

Organizational Models in University-Industry Collaboration-International Perspective

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Abstract

The prime objective of this paper is developing a taxonomy, which uses both institutional and functional criteria. Departing from the assumption that there are several evolutionary stages in the development of university-industry collaboration, which embrace unstructured to fully structured and complex modes, the paper identifies five stages : (i) ad hoc collaboration at an individual level, (ii) development of internal support structures, (iii) creation of autonomous support structures, (iv) setting up of individual enterprises and (v) national and transnational networking. These five development stages include organizational forms, such as Industrial Liaison Offices, University-Industry Research Centers, Trading Companies, Foundations, and, Affiliate programs and Consortia. Each of these organizational models is reviewed in terms of its objectives, functioning and predominance in different regions of the world. Without attempting to be exhaustive specific case examples are included from the African, Western European and Latin American countries. Moreover, the paper also focuses on particular attention to some of the crucial management aspects in the development of university-industry collaboration.

Keywords : Collaboration, Organizational Model, University, Industry.

1.0 Introduction

Alliances between universities and industries are proliferating. At one level, these partnerships effectively provide universities with needed funding sources as government support for research declines. Companies, in turn, are able to tap into knowledge at the frontier of science and achieve greater flexibility in funding their own research and development efforts. Collaborative activities between universities and industry have increased considerably during the last two decades. The reasons for this have been well studied and include motivations such as the advancement of technology, changes in the characteristics of industrial production and management practices, policies affecting universities and the availability of funding mechanisms (Chakrabarti & Santoro, 2004; D'Este & Patel, 2007; Grimaldi, Kenney, Siegel, & Wright, 2011). The study follows the constructive research approach (Kasanen, Lukka, & Siitonen, 1993) and its typical structure (Lindholm, 2008; Oyegoke, 2011). The

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international business literature has already acknowledged a number of positive outcomes for companies actively engaged in strategic alliances, such as higher return on equity, better return on investment, and higher success rates, compared with integration through mergers and acquisitions, or companies in the Fortune 500 list that avoid building inter-corporate relationships (Booz-Allen & Hamilton, 1999). At the same time, it is an acknowledge fact that there is little understanding among business executives regarding the formation processes, the dynamics and evolution of inter-corporate relations, and what are the factors that determine the success rate in strategic alliances (O'Farrell & Wood, 1999). The issues of trust, partner selection, knowledge transfer through co-operative business ventures, complementarities and synergies between partners have dominated the scientific discourse. Some of the leading research questions explored were: why alliances are set-up (Gugler, 1992, Lei, 1993); the international context of cross—border strategic alliances (Snodgrass, 1993, Levinson & Asahi (1995), or how to achieve success in international strategic alliances (Bleeke and Ernst (eds.) 1993), Mohr and Spekman, 1994). In general the contributions to the field of inter-corporate strategic alliances focus either on an in-depth analysis of a selected narrow issue - such as the effect of knowledge ambiguity on technological knowledge transfer in strategic alliances (Simonin, 1999), and methodological issues of construct validity in measuring strategic alliance performance (Arino, 2003). The relations of business schools with their socioeconomic environment have become a topical issue in the literature on higher education over the past twenty years or so. Likewise, this issue has moved high on the agenda of business school's success. Some aspects in this regard are discussed here.

1.1 Literature Review

Building successful collaborative relationships has often proved challenging due to factors that can roughly be classified into two categories: a wide range of issues related to cultural differences between the organizations, and issues related to intellectual property and technology (Dooley & Kirk, 2007; Perkmann & Salter, 2012). University–industry collaboration can take place in many forms, requiring different levels of formalization and organization (Thune, 2011). D'Este and Patel (2007) recognize five types: meetings and conferences, consultancy and contract research, creation of physical facilities, training and joint research. Factors to consider include the strategic importance of the topic for both, complementary skills and expertise, evidence of recent corporate instability (Barnes, Pashby, & Gibbons, 2002), geographical proximity (D'Este et al., 2012) and the size of the industry partners (Butcher & Jeffrey, 2007). A possible division of roles can be the university staff working on research-oriented tasks, while the industry staff focuses on development activities (Rohrbeck & Arnold, 2006). Having a clear and flexible policy on

