



## UNIVERSITY-INDUSTRY INNOVATION ECOSYSTEM HUBS: BUILDING BRIDGES OVER UNCERTAIN WATERS

**Abraham (Abi) Moskovicz, PhD** 

Entrepreneur College (Taicang)

Xi'an Jiaotong-Liverpool University, China

[abraham.moskovicz@xjtlu.edu.cn](mailto:abraham.moskovicz@xjtlu.edu.cn)

**Stuart Perrin, PhD**

Entrepreneur College (Taicang)

Xi'an Jiaotong-Liverpool University, China

### Abstract

*There has been an increase in awareness of the relevance of university's involvement in the production of new products, services, technologies, and processes, as well as the commercialization of their output. This development has resulted in the emergence of entrepreneurial universities. According to relevant literature, much higher education institutions have already started working together with the industry by incorporating these skills into their curriculum. Usually, when the industry starts looking for an interaction with the university, there is an unresolved problem at their hand and through this collaboration, they found a cheaper and faster solution to their crisis. University sometimes seeks cooperation with industry when they have inventions and there is a need to commercialize them since they commonly are not well versed in business management. The purpose of this study is to present the key concepts and insights from literature and the author's own experience related to the question of building university-industry entrepreneurial hubs. Research findings suggest there are benefits to creating ties in an entrepreneurial ecosystem between professional facilities and academic institutions, and these benefits help foster greater entrepreneurial success. The universities play an important role in innovation ecosystems as they are increasingly participating as economic development partners with industry and local, regional, and national governments. Beyond enriching their curriculum from*



*industry inputs, universities need to provide students with career counseling, opportunities for industry interfacing, and online courses for skill set upgradation. In pursuit of this aim, universities could use technology to provide experiential and collaborative learning, flexibility in program structures, and encourage innovative ideas, being focused on solving societal challenges. The aim of a business school serving as an entrepreneurial ecosystem hub is to encourage economic development by employment generation and create innovative technology-based ventures or service businesses. For graduates, it is certainly a better deal not just to be hired by firms as employees but to also be enrolled together with their own projects, as it offers to them an appropriate environment for developing their ventures, and working in some kind of partnership.*

*Keywords: Entrepreneurial University, Innovation Ecosystem, Business Hubs, Startups*

## **BRIEF INTRODUCTION TO ENTREPRENEURIAL EDUCATION**

Many of the new products used every day have sprung to life out of university research labs, but in recent years, most universities have ceded the task to the private sector.

Smith & Petersen (2006) sustain that education entrepreneurs are a rare breed of an innovator whose characteristics and activities may lead to the transformation (not merely the slight improvement) of the public education system. According to Smith & Petersen, Entrepreneurship Education can be defined as a collection of formalized teachings that inform, train, and educates candidates interested in taking part in socioeconomic progress through a project to promote entrepreneurship awareness, business creation, or small business development.

Many high educational institutions and states incorporated entrepreneurship courses in the programs to help students learn entrepreneurial skills. Entrepreneurship education provides students with functional knowledge and skills to build up their character, attitude, and vision. It is crucial in developing an eco-system that promotes innovation, provides the base for innovation, creates a value system, and develops entrepreneurial culture. Entrepreneurship education targets empowering people to create employment opportunities.

According to Etzkovitz (2008) *“the entrepreneurial university mines research findings for their technological potential translating them into use. The university is a natural incubator, providing a support structure for teachers and students to initiate new ventures. Time and space, physical and social, are available to provide the groundwork for “new ventures,” whether political, intellectual, or commercial, that are exportable across highly permeable boundaries. The university is also a seedbed for new scientific fields and new industrial sectors, each cross-fertilizing the other”*.

Currently, new technologies impact every field of our lives. The education system is being redefined, placing students at the center and shifting the focus from teaching to learning.

*Education 4.0*, encourages non-traditional learning, increasing demand for competency-based skills and advancements in technology. This is driven by four key factors: employability, student experience, research excellence, and society.

Several authors such as Atkinson & Blanpied (2008), Cheng (2011), and Wong (2011) among many others, sustain that the traditional university system was originally created for the purpose of spreading knowledge, later including an additional mission of disseminating knowledge and production through research. Recently universities have again expanded to a third mission: involvement in regional economic development through capitalization of knowledge produced at the university.

