

Q&A

Mohammad Saud Khan

Q. *Are Universities Ready for Knowledge Commercialization?*

A. Increasingly, the need for scientific knowledge in the innovation process is reshaping the role of universities from teaching and research to engines of knowledge commercialization. Being pressed for resources, universities are feeling a greater need to reach out to companies, which, in turn, helps these firms to acquire expert knowledge and advice without having to make in-house R&D investment (Svensson et al., 2012). Universities now face a direct role to participate in the economic development of their respective regions. Specifically, being seen as “entrepreneurial” (Guerrero et al., 2016) means that universities are now part of an evolving and complex engagement of multiple stakeholders (e.g., academics, corporations, universities) within the knowledge transfer ecosystem (Sengupta & Ray, 2017). Such a scenario has brought numerous opportunities (e.g., licensing, research contracts, consultancies, greater mobility with the industry) for academic institutions. Although universities have progressed in developing key internal processes to support knowledge transfer activities, the pressing issue revolves around the efficacy of connecting academic and corporate systems of knowledge. Moreover, to what degree are these new partnerships becoming a cradle of sustained innovation and entrepreneurship? This commentary focuses on a critical analysis of these challenges and how incubation support could address the journey of knowledge commercialization for universities.

Lack of Commercialization Expertise

The past decade has evolved a growing body of knowledge on wealth creation and exploitation of scientific knowledge in universities (Mascarenhas et al., 2017). Being awarded a patent is certainly a good indicator of a university’s commercial endeavours, however, it is important to realize that this is only the initiation of implementing a business-relevant technology (Mets, 2015). The first major bottleneck encountered is the lack of commercialization expertise in universities. Founders of technology-based startups are quite often experienced specialists in their fields of technical and natural sciences but know little about business needs. This shortage of industry-specific knowledge puts university-

based scientists in a situation where even the best of products often fail to penetrate the market. This handicaps the founder (during decision making) on issues related to equity capital of the startup or mergers and acquisitions, which can eventually result in sub-optimal, irrational, and unfavourable solutions.

The following case illustrates this scenario quite appropriately. AMET (Applied Mechatronic Engineering & Technologies) was an academic startup founded in Italy with a product portfolio encompassing hardware and software development (especially real-time control applications, design, modeling, and simulation). It comprised six team members: a PhD student, two professors, a recent graduate, and two researchers (Colombo & Piva, 2005). Although each member of the team was highly specialized in electrical engineering and possessed high educational background (mostly PhDs), they felt short on industry-specific work experience and entrepreneur-specific experiences. These competencies include knowledge and experience in analyzing competitors and customers, as well as organizational and managerial skills related to earlier self-employment in another environment.

AMET was at the initial phase of setting up the startup – a phase that often puts forth several challenges in terms of decision making. This case revolves around the discussions between team members in their evaluation of three possible financing options at this early stage. They had been approached by Altair Engineering, a large firm from the United States, with a proposal to collaborate and share equity. The second option under consideration was to join a new upcoming incubator, the Innovative Enterprise Incubator (I3P) at the Polytechnic University of Turin, Italy. The third option on the table was to leverage the infrastructure (equipment and machinery) of their parent organization, the Mechatronics Laboratory (Laboratorio Interdipartimentale di Meccatronica, LIM) housed at the Polytechnic University of Turin (the home university of the researchers). In these circumstances, the presence of a commercially oriented team member is vital for analyzing initial financial projections and feasibility,

Q&A. Are Universities Ready for Knowledge Commercialization?

Mohammad Saud Khan

but university-based startups often lack such a team member, as did AMET. The six team members found themselves confused and were struggling to reach consensus. As Colombo and Piva (2005) aptly end their case: “Suddenly, the silence falls on the six entrepreneurs”. Because these non-specialist team members (in terms of commercialization knowledge) contributed their judgments without a systematic process of financial projections and market analysis, only a haphazard exploration of the target market was undertaken by the founders. Preliminary projections in relation to revenue streams and market share (which were clearly lacking in AMET due to the absence of a commercially oriented team member) make a venture idea more tangible, motivating, energizing, and enthusiasm-driven for teams.

The above arguments highlight one of the first challenges as seen in terms of the depth and breadth of business and commercialization knowledge among founders of university-based startups. It is crucial to engage commercial expertise early in the process to fill up this kind of knowledge gap, which emerges at the introductory stage of a startup.

Dearth of Business-Oriented Ties

The second challenge in commercializing university research stems from the fact that “working ties to operating sectors of the economy are not central to the internal design of the university as an institution” (Lester, 2005). This challenge partially arises due to the fact that most academics typically have less frequent contacts with commercial entities and existing contacts are limited due to differences in work culture (Mosey & Wright, 2007).

The two most important requirements for a technology transfer include:

1. A university must be able to locate a buyer who finds value in the intellectual property and is also willing to investigate this intellectual property.
2. The buyer must gauge that the costs of licensing and patenting are lower than the value of this intellectual property.