publication and intellectual property rights supports trust formation (Bstieler et al., 2015), as conflicts with technology-transfer organizations and university administration can potentially deter companies (Bruneel et al., 2010). Utilizing a broad range of interaction channels enhances research progress, promotes the formation of trust and contributes to collaboration success (Bruneel et al., 2010; D'Este & Patel, 2007). While good personal relationships are beneficial, relying on them alone poses risks (Aapaoja et al., 2012; Rohrbeck & Arnold, 2006). Communication can be supported by developing a clear communication strategy and structure, and by facilitating frequent interaction (Barnes et al., 2002; Mead et al., 1999), as especially inexperienced researchers may be hesitant to communicate with their supervisors and industry representatives (Butcher & Jeffrey, 2007). The above quote expresses the 'open data' rule that constituted a cornerstone of the Human Genome Project. The disclosure regime of this large-scale research programme was built on the principle of free, unrestricted and timely access to research findings for all interested parties (Murray-Rust, 2008 and Molloy, 2011). In the Human Genome Project, public science was pitched against for-profit entities with competing projects based on proprietary intellectual property (Williams, 2010). Yet increasingly firms themselves participate in and even instigate open data initiatives, either by releasing data to academic communities with no restriction or by supporting the generation of open data. Partnerships sponsored by pharmaceutical companies, such as the SNP2 consortium and the Genetic Association Information Network (GAIN) have made their data publicly available (Cook-Deegan, 2007, Pincock, 2007 and Allarakhia and Walsh, 2011). Partnerships with universities, aided by public or charity grants, are natural territory for open data practices, given the prominence that public knowledge creation has in the norms and traditions of academic science (Dasgupta and David, 1994). The propagators of open data in corporate R&D argue that by integrating their R&D programmes more closely with those of open academic communities, firms may reap significant benefits for both the quality and the volume of their innovation activity (Melese et al., 2009). There are many projects which are being implemented in the University of Chittagong under Higher Education Quality Enhancement Project (HEQEP), financed by The World Bank, where University authority executes Memorandum of Understanding (MoU) with different commercial organizations. The main objective of this MoU is to provide students internship facilities, industry excursions, job opportunities etc. On the other hand, industry people also get opportunity to share their experience with the potential workforce in the form of seminar, part time class etc. This create a unique platform for both university and commercial organizations to help each other from their respective position. Through this type of alliance, students, university authority, companies and the society at large get benefits in multiple ways.

At the present time, some benefits for business schools are seen as underlying stronger collaboration with industry:

- (i) Opportunity to attract additional funds for initial teaching and research thereby increasing financial autonomy of business schools, especially if government core funding is tightly linked to specific academic purposes,
- (ii) Cooperative research with enterprises as a lever to attract more public funds if there are governmental project funds for collaborative research programs,
- (iii) Acquisition or access to up-to-date equipment,
- (iv) opportunities for faculty and students to become familiar with state-of-the-art industrial management systems and enhancement of their familiarity of the constraints of industry,
- (v) improved interaction for the development and adaptation of degree programs,
- (vi) improved employment prospects for students,
- (vii) supplemental income from consulting, allowing academic staff to improve their salaries, and
- (viii) Enhancement of the business schools' image as a contributor to the economy.

1.2 Determining Factors of Type of Collaboration and Its Degree of Intensity

Most business schools worldwide have by now some type of interaction with local, national or multinational industry. The type of interaction and its degree of intensity depends on many external and internal factors for instance the existence of:

- (i) research capacity within the business school,
- (ii) an industrial base involved in 'Research and Development' (R & D) activities,
- (iii) the existence of governmental policies, initiatives structures or programs to stimulate collaborative R & D,
- (iv) a tradition of interaction between business school and industry,

- (v) an entrepreneurial culture within the higher education sector, and
- (vi) an academic reward system and incentives.

