majority of the students and the instructors returned the questionnaire with responses in the two weeks. Business leaders returned the questionnaire a little late. A very few numbers of respondents needed to be reminded about the submission of the questionnaire. A negligible number of respondents reported that they misplaced the questionnaire and were duly replaced. Altogether within two and half months starting from February to the third week of April 2020 the questionnaire forms were collected. The valid usable response rate was 74%, 70% and 71% for students, course facilitators and FNCCI leaders respectively. The aggregate response rate comprising all the categories was 72%. The computed Cronbach's Alpha was 77.50%. The value

shows that Cronbach's Alpha Coefficient for the factor with total scale reliability is 0.775>0.5 (Nunally and Bersnstein, 1994). It indicates that the variables exhibit a correlation with their factor grouping and thus they are internally consistent.

The information received from the usable questionnaire were duly entered in the statistical package for social science research (SPSS) version 23 for window. Microsoft office excel 2013 was also used to process the data. Statistical tools applied to reach the finding were descriptive statistics like percentage, mean, standard deviation, and analysis of variance (ANOVA).

Results and Discussions

This section of the paper is devoted to analyzing the collected data reaching the findings on the basis of statistical computations. The students, instructors and industry leaders were requested to consider the UIC objectives in the scale like most attainable (5), attainable (4), somewhat attainable (3), less attainable (2) or least attainable (1). The table below presents the mean values and standard deviation of the responses received from the students, instructors and the industrial leaders.

As shown in table 1 above, the mean values obtained for the responses of students, instructors and industry leaders in regard to contribute research and consultancy was 4.44, 4.13 and 4.44 respectively. According to mean values continued research and consultancy were important UIC objectives for the respondents of all the sectors. To work in collaboration research was accepted as important UIC objectives by students, instructors and business leaders. The mean values in this respect were 4.35, 4.22 and 4.48 for the responses of students, instructors and the industry leaders. Sharing the facilities of university and company were recognized was most important UIC objective by the industrial sector and important by student and instructors. The representing mean values were 4.27, 4.25 and 4.52 for the responses of students, instructors and industry leaders. Training and continuing professional development were important UIC objective for students, instructors and industrial leaders. The supporting mean values were 4.21, 4.31 and 4.44 for the responses of students, instructors and business leaders.

Table 1

Objectives of University-Industry Collaboration: Sector Perspective

S.N.	Objectives of UI Collaboration	Student N=63		Instructor N=32		Industrial Leader N=25	
		Mean	SD	Mean	SD	Mean	SD
1	Continue research and consultancy	4.44	713	4.13	707	4.44	651
2	Work in collaborative research	4.35	652	4.22	751	4.48	714
3	Share facilities	4.27	723	4.25	718	4.52	653
4	Training and Continuing Professional Development (CPD)	4.21	806	4.31	738	4.44	768
5	Professional journal publication	4.32	668	4.34	745	4.28	737
6	Joint supervision	4.30	796	4.28	772	4.32	748
7	Student placement	4.33	762	4.13	833	4.32	690
8	Joint conference	4.30	754	4.22	7.93	4.32	802
9	Secondment	4.27	812	4.28	772	4.24	779
10	Networks	4.37	784	4.22	832	4.24	779
11	Spin-outs	4.24	817	4.22	7.51	4.24	779
12	Patenting and licensing	4.32	798	4.25	762	4.28	737
13	Joint venture	4.35	744	4.31	.780	4.44	.768
14	Orientation to knowledge transfer activities	4.51	644	4.38	.707	4.56	.583

For all categories of respondents, professional journal publication was an important UIC objective. The respective mean values in this concern were 4.32, 4.34 and 4.28 for the responses of students, faculties and industry leaders. Joint supervision of the research was regarded as an important UIC objective by students, instructors and business leaders. The computed mean values in this concern were 4.30, 4.28 and 4.32 for the responses of students, faculties and industry leaders. Students' placement in the industry was an important UIC objective for students, teachers and the industry representatives. The mean values in this respect were 4.33, 4.13 and 4.32 for the responses of students, instructors and industry leaders respectively. All categories of respondents recognized joint supervision as an important UIC objective. The supporting mean values were 4.30, 4.22 and 4.32 for the responses from students, faculties and

business leaders. Secondment was an important UIC objective for students, teachers and industry representatives. The respective mean values were 4.27, 4.28 and 4.24 for the responses of students, faculties and industry leaders.

