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Institut für Soziologie
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The prospects and processes of academic entrepreneurship

Muhammad Nawaz Tunio

A decorative graphic at the bottom of the page consists of several overlapping, swirling lines in various shades of green, creating a sense of movement and depth.

Discussion
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The prospects and processes of academic entrepreneurship

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Institut für Soziologie, Alpen-Adria-Universität Klagenfurt
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Table of Contents

| | |
|---|----|
| Abstract..... | 4 |
| Introduction | 5 |
| Academic Entrepreneurial Eco-systems | 6 |
| The role of entrepreneurship in education | 8 |
| Research and Development (R&D) | 11 |
| Patent and Intellectual Rights..... | 11 |
| Business Incubation Centres | 12 |
| Transfer of knowledge | 14 |
| Literature review | 15 |
| Conclusion | 19 |
| Acknowledgement | 20 |
| References | 21 |

Abstract

Academic entrepreneurship is a set of different, interrelated and co-dependent functions which evolve at universities for the benefit of economic development. Academic entrepreneurship arises when students, graduates and/or professors develop business ideas. Incubators include logistic support like infrastructure, technology and furniture, etc., which may be required in the process. This study aims to explore and develop our basic understanding of academic entrepreneurship, contributing to the literature by extending our knowledge of it while discussing all those closely related aspects which can influence academic entrepreneurship and its potential outcomes. The study starts off by conducting an extensive review of the current status of research. The findings show that academic entrepreneurship is an emerging field and has become a priority course in degree programs like business administration, information technology, engineering and agriculture. It is very beneficial to promote the awareness, importance and utilization of academic entrepreneurship as an opportunity which benefits universities, individuals (teachers and students) and society.

Keywords: Academic entrepreneurship, business ecosystem, business start-up, university graduates

Introduction

Academic entrepreneurship and its role in social and economic developments have attracted attention in recent years as an interesting topic and burning issue for individuals and institutions alike (Rasmussen and Wright, 2015). The phenomenon of entrepreneurship is not limited, existing as it does in different forms and shapes corresponding to different types of enterprises, joint ventures and new start-ups; hence it can be said to be a multifaceted phenomenon (Bögenhold and Fachinger, 2009). Small enterprises are responsible for the breakthrough innovations because innovation fuels the survival of enterprises in a competitive environment (Baumol, 2004). Entrepreneurship needs social networking to connect with the actors and stakeholders who have a strong influence on the market. In order to establish a stable relationship and to develop a social perspective of entrepreneurship, social engagement is of paramount importance. Such collaborative endeavors improve the efficiency and performance of the enterprises. Collaboration plays an important role between the different actors, like academia, industry, the government and society, for all kinds of transactions (Chatterjee and Ramu, 2018). During the process, academic entrepreneurship has gained in importance to utilize the knowledge produced by universities. Such an evolution of entrepreneurship at universities has been the focus of developed and developing countries alike (Mirandaa, et al., 2017). Knowledge and facilities at universities catalyze the entrepreneurship process to produce new products or services. Entrepreneurship needs to combine existing resources in a creative way (Schumpeter, 2000). Therefore, the role of higher education in the entrepreneurial process is to contribute social and economic development. The transfer of technology and the additional involvement of technology parks propagate the entrepreneurial process as the universities' third mission, after education and research and development. Through technology, the transfer of knowledge from universities to external stakeholders transforms and transmits academic knowledge, aiming to create and expand new businesses and business ventures. In the venture process, different actors are involved in the successful and smart growth of business (Yunis, et al., 2018). While discussing a model of the entrepreneurial economy, Audretsch and Thurik (2004) distinguished between an entrepreneurial economy and a managed economy for entrepreneurship education in developed countries. They explained that in the case of an entrepreneurial economy, knowledge is a comparative advantage because knowledge participates in economic development like land, labour and capital, albeit in a different manner. Thus, knowledge-based activities are gradually transferred and mostly exist in an entrepreneurial economy. Approaches in an entrepreneurial economy are different to those in a managed economy. The forces, too, differ in an entrepreneurial and a managed economy. For example, small businesses are the outcome of a managed economy while new and small firms are the outcome of an entrepreneurial economy. On the other hand, Thurik (2011) investigated the entrepreneurial economy in developing and emerging economies. Compared to developed countries, developing countries face several challenges in shifting from a managed economy to an entrepreneurial economy while emerging

economies are a mix of both. Thurik also indicated that traditional factors of production, like labor and capital, are not enough to describe long-term growth: endogenous and exogenous factors are also necessary. One endogenous factor is knowledge and one exogenous factor technological developments. Knowledge is considered crucial for economic growth and a competitive advantage on global markets. In the past, it was (falsely) believed that it was not possible for small and new firms to generate R&D activities and to employ highly educated workers. Moreover, it was supposed that small firms would not have advantages of endogenous factor over large firms as a production factor because they would not be able to afford the cost of learning about global markets, cross-border communication and negotiating with national governments. Despite these forces, small enterprises have turned out to be the engine of economic growth and social development in developed countries.