Although there is no general definition, third mission activities usually comprise three dimensions performed by universities in external environments: a) technology transfer and innovation, b) continuing education and c) social engagement. As stated by Etzkowitz (2016), the term *Entrepreneurial University* has been adopted by academics and policymakers to describe universities that effectively deliver on their “third mission” contributing to the regional economy simultaneously.

According to Hetzkowitz (2010) *“There has been debate over whether a teaching university can be an entrepreneurial University... In a traditional conception of academic entrepreneurship focused on achieving commercial profit, a research base may be a pre-requisite to creating spin-offs. However, if we expand entrepreneurship into a broader conception to map its different forms such as commercial, social, cultural, and civic entrepreneurship, it is clear that the answer is positive”*.

Today’s fast-changing industry dynamic environments create a greater need for academia to match students learning outcomes with industry needs. Many higher institutions have already started working together with the industry by incorporating these skills into their curriculum. In addition, a large number of firms are now partnering with HEIs and content platforms to develop tailor-made learning programs for their employees in order to train them in new job opportunities.

Parameters	Education 3.0	Education 4.0
Faculty	Full-time teachers	In addition to full time faculty, industry participants act as part-time faculty for classroom and online courses
Curriculum and pedagogy	Minor flexibility in pedagogy; massive learning	Subject matter decided by the learner; personalized learning
Research	Transition towards collaborative research using technology	Ease of data sharing has removed the geographical barriers to collaboration
Funding	Fee-based funding systems at degree level	Fee-based funding systems in both online and classroom program
Infrastructure	Majority of investment in physical infrastructure	Investment in technological infrastructure to support blended learning

Figure: 1 Student-led Model by FICCI (2020).

Students are nowadays looking for freedom to choose courses even outside of a program and are flexible to define their pace of learning by accessing faculty and content worldwide. To reply to this new scenario, the education model has changed from an instructor-led to an interactive model. University, industry, and government are working together to research and develop innovative solutions to solve current and future business challenges.

Universities could focus on transforming into a platform that enables learning from multiple sources such as faculty, open-source content, industry professionals, alumni, etc.

In the near future research will be one of the key differentiators for universities where they can stay ahead of open-source content by enriching their curriculum with the latest findings and outcomes.

Extensive collaboration among each institute's faculties and other universities as well will drive multi-disciplinary studies and externally with industry to quickly fundamental research outputs into real-world applications.



Figure 2: External Stakeholders by Bischoff, Volkmann & Audrestch (2019)

## EDUCATION-INDUSTRY RELATIONSHIP

As per Ramli & Ashiquin (2013), Universities have been identified as a crucial tool for national wealth creation as they created an environment for talents to emerge. Traditional University's profile as a non-profit organization has made the experts in certain fields quite unknown to the industry, therefore their expertise was not fully exploited. Nowadays we are facing a great increase in the importance of university's involvement in the production of new

technologies and commercialization of their research output, creating the climate for the emergence of the entrepreneurial university.

Yusuf (2008) remarks that university research is a very risky investment and requires big funding for development since university research outcomes are normally focused on the preliminary stages.

Plewa (2013) describes the university-industry collaboration as *“bi-directional linkages between university and industry entities, established to enable the diffusion of creativity, ideas, skills, and people with the aim of creating mutual value over time”*.

According to Lind, Styhre & Aaboen (2013), this partnership takes four types: The first is when the industry provides research funding for the university and takes no part in the decision-making of the research direction. The second type is where the industry is a member of the board of research. The third is where industry dictates the direction of the research and thus university researchers have little freedom. The fourth type is where both parties decide on the direction of the research.

The resources involved in the research, and development of new technologies and their commercialization are very high. Therefore, a tight collaboration between the university and industry seems pretty logical as it makes the process shorter and more affordable.

Plewa (2013) details five stages in the university and industry collaboration: pre-linkage, establishment, engagement, advancement, and latent phase.