2.0 Objective of the Study

The primary objective of this paper is to highlight the different models of university-industry collaboration. Specific objectives are:

- (a) To present the readers with a continuum of organizational models encompassing both the least and most structured;
- (b) To explore the benefits of 'university-industry collaboration';
- (c) To study the feasibility of different models of 'university-industry collaboration'

3.0 Methodology

The paper is based mainly on secondary data. Helpful information from different magazines, and articles published in different journals were abundantly used. Different models of university-industry collaboration have been studied. Some cases on these models have been presented. Discussions with academicians involving semi-structured interviews also provided information in the study. An extensive desk study has been carried out to get a clear idea about the concept of this study, the areas of University-Industry Collaboration in historical and global context, the methods, procedures, and the practices of this. Literature thus came under review provided the opportunity to develop the framework of the study of University-Industry Collaboration. For this purpose, most of the available literatures came under perusal. Use of internet was one of the sources of related literature and necessary information.

4.0 Organizational Models of Collaboration Developed in Different Countries

In North America and in several Western European countries university-industry relations have a long-standing tradition and they have developed into a multitude of organizational models. In Latin America and Asia, relations have been developing rapidly over the past decade. In other regions, in particular in Africa, relations are not as densely interwoven and less structured. The African continent perhaps with the exception of Nigeria and certainly of South Africa, has a much lesser developed profile of university industry relations. Five categories of interaction relation to different stages in the evolution of university-industry relations from the most unstructured to highly structured organizational models can be distinguished:

- (i) Informal collaboration
- (ii) Setting up internal support structures
- (iii) Creating autonomous support structures
- (iv) Setting up independent support structures
- (v) National and transnational networking

4.1 Informal Collaboration

The informal links of individual academics with enterprises have been and still current practice in higher education institutions. The extent of such linkages depends mainly on the type and professional specialty of institution. In many cases, informal interactions with the productive sector represent an important means for individual researchers to upgrade their salaries. Higher education institutions may benefit from this interaction because it reduces the risk of brain drain for economic reasons. However, if there are no rules and control of the use of staff time, such informal links with industry can conflict with professional commitments, i.e., teaching or research.

Case 1: 20% Formula (Kelly, 1992)

20% formula is applied by some Western European universities. Under this formula, a staff member may, under certain circumstances, and with the permission of the head of institution, take one day off per week for private consultancy under the condition that work is not done during term time and that it should complement the research interest of the academic and his/her department.

4.2 Setting up Internal Support Structures

The most developed organizational models are to be found in countries where institutions are located in a market oriented environment and enjoy simultaneously a high degree of autonomy, i.e., in North America and more recently so in Western Europe. In Western Europe, such an approach has been strongly supported by national governments, which have keen interest in technology transfer and joint continuous education activities as a means to upgrade the international competitiveness of their economies.

The Industrial Liaison Office

The attempt to institutionalize and structure the collaboration of an institution with industry has become most visible with the creation of 'Industrial Liaison Offices' (ILOs). The function of such units is to provide an interface for the

supply and demand of higher education products, that is, (i) to identify all resources available for collaborative ventures; (ii) to set up data bases and any other required information source; (iii) to promote and market the institutions' *relevant expertise and services*; (iv) to negotiate and advise on commercial contracts, their costing and legal terms. Such offices are generally part of the central administration and closely supervised by the academic authorities.

These units may be regarded as serving the university community and be funded out of the university budget; or they may be understood as a commercial enterprise, and fees may be charged for services rendered.

Case 2: The Industry and Technology Relations Office of the National University of Singapore (Chou, 1993)

In 1992, the National University of Singapore established the Industry and Technology Relations Office (INTRO) in order to provide a 'one-stop-shop' for faculties and outside organizations. INTRO's main aim is to bridge the 'development gap' between the university's research output and industrial application. In order to accelerate interaction between business and academia, INTRO introduced an active company visit program and in return invites companies to visit university facilities. INTRO manages the INTROLink, an industrial affiliate program which was established to provide companies or individuals who undertake research & development direct access to NUS facilities and research output. Member of the INTROLink program make an annual contribution to the university according to their category and are offered special services, such as general assistance in research and development, direct access to databases and other information and assistance in the identification of their training needs.