This study aims to explore the prospects and processes of academic entrepreneurship, focusing particularly on debates in the literature about academic entrepreneurship, research and development, entrepreneurial ecosystems, business incubation systems, transfer of knowledge and patent and intellectual rights as well as on research into academic entrepreneurship in developing countries.

Academic Entrepreneurial Eco-systems

General definition of an ecosystem is presented as

“A biological system composed of all the organisms found in a particular physical environment, interacting with it and each other. Also in extended use: a complex system resembling this” (Oxford.English.Dictionary, 2017).

Whereas; the concept of the ecosystem is also important in the field of the management of technology and innovation. In this regard, an ecosystem is a system of interconnected actors inside the ecosystem boundary which are co-related or interdependent directly or indirectly. An entrepreneurial eco-system creates an environment for entrepreneurship, promoting resources and incentives among university students and graduates. The literature suggests that universities are adopting sustainability to initiate entrepreneurship and promote an entrepreneurial environment. A spirit of entrepreneurship can be prompted by creating and preparing the mind-set of the future. It is a very important matter for universities to create, connect and address entrepreneurship in higher education (Fichter and Tiemann, 2018). Universities are driving force of academic entrepreneurship and introduce innovation in the new start-ups established by the young academics, university graduates and existing students. Academic entrepreneurship emphasizes the entrepreneurs, a transfer of knowledge, and university spin-offs. These interrelated and interdependent activities connect resources to create an environment for entrepreneurship. Furthermore, it is important to stress that the entrepreneurship ecosystem does not only need innovators but

also investors who can fuel the innovation process for the growth and survival of entrepreneurship (Lee and Eesley, 2018). Thus, universities have had a strong influence on creating and boosting spin-offs for the last few decades. Universities can affect the choices of students and alumni to create a start-up by furnishing them with entrepreneurial orientation both on a theoretical and on a practical level. Such a mechanism to foster an entrepreneurial environment provides a great hope for those universities which lack an entrepreneurial ecosystem. Designing entrepreneurial programs requires universities to adopt a technical approach which makes use of high-quality inventions and access to researchers and also deals with the extensive entrepreneurial process. In this process, an important element of the ecosystem is to establish relationships of both cooperation and coordination with collaborators, financiers and university researchers (Åstebro, et al., 2012). Furthermore, tangible and intangible resources contribute to setting up and maintaining entrepreneurial ecosystems in universities. Tangible resources may include the physical infrastructure, corporate physical assets, R&D laboratories, business incubators and science parks while intangible resources may include human capital, routines, facilities like financial support in the form of small loans, consultancy and social networking and channels to connect with customers and the market (Fini, et al., 2009). A business community has support in the collaboration and coordination of entrepreneurs and organizations to produce goods in the form of products and services for end consumers, who are directly or indirectly part of the ecosystem. In this association, other individuals may also include suppliers, producers, competitors and stakeholders. Thus, entrepreneurs follow the trend of innovation in start-ups and spin-offs according to dynamic capabilities and roles (Bozeman, et al., 2013).

The ecosystem promotes the conditions for the creation of new organizations at a micro level. It pays attention to frame policies which generate demands. It creates an environment where institutional support connects individuals with opportunities according to their capability and capacity. In such a way it eases the entry of new entrants and new entrepreneurs while using new technology platforms. The ecosystem furnishes space to interact with external organizations to acquire resources and interact with communities (Surie, 2017). In both theoretical and practical terms, governments provide different resources to start-ups and spin-offs through business incubations to help create and commercialize new goods. These resources include human, institutional, financial and commercial resources. In terms of human resources, universities provide intellectual support to entrepreneurs from a very basic level to succeed in business. Institutional support includes the provision of technology and logistic support. In the case of the financial resources, universities, with the help of regional government, should provide small loans to the students and graduates as an initial investment or help to connect them with financial institutions for student or business loans. Finally, commercial resources involve universities connecting entrepreneurs with the market. Here entrepreneurs obtain ideas and possibilities, means and methods to identify, reach and enter into commercial markets and

target customers (Hsu, 2015).