University research is largely embryonic in nature with high technical and market uncertainty, making it difficult to manage investments at an early stage. However, external environmental conditions can sometimes facilitate a surge of funding for a particular scientific field. An interesting example is seen from the biotechnology

industry, where the innovative potential is often linked to the novelty of the startup. Around 1997, an early stage biotechnology startup, UrGenT, was set up in Germany by five scientists (with no commercial expertise), focusing on genomics-based drug development (Cresey & Remer, 2004). UrGenT’s initial aim was to undertake basic R&D on urogenital diseases, but they did not have a concrete product idea. Albeit, the startup was founded at the start of the biotechnology boom.

In spite of being a classic biotechnology startup, several experienced and high-profile venture capitalists were queuing to invest in UrGenT during the first round of funding in 1999, which facilitated remarkable early growth. Two years later, UrGenT entered a second round of financing only to experience a shift in market pulse, manifested by investor reluctance. The burst of the dot-com bubble had impacted the upward expectations in the biotechnology world as well. Although UrGenT succeeded in gaining investment and partnerships, it came with lower valuations (this time) and eventually an expectation to bring at least one re-targeted drug into clinical testing within a short period. In doing so, UrGenT was forced to target short-term gain over long-term sustainability by ignoring additional pre-tests based on preliminary results only to fortify investor confidence. Unfortunately, the Phase 1 clinical trial failed, which left UrGenT in a financial situation in which the startup could last only a few months. This happens when firms are constantly struggling to secure investment opportunities and keep track of their milestones, which are often detracted by investors. Therefore, it is important to realize that the value in the embryonic work of a university startup is not necessarily the sole determinant of its success or failure. Therefore, it is vital for potential academic entrepreneurs to consistently transform and expand their business networks to develop and transfer their knowledge to business (Rasmussen et al., 2015).

Need for Greater Founder Dedication

The characteristics of a commercial setting demand dedicated individuals within the entrepreneurial team who have developed mutual trust through their relationships (Khan et al., 2015a; Khan et al., 2015b). This need is especially crucial in a university setting because corporate culture and business practices are already a new area for academics, who may need to face a tough terrain if the founding team lacks the consistent dedication required to handle it. The UrGenT case provides ample evidence in terms of the impact of a lack of founder devotion on the daily operations of a newly

Q&A. Are Universities Ready for Knowledge Commercialization?

Mohammad Saud Khan

founded company. UrGenT was the brainchild of two biology professors who were well placed in their academic careers; the primary reason they wanted to start a new venture was that they had not founded a company as yet. They were unaware of any opportunities in the market and only wanted to take advantage of the government support programmes for the biotechnology sector. Furthermore, they were also not interested in running the company themselves and hired five additional scientists at a very early phase. The problem with such an approach is that the original founders not only lack a concrete idea and direction (to begin with) but also remained detached from the daily challenges faced by the company, which became evident through inapt group dynamics of the working team towards the end.

Managing Work Dynamics with Commercialization Partners

University knowledge commercialization often involves a large investing company. The governing factors binding this relationship may lead to certain challenges. The case of AMET illustrates these dynamics. Altair Engineering (the large engineering multinational) was keen to have an equity share in AMET. From a commercial standpoint, AMET, the young startup, could foresee the benefits of enhanced business development opportunities and the possibilities of extending their offer and potential market via this prospectively stable cooperation. On the other hand, Altair Engineering, being a larger player, posed the threat of opportunistic behaviour by creating appropriability hazards, technology spillovers, and an involvement in decision making within the younger partner, AMET. Subsequently, such alliance-formation scenarios have the potential of creating challenges for university–industry agreements in terms of conflict of interest and decision power issues. Similarly, another bone of contention is often the academics' need to publish, which may be at odds with the need to maintain confidentiality as far as corporations are concerned (Perkmann et al., 2013)

Balancing Technology Development and Business Development

The difficulty of valuing a university technology is significantly reduced when a startup is linked to a university (Rao & Mulloth, 2017). In the AMET example, the team members felt the need to stay close to the Mechatronics laboratory (LIM) that served as a parent organization for the scientists. This need is primarily secured to pull commercial benefits at an early stage of the startup and to gain advantage from technical competencies, human

resources, and infrastructure. The flip side for a startup is the fear of being diverted from business development efforts and staying too focused on the academic aspects required for maintaining a privileged relationship with the university.

Investment Trials

One of the big tests for the university sector is the access and management of funding (Bellavitis et al., 2016). There are several reasons in support of the specific importance given to this challenge when compared to any other entrepreneurial venture. Such ventures mostly involve complex and fast-developing technologies that have long development periods. A large variety and large amounts of intangible assets come into play in the form of brilliant ideas accompanied with one or more patents to protect those ideas. In some cases, the assets may be either extremely specialized or there may be no tangible assets. This intangibility makes it difficult to attract traditional investors because they cannot evaluate the market value of the “soft assets” and recover their investments in case of failure.

