

Strategic and Tactical Approaches on University - Industry Collaboration

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Abstract- This paper presents the strategic and tactical approaches on university and industry collaboration in contemporary commercial climate. Currently, the Malaysian government is transforming the nation into an international education hub & as a result, the public and private universities are constantly on the move to conduct collaboration with other universities, institutions, and the industries. In many cases, such collaborations were initiated, signed, and essentially expired without any activities involved. Thus, a successful collaboration needs to involve a dedicated project champion to manage the collaboration and to keep the relationship on-going at all times. The success factors will depend largely on the strategic and tactical approaches made by the university as one of the party or collaborators. This paper provides a commercial approach which may be adopted by the university in propagating the collaboration resulting in a win-win situation for both collaborators. First, the collaboration in a strategic sense between the university and the industry can be shaped in ways such as research, research consultancy, staff attachment, student internship, student placement, examination of student scholastic achievement, and etc. Thus, a holistic view must be made in the first instance to ensure that such components are well addressed. Then, the selective process will be used to narrow down the common strategic denominators between the industry and the university. The second stage is now known as tactical aspect of the collaboration. The tactical aspect must address at least 3 aspects; personnel, finance & facilities, and a thorough implementation plan for both parties. Milestones must be set to ensure that the support level is optimized so that the action plan and successes arising from the plan are constantly monitored and adjusted if necessary.

Keywords – University-industry collaboration, strategic planning, tactical planning, collaboration framework, networking

I. INTRODUCTION

University-industry collaborations (UIC) have been the staple of development in science & technology & as such, exist through many forms of collaboration. Collaborations can take the form of differing levels of engagement; ranging from traditional forms of engagement such as internships, and publications of results to more holistic forms of engagement such as JIPs and research consultancies. However, the success of a relationship between the industry & universities are subjected to open interpretation depending on the parameters of measure. Previous research have indicated parameters of measurement which included the increased number of publications while some others took

claim to the number of Intellectual Property (IP) patents being filed for. While they may account for a certain weightage of the overall university's Key Performance Indicators (KPI), they may not necessarily reflect the success of the collaboration with the industry. This paper intends to establish a change from that by addressing the initial objectives that the UIC had set out to achieve since its inception, which is the applicability of research works as a result of the collaboration into industrial applications. The measure of such applicability is the direct application & adoption of technological research and development in the joint area of interest rather than producing many IPs under the research but with little or no impact on company productivity or efficiency. These include collaborative research projects which result in the setup of consultancy arms that fulfill the intended deliverables via transfer of technology or know-how to the industry. As such, from this point hereon, the success of a collaborative work shall be defined as the degree of applicability of technological development for industrial applications.

Historically, UICs have been ramping up especially among Asian nations in the past 20 years due to the fundamental need to stay in competition with in particular the United States (U.S.). Taking Japan as a close example of the development of UIC, much of their UIC efforts only began on the 1990s as a result of stiff competition from the U.S. [1] due to their consolidation of the information technology & biotechnology industry. This is a change from earlier trends whereby Japan was largely reliant on the manufacturing sector to stamp its mark. This allowed for an environment whereby state-owned universities were able to achieve academic-oriented objectives of knowledge sharing as opposed to capitalist driven research initiatives which may disrupt the academia by subjecting the learning process to the dynamic nature of the economic force. In 2002, Japan Ministry of Economy, Trade & Industry (METI) set about a target of 1000 UICs to be created by March 2005 in a target set about a major policy shift in UICs. This figure exceeded expectations with major contributors from Tokyo Uni, Waseda Uni and Osaka Uni. The following table illustrates this positive trend [1].

TABLE 1: Number of start-up companies in Japan according to MEXT: Ministry of Education, Science and Technology & METI: Ministry of Economy, Trade and Industry

	1997	1998	1999	2000	2001	2002	2003
MEXT Survey	22	33	62	127	152	159	179
METI Survey	32	53	86	142	165	190	194