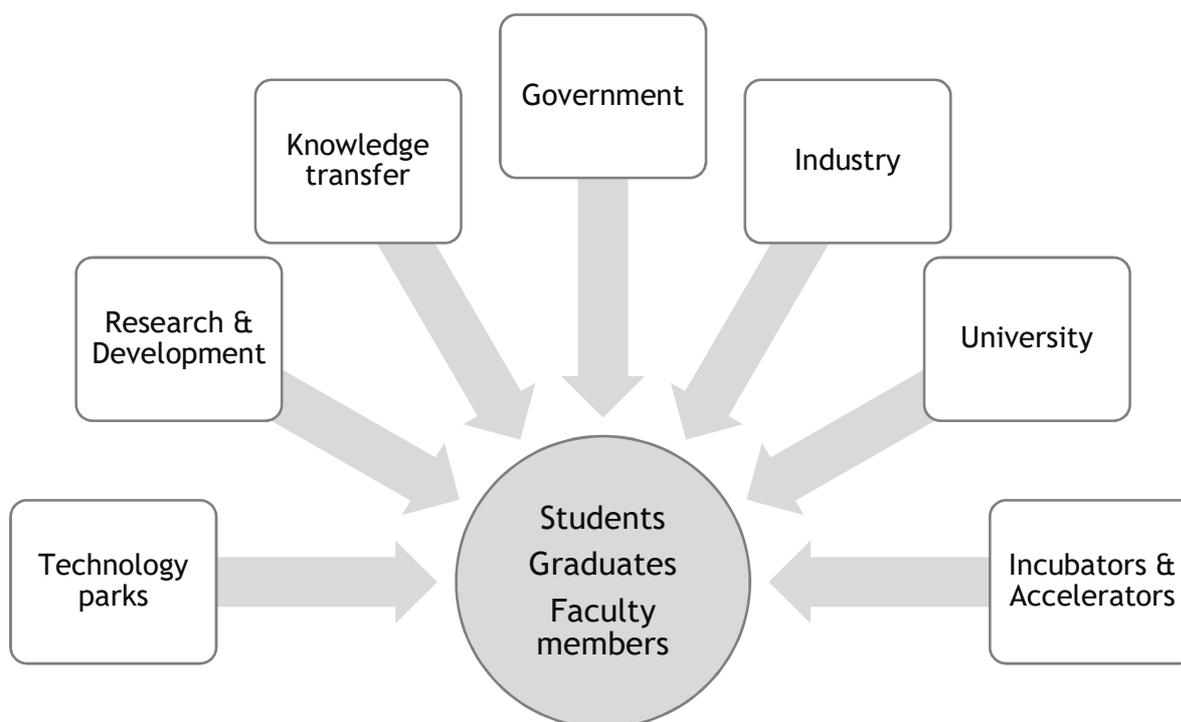


Figure (1) The Academic Entrepreneurial Ecosystem (created by the author)

Figure 1 shows such a combination, where the government is a central institution which supports the whole mechanism. Governments create the possibilities for coordination between universities and industry by addressing university-industry collaboration. Transfer of knowledge takes place where links are encouraged for research.

The role of entrepreneurship in education

Education prepares and trains students to enter into the workforce as employees or the self-employed, the choice depending on the individual's preferences and career choices. These preferences are influenced by the information and skills gained while studying. Entrepreneurship education attracts young people due to the broad range of information it provides, from planning to implementation, and from how to enter and survive in the market to how to be successful. Therefore, academic programmes provide information and guidance on how to become self-employed (Premand, et al., 2016). In this regard, the perspective of academic entrepreneurship is to develop understanding as a process. Furthermore, as the literature points out, entrepreneurship neither occurs in a vacuum nor is it isolated in its journey because it is interlinked directly or indirectly with different dynamics such as economics, education, politics, culture, law and social aspects. These are all important segments of society but education is the most important of them all because education provides the origins for these dynamics. Therefore, education can be said to be an agent of

entrepreneurship (Kauffman Foundation, 2008).

