Chapter 6
Entrepreneurship and Innovation Ecosystem's Drivers: The Role of Higher Education Organizations

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Abstract Extant empirical entrepreneurship studies recognize that the main challenge of emerging economies is transforming into entrepreneurial societies. Following this perspective, the involvement of several actors (government, universities, entrepreneurs, investors, etc.) is required in this evolutionary process. In this regard, emerging economies' governments promote the configuration of entrepreneurial ecosystems to achieve this transformation. Even in previous insights, the role of each actor is an interesting attention for academics and policy makers. In this sense, this chapter tries to provide a better understanding about the role of higher education organizations as driver of entrepreneurship and innovation ecosystems in Mexico. Our analysis provides evidence about the relevance of incentives in configuration of triple mission of Mexican higher education organizations as well as their lower participation in the involvement of innovation and entrepreneurial activities.

Keywords Entrepreneurship • Innovation • Higher education organizations • Mexico

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6.1 Introduction

During the past few decades, the configurations of new knowledge-intensive environments have required fertile settings for innovative and entrepreneurial activities. Both types of activities play a crucial role in the economy, and many studies have examined the factors that influence these activities (Autio et al. 2014). Despite innovation and entrepreneurship being multidimensional processes, empirical studies continue to employ models that presume that these phenomena occur at a single point in time (McMullen and Dimov 2013). Those facts explain why the triple- or quadruple-helix concepts have been operationalized in different ways (e.g., with/without government intervention, closed/opened, administrated/entrepreneurially, etc.), in different spaces (e.g., global, national, regional, local), and in different contexts (e.g., organizational, technological, social, etc.).

Because of this diversity, there has been growing interest in the study of how organizations transform their roles and practices in the development and strengthening of national innovation and entrepreneurial ecosystems (Etzkowitz and Leydesdorff 2000). According to Autio et al. (2014), in both temporal and spatial contexts, entrepreneurial innovation is the result of a variety of elements that compare the attributes of national innovation systems, entrepreneurship, contextual influences, and the main benefits for the actors involved in this process. Applying this perspective, how different agents operate, collaborate, make decisions, identify benefits, or transform their roles is still an interesting research area (Cunningham and Link 2015), particularly in emerging or transitional economies (Wright et al. 2005). For instance, these types of economies comprise countries[1] that face a rapid pace of development and government policies that favor economic liberalization and the transition from centrally planned economies (Wright et al. 2005).

In general, emerging economies invest in more productive capacity and adopt a free market or mixed economy to move toward an innovative economy (Meyer et al. 2009). In these scenarios, governments create subsidies to promote entrepreneurship innovation through compulsory university partnerships as a strategy to stimulate regional economic development (Cohen et al. 2002; Thompson 1999). Therefore, questions about how institutions influence organizational/individual entrepreneurial and innovative decisions have been relatively unexplored (Hoskisson et al. 2000; Meyer et al. 2009), particularly in emerging economies, where there is significant organizational heterogeneity represented by incumbent enterprises (primarily busi-

[1] According to Hoskisson et al. (2000), some countries identified as emerging or transitional economies are (in alphabetical order) Albania, Argentina, Armenia, Azerbaijan, Bangladesh, Belarus, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Chile, China, Colombia, Cote d'Ivoire, Croatia, Czech Republic, Ecuador, Egypt, Estonia, Georgia, Ghana, Greece, Hungary, India, Indonesia, Israel, Jamaica, Jordan, Kazakhstan, Kenya, Korea, Kyrgyzstan, Latvia, Lithuania, Macedonia, Malaysia, Mauritius, Mexico, Moldova, Morocco, Nigeria, Pakistan, Peru, the Philippines, Poland, Portugal, Romania, Russia, Saudi Arabia, Slovakia, Slovenia, South Africa, Sri Lanka, Taiwan, Tajikistan, Thailand, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Ukraine, Uzbekistan, Venezuela, and Zimbabwe.

ness groups, state-owned enterprises, and privatized firms), entrepreneurial start-ups, and foreign entrants. Based on those arguments, the purpose of this research is to provide a better understanding about the micro-foundations of entrepreneurial and innovation ecosystems explained through their main actors, particularly, exploring the role of higher education organizations. To achieve this objective, adopting institutional economic theory and case study approach, we analyzed the case of the drivers of the Mexican innovation and entrepreneurship ecosystems.