Irrespective of categories of respondents, networks between industry and university were an important objective of UIC for all groups. The mean values were 4.37, 4.22 and 4.24 for the responses of students, faculties and industry leaders respectively. Spin-out was the important UIC objective for the students, faculties and industry leaders. The respective mean values for the responses of students, instructors and business leaders were 4.24, 4.22 and 4.24 in the order. The mean values computed for the responses received from students, instructors and industry leaders concerning patenting and licensing were 4.32, 4.25 and 4.28 accordingly. As determined by mean values patenting and licensing was an important UIC objective for all kinds of respondents. Joint venture was an important UIC objective for students, instructors and business leaders. The respective mean values for the students, faculties and industrial respondents were 4.35, 4.31 and 4.44. Orientation to knowledge transfer activities was the most important UIC objective for the students and industry leaders. It was accepted as an important UIC objective by the instructors. The computed mean values were 4.51, 4.38 and 4.56 for the responses of students, instructors and the business leaders.

To sum up, sharing facilities was the most important UIC objective for industrial leaders. Orientation to knowledge transfer activities was the most important UIC objective to students and industry leaders. All other UIC objectives were regarded as important by students, instructors and industrial leaders.

One-way analysis of variance was run to find the similarities and differences in average perception of respondents categorized as students, instructors and the industry leaders in regard to UIC objectives. As shown by ANOVA, there were no significant differences among the respondents concerning the UIC objectives like, continue research, share facilities, training and continuing professional development, professional journal publication, joint supervision, students' placement, joint conference, secondment and network as UIC objectives in Nepal. According to ANOVA, the respondents regarding spinouts, patenting and licensing, joint-venture and orientation to knowledge transfer activities as recognized as UIC objectives. In all cases of UIC objectives the P-values were greater than α at 5 percent level of significance.

Nepalese university faculties and their MBA students considered all fourteen UIC objectives as attainable and some highly attainable. In addition, the students, instructors and business sector respondents considered the identified objectives as attainable and some highly attainable. This finding has similarities with the work of Alexander and Martin (2013).

Conclusion and Implication

The findings of this research can be implemented by the universities, business management schools, management institutes and business community leaders in the process of framing the UIC policy and the curricula especially for MBA students. It clearly gives the insight views of students, professors, and the business leaders in regard to cruciality and attainability of the objectives of UIC in Nepal. Future researchers are requested to conduct further research in the topics like this and its further related matters.

References

Alexander, A.T. & Martin, D.P. (2013). Intermediaries for open innovation: A competence-based comparison of knowledge transfer offices practices. *Technological forecasting and social change,* 80, 38-49.

Ankrah,S. & Al Tabba, O. (2015). Universities-Industry collaboration: A systematic review. *Scandinavian Journal of Management,* 31, 387-408.

Antonelli, C. (2008). The new economics of the university: A knowledge governance approach. *Journal of Technology transfer*, 33, 1-22.

Audretsch, D.B. (2009). The entrepreneurial society. *The Journal of Technological Transfer*, 34, 245-254.

Azaroff, L.V. (1982). Industry- university collaboration: How to make it work? *Research Management, 2*5, 31-34.

Barbieri, I., Pollin, G. & Micozzi, A. (2018). What are the trade-offs of academic entrepreneurship? An investigation on the Italian case. *Journal of Technology Transfer*, 43, 198-221.

Barbilla, A.M. B. &Corredera, J.R.C. (2009). Critical factors for success in university-industry research projects. *Technology Analysis & Strategic Management*, 21, 599-616.

Barnes, T., Pashbby, I. & Gibbons, A. (2002). Effective university-industry interaction: A multi-case evaluation of collaborative R&D projects. *European Management Journal*, 20, 272-285.

Bekkers, R. & Bodas-Fritas, I.M. (2008). Analyzing knowledge transfer channels between universities and industry: To what degree do sectors also matter? *Research Policy* 37, 1837-1853.