The educational system is a basic unit to foster academic entrepreneurship for economic growth and development. Academia is a key to producing a skilled and trained workforce with theoretical knowledge and practical skills. Besides that, academic institutions focus on developing the competence among students to create or explore business opportunities and compete in the market to survive and be successful. Academic entrepreneurship is a lifelong process, not only for existing individuals but also for future generations and society as a whole. New small enterprises established by the young academics are backed up by the technical support of the supervisory team. In economic terms, the importance of academic entrepreneurship has been recognized for several decades in connection with underdeveloped, transitions and developed phases (Ayatse, 2013). In the best interests of entrepreneurship, many countries support and contribute to entrepreneurship education at academic institutions. Academic entrepreneurship is a process in which individuals and institutions establish a network and a process of collaboration to work together while utilizing available resources for the development purpose. Education and training prepare students for a career to find suitable employment. In this connection, academic entrepreneurship, besides providing knowledge about entrepreneurship itself, guides and trains the students to be creative in their thoughts and enables them to develop business plans. Creative business plans cause rapid growth of the business and thus become helpful for the business to survive in the market (Rasmussen, et al., 2014). Academic entrepreneurship guides the business activities of the group, including current students, graduates and researchers, with the support of the academic institutions to become involved in commercial activities. Becoming involved in entrepreneurial activities generates revenue for the universities and incentives for the students and graduates (Wood, 2011). Scholarly interest in the diffusion of entrepreneurship in academics brings tangible outcomes in the form of applications and entrepreneurial activities among the students and graduates. The addition of entrepreneurship education (EE) to university curricula increases the knowledge of the stakeholders, which include teachers, students and graduates, and, consequently, it increases their skills and confidence for practical work. With the help of entrepreneurship education, universities encourage graduates and promote business start-ups from the very beginning. Such an education is mirrored in practice with the long-term effects in the form of successful businesses (Dave, et al., 2018).

In the generic sense, academic entrepreneurship covers huge diversity: it is knowledge of a process which can be practised by anyone who comes from any discipline but he/she needs to have an entrepreneurial mind-set. Academic entrepreneurship is the application of this knowledge in the entrepreneurial process. Most studies suggest that academic entrepreneurship cultivates entrepreneurial interest and promotes entrepreneurial activity among students and graduates (Abreu and Grinevich, 2013). It develops understanding and creates likely mindsets for becoming involved in entrepreneurial activity. It is a kind of

method for self-employment; accordingly such methods reduce unemployment and elevate societies from economic underperformance (Dave, et al., 2018, and Wood, 2011).

The entrepreneurial mechanism is concerned with small businesses, business owners and entrepreneurial opportunities, and opportunities are based on ideas and knowledge. For the exploitation of opportunities, universities have become more important for encouraging the entrepreneurial phenomenon. It was found that there is a dire need to reduce the gap between universities, business and society. Entrepreneurial activities bridge such gaps and also connect to regional social and economic development (Guerrero, et al., 2016). In such combinations and connections, students with the choice to work independently are likely to exploit entrepreneurial opportunities and be self-employed. Independent occupational choices reflect education and training in the background (Bögenhold and Fachinger, 2016). Education and training provided by academic institutions are sources of new knowledge and innovation. That information is utilized to solve economic and social problems by applying it to new businesses (Küttim, et al., 2014). Academic institutions transform their services from teaching and research to foster an environment for entrepreneurship by transferring knowledge, which is important for their current students and graduates. Thus, universities can make an important contribution to the local economy (Gieure and Berbegal-Mirabent, 2016). The motives of universities are being changed and expanded according to current requirements, for instance patenting, licensing and the creation of spin-off firms. The purpose of this new initiative is to convert scientific research into entrepreneurial engagement (Mowery, et al., 2004).

Some universities offer business programmes which include entrepreneurship as well while others award an independent degree in entrepreneurship; both are the result of the increasing interest of governments to promote a business education for the social and economic benefits. The number of beneficiaries of entrepreneurship programmes or degrees in entrepreneurship is increasing globally. The question arises here as to how much academic education values entrepreneurship in the whole mechanism and how much entrepreneurship is valued in practical terms. The benefits of academic entrepreneurship are not only limited to the students or graduates of business education: students and graduates of all disciplines like engineering, information technology, etc. are taken into its fold to be educated, trained and nurtured for self-employment (Hamidi, et al., 2008). In universities, different departments play a specific role, providing technology transfer offices and incubators, for example, to contribute to the new ventures undertaken by the students and to influence their development (Rasmussen, et al., 2014). Academic entrepreneurship has different functions in the range of academic knowledge and research. In this regard, academic institutions are multitasking in nature and functions (Etzkowitz, et al., 2000). Therefore, in the combination of teaching and research, entrepreneurship has become the third major objective of universities and the idea of an entrepreneurial university is a growing trend everywhere for to variety of functions (Cantu-Ortiz, et al., 2017). A few of them are discussed here in the context and combination of academic entrepreneurship.