This increased number of UICs in Japan is a clear indicator that a framework or strategy must be in place to effectively produce successful industry collaboratives. Their shift in policy has allowed Japan to compete once again industrially through continuously evolving technologies that originate from successful UICs. Although the U.S. has consolidated themselves far ahead in the biotech sector, Japan is driving home in the manufacturing & mechanical sector in an attempt to level the playing field. The role of successful UICs have played a large role in the constant battle for market share between the two industrial giants & as such, the U.S. has also been playing an active role in implementing frameworks & policies to meet the challenging industrial environment. The Bayh-Dole act in 1980 was instrumental in facilitating up to USD40 billion in research activity since its inception until 2005 which contributed to lowering high unemployment & inflation rates by reinstating itself as the forefront of technology ahead of Germany & Japan by successfully commercializing research works. This is further iterated by the act being successful in creating nearly 260,000 new jobs (as a result of 5,000 new companies being set up around the growing research consultancies) until 2005 on top of resulting in the creation of nearly 3,641 different products in the marketplace. Former NASDAQ president was also quoted that nearly 30% of NASDAQ's value lies within university & federally funded research results that have been created as a result of the framework that act allowed [2]. All only serves to further drive home the point that success of a UIC is very much dependent on how the research outcomes affects both the microeconomics and macroeconomics of a nation.

Easier said than done, previous studies have indicated that the success of a research is constantly hampered by what is termed as the Outcome-Impact Gap. A study by MIT Sloan in 2010 reviewed 106 UICs & of this total, only 50% had seen significant outcomes in terms of potentially beneficial IPs. While this may indicate a rather good ratio considering the outcome-related risks of research, only 40% of the halved amount led to applications which were able to impact the efficiency as well as the productivity of the companies in collaboration [3]. A similar effect was also noted in government-sponsored Engineering Research Centers [4], thus indicating that this is not a problem isolated to UICs. This study is therefore aimed at isolating the primary issue of UICs being unable to meet its aforementioned deliverables & proposing a framework or a

collaboration matrix in which it is able to effectively identify the denominators that will contribute to a successful UIC in which will result in favourable outcomes for both the university & the industry.

II. UIC FRAMEWORK

In order to address the success of collaboration, it is largely reliant on the ability to identify the common denominators between the university & the industry. These denominators will become parameters that will be prioritized in the collaboration framework to ensure the resources of both collaborators are sufficient. This will allow the development of long-term strategies that will become the platform for delivery. This will be followed by the tactical aspect of the delivery which includes the detailed planning and micromanagement of the UIC. These proposed methods serve only as a guideline to best practices and will not guarantee success in every scenario but will at least aid in recognizing key factors that will aid a successful collaboration as well as potential fallacies that a collaboration may encounter during its due course.

A. LONG-TERM STRATEGIC PLANNING

Financial Support – A brief study on funding in various countries have indicated towards heavy involvement on the part of the government in providing funding for UICs. This is largely attributed by the growing need to stay abreast in the multi-faceted business environment which can only be achieved with sufficient support in the form of financial funding, tax incentives, facilities & incubation centers. Furthermore, research supports that the expansion of successful application of UICs are very much reliant on the government contribution towards the research fund. For example in China, approximately RMB 2.2 billion had been poured in from the republic's coffers itself which accounts for nearly 50% of the total R&D funds [1]. Further incentives were also provided in the form of matching funds to support the project if the project champion came from the industry-side. In similar fashion, Japan had also nearly 90% of its funds channeled to public universities as well as national laboratories despite the country heavily run on a deficit basis. In Malaysia, the Ministry of Higher Education (MOHE) has allocated a total of MYR 3.1 billion between 2006-2010 for research under the 9th Malaysian Plan in which MYR 336 million had been approved out of a MYR 285 million allocation for FRGS funds [5], indicating strong drive in commitment towards UICs from both government, academia & industry. This only serves to further iterate the point that governing bodies understand the magnitude of sufficient funding as a catalyst for a successful UIC which eventually leads to positive economic growth.