As per Haour & Mievile (2011), the first stage is when both sides align their interests and thus lead to an agreement to work together. The establishment phase consists of meetings and negotiations of the terms and conditions of the collaboration thus leading to the formation of the contract.

Liew, Shahdan & Lim, (2012) argue that the engagement stage is where the collaborators are actually working together and delivering the project. A successful collaboration will lead to the stage of advancement where parties have built trust among each other and lead to a sustainable relationship with more research collaboration in the future. The latent phase is when parties are on good terms but without any formal relationship.

According to Lee and Win (2004) Interaction between university and industry usually requires some sort of technology transfer from either side or each side of the contracting parties. Among the mechanisms of technology transfer are the following nine:

1. Collegial interchange, conference, and publication. Informal and free exchange of information.
2. Consultancy and technical services provision. Members from the university provide advice.
3. Exchange program and expertise or employee secondment.

4. Joint venture of research and development. Both sides share the cost of the program.
5. Cooperative R&D agreement where there is more than one university or industry.
6. Licensing of university intellectual property to the industry.
7. Contract research by the industry to a university where the usually industry provides the fund.
8. Research, Science and Technology Parks, or incubators.
9. Training/ Internship.

Usually, when the industry starts looking for an interaction with the university, there is an unresolved problem at their hand acting as a catalyst, and through this collaboration, they found a cheaper and faster solution to their crisis.

University sometimes seeks cooperation with industry when they have inventions and there is a need to commercialize them since they commonly are not well versed in business management. The industry will also benefit from recruiting trained graduates as future workers. Haour & Mieville, (2011) argue that practical training where students are exposed to the working methods and requirements of jobs in the industry is the most effective way of technology transfer.

Atkinson and Blanpied (2008) were concerned that such a relationship may corrupt knowledge creation and transmission of knowledge and that publication of research outcomes will be delayed.

Bruneel (2010) classified two types of Education-Industry collaboration barriers:

1. Related to different motivations, University researchers are always keen to disclose their research findings either through journal publications or conferences whereas industrial personnel is more likely to keep the research findings secret to avoid their rivals from gaining the information.
2. Related to conflict over intellectual property ownership and dealing with university administration.

Through ownership, the university has an exclusive right to exploit the research finding. However, this is also the goal of an industry that is to own intellectual property from research they funded.

Plewa (2013) describes some factors that can determine successful collaboration:

1. Trust between collaborators
2. Frequent communication will develop an understanding of eaother'sers missions and visions.
3. Credible and capable collaboration agent is the person who is responsible.
4. Prior experience with cross-sector collaborations.
5. Ensure the collaboration does not damage the university's reputation for future funding.

6. The university possesses competence in the area of research.
7. High-profile academic researchers handle the research.
8. Provisions that allow knowledge exchange between researchers.

World Intellectual Property Organization published a list of actions to be taken by the university toward a successful collaboration:

1. Clear and transparent intellectual property policy.
2. Scenario of inventions and the ownership of the intellectual property in each scenario.
3. Clear distribution of revenue sharing.
4. Guidelines to be used in the collaborative or sponsored research contract.
5. Develop policies on conflicts of interest, for a situation where university researchers have an interest in the licensees of intellectual property resulting from the university research.
6. Capable department to manage university intellectual property.
7. Clear guides on the obligation and responsibilities of the university and of the researchers. For instance duty to disclose the invention and confidential information.

Graybeal & Sindik's (2016) research findings show there are positive outcomes to creating ties in an entrepreneurial ecosystem between professional and academic organizations, and the benefits help foster even greater entrepreneurial success in the ecosystem. The outputs include increased legitimacy, increased networking, and a much greater regional and national identity as an entrepreneurial hub.

Universities are not only related to the industry. As per Moon, Ju-Huan & Hosung (2020), as social problems become more complex, entrepreneurs can solve problems better through collaboration with stakeholders, which leads to sustainable innovation in society. Social entrepreneurship education (SEE) programs should be designed and operated to cultivate social entrepreneurs' abilities to improve connectivity with all relevant organizations of the ecosystem. Furthermore, SEE programs can build ever-growing communities of social entrepreneurs while functioning also as innovation hubs for entrepreneurial ecosystems (EEs) evolving on their own.