Research and Development (R&D)

Universities are very promising institutions for producing and providing knowledge for research and development. Universities have two major functions, teaching and research, and these functions are interlinked with their performance. Through these two major functions, universities aim to create, utilize and exploit the available knowledge on site and to transfer that knowledge beyond the university's boundaries for social benefits (Labini and Zinovyeva, 2014). Academic research exists in different disciplines and degree programmes, depending upon the nature and objectives of the university, but the quality of research is measured by the number of publications in top scientific journals. Alongside publications, which bring individual career benefits and credit to the institute, research-generated knowledge is a key player in innovation (Siegel and Wright, 2015). Researchers/academics affiliated with academic institutes display two types of personal motivation that drive them to become involved in academic research, namely external drives and internal drives. External drives include fulfilling requirements for a promotion and/or an increase in income while internal drives relate to personal interests to solve complex issues through research, contributions to the discipline and gaining recognition in the discipline (Chen, et al., 2006). Universities provide a stable platform to structure basic research as a basis for applied research. The quality of higher education institutions cannot be determined merely by delivering knowledge to a greater or lesser number of students. Parallel to teaching, research plays a very dynamic function for universities. Research in combination with education develops creative thinking and research skills. These qualities in students enable them to deal with future professional activities and practical problems (Tyabaev, et al., 2015). The utilization of research and development at universities is not an easy task as knowledge originating from R&D can be multifaceted; therefore, it can be very challenging to transfer knowledge from academia to practice (Easterby-Smith, et al., 2008). Furthermore, the literature suggests that there are two procedures for knowledge transfer from academia to practice: one is knowledge articulation and the second is knowledge codification. In knowledge articulation, conferences and reviews are included whereas in knowledge codification, contracts, documents and reviews are included. This is a potential transition from one phase to another for innovation in the form of products (Harryson, et al., 2008). In this regard, those students who remain engage in research activities, providing them with research competence and enabling them to create an environment for scientific work. Creative and critical thinking comes by participation in research oriented activities like conferences, workshops and training programs and presenting in university's research work and scientific societies (Kuyumcu, 2013).

Patent and Intellectual Rights

Patenting is one of the more important roles of a university. In order to carry out this role, most researchers at universities have moved their priorities from basic research to applied research, due to the motive of the business (Henderson, et al., 1998). In this regard, it is

always a question as to whether the legalization of intellectual rights could stimulate innovation processes to justify the social, political and economic costs of its implementation. It is a heated debate among scholars, innovators and stakeholders. However, it is impossible to exclude the topic of patent or intellectual property rights (IPR) when talking about the invention and commercialization.

A patent is a set of rights granted by a patent office to an inventor for a considerable time period for the purpose of innovation and commercialization. Invention means producing something novel in order to solve a problem by using technology. Such inventions are protected by registration within a legal framework. The purpose of patents is to prevent the use of a patented invention by any other institution or individual without the consent or legal permission of the owner (WIPO, 2008).

Mutual collaboration between two partners serves the purpose of exchanging knowledge in connection with R&D with the motivation of boosting patenting activities. This combination of R&D and patents creates competition based on the knowledge produced; as a result, it provides new avenues of opportunities and scope to new entrants/new enterprises to advance in productivity and profitability (Kaul, 2012). The licensing of university-generated patents is useful for scientific disciplines. In this context, it is very important to study the trends and tendencies of the relationship between academic science and industrial innovation on account of investments in basic sciences to stimulate technology-driven economic growth where knowledge flows from research productivity. For this reason, industrial research is getting closer to academic science. The knowledge spillover from academic research contributes to university patents and citations while academically; the promotion system generates incentives for academic scientists to publish the results (Branstetter, 2003).

Business Incubation Centres

The literature on incubation shows that some scholars have confused the concept of incubation with science parks, technology parks, and spin-offs. The term incubation is quite different from these, in terms of both its aims and activities. The basic motive of incubation is to bridge the two phases between planning and performing effectively and efficiently. An incubator nurtures immature ideas which are yet not established, turning them into business ideas. The basic ideas are transformed and developed to create a viable business plan with the help of mentoring and guidance under the umbrella of the incubation process (Hackett, 2004). The selection of a business plan depends on the novelty of the idea or the ability of the entrepreneur. The novelty of the business plan determines market demand and feasibility within a specific geographic context. However, the ability of the entrepreneur determines the characteristics, qualifications, experience (if any) and level of confidence to cope with the uncertainties, challenges and potential risks. Translating business ideas

into actions is a very dynamic process which requires high levels of competence in the entrepreneur (Bollingtoft and Ulhoi, 2005).