This chapter is organized as follows. Section 6.2 presents the link between entrepreneurship and innovation. Section 6.3 integrates the methodological design. Section 6.4 describes the main agents that allow for the understanding of the entrepreneurship and innovation ecosystem of an emerging economy (Mexico), as well as of the role of higher education organizations such as drivers of innovation and entrepreneurship ecosystems in the light of previous studies. Finally, Sect. 6.5 summarizes the concluding remarks.

6.2 Theoretical Framework

Entrepreneurship and innovation have always been strongly related. According to Schumpeter (1934), creative destruction is present when entrepreneurs introduce radically new products, services, and processes to the marketplace. Baumol (2002) also argues that entrepreneurship and innovation were the true source of national competitive advantage because new ventures broke the established development paths and undermined established competencies. In this regard, associating entrepreneurship with innovation, many nations, regions, and states have adopted policies to stimulate innovation by entrepreneurial firms with the aim to facilitate economic growth (Autio et al. 2014). For instance, several policies include local, regional, and national initiatives to promote technology-based entrepreneurship (Mustar and Wright 2010; Grimaldi et al. 2011).

Based on this perspective, we assume that institutions, defined as the rules of the game in the society, not only encourage the formal and informal factors (policies, culture, etc.) but also are linked to the drivers of each socioeconomic transformation process in the society (North 1990). In this regard, Zahra and Wright (2011) argue that the innovation literature, and especially the National System Innovation (NSI) literature, was mostly about structure and organizations, while the entrepreneurship literature has been mostly about the individual or the firm. For one side, NSI focused on the complex relationships of cooperation, communication, and feedback among organizations in both the process of innovation and the innovative performance across countries (Carlsson et al. 2002). This orientation has been criticized because the existing literature provides only limited insights into the drivers and mechanisms that can explain their evolution and growth over time (Castellacci and Natera 2013). For the other side, the entrepreneurship literature traditionally focused on independent ventures as well as on the organizational mode within which entrepreneurial initiatives took place intrapreneurship (Parker 2011). Based on this

theoretical gap, Autio et al. (2014) propose that the concept of entrepreneurial innovation ecosystems distinguishes between the different types of contexts that influence it such as industrial, organizational, and social contexts—overlain by temporal and spatial contexts.

An entrepreneurial and innovation ecosystem could be understood as a set of interconnected actors (potential and existing), entrepreneurial organizations (e.g., firms, venture capitalists, business angels, banks, public sector agencies), innovative organizations (e.g., universities, research centers), and entrepreneurial and innovative processes (e.g. business birth, high growth firms, serial entrepreneurs, degree of entrepreneurial and innovative mentality within firms, and levels of ambition) that formally and informally coalesce to connect, mediated by government initiatives oriented to the performance of the local entrepreneurial environment (Mason and Brown 2014, p. 5). Generally, an entrepreneurial and innovation ecosystem emerges in locations that have place-specific assets/attributes. It represents a shift from traditional economic thinking on firms/markets (management societies) to new economic thinking involving different agents in the society, market, and organizations (entrepreneurial societies) (Audretsch and Thurik 2004). Typically, successful ecosystems have emerged under a unique set of pre-existing circumstances as well as with subsequently created conditions. For instance, Isenberg (2010) identified certain pillars that comprise a successful entrepreneurial innovation ecosystem, including accessible markets (both domestic and foreign), talented human capital and a qualified workforce, access to private/public sources of funding, an adequate support system and regulatory frameworks, and cultural support, among others. Nevertheless, these optimal conditions or pillars are not presented in all types of economies.