What this trend indicates is that UICs are recognized as a capital intensive venture & as such, securing funds from the platform already provided will be critical in ensuring the research framework is sustainable for the duration required. A clear positive correlation can be seen between the level of funding and the quality of research produced as the level of

equipment/facilities and expertise that can be procured will be increased as well. While the framework to access the coffers allocated for research is already there, a proper strategy and concept must be applied when applying for funding and this stretches all the way from capturing fundamentals to highlighting applicability. According to MOHE Malaysia, a report in 2010 indicated that factors that attributed to UICs being unable to procure funding included, a) lacking fundamentals (too exploratory in nature), b) inability to highlight industrial significance of research, c) technology is well established; no novelty in project, d) economics of the project is not feasible, and e) lack of expertise to supervise and conduct research [5]. Japan Research Institute of Economy, Trade & Industry (RIETI) also indicates that insufficient expertise at the research level on top of lack of close business ties on the project as leading factors for lack of success in UICs [6]. In general, the driving message here implies that establishing and capturing a clear linkage between the industry requirements and the research direction is essential to come to a compromise the required funding as well as establishing a two-way benefit. Strong evidence supports belief that having a good project champion is second to having strong relationship and significance on industrial application in order to secure funds [1]. Later parts of this paper will attempt to tie back the details of these factors as part of the strategy in convincing and securing essential funding.

Technology Transfer Mechanism – This particular mechanism is seen as a critical point in ensuring the transition of technology from the research machine into practical applications in the industry and does so by managing the IP and occasionally the marketing aspect of the final outcome as well. The management of IPs in a UIC is seen as critical in being able to define in particular the profit-sharing status, ownership as well as definition of works and responsibilities of parties at stake. Traditionally, research would be dealt with at a personal level between the principal investigators and the companies involved in the form of financial contribution or even assuring job placements of postgraduate researchers. This trend is slowly phasing out as companies prefer to opt for a more formalized and systematic framework to adopt in the execution of UICs. This framework will usually be embodied in an arm of the university also usually known as the Technology Transfer Office (TTO) or even Research and Innovation Office (RIO). They can take form of internal or external bodies; universities however tend to set up their own branch within the campus itself and will operate as either a self-sustaining body or dependent on the university fund to support it. This is widely dependent on the throughput of successful UICs coming through as sustenance of a TTO is dependent on the quantity of projects coming in, ability to assign a market value and ability to perform due diligence on the outcome[7]. The role of a TTO is not to be underestimated as it can greatly lift the burden off the research team and the companies as it will manage the legal and financial aspects of the project which either party may be unfamiliar with. As such, it is key to engage and leverage on the existing TTOs

closely with the UIC by providing key technical competencies to them in order to evaluate and manage better the marketing value of the UIC. This empowers the TTOs to be the multi-faceted body that it needs to be in order to manage the legal and financial aspects of UICs.

Training Personnel – The development of human capital for UICs are relatively more cost effective than engaging external laboratories to perform them. Conventionally, UICs will draw upon the student talent pool in the form of M.Sc./MBA or even Ph.D students by attaching themselves to a UIC. This form of arrangement will draw upon principal investigators to conduct on-the-job training (OJT) in order to achieve knowledge transfer and development. This has to be coupled together with recruitment of professionals with sufficient technical expertise to form part of the technical management of the researchers on the project. However, ability to draw upon external professional is not easy to come by due to fierce competition for good talent and as such; it is also viable to appoint co-principal investigators to act as a technical advisory to the UIC. This will ensure the balance of project financing in terms of manpower on top of being able to ensure quality control of the research outcomes. This arrangement will leave the principal investigator more freedom to engage with the company in order to foster a strong working relationship by providing a two-way feedback on the UIC. This will ensure that industry requirements are constantly met while maintaining such practices are commonplace in universities but should however be monitored rigorously to maintain the quality of delivery. In addition to that, industrial attachment of students to the companies will provide even higher level of engagement and knowledge sharing as it will promote a strong sense of collaboration on a personal and technical level by understanding the industrial deliverables. This sort of approach will provide a manageable platform in which a high level of intellect can develop to resolve the project at hand while at the same time tackle the economics of the project, especially capital intensive ones.