The setting up of Industrial Liaison Offices has become quite common practice worldwide. In sub-Saharan Africa, a survey conducted by Blair (Blair, 1992) found that six of the 15 universities surveyed possessed an institutional structure, dedicated to pursuit of consultancy, such as a university consulting company, or an industrial liaison office. In the case of the University of Dar-es-Salaam, the Faculty of Engineering comprises an industrial liaison office, which is attached to the dean's office in order to coordinate the practical training of students and industry's needs for qualified engineers.

4.3 Creation of Autonomous Support Structures

Many universities worldwide have created structures enjoying a certain amount of management autonomy such as University-Industry Research Centers, Higher Education Trading Companies, Constancy Centers, Foundation, Incubators and Science Parks.

University-Industry Research Centers: Setting up Sectoral Structures

The University-Industry Research Centers can be created by some particularly enterprising researchers, by national authorities, and also by the universities themselves. The University-Industry Research Center is a predominant model in North American and Western Europe. In most countries in this region, "the group of the directors of the center is recruited from the faculty of the university, in fact they are professors at several institutes in the department of information technologies (Gering and Schmied, 1992).

4.4 Commercializing University Products—Setting up Independent Support Structures: Consultancy Center, Trading Company and Foundations

With a view to promoting the commercialization of university projects, more and more institutions are establishing separate structures. Such structures may be called 'University Consultancy Centers', if they concentrate on the provision of export advice, or 'Higher Education Trading Companies', more predominant in Western Europe, or 'Foundations' in Latin America, if the services offered by the university encompass a wide range of products. All these external structures aim at creating favorable conditions for commercial activities or exploiting the results of technology transfer with the primary purpose of creating financial benefits for the mother institution. Their higher degree of autonomy allows them to constitute governing bodies with the needed expertise and experience, the development of their own strategic plans the ability to employ staff with a required specialty unfettered by public employment constraints, the direct participation of academic staff as paid consultants. Since they may be companies with limited liability, the mother institute may be protected from the economic risks these structures face.

The University Consultancy Center

The Consultancy Center model is quite predominant in African Countries. Its aim is to provide a university interface for all those who are interested in expert advice by university staff. For instance (Djangmah, 1992) in Ghana, the three national universities: Legon, University of Science and Technology and the University of Cape Coast have all set up University Consultancy Centers.

Case 3: The Technological Consultancy Center of the University of Science and Technology at Kumasi, Ghana (Djangmah, 1992)

The Technology Consultancy Center (TCC) of the University of Science and Technology at Kumasi, was already established by the council in 1972. The TCC at Kumasi has, over the years, developed into a major center for the development, promotion and transfer of appropriate technologies, in particular

for small-scale industries, despite the fact that its initial mission was the provision of consultancies. The TCC at Kumasi is an autonomous university unit with a management board chaired by Vice-Chancellor and on which all the deans of the faculties serve. This principle was set up to make the board a high-level decision-making body which represents the University at large. The TCC director is appointed by the Vice-Chancellor. The University of Science and Technology provides funds for the payment of staff salaries, office expenses and transport. It is, in particular, the production units that contribute widely to the total income of TCC. The TCC experienced considerable difficulties in its attempt to transfer technology from the university to the entrepreneurs until it set up the Intermediate Technology Transfer Unit (ITTU). The objective was to assist local craftsmen and engineers to establish their own workshops and to apply the improved production techniques they have seen in practice. The TCC at Kumasi can be considered as a successful structure for technology transfer. However, its role in attracting funds for the university and supplementary income to the staff has been rather limited. The Center has been very successful in attracting funds technical assistance, travel grants and donations from many nongovernmental organizations, development agencies UNESCO, foreign governments and sector ministries of the Ghana Government, but less so from the private sector.

The Higher Education Trading Company

These specific companies were established in most of the Western European countries and they are particularly frequent in the U.K. Several Western European governments have supported the setting up of these organizations, such as through the creation of a favorable legal environment, allowing a higher education institution to become a shareholder in a private company. Thus, in Ireland, the universities have been entitled to hold some shares in an enterprise (Frain,1992).