Within an emerging economy, policy makers usually try to translate successful formulas applied by developed economies, such as fostering ecosystems to promote innovation and entrepreneurship as the best transitional instrument (Wright et al. 2005). Traditionally, in a scenario characterized by several constraints, governments have eschewed a linear model encouraging universities and government laboratories to embrace the cause of innovation and technology commercialization (Cohen et al. 2002). In other words, in response to the widespread view that public research is too distant from industry in most sectors (with notable exceptions), they have called on universities and government R&D labs to implement their science and engineering strategies (Cohen et al. 2002, p. 2). In many developed countries, collaborative research is subsidized by public policy programs that provide resources for projects involving universities and enterprises (Caloghirou et al. 2001; Almus and Czarnitzki 2003; Grimaldi et al. 2011). Astrom et al. (2008) have defended the important role of public subsidies in supporting all types of collaboration, but in emerging economies, where the compulsory character of university-enterprise partnerships for access to subsidies allows for an effective exchange of knowledge, this type of collaboration is the most widespread (Boschma 2005). In addition, there is evidence to support the existence of long-standing partnerships between universities and enterprises and the fact that universities continue to aggressively seek industrial sponsorship. These partnerships persist despite the fact that government subsidies

and grants create strong administrative burdens for companies, as government support is considered to be highly inflexible since it does not allow for the change of partners and the programs cannot end before a given date (Van de Vrande et al. 2009; Urbano and Guerrero 2013).

As a result, the university's significance increases in terms of its impact on the economy (Audretsch 2014). As universities are located in the intersection of the education, research, and transference processes, they are considered a key access agent in any entrepreneurship and innovation ecosystem. Traditionally, universities tend to be large organizations that by nature are not very entrepreneurial in their focus; however, the incorporation of an entrepreneurial orientation into a university's missions could change this convention (Hannan and Freeman 1984; Kirby et al. 2011). The core activities of universities have been universally recognized as teaching and research, but currently universities have undergone internal transformations in order to adapt to external conditions and to legitimize their role in the economy, giving place to a new kind of university: the entrepreneurial university (Guerrero and Urbano 2012, 2014; Guerrero et al. 2015).

6.3 Methodology

6.3.1 Case Study Approach

This analysis uses a qualitative perspective to investigate the complex phenomenon of the entrepreneurship innovation ecosystems, where the interaction between the phenomenon and the context is unclear (Yin 1984). In particular, we take a single case study approach (Yin 1984; Eisenhardt 1989, 2007) with the purpose of understanding the knowledge concerning the role of higher education organizations as drivers of entrepreneurship and innovation ecosystems. As a result, case study research involves the examination of a contemporary phenomenon in its natural setting (Yin 1984), and it is especially appropriate for research for providing the analysis of a phenomenon in a specific setting. Adopting the theoretical criteria to identify emerging economies (Hoskisson et al. 2000; Wright et al. 2005), the case of the Mexican entrepreneurial and innovation ecosystems was selected to analyze this contemporary phenomenon in-depth within its real-life context, especially when the boundaries between this phenomenon and the university role are not clearly evident (Eisenhardt 1989, 2007; Yin 1984).

Mexico is an interesting example of an emerging economy, as classified by the International Monetary Fund (2015).[2] Since the first editions of the Global Competitiveness Index, Mexico is classified as an efficiency-driven country (Porter and Schwab 2008, p. 9). This means that the country's main advantage comes from producing more advanced products and services highly efficiently.

[2] For further details, [http://www.imf.org/external/pubs/ft/weo/2008/01/weodata/groups.htm#oem].