B. TACTICAL STANDPOINT

Priority-based planning – One of the major fallacies of UICs is lack of concerted project management and planning. This is usually attributed by the false sense of time that is provided especially by government or university funded UICs. Such UICs tend to provide a longer time frame for the final deliverables and this does not always tally with industry requirements. For example, Universiti Teknologi Petronas (UTP) is a close collaborator with Petronas Carigali SB on several key structural and upstream businesses, they however draw much of their funding from Yayasan UTP which is a university-based fund for research and as such, sets deliverables at a 2 year time frame at a time. With practical concerns at hand, a 2 year time frame to deliver on research efforts especially in the fast moving oil & gas industry is proven to be unacceptable as demand for technology evolves according to the global oil demand. It is commonplace to see deliverables being achieved in a span of anywhere between 6

months to 1 year with intense industrial engagement along the way to address ever evolving requirements that develop as new requirements arise. The remainder time frame on the funding period can be utilized by the researchers to add further value to their academic papers by providing post-delivery support and investigating over and beyond deliverables. The important point to highlight here is the ability to ensure continuity of the project as it is within the research time frame of a single masters or doctorate student. On top of that, it will address the issue of heavy revision of research works required post-delivery as lack of communication will cause the research work to deviate from its intended application or leave researchers oblivious to new demands. As such, it is important to develop a sense of priority tied with the industry to achieve practicality for industrial application while developing a strong sense of novelty to the academia due to the recent challenges presented. This thus leads to the next part which forms a critical point in aiding the formation of priority based plan.

Networking Aspect – One of the critical defining points of any UIC is the informal aspect of the technical communications and personal relationships [3]. This sort of relationship allows two things in essential; a) the transfer of tacit knowledge between working members, and b) building the level of trust between working members. The former being important as it allows the transfer of knowledge that is conventionally not possible by work in isolation or lacking face-to-face interaction. This is important in two aspects; a) innovations which requires extensive knowledge on previous methodologies for comparative purposes, and b) garnering feedback essential in keeping the research in line with industrial applicability. This sort of knowledge sharing is possible via industrial attachments as well as interim meetings which serve to include participation from concerned members. This leads to the second part which is the build of trust between working members. Constant and regular interaction between working members can build an informal personal touch which can serve to maintain the free flow of information which would otherwise be difficult to procure formally. Scenarios could arise whereby there is a strict sense of confidentiality regarding the overall strategy of the company which is kept from the research team. This could lead to problems whereby the research team could be groping in the dark with constant hit-and-miss situations that could never satisfy the different facets of the UIC. A descriptive study done shows that there is a strong correlation between the between the strength of the link of the business and the researcher and the rate and diversity of knowledge transfer into the UIC [8]. As such, it is imperative that strong networking be maintained to provide the UIC a good sense of direction on top of giving researchers the upper hand in working instead of speculating.

Follow-through on Deliverables – An important aspect constantly neglected during the delivery of the UIC is the lack of follow-up on the project deliverables upon completion of the project. There has been a trend seen among UICs that a lack of cohesiveness and continuity in

future collaborations take root in the inability of the principal investigator and the company personnel in engaging the research outcomes until an applicable solution can be achieved. This mindset is rooted within the contractual bindings of the UIC which tends to limit the responsibilities of the researcher to deliverable outcomes rather than seeing through the entire technology transfer phase. Taken note that this is usually the role of the TTO, the principal investigator must also play an active role in ensuring that the technical deliverables are properly transferred where TTO lacks the full range of technical expertise to handle. This boils back to the point regarding the strong peer-to-peer relationship or network which is strongly advocated upon by industrial members as part of an essential tool to improve communications and working outcomes of the project through free flow of knowledge transmitted between both parties. Establishing a sense of ownership among working members would be key in fostering a mindset of continuity in works as well as the responsibility to facilitate the proper implementation of works. Such practices will serve to not only promote the repertoire of the research group but also the continuity in other UICs, thus providing a long-term sense of partnership will ultimately contribute to the bigger picture of increasing the number of UICs.

III. CONCLUSION

In essence, the message intended to be driven home in this paper is that common best practices being maintained out in the industry maintain a strong sense of similarity between each other. Strategic measures require some sense of long-term planning before initiating a UIC while tactical measures are seen as day-to-day practices that need to be upheld in order to a maintain good working order of the project. All in all it ties back to two basic elements, a good sense of planning as well as the ability to maintain strong informal relations. Such is the case of conventional industrial relations and as such, should be well-adopted by universities themselves in order to succeed in UICs. Easier said than done, applying these best practices may not be as easy in execution and therefore a strong project champion and an understanding working group is required to work in tandem with such values. Universities need to maintain a different and more demanding sense of professionalism and time management when dealing with industrial collaborations in order to cater to the fundamental objectives of a UIC. Simply put, “if you fail to plan, you have planned to fail”.

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