Bikard, M., Vikili, K, &Teodoridie,J. (2018). When collaboration bridges institutions: the impact of university industry collaboration on academic productivity. *Organization Science*, 30, 426-445.

Binanchini. S., Lissoai, F., Przzoni, M., & Zirutia, I. (2016). The economics of research, consulting and teaching quality: Theory and evidence from a technical university. *Economics of Innovation of New Technology*, 25, 668-691.

Bjerregaard, T. (2010). Industry and academia in convergence: Micro-institutional dimensions of R&D collaboration. *Technovation,* 30(2), 100-108.

Bloedon, R.V. & Stokes, D.R. (1994). Making university/industry collaborative research succeed. *Research Technology Management*, 37, 44-48.

Bonaccorsi, A. & Piccaluga, A. (1994). A theoretical framework for the evaluation of university- industry relationships. *R&D Management,* 24, 229-247.

Brundenious, C., Lundvall, B. A. & Sutz, J. (2009).The role of universities in innovation systems in developing countries: Development university systems-empirical, analytical and normative perspective. In B. A. Lundvall, K. J. Joseph, C. Chaminade, & J. Vang, eds. *Hand Book of systems and Developing Countries*, Cheltenham, UK: Edward Elgar.

Brundenius, C., Goransson, B., Agren, J. (2011). The Role of Academic Institutions in the National System of Innovation and the debate in Sweden: New York, *Universities in Transition*, pp 307-325.

Brunnel, J., D'Este, P. & Salter, A. (2010). Investigating the factors that diminish to university-industry collaboration. *Research Policy*, 39, 858-868.

Christiansen, J.K. & Vendel, M.T. (2003). *The* role of reputation building in international R&D project collaboration. *Corporate Reputation Review*, 5(4), 304-329.

Clark, B.Y. (2011). Influences and conflicts of federal policies in academic industrial scientific collaboration. *Journal of Technology Transfer,* 36, 514- 545.

Cohen, W.M., & Levinthal, D.A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quality*, 35, 128-152.

Cyert, R.M. & Goodman, P.S. (1997). Creating effective university-industry alliances: An organizational learning perspective. *Organizational Dynamics*, 25, 45-57.

D' Este, P. & Patel, P. (2007). University-industry linkages in UK: what are the factors underlying the variety of interactions with industry? *Research policy*, 36, 1295-1313.

D 'Este., P. Liopis, O., Rentocchini, F. &Yegros, A. (2019). The relationship between interdisciplinary and distinct modes of university-industry interaction. *Research Policy* 48, 103799.

Elmuti, D., Abebe, M. & Nicolosi,M. (2005). An overview of strategic alliances between universities and corporations. *The Journal of Workplace Learning,* 17, 115-129.

Etzkowitz, H. (2004). The evolution of entrepreneurial university. *International Journal of Technology Globalization*, 1(1), 64-77.

Feldman, M. P. (2003). Entrepreneurship and American research universities. In D. M. Hart ed. *The Entrepreneurship Policy: Governance, Start-ups and Growth in the US Knowledge Economy*. Cambridge: Cambridge, pp 92-112.

Genger, R.L & Sa, C. (2008). *Topping the Riches of Science: Universities and the Promise of Economic Growth, Cambridge*. Massachuretts; Harvard University Press.

Goel, R.K. & Goktepe-Hulten, D. (2013). Industrial interaction and academic patenting: Evidence from German Scientists. *Economics of Innovation and New Technology*, 22, 561-565.

Guimon, J. (2013). Promoting university-industry collaboration in developing countries. *The Innovation Policy Plate form*, World Bank.

Gulbrandsen, M. & Thune. T. (2017). The effects of nonacademic work experience on external interaction and research performance. *Journal of Technology Transfer,* 42, 795-813.

Gurrero, M. & Urbano, D. (2012). The development of entrepreneurial university. *The Journal of Technology Transfer*, 37, 43-74.

Hall, B.H., Link, A.N. & Scott, J.T. (2003). Universities as research partners. *The review of Economics and Statistics*, 85, 485-491.

Henn, M., Weinstein, M., & Foard, N.A. (2010). *A Critical Introduction Social Research*, India, Sage Publication.