Heavy investment in efficient infrastructure, business-friendly government administration, strong investment incentives, improving skills, and better access to investment capital allow for major improvements in productivity. The trade of products and services and human capital movements between countries has enormous effects on an economy's productivity and efficiency, especially for efficiency-driven countries such as Mexico. However, the challenge is to reinforce the ability to produce innovative products and services at the global technology frontier using the most advanced methods to become the dominant source of competitive advantage (Solleiro and Castañón 2005), in other words, a transformation of an *efficiency-driven economy* to an *innovation-driven economy*. In this context, Mexican higher education organizations are characterized by law, rules, and conditions that are introduced within a legal, economic, cultural, and social context of each country; and these are influenced by the level of development achieved (factor-efficiency-innovation driven). Mexicans face a big challenge for higher education organizations because many problems and gaps must be solved beforehand. In the past three decades, governmental agencies have been introducing supporting programs to promote collaboration between enterprises and knowledge creation agents in order to improve innovation and knowledge transfer and to achieve a higher development state. Therefore, it is important to analyze that Mexico needs to improve the drivers to economic development, especially human capital (Solow 1956), knowledge capital (Romer 1990), and entrepreneurship capital (Audretsch 2014).

Data were gathered by different methods and tools applying the concept of triangulation proposed by Yin (1984). In particular, we collected data using secondary sources such as the International Monetary Fund, World Bank, Mexican government (National Development Plans, from 1983 to 2018, *Diario Oficial*, Presidency, Chamber of Deputies), National Council for Science and Technology (CONACYT), Ministry of Economy, INADEM, Fondo PYME, Ministry of Education (SEP), National Association of Universities and Higher Education Organizations (ANUIES), Global Entrepreneurship Monitor (GEM), World Economic Forum (WEF), National Institute of Statistics and Geography (INEGI), World Intellectual Property Organization (WIPO), Organisation for Economic Co-operation and Development (OECD), Times Higher Education, and the El Financiero. The data collection was conducted over a 6-month period (September 2015 to March 2016). Regarding data analysis, procedures suggested by Yin (1984) and Eisenhardt (1989, 2007) were adopted. In particular, we used a general analytic approach that prioritizes information through the development of categories of data and the examination of similarities.

6.3.2 *Understanding the Mexican Entrepreneurship and Innovation Strategies*

During the past 32 years, Mexico has experienced a deep process of transformation. After the 1982 financial crisis created very critical conditions for the Mexican economy, it was necessary to introduce structural changes to design and apply economic policies in order to drive stability and development for Mexico and Mexicans. According to the World Bank Indicators, Mexico's economy, politics, and society have rapidly transformed from an efficiency-driven economy to an innovation-driven economy. The Mexican government has implemented certain strategies to stimulate regional economic development and the transition from an efficiency economy to an innovation economy. Figure 6.1 shows the government's economic development objectives during the past three decades.

The first initiative was the National Development Plan applied during the Miguel de la Madrid Hurtado administration (1983–1988). The main challenge during this period was maintaining and reinforcing the independence of the nation (Gobierno de la República 2015b). Its focus was to build a society under the principles of the state's rights and to guarantee individual and collective freedom in an integral democratic system with social justice conditions (pp. 3–4). Based on these challenges, the economic and social development strategy was oriented to an economic restructuring and a structural change.

The second initiative was the modernization plan implemented during the Carlos Salinas de Gortari administration (1989–1994). In this period, the main focuses were the defense of sovereignty, the expansion of democratic scenarios, the recovery of the economy, and the improvement of productivity (Gobierno de la República 2015c). However, after a 5-year period of stability and national recovery, another crisis occurred during the last year of this administration. As a consequence, during the Ernesto Zedillo Ponce de Leon administration (1995–2000), the main challenge was