Trading Companies are autonomous interfaces for the management of the university's commercial activities, usually at a non-profit making basis. They may run specialist facilities, consultancies, short course work and even run Science Parks. In general, they support technology transfer, or they conduct R & D tasks for industry or government, as well as produce and market a good or a service (Osterrieth, 1993). A Trading Company does not need to have any employees, as all its management and support services are bought as required from the parent institution (Leonard, 1992).

Foundations

Foundations have been established in particular in Latin American universities, but their functions and functioning is quite similar to that of the Trading

Companies. They have private non-profit-making status with the purpose of bypassing bureaucratic rules existing within universities, in particular, in the area of financial management of the projects contracted with firms. Foundations may cover the activities of all departments, or only a single one.

Case 4: The Foundation of the Central University of Venezuela (Project Columbus, 1990)

The Foundation at the Central University of Venezuelan research type university was created in 1982 as a nonprofit making private association with legal personality, with a capital of 80 million bolivars. Its function is to commercialize university research products and to act as a body that receives donations for the University. As such, the Foundation can be considered as being primarily concerned with income generation.

The Foundation works through a network of so-called enterprises which produce goods and services out of university research. Such enterprises exist in five areas:

- production, distribution of products for the health sector;
- laboratory analysis;
- production and distribution of cosmetic products;
- production of educational and training materials; and
- expert advice in petrol extraction.

Some enterprises are tightly controlled by their academic unit, others have a higher degree of autonomy. Some do limit their action to contractual research or to commercialize the results of their research; others are involved in activities, such as production, which are outside the traditional scope of university activities. The management structure of these enterprises is relatively simple since their executives are university professors and they have their offices on the university campus.

These enterprises have emerged from the Faculties and research Centers. They are private companies. Ninety per cent of the capital belongs to the Foundation and 10% to the University. An agreement has been established between the University and the Foundation that profits will not be distributed according to the proportion of share holding, but shall benefit university research. Fifteen per cent goes to the Foundation. 15% to the Faculty in which the research is conducted. 60% goes to the research unit to which the enterprise is attached and the remaining 10% is kept as a reserve in the enterprise.

4.5. National and Transnational Networking

Another model independent from the above logic of development stages in university-industry relations is that of networking numerous institutional partners. The university may be the driving force behind the networking of a number of enterprises, such as through the creation of an 'affiliates program', or a national or government or international non-government organization.

The Industrial Affiliate Program

Such programs have a long-standing tradition in North America, but are spreading also to Western Europe and Asian countries (cf. Example of National University of Singapore). They may cover three related, but different types of university-industry relations:

- (i) formal industry-university research program often organized under the auspices of a national agency concerned with promoting R & D;
- (ii) a university-wide or centralized affiliate program; and
- (iii) a focused or decentralized affiliate program, typically operating within an academic department.

The focused affiliate program is by far the most common type to be found in the United States. Organized by the university, firms with interest in a given area "affiliate" with a department or faculty possessing a national reputation in that area. Member firms pay affiliation fees. Such type of affiliation allows firms to have an influence on the direction of university-based research in an area of direct interest to the corporation, an inside track on acquiring technological information, access to researchers and graduate students of the department (Burke and Light, 1990).

The National Consortium

The consortium model is well developed and has been particularly successful in countries of the European Union with less developed national R & D policies and programs and where opportunities for collaboration with industry were less developed. In these countries, such as Portugal (Sellar, 1990), Italy (Romagnoli, 1991), and Spain (Castillo, del 1995) such consortia represent the most developed structures for collaborative activities with enterprises.

Transnational Initiatives

In the Western European context for instance, the European Union has played an important role in the networking of several industries and universities in a

selected number of research areas, in particular in the pre-competitive research domain. The purpose of such networking is the pooling of expertise and knowledge for R & D activities in some of the high tech areas such as information and communication technologies and implementation of an applied research project with a particular development objective.