Hu, M.C. & Mathews, J.A. (2009). Estimating the innovation effects of university-industry-government linkages: The case of Taiwan. *Journal of Management and Organization*, 15, 138-154.

Huang, M.H. & Chen, D. Z. (2016).How can academic innovation performance in university-industry collaboration be improved? *Technological Forecasting and Social Change*, 123, 210-215.

Iorio, R., Labory, S. & Rentocchi, F. (2017). The importance of pro-social behaviour for the breadth and depth of knowledge transfer activities: An analysis of Italian academic scientists. *Research Policy*, 46, 497-509.

Johnson, W. H. A. (2008), Roles, resources and benefits of intertmidiate organizations supporting triple helix collaborative R&D: The case of Precran. *Technovation*, 28(8), 495-505.

Klofsten, M., Fayolle, A., Guerrero, M., Mian, S., Urbano, D. & Wright, M. (2019). The entrepreneurial university as driver for economic growth and social change: Key strategic challenges. *Technological Forecasting and Social Change*, 141, 148-158.

Krishnaswamy, K.N., Sivakumar, A.L. & Malhirajan M. (2010). *Management Research Methodology: Integration of Principles, Methods and Techniques.* India, Pearson Education in South Asia.

Lai, W.H. (2011). Willingness to engage in technology transfer in industry university collaborations. *Journal of Business Research,* 34 (11): 1218-1223.

Lavie, D. & Drory, I. (2012). Collaborating for knowledge creation and application: The case of Nano-technology research programs. *Organization Science*, 23, 704-724.

Lawson, C., Salter, A., Hughes, A. & Kitson, M. (2019). Citizens of somewhere; examining the geography of foreign and native-born academics engagement with external actors. *Research Policy*, 48, 759-774.

Lee, Y.S (2000). The sustainability of university-industry research collaboration: An empirical assessment. *Journal of Technology Transfer*, 25, 111-133.

Marrotta, D. M., Mark, A. B. & Thorn, K. (2007). Human capital and university-industry linkages' role in fostering firm innovation: An empirical study of Chile and Colombia. Policy Research Working Paper 4443, World Bank, Washington, DC.

May, T. (2001). *Social Research: Issues and Process* Buckingham, Open University Press.

Mindruta, D. (2013). Value creation in university-firm research collaborations: A matching approach. *Strategic Management Journal*, 34, 644-665.

Morandi, V. (2011).The management of industry university joint research projects: How do partners co-ordinate and control R&D activities? *Journal of Technology Transfer*, 38(2), 69-92.

Mowery, D.C &Sampat, D.N. (2006). Universities in national systems of innovation, In J. Fagersberg et.al.eds., *The Oxford Handbook of Innovation*, Oxford University Press, New York.

Myoken, Y. (2013). The role of geographical proximity in university and industry collaboration: Case study of Japanese companies in the UK. International Journal of technology Transfer and Commercialization, 12, 43-61.

Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organizational Science*, 5, 14-37.

Nunally, J.S. & Bernstein, I.H. (1994). *Psychometric Theory 3rd edition*, New York-Mc Grow-Hill.

OECD (2015). *OECD science, technology and industry scoreboard 2015: Innovation for growth and society*. OECD. Paris.

Perkmann, M & Walsh, K. (2009). The two faces of collaboration: Impact of university-industry relations on public research. *Industrial and Corporate change*, 18(6), 1033-1065.

Perkmann, M, & Walsh, K. (2007). University industry relationships and open innovation: Toward a research agenda. *International journal of Management Review*, 35(10), 259-280.

Perkmann, M., Neely, A. & Walsh, K. (2011). How should firms evaluate success in university-industry alliances? A performance management system. *R & D Management*, 41, 201-215.

Perkmann, M., Tartari, V., Mckelvey, M., Autio, E., Brostorm, A., D'Este, P. Fini, R., Geuna, A. Grimaldi, R., Hughes A., Krabel, S., Kitson, M. Lierena, P. Lissoni, F. Salter, A., & Sombrero, M. (2013). Academic engagement and commercialization: A review of the literature on university-industry relations. *Research Policy*, 42, 423-442.