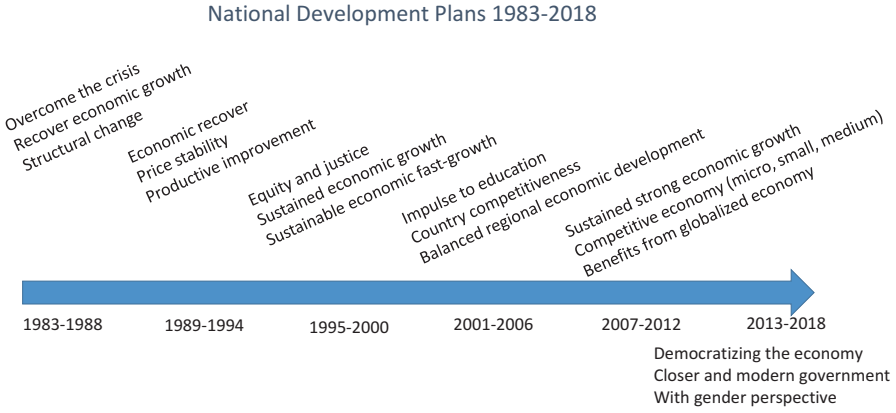

Fig. 6.1 Evolution of national development plans

to face the most severe crisis in Mexico. In this scenario, strategies were devised to reinforce national sovereignty, to consolidate a social harmony, to build a complete democratic development system, to improve socioeconomic development, and to promote a sustained/sustainable economic fast growth (Gobierno de la República 2015d).

Mexico started a new political era with the Vicente Fox Quesada administration (2001–2006). Its main strategy was to launch Mexico toward an accelerated growth through collaborative public relationships including education, social cohesion, human development, economic course, competitiveness, and public security, among others (Gobierno de la República 2015e). The following Felipe Calderón Hinojosa administration (2007–2012) focused on sustainable human development based on five axes: law enforcement and security, competitive job creation and equal opportunities, environmental sustainability, effective democracy, and responsible foreign policy (Gobierno de la República 2015f). December 2012 saw the start of the Enrique Peña Nieto administration, with its general objective to lead Mexico to its full potential and achieve the central idea that Mexico is a place where each person is able to write his/her own successful story and be happy (Gobierno de la República 2015a). Peña Nieto's planning was based on inclusion, peace, prosperity, qualified education, and worldwide responsibility, with productivity, modernization, and gender perspectives as transversal strategies.

Based on our review of those National Development Plans, we confirm that Mexico is trying to implement strategies to move from a factor-driven economy to an efficiency-driven economy and is now oriented to introduce an innovation economy to achieve the status of an innovation-driven economy (Global Entrepreneurship Monitor 2015). Today, economic development is characterized by a deeply competitive international environment and a knowledge-based economy. Mexico is classified by the World Economic Forum (2014) as an efficient-based economy. According to the National Development Plan 2013–2018 (Gobierno de la República 2015a), Mexico is searching for a strategy and processes to enhance this level and achieve a new development level based on innovation and knowledge. Therefore, this evolutionary perspective helps us to understand the configuration of the Mexican entrepreneurship and innovation ecosystems that will be explained in the next section.

6.4 Results and Discussions

6.4.1 Mexican Innovation Ecosystem

Supported by the Innovation Law (Diario Oficial 2014), the Mexican Science, Technology and Innovation System is integrated by (i) the National Council for Science and Technology (CONACYT), (ii) the Mexican government, (iii) the Mexican industry, and (iv) higher education systems. Figure 6.2 shows the main agents involved in the Mexican Science, Technology and Innovation System (Diario Oficial 2014).

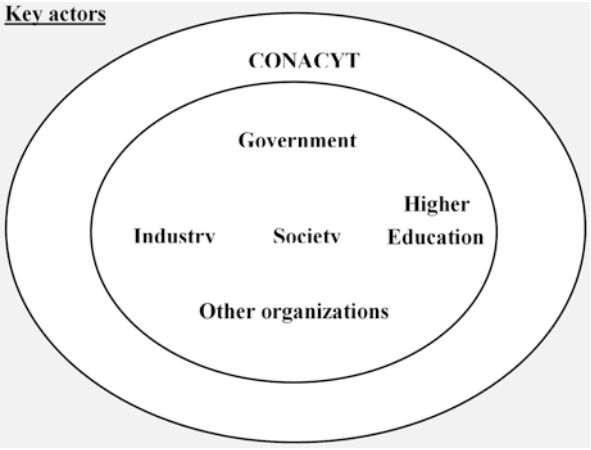

Fig. 6.2 Mexican Science, Technology and Innovation System (Diario Oficial 2014)