In developed countries, it has been found that universities have established business incubators (BI) to commercialize university research in order to contribute to regional economic growth as well as social development (Mustar, et al., 2008). For this reason, demand for business incubators has been increasing in many countries. Through BI, new business ventures are developed to create wealth and employment opportunities (van Geenhuizen and Soetanto, 2009). BI became vibrant in 1990s and gradually became famous worldwide. Initially, they were about providing space, infrastructure and every possible support to promote the new business (Voss and Voss, 2013). Incubation is all about mentoring and coaching the new business with support in terms of a business plan, execution, financing, networking, associated facilities and progressing. Besides support, it is constant process of stimulation to progress and expand the business with minimum risk as well as providing techniques to deal with the risk and other challenges (McAdam and McAdam, 2006). The hatching of incubators is a clear debate in institutions and one purpose mentioned is for economic growth. Besides economic contributions, the social return is an issue because economic fluctuations and the consequences of economically unstable conditions affect the social health of a region (Adler and Kwon, 2002).

Incubators play a pivotal role at universities for entrepreneurial activities and in boosting academic entrepreneurship. It is a novel approach to support new entrepreneurs by transferring knowledge through the incubation of small business. Incubators generate links between entrepreneurs and companies by providing services and resources. Incubators at universities ensure the stability, growth and survival of businesses undertaken by new academic entrepreneurs (Albort-Morant and Oghazi, 2016).

Academic spin-offs also emerge from universities and create an environment for entrepreneurial activities for students and graduates (Soetanto and Geenhuizen, 2015). Universities are beneficial for graduate students who are interested in starting their careers as entrepreneurs in order to set up a new business. Universities provide business ideas and business plans to graduate students to utilize the information on entrepreneurial activities. In this way, universities help current and former students to follow up on their intentions to start up a business (Lerner and Malmendier, 2011). Shirokova, et al. (2016) studied start-ups by recent university graduates and included three universities in their research, the Massachusetts Institute of Technology in the USA, Halmstad University and Chalmers University of Technology, both in Sweden. They found that entrepreneurial interest is common among their graduates due to the university spin-off effects and entrepreneurial orientation in faculty and alumni. Businesses started by graduates have better survival prospects and can contribute 40% more earnings compared to graduates employed by companies.

A business plan is a written document that states the business objectives and defines the business idea type, i.e. whether it is service oriented or product oriented. The nature of the business depends on the size and nature of market. It is decided after a detailed study and observation of the market in order to identify market demand. Beside this, the business plan also spots expected problems and suggests approaches how to deal with them. One of the most important functions of the business plan is to identify the sources to support the business financially, including practical matters such as exploring and accessing financial institutions which could invest in the business (Brinckmann, et al., 2010).

Transfer of knowledge

Universities have a growing interest in the contribution of knowledge for entrepreneurial progress and economic development and this interest shows the way to transfer knowledge from the creation of knowledge to commercialization for growth through human capital and innovation management. Therefore, interest is mounting in academic spin-outs and the focus is laid on establishing a collaborative relationship between academics and industries in order to utilize potential sources. Technology-based start-ups established by universities are priorities for transferring knowledge to start-ups and spin-offs for economic growth (Lerner, 2005). Collaboration between universities and industry brings about mutual benefit for both because it is critical for innovation and technology transfer to promote start-ups and spin-offs. One tangible outcome of university-industry collaboration is to stimulate and increase both research and development and investment in R&D. As a result, it initiates and accelerates the research process and commercializes the output of R&D. In addition, it creates new channels to mobilize the workforce between public and private universities to exploit scientific and technical capabilities (Marotta, Blom, and Thorn 2007). In order to foster academic entrepreneurship, different kinds of collaborations occur for mutual benefit between academic institutions and industry while depending upon the objectives and scope of those institutions. However, there are different stakeholders in academia and industrial research partnerships which may be members of the community and university researchers responsible for implementing research outputs. Participation could be direct or indirect, including consultation to promote start-ups and spin-offs (Dave, et al., 2018). Linking those three important actors, as mentioned above, plays a critical role in establishing a network for the purpose of generating, acquiring and adopting knowledge for the knowledge-based economy. Within these links, every actor has a different role and contribution to serve the purpose. Governments act as an umbrella, leading the other two actors in all initiatives and activities. Governments support universities to concentrate on research and development activities with the collaboration of counterpart institutions or industry. In this situation, industry participates as secondary support to academia in order to implement strategies and ideas (Etzkowitz, 2002).