Perkmann. M., Fini, R., Ross. J.M., Salter, A., Silvestri, C. &Tartari, V. (2015). Accounting for universities impact- using augmented data to measure academic engagement and commercialization by academic scientists. *Research Evaluation,* 24, 380-391.

Pinheiro. P., Langa, P.U. & Pausits, A. (2015). One and two equals three? The third mission of higher education institutions. *European Journal of Higher Education*, 5, 233-249.

Politt, D. & Melons C. (1993). Making knowledge work: Through closer ties between town and gown. *European Business Review,* 93: 36-37.

Putnam, R. (2001). *Social Capital: Measurement and Consequences*, Paris: OECD.

Qureshi, S. & Mian, S. (2020). Transfer of entrepreneurship education best practice from business schools to engineering and technology institutions: Evidence from Pakistan. *The Journal of Technology Transfer*, Dio.org/10.1007/510961-020-09793-7.

Rapke, J. (1998). *The Entrepreneurial University, Innovation, Academic Knowledge Creation and Regional Development in a Globalized Economy Working paper no.3, Marburg: Germany, Department of Economics,* Philipps Universitat.

Rothaermel, F.T., Augung, S.D. & Jiang, L. (2007). University entrepreneurship: A taxonomy of the literature. *Industrial and Corporate Change*, 16,691-791.

Santoro, M.D. & Chakrabarti, A.K. (2002). Firm size and technology centrality in industry-university interactions. *Research Policy,* 11, 1163-1180.

Schuelke-Leech, B.A. (2013). Researches and research: An empirical study of influence of departmental research resources on individual STEM researcher's involvement with industry. *Research Policy*, 42, 1667-1678.

Sehaeffer, N.C. & Presser, S. (2003). The science of asking questions. *Annual Review of Sociology,* 29, 65-88.

Seppo, M. & Roolaht, T. (2012). The policy suggestions concerning motivations and barriers of university-industry cooperation. *Research and Innovation Policy Monitoring Program*, Estonian Ministry of Education and Research.

Spiltover, A. & Knockaert, M. (2012). Technology intermediaries in low tech sectors: a case of collective research centers in Belgium. *Innovation Management Policy and Practice*, *14*(3), 375-387.

Steingraber, R & Gonclaces, F.O. (2015).*The University-Industry Relationship in Brazil The Impact of Institutions and Social Capital in Brazilian Sectorial Systems of Innovation*, Positivo University.

Tartari, V. & Breschi, S. (2012). Set the free scientists evaluations of the benefits and costs of university-industry research collaboration. *Industrial and Corporate change,* 21, 1117- 1147.

Teece, D. (1998). Capturing value from knowledge assets: The new economic markets for know-how, and intangible assets. *California Management Review*, 40, 55-79.

Thumbas, P., Malkovic, P., Maric, M. & Pavlicevic V. (2016) Organizational aspects of university industry collaboration. Barcelona; Spain, *Proceedings of EDULERN 16 Conference.*

Thune, T. (2007). University-Industry collaborations: The network embeddedness approach. *Science and Public Policy*, 34 (3), 158-68.

Tsubouchi, M., Morishita, R., Tabata, Y., Matsui, S, & Kawakami, K. (2008). Critical issues for effective collaboration between academia in the field of regenerative medicine in Japan. *Regenerative Medicine (Journal)*, 3, 497-504.

Veilleux, S. & Queenton J. (2015). Accelerating the pace of innovation through university-industry collaboration enhancement: in search of mutual benefits and trust building. *Journal of International Management Studies*, 15(2), 415-458.

Wright, M., Andy, C.B.L. & Knockaert, M. (2008). Mid-range universities linkages with university: Knowledge types and the role of intermediaries. Research Policy, 37(8), 1205-1223.

Wu, W. & Zhou, Y. (2012). The third mission stalled: Universities in China's technological progress. *The Journal of Technology Transfer*, 37: 812-827.

Wu, W. (2010). Managing and Incentivizing research Commercialization in Chinese Universities. *Journal of Technology Transfer,* 35(2), 203-224.

Zukauskaite, E. (2012). Innovation in cultural industries: The Role of University Links, *Innovation Management Policy and Practice*, 14(3), 404-415.