6.4.1.1 National Council for Science and Technology

The first agent is the National Council for Science and Technology (CONACYT), which is a decentralized public organization responsible for the design, development, and implementation of the main scientific and technological policies. Since its foundation in 1970, based on the national priorities and in collaboration with all the other agents, CONACYT promotes the reinforcement of human capital (scholarships and evaluation of national researchers), the development of scientific/technological activities (research funding, supporting innovative enterprises, etc.) in strategic areas (e.g., communication, biotechnology, advanced materials, manufacture design, socioeconomic development, social innovations), and the implementation of each administration (CONACYT 2015a).

CONACYT was involved with the development and implementation of the Scientific and Technological Research Law in 1999 and the Science and Technology Law in 2002 (Pérez-Hernández and Calderón-Martínez 2014). During the Calderón administration (2007–2012),[3] the Mexican Science, Technology and Innovation System faced a decentralization strategy across the 31 states that integrate Mexico. According to the INEGI (2016), the exercised budget by CONACYT was 202 million pesos in 1990 and 18,421 million pesos in 2013. As a result, during the past decade, Mexican knowledge production—measured by the number of patents of Mexican residents, trademarks, and industrial designs—has increased from 1% in 2000 to 3% in 2014 (WIPO 2016). The distribution of those patents has been primarily in pharmaceutical, engineering, and medical areas, and the 2014 top higher education applicants were the UNAM and the ITESM.

In this regard, CONACYT has implemented several initiatives to foster innovation throughout the collaboration among different agents (enterprises, research centers, higher education organizations). Some examples include innovation incentives

[3] For further details, review Gobierno de los Estados Unidos Mexicanos (2007).

such as the Programa de Estimulos a la Innovación (PEI), with three modalities (Innovapyme, Finnova, and Innovatec) and an investment of more than 7447 million pesos since 2009 and programs such as the Mixed Founding (FOMIX), the Technological Modernization Program (PMT), the Technological Consultant Register (RCCT), and the Innovation and Technology International Fund (FONCICYT), among others. It is important to note that the results obtained during the past decade from those supporting programs were lower than expected because they have also been influenced by factors such as the lack of collaboration from enterprises, the lack of human capital, the lack of trained employees, and higher cost in production factors. Simultaneously, CONACYT has implemented incentives for the development of human capital, including Sistema Nacional de Investigadores (SNI) and Sabatic stancies in foreing institucions (CONACYT 2015b).

6.4.1.2 Government

The second agent is represented by the Mexican government, which has implemented programs to facilitate the development of basic/applied research, technology, and innovation. According to the *Diario Oficial* (2014) and OECD (2010, 2012), during the Calderón administration, Mexico spent 378,021 million pesos to develop scientific activities and technology that represented around 37% of the gross domestic product (GDP). In general terms, federal government expenses in science and technology increased from 2035 million pesos (28% of GDP) in 1990 to 68,317 million pesos (42%) in 2013 (INEGI 2016). Typically, the distribution of expenditures for national science and technology has been 56.5% toward research and development of experimental activities, 23.9% toward education and training for scientists and technicians, and 19.5% toward the services of science and technology. The main funders have been the government (49.3%), private sector (44.5%), and universities (6.2%).