The framework emphasizes strengthening internal connectivity among SEE program members and external connectivity with outside entities, including firms, government agencies, civil societies, and natural environments.

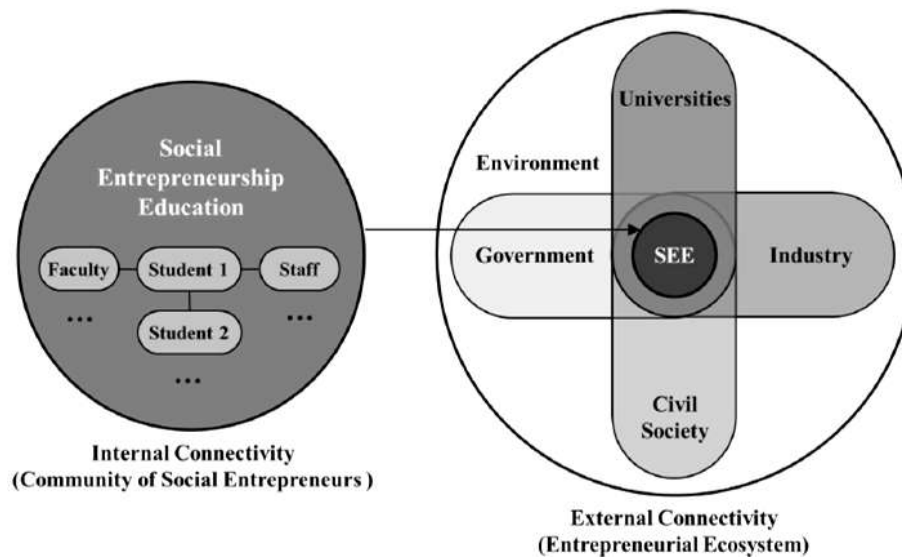


Figure 3: Framework for Social Entrepreneurship Education by Moon, Ji-Huan & Hosung (2021).

As per Bischoff, Volkmann & Audretsch (2017), the results of 20 European case studies indicate that stakeholder involvement in entrepreneurship education at HEIs is overall rather strong and extensive. All twenty case studies emphasize the importance of stakeholder collaboration in entrepreneurship education. In several case studies, it is stated that stable, extensive, long-term stakeholder relationships and a supportive entrepreneurial ecosystem can be key success factors for entrepreneurship education through the exchange of best practices and the transferability of successful entrepreneurship education approaches.

Several initiatives are currently running. For instance, Li Sun, Zhang & Cao (2018) analyzed the Suzhou Dushu Lake Science and Education Innovation District case study, finding that the local government has played an important role in improving Education-Industry connections, promoting a hybrid of the top-down and bottom-up approach. Another good example is the brand new XJTLU's Taicang Entrepreneurship & Enterprise Hub, where the authors are directly involved, promoting an innovative relationship between the actors.

### **INNOVATION ECOSYSTEMS: A BUSINESS SCHOOLS HUBS OVERVIEW**

The traditional university faces many obstacles that hinder their full integration into the development of their respective region and country, explaining why currently well-known models cannot really adapt to regions that have deficient relationships with the government, and an entrepreneurial base is missing.

This new model is based on a structure composed of units called *Innovation Hubs*, differentiating by the incorporation of social innovation, permitting the university to become fully integrated into the regional innovation ecosystems.



The term ecosystem is used in business to describe diverse collectives at complementary organizations who jointly create some kind of system-level output similar to an ecosystem service, that extends beyond the outputs and activities of the own individual participants of the ecosystem.

According to Heaton, Siegel & Teece (2019), universities play an important role in innovation ecosystems as they are increasingly expected to participate as economic development partners with industry and local, state, and national governments.

Models such as the *Triple Helix* (interactions among academia, industry, and governments) highlight the roles of universities and provide a predetermined list of actions Higher Education institutions could take to strengthen their ecosystem.

Despite the aforesaid, the authors sustain that the flexible and entrepreneurial management of universities required to make this model work has virtually been ignored in the academic literature.

Cai, Jinyuan & Qiongqiong (2020) argue that while higher education has been considered both an *engine for innovation* and a *catalyst for sustainability* development, the integration of both roles seem perfectly reflected in higher education's innovation ecosystems.