Government addresses the links between industry, academia and government. Furthermore

it elaborates that industries take advantage of knowledge produced by universities, as academic knowledge contributes to the capacity building of industry that leads to advances in technology and boosts to the economy. Governments guide and provide support to strengthen the collaboration between academic institutions and industry to produce and use of new knowledge to improve the regional economy (Etzkowitz, 2003)². In this context, the triple helix approach is closely related to the same concept discussed above; it represents the interface of academic institutions, industry and government. This structure was introduced by Etzkowitz and Leydesdorff in the 1990s (Etzkowitz, 2003)¹. In entrepreneurship growth, the triple helix approach also has a major contribution to make. Many studies (Amaral, et al., 2017; Ryana, et al. 2018; Ueasangkomsate and Jangkot, 2017) have postulated the value of the triple helix in economic development and have portrayed the role of each actor (academia, industry and government). In this regard, the three-way coordination promotes the transfer of technology and knowledge between the actors to improve innovation efficiency. By combining the three actors, governments provide enormous resources to encourage collaboration between academia and industry. Due to the common objectives and interests to promote economic growth, mutual collaboration between the two actors (academia and industry) is shifted from sponsorship to partnership. Following innovation, academic research improves the efficiency of businesses to solve complex issues (Baba, et al., 2009). Furthermore, Ankrah, et al. (2013)'s study reveals that academia and industry play a role to transfer knowledge and exchange information. Transparency between these two actors bridges trust in the relationship to initiate and enhance knowledge transfer and outcomes, whereby policy makers need to take action in order to take advantage of such a partnership for social and economic development. Communication between and the coordination of the business sector and academic institutions has become the prime concern of many countries in order to exchange knowledge and technology to frame new policies and support the programmes which could bring expansion to the economy. In this connection, academic institutions are focusing on innovation in order to contribute at industry level individually and at country level as a whole. It is found that less attention is paid to the commercialization of university research. One major fear mentioned is that a university's revenue generated by commercialization may replace public funds (OECD, 2002).

Literature review

The table below summarizes some leading studies focusing on the outcomes of academic entrepreneurship, giving the title, approaches and findings. The literature review covers 13 articles from 2017 to 2010 which focus on academic entrepreneurship, the entrepreneurial process, entrepreneurial activities and business incubators.

| Web of Science search results on the academic entrepreneurship in developing countries | | | | | |
|--|-----------------------|------|---|--|--|
| S. No. | Authors | Year | Title | Methodology | Focus/Findings |
| 1. | Yusof, et al. | 2017 | Exploring the cultural determinants of entrepreneurial success: The case of Malaysia | Qualitative research A case study approach Semi-structured interviews Four in-depth cases | The skills and knowledge of entrepreneurs are particularly important to compete on the market. The presence of experienced entrepreneurs is positively related to entrepreneurial success. Cultural attitudes towards entrepreneurship are positively related to success in entrepreneurship. The proximity of business to the university has spillover effects. |
| 2. | Filippetti and Savona | 2017 | University-industry linkages and academic engagements: individual behaviours and firms' barriers. Introduction to the special section | Revisits the latest developments in the literature and policy Review of the extant literature | Science, technology and innovation policy can play a crucial role in fostering UI links. There is no such thing as a single one-size-fits-all or best-practice policy to encourage joint research between the public research sector and the business sector. |
| 3. | Kautonen, et al. | 2017 | Late-career entrepreneurship, income and quality of life | Empirical study | For late-career individuals, starting a business is positively associated with changes in the quality of life and negatively associated with changes in income. |
| 4. | Tofighi, et al. | 2017 | Academic Entrepreneurship in a Medical University: A System Dynamics Approach | Cross Impact Analysis method | The entrepreneurial ecosystem is growing in the country Iran; still there are problems to be taken into account in order to improve entrepreneurship at university |
| 5. | Lalit Sharma | 2017 | Teachers' perspective on institutional barriers to academic entrepreneurship - | Qualitative interviews | The major barriers identified were: a poor entrepreneurial ecosystem, poor entrepreneurial orientation, poor inclination of universities and institutions |