6.4.1.3 Industry

The third agent is represented by more than three million economic units. In general, small and medium enterprises (SMEs) represent more than 99% of all Mexican firms. They have accounted for more than 70% of all employment since 1993, and they generate more than 50% of the GDP (Hausmann et al. 2009). Mexico is also characterized as one of the world's most entrepreneurial countries in terms of the percentage of its population who has started or is in the process of starting a new venture (Flores et al. 2013). Yet there is evidence that Mexico is not friendly to entrepreneurs. It is estimated that between 60% and 90% of new ventures are started in the informal sector. While job growth expectations and realizations arguably constitute the most visible medium-term impact of entrepreneurship, innovative orientation impacts structural renewal in the long-term. Mexico has made room for entrepreneurship, but it does not seem to foster the kind of entrepreneurship required for economic growth. In terms of innovation, only one-third of new entrepreneurs

identified in the total entrepreneurial activity develop new products or services for their customers, when in innovation-driven economies it is almost one-half of new entrepreneurs (Flores et al. 2013).

6.4.1.4 Higher Education Organizations

The last agent is represented by higher education systems, comprising technological institutes, technological universities, intercultural universities, polytechnic universities, federal public universities, regional public universities, higher teacher education universities, private universities, and public research (SEP 2012). Therefore, Mexican higher education systems are characterized by diversity and heterogeneity as well the normative of the Mexican Ministry of Education (SEP 2015a, b). The laws and regulations associated with Mexican higher education systems are Article 3 of the Constitution, Article 38 of the Organic Law of Federal Public Administration, the General Law of Education, the Science and Technology Law (SEP 2015a), the local laws from each state of the country, and specific organic laws and regulations of each local organization. There are also some associations such as the ANUIES (National Association of Universities and Higher Education Organizations) that include 179 members (ANUIES 2015). Interestingly, the origin of higher education resources is from private organizations (31.7%), from autonomous organizations (31.2%), and from public funding distributed by the federation (13.4%) and the states (17.8%) (SEP 2012). In addition, according to Silas Casilla (2005), the Mexican private education system has shown three tendencies since 2000: (i) diversification and growth; (ii) differences in contributions, impact, and quality with respect to public organizations; and (iii) the focus to attend to the demands of poor people who have not got any place in a public university. In terms of quality, according to the Times Higher Education, World University Ranking 2014–2015, Mexican universities are not found in the first 400 positions (The Times Higher Education, 2015). However, in the classification presented by the Shanghai Ranking in the Academic Ranking of World Universities (Top 500), the National Autonomous University of Mexico (UNAM) is found only in the 201–300 range and within the best 400 worldwide only in 2014 (Ranking Shanghai 2015).

6.4.2 Mexican Entrepreneurship Ecosystem

In Mexico, an entrepreneurial ecosystem is a system integrated by a set of economic agents linked and working to create, develop, and consolidate conditions to promote entrepreneurial activity and micro, small, and medium enterprise (MiPyME) development (INADEM 2015). According to the INADEM (2015), the Mexican entrepreneurial ecosystem is integrated by (i) private and public sources of funds, such as venture capitalists, banks, subsidies, and so on; (ii) chambers of commerce; (iii) higher education organizations and research centers; (iv) public and private incubators and accelerators; and (v) other public/private organizations (Fig. 6.3). Similar

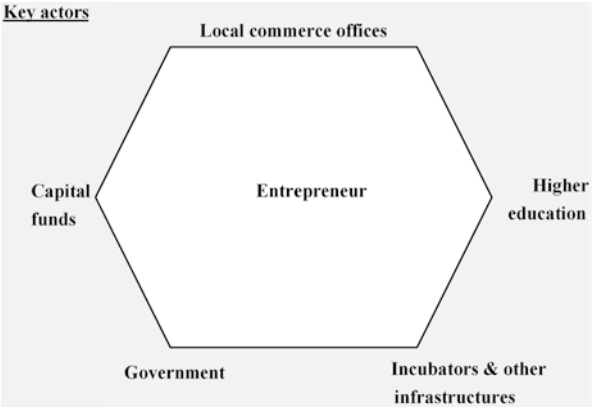

Fig. 6.3 Mexican entrepreneurial ecosystem (INADEM 2015)

to an innovation ecosystem, the entrepreneurial ecosystem works across the 31 states and with the support of universities.