As per Seniuk (2018), High Education System and the transitional economy face market and innovation challenges. The assertive responses cannot be found in universities only, but in a large number of distributed small and medium innovation enterprises as well. The foundation of an entrepreneurial university integrated with a startup incubator jointly with a business may sort the issue. In this case, such a university by creation based on smart contracts universal digital platform integrated into GVCs (Global Value Chains) actually turns into a modern innovation hub, being able not only to incubate the startups and develop them into new-innovation enterprises but to train innovative entrepreneurs as well.

Moreover, citing Youtie & Shapira (2008), "*knowledge hub is the emergence of new institutional leadership, programs, organizational forms and boundary-spanning roles that mediate among academic, educational, entrepreneurial, venture capital, industrial, and public spheres*".

Wynn & Jones's (2017) research in the UK shows that the *KTP* (Knowledge Transfer Partnership) produced tangible benefits for businesses, the Industry, and Higher Education since it constitutes a powerful means of involving academic staff in the development of the entrepreneurial university, contributed positively to enterprise and entrepreneurship in the local region.

Rucker Schaefer, Fischer & Queiroz's (2018) research made in Brazil found that major academic institutions lie at the heart of innovation ecosystems, but impacts are mostly local, happening more strongly at the level of cities.

Schaeffer & Matt (2016) focused on how the evolving roles of a university and its Technology Transfer Office (TTO) are stimulating academic entrepreneurship in a non-mature entrepreneurial ecosystem, analyzing how the university became a hub organization and studying the case of the University of Strasbourg. According to the authors, this *hub university* became a leading regional organization at the political level, playing a central role in supporting academic entrepreneurship at the operational level based on its evolution from a revenue-maximizing model to a model that takes account of social and economic regional development.

Lyu, Wu & Hu (2019) sustain that collaboration among industry, university, and research institutions (IUR) is dialectically linked with regional resources and networks. Their research analyzes the Zhongguancun innovation region in Beijing, focused on linkages between industry and university as well as public research institutes, a key mechanism for the transfer and diffusion of academic research and knowledge. The network has moved from a single driver relying just on government-centered connections into a wider system based also on market incentives.

Felce (2016) analyzed an Apprenticeship Hub created by the University of Wolverhampton to meet the national and local contexts, satisfying the needs of the stakeholder groups by providing an environment where the integrated regional apprenticeship offer can be accessed.

New needs and concerns related to universities' role in innovation	Institutional responses of universities	Necessary framework conditions
<ul style="list-style-type: none"> <li>Facilitate joint innovation between universities and companies, public organisations</li> </ul>	<ul style="list-style-type: none"> <li>Create incentives to reward academic staff to engage in cooperation for external societal impact</li> <li>Create joint labs with external partners</li> <li>Establish and use advisory boards level to develop common agendas</li> <li>Develop framework contracts for partners</li> <li>Expand research contract support and business facilitation service</li> </ul>	<p>Regulatory:</p> <ul style="list-style-type: none"> <li>Facilitate private-public partnerships by helping to minimise regulatory hurdles and transaction costs</li> </ul> <p>Financial:</p> <ul style="list-style-type: none"> <li>Provide competitive support schemes for common research and research structures</li> <li>Provide sufficient core funding to allow universities to be equal partners in joint structures</li> </ul>
<ul style="list-style-type: none"> <li>Create and protect value from IP</li> <li>Create new businesses with high innovation and growth potential</li> </ul>	<ul style="list-style-type: none"> <li>Develop technology transfer/IP service</li> <li>Develop start-up support service and spaces for students and researchers</li> <li>Connect with external actors, such as start-up services, science parks, and investors</li> </ul>	<p>Regulatory and Financial:</p> <ul style="list-style-type: none"> <li>Provide financial support for business creation and growth</li> <li>Establish or support establishment of Venture Capital</li> </ul>
<ul style="list-style-type: none"> <li>Promote social innovation, including civic participation</li> </ul>	<ul style="list-style-type: none"> <li>Reward engagement for social innovation symbolically and in career advancement</li> </ul>	<ul style="list-style-type: none"> <li>Create financial incentives to reward research and teaching engagement for social innovation</li> </ul>