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| | | | a case of Uttarakhand state, India | | to prepare students for jobs, inadequate content in the courses, a need for training entrepreneurship faculty or a specialized entrepreneurship faculty, ineffective teaching methodology. |
| 6. | Rezaei Zadeh, et al. | 2017 | Core entrepreneurial competencies and their interdependencies: insights from a study of Irish and Iranian entrepreneurs, university students and academics | Qualitative collective intelligence methodology | Productive thinking, motivation, interpersonal skills and leadership are core entrepreneurial competences that need to be developed in educational contexts. |
| 7. | Hernández-Sánchez, et al. | 2016 | University-Industry Collaboration: A Successful Case In The Electronics And Software Design Area In Mexico | Exploratory Case study From field and documentary evidence as well as interviews | The success of the CST model can be explained by two factors which have been combined properly: an active group of researchers and a receptive group of local managers developing highly qualified and specialized human resources involved in joint research projects with local industries situated in the Metropolitan Area of Guadalajara. The CST's technological capabilities led to the creation of accelerated training programmes. |
| 8. | Nikhil A. Gokhale | 2016 | Supporting Research-Inspired Entrepreneurial Activities in India | Review | If the challenges can be overcome and the opportunities can be taken, the scene is set for Indian entrepreneurs to redefine and reinvigorate the Indian Economy. |
| 9. | Guerrero, et al. | 2016 | Entrepreneurial activity and regional competitiveness: evidence from European | Exploratory | Informal factors (e.g. attitudes, role models) have a greater influence on university entrepreneurial activity than formal factors (e.g. support measures, |

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| | | | entrepreneurial universities | | education and training). |
| 10. | Dejin Su, et al. | 2014 | Government-driven university-industry linkages in an emerging country: the case of China | Analytical | More than just a site for high-quality workforce education and the dissemination of knowledge, universities as an important part of national innovation are required to participate in economic activities. Considering that most Chinese universities are national, S & T policies with particular regard to university technology transfer would be more important and essential. This research finds that S & T policies enacted by the government have made critical contributions to UILs in an economic transition period, such as improving academic faculty, enhancing university-industry collaborations and supporting university spin-off formation. The experiences of China suggest that the government should enact more effective S & T policies in the knowledge-based economy era. |
| 11. | Yaakub, et al. | 2011 | Challenges for Commercialization of University Research for Agricultural Based Invention | Review | University researchers have faced challenges to introduce new products on the market for a long time but little attention has been focused on the commercialization of agricultural inventions. Changes at university and a non-static environment ensure that learning occurs for the researcher and practitioner to integrate their expertise for the sustainability of the university in the future. |

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| 12. | Tchalakoy, et al. | 2010 | The Academic Spin-Offs as an Engine of Economic Transition in Eastern Europe. A Path-Dependent Approach | Review | The paper reveals the common ground behind the two conflicting tendencies in post-socialist academic spin-offs. An authentic form of academic entrepreneurship grasping the opportunities opened up by the economic crisis and compensating for failures in science and technology policy. Rent-seeking strategy draining valuable public assets. |
| 13 | Ratinho and Henriques | 2010 | The role of science parks and business incubators in converging countries: Evidence from Portugal | Qualitative approach Case study A written survey combined with a semi-open phone interview | The success of science parks (SP) and business incubators (BI) is buttressed on planning issues and operational features. In this case, the determinant issue when planning SPs or BIs is to ensure university links, while when operating one, the suitability of management is crucial. Future research should focus separately on these issues in order to investigate in more detail management best practices and planning best practices. |

Figure (2) Table of literature review

Conclusion

In sum, knowledge and participation in entrepreneurship by academia is very beneficial for different kinds of actors. As mentioned above, there are a variety of benefits of academic entrepreneurship to entrepreneurs, academics, communities and nations where entrepreneurial approaches and practices exist. The above discussion suggests that institutional support could be provided at different levels. Academic entrepreneurship is beginning on a very small scale but will increase in depth and breadth. In order to run this mechanism, academic institutions need to multitask to play a variety of roles to develop an entrepreneurial ecosystem and maintain it at a constant pace and with progress. A greater responsibility lies on the shoulders of universities to train and support young academics to incubate businesses. When those businesses become stable, they need to shift from incubation to the open market. Before shifting to the market, academics need the skills and abilities to cope with the challenges of collaborating and networking on the market.

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