As evident in the cases of AMET and UrGenT, the products were highly specialized (real-time control systems and urogenital disease drug identification). For AMET, the highly specialized mechatronics lab (LIM) was the available tangible asset. The biotechnology firm, UrGenT, went through several rounds of financing involving different types of investors at various stages. The challenge was to manage market entry in line with strict adherence to milestones for further funding. During their second round of financing, UrGenT deviated from their core competencies and adopted a new strategy by retargeting existing patented drugs for urogenital diseases. This new strategy was partly driven by the expectation that they could deliver faster (in terms of clinical trials of drugs) to their investors. Unfortunately, the struggle to reach the milestones and a lack of sound commercial knowledge led to vital strategic shifts that eventually brought failure. In essence, the inherent funding challenges for academic startups spiral into a bigger dilemma for managers of such firms, who may struggle to cope with appropriate financial investment and time schedules.

Incubation Support for Knowledge Commercialization

The role of an incubator in university knowledge commercialization should not be underestimated (Moeen & Agarwal, 2017). Another attention-grabbing case is

Q&A. Are Universities Ready for Knowledge Commercialization?

Mohammad Saud Khan

CardioGenix, another biotechnology startup founded in Germany with very similar characteristics to UrGenT (Cresey & Remer, 2004) but that focused on developing drugs for cardiovascular conditions. Both startups began their journey through government funds and rolled out from the same incubator. The main advantages of the incubator for UrGenT were in terms of office space, initial seed investment, networking, and development of managerial skills through seminars. In comparison, CardioGenix saw similar benefits and received seed investment from the incubator, but the founders also looked for answers regarding their business model. They deliberated on two possible business models:

1. The first option would make the startup a traditional biotechnology firm making drug candidates and selling them to large pharmaceutical companies capable of large-scale testing and manufacturing. The founders could gain in the short run (through R&D), but long-term gains were not envisaged in this model (due to dependence on licensing to large pharmaceutical partners).
2. The second option was to develop customized drugs for patients, thereby making CardioGenix a comprehensive bio-pharmaceutical firm. This model faced challenges regarding technological feasibility, legal issues, regulatory approvals (to name a few), thereby necessitating greater financial resources and greater uncertainty.

Again, it was the incubator that helped CardioGenix shape its choice of business model (they choose the second option) by facilitating contacts with initial investors. Later in their financial journey, it was quite evident that the incubator strongly believed in the inherent potential of CardioGenix's innovative technology (drug research: customizable biochemical agents for a patient's genetic profile) and hence left in to save it from imminent insolvency in 2001. The incubator not only provided bridge financing from their own funds but also arranged some funds from a German venture capital firm.

An added incubator-support perspective is the linking of an incubator to an ill-equipped capacity of a firm (as was the case with AMET) to help survive a competitive environment (in the long run) after exiting the incubator. The possibility of placing AMET as a virtually incubated company of the Polytechnic University of Turin within the Innovative Enterprise Incubator was also a

possibility, provided the offer from Altair Engineering was also accepted. Consequently, the benefit of a relationship between a startup and an incubator is clearly significant in bringing university research to the market. However, great caution is needed when the support and assistance function of an incubator is pushed to the level of "creation from scratch" for revamping the business model.

Intellectual Property Protection and Shifting Market Trends

An important measure of technology transfer is the time between discovery and commercialization (Dutta & Hora, 2017). Accelerating the speed of commercialization delivers greater benefits to both the commercializing agent and the university in achieving quicker returns against R&D efforts. The role of timely intellectual property protection surfaces in this crucial period of discovery and commercialization. For university researchers that are relatively unknown, receiving a patent on the intellectual property seems to be a strategy that helps reduce uncertainty regarding the value (Elfenbein, 2005).

Even if a startup receives fast-track patent approval, it invariably loses valuable time because of the rapid shifts in market trends. This unresolved intellectual property issue ultimately leads to withdrawal of potential investors from negotiations. Indeed, time is of the essence, especially for the investors, because it is very risky to gamble on something for which the intellectual property is not protected. Furthermore, from an academic startup's perspective, something that may appear very promising today could be almost obsolete tomorrow based on several external factors.

Conclusion

So, are universities ready for knowledge commercialization? As the cases above illustrate, universities must overcome critical challenges when striving to make an invention become an innovation through the process of commercializing university research. It highlights the need for universities to consider a number of mechanisms collectively for designing policies that help in increasing commercialization of university research. And such efforts by no means devalue the importance of the main commercial mechanisms of licensing agreements: joint research ventures and university spin-offs (Siegel & Phan, 2005).

Q&A. Are Universities Ready for Knowledge Commercialization?

Mohammad Saud Khan

Nevertheless, the complexities of these processes demand a strategic plan with a long-term view. Such a plan should perhaps incorporate inter-ministerial policy making for innovation, creation of a critical mass of diverse actors, efficient transfer channels, and interaction (Nilsson et al., 2006). However, at the same time, this industry experiences some peculiar challenges in terms of its very nature. These include requirements for large funds, complex and rapid technological development, stretched gestation periods, predominantly intangible assets, and high vulnerability to failure (Cresey & Remer, 2004). Thus, universities do recognize the need to commercialize knowledge; however, to be truly ready for knowledge commercialization, they must develop a shared commercial mentality with all actors within their broader ecosystem.

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Q&A. Are Universities Ready for Knowledge Commercialization?

Mohammad Saud Khan

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