Bangladesh Perspective

Although the university-industry collaboration in Bangladesh is disappointingly weak, several researches indicate that there is a positive role of university-industry collaboration in improving the quality of business education. In this view the level of collaboration between business school and industries in Bangladesh that may exist in the form of: i) Collaboration through Designing and Updating business Course Curriculum, ii) Collaboration through 'summer Internship Project iii) Collaboration through Consultancy iv) Collaboration through Seminars, Workshops and Conferences. Based on the analysis of literature and discussion with concerned bodies, some suggestions have been made to improve the effectiveness of collaboration in Bangladesh.

Some public as well as private universities wish to organize some program to improve their visibility along with generating some funds. But within the existing status of the university system, public financed university departments/faculty in Bangladesh cannot collect fund by any other means except the allocation of the government. The present study observes that most business school in Bangladesh organize some seminars, workshop and conferences every year and the industry meets the faculty members of the business schools at such venues. Such type of seminars provides a forum for a dialogue between business school and industry.

i) Collaboration through Designing and updating business Course Curriculum:

To make the curriculum more effective, the industrial executives may be co-opted as the members of the academic body of the business school, who can provide significant inputs to the designing and updating the curriculum. However, the survey of some literature indicates that 'business school-industry collaboration' for a better business curriculum can operate at four major stages. These are:

- a) Policy perspective
- b) Designing and developing the curriculum;
- c) Review of the existing curriculum; and
- d) Implementing the curriculum.

ii) Collaboration through 'summer Internship Project

As a part of the course requirement, in most of the business school in Bangladesh, students are expected to work on a project in the industry involving fieldwork. The return, which may be expected from such type of interface through 'summer internship project', is that some real problems of the industry are intimated to the business schools through this process. Also some of the projects reports with suitable additional information can be developed into good cases for the classroom discussion. For this, students require the support o the industry in providing the necessary information. In this regard, the initiative has to come from the top management of firms in respond to the request from business schools.

iii) Collaboration through Consultancy

The broad terms of reference of consultancy are add commercial value to academic expertise and knowledge, and to market the intellectual and infrastructural resources of business school for national and industrial development. Emanating from this broad objective, the specific objectives of such consultancy may include the following:

- a) To provide technical support to industry;
- b) To promote and foster goal- oriented industrial research and development both at industrial premises and business schools; and
- c) To foster exchange of information and technical experts between business school and industry, to work in generic areas of interest.

iv) Collaboration through Seminars, Workshops and Conferences.

Seminars, workshop and conference are important means for 'business school-industry collaboration'. But paucity of fund is a barrier for arranging such type of discussion methods. Some public as well as private universities wish to organize some program to improve their visibility along with generating some funds. But within the existing status of the university system, public financed university departments/faculty in Bangladesh cannot collect fund by any other means except the allocation of the government. The present study observes that most business school in Bangladesh organize some seminars, workshop and conferences every year and the industry meets the faculty members of the business schools at such venues. Such type of seminars provides a forum for a dialogue between business school and industry.

6.0 Conclusion

Collaboration between universities and industry has drastically increased recently. The drivers and success factors for this have been thoroughly analyzed. A less-studied, yet important, topic is how to measure and evaluate this collaboration and its success. As the relations of higher education institutions with enterprises are developing, they become also more difficult to manage. Management of these relations refers to both strategic and operational management issues. Strategic management of university industry relation means that guidelines have to be established which allow universities to make use of these relations to better fulfill their overall mission. Operational management relates to structures, rules and procedures, such as those concerning the control of newly created semi-autonomous structures. Also financial and personnel management as well as management of contracts and intellectual property issues are becoming increasingly important. A program concerned with developing university-industry relations must receive top management backing in order to receive recognition by the academic community, who, in many cases will have to collaborate actively in it. Indeed, such programs perform a secondary function at the university whose traditional tasks are teaching students and doing basic research. Academic staff will only support a university-industry program if they perceive its usefulness for the institution, for instance in terms of generating income and widening research opportunities. Finally, it is important to ensure that the thrust of the program matches the needs of industry. In that respect, it is essential to link a limited number of leading local business people through their membership in a central governing board. Likewise, the board must include senior academics and administrators from the university to ensure that activities and policies are consistent with the academic strengths and aspirations of the university and that they will have the support of its academic community.

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