Figure 4: Exchange and Knowledge by Reichert (2020)

According to Cunningham et al (2019), there have been various types of research taking US data and context that have already examined the impact and effect of government rules aimed at supporting effective technology transfer from universities and research centers to the market. The purpose of their study was to know whether regional entrepreneurial and innovative outcomes have been impacted by this change in intellectual legislation rights of inventions made by scientists. The finding suggests that legislative change did have an at last initial positive effect on universities as measured by startups and patents. The effect yet changed over time, leading to some unintended consequences.

The authors argue that policymakers and legislators need to give duly consideration to the replication of policy and legislative instruments from other contexts along with the criteria that are used just to measure success.

Must be mentioned same authors like Deog-Seong, Phillips, Park & Lee (2016) that just a few years ago sustained that the risks involved in innovation ecosystems outweigh the benefits, is not a clearly defined concept much less a theory. According to them, the system carries pitfalls, is over-based on market forces and it's a flawed analogy to natural ecosystems.

## **LIMITATIONS, CONCLUSIONS, AND RECOMMENDATIONS**

Wong, Yuen-Ping & Singh's (2007) findings of a high and increasing level of recruitment of foreign students, researchers, and faculty members at the National University of Singapore sustain our argument that an entrepreneurial university model for universities in small, open economies needs also to recruit foreign talent.

For Education 4.0 to succeed and sustain, universities need to be future-ready and facilitate the adoption of this phenomenon across all levels.

Every university needs to transform, being guided by the central principle of agility and keeping pace with the ever-changing economy while the route would differ as per their own characteristics.

The future roadmap of universities to get closer to the Education 4.0 tenets may look at budgetary constraints, unique demographic and faculty constraints, and the maturity of the institutes across teaching and research outcomes.

As sustained by Vekic & Borocki (2017) state support and its institutions play a very important role in the process of establishing startup companies and their further development and operation. It is expected the government will endeavor and recognize innovative startups and help them to grow.

Beyond enriching their curriculum from industry inputs, universities need to provide students with career counseling, opportunities for industry interfacing, and online courses for

skill set upgradation. In pursuit of this aim, universities could use technology to provide experiential and collaborative learning, as flexibility in program structures and encourage innovative ideas, being focused on solving societal challenges.

It is expected from regulatory frameworks in each country to recognize the changing education ecosystem and support universities to fulfill industrial and employer demands.

The previous requires reducing the focus on inputs and creating monitoring and accreditation systems mainly based on outcomes.

There are studies mainly related to management and originating from the USA and Europe with definitions not showing a clear interrelation between innovation and entrepreneurship, or their use within universities in coherence with their traditional definitions. With only a few exceptions, empirical models do not share many components and variables, and there are no clear boundaries between the different models. Despite the increasing literature, it is still fragmented and undertheorized, requiring more systematic and holistic studies, considering both the economic and the social aspects of innovation and entrepreneurship within universities.

Academia attracts talented entrepreneurs as well as interested external stakeholders. When their energy is unified toward a common goal, this environment provides the firms with much stronger resources than the private sector alone can do.

Sharing Jensen & Jones (2011) university entrepreneurship is more common in bad economic times, and we are *certainly* facing a very uncertain and everlasting future.

For graduates is certainly a better deal not just to be hired by firms as employees but to be enrolled together with their own projects, as it offers to them an appropriate environment for developing their ventures, and working in some kind of partnership.

Quoting Stagars (2014), *"in the long run, universities need to integrate entrepreneurship one way or another. It will no longer suffice to try to launch startups. Success must be measurable. When that time comes, it will be too late for some institutions, and they will miss the boat."*

The aim of a business school serving as an entrepreneurial ecosystem hub is to encourage economic development by employment generation and create innovative technology-based ventures or service businesses.

We encourage the expansion and improvement of University-Industry centers which due to its ideal Business Ecosystem, makes it possible to anticipate competitors and learn about new proposals.

It is a unique opportunity, where is possible to count on the advice and mentoring of academics as independent as professional experts.

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