6.4.2.1 Chambers of Commerce

These organizations and entrepreneur associations play a relevant role in any entrepreneurial ecosystem because they know the main needs and have strong channels of communication among the agents. In other words, these organizations are the main translators between the enterprises and local agents such as the government, universities, and employee associations.

6.4.2.2 Capital Funds

Funding tends to be the main element associated with the creation and growth of new/established ventures. For this reason, venture capitalist, business angels, crowdfunding, and banks are some of the most common sources of funding. Any entrepreneurial ecosystem requires strong financial mechanisms that allow entrepreneurs access not only to start-up capital but also capital for growth. Some examples include the creation of investors' clubs or networks, the establishment of loan programs to support entrepreneurial activity (e.g., programs developed by Santander Bank, BBVA Bancomer, Nacional Financiera, Banamex, Banregio, and Banorte), the development of co-inversion modalities (public-private), and the creation of crowdfunding platforms.

6.4.2.3 Higher Education Organizations

Many higher education organizations contribute to entrepreneurial ecosystems by providing talent, resources, and capabilities through their activities as well as supporting infrastructures (technology transfer offices, incubators, and accelerators). In this regard, Pérez-Hernández and Calderón-Martínez (2014) have shown that the support of higher education organizations contributes to the development of innovation as well as knowledge transfer and commercialization, where the efficiency of technology transfer offices (OTT) has been fundamental. For instance, many entrepreneurship educational programs and infrastructures developed by higher education organizations are classified/registered/certified by the INADEM according to the level of impact produced (e.g., university incubators and accelerators).

6.4.2.4 Incubators and Accelerators

With its integration of a national network of incubators and accelerators, INADEM tries to ensure solid entrepreneurial support, in particular for the different stages of the entrepreneurial process. For instance, INADEM's records show 196 basic incubators registered, including 24 high-impact incubators and 24 accelerators (INADEM 2014). The creation and operation of incubators across the country are an important factor in obtaining successful start-up rates. INADEM classifies these infrastructures into high-impact of basic-impact categories. In general, two models proposed by the Instituto Politécnico Nacional and the Tecnológico de Monterrey are examples of that.

6.4.2.5 Government

Over the past three decades, the Ministry of Economy has been responsible for the strategies associated with the creation and development of ventures. In the current Peña Nieto administration (2013–2018),[4] the main focus has been to foster economic development via innovation and new/established enterprises, with strategies in place to reinforce several elements of the Mexican entrepreneurial ecosystem, such as governmental supports, financing, entrepreneurial capabilities and culture, and technology. With this aim, this administration has created the National Institute of the Entrepreneur (INADEM), which is linked to the Ministry of Economy, as well as modifying existing legislation (e.g., education, foreign investment, telecommunications, tax system, and labor) to develop the entrepreneurial ecosystem.

During the Fox and Calderón administrations, the main program in support of entrepreneurship was the Small and Medium Enterprise Fund (Fondo PYME), an important advancement to improve entrepreneurial capabilities in Mexico managed by the Ministry of Economy between 2004 and 2012. During this time, many higher

[4] For further details, review Gobierno de los Estados Unidos Mexicanos (2013).

education organizations were important actors offering support via knowledge, experience, and networking. In the current Peña Nieto administration (2013–2018), two programs have been designed as the platform to encourage entrepreneurship: the Entrepreneurial Development Program (Programa de Desarrollo Empresarial) and the Entrepreneur and Financing Program (Programa de Emprendedores y Financiamiento). These mechanisms were introduced to improve entrepreneurial activity and increase the value of Mexican products and services (Secretaría de Economía 2016a, b, c). As a result, between 2004 and 2012, a total of 76,087 enterprises were created, with an employment generation of 395,674 and with the support of more than 32,015 million pesos (Fondo PyME 2016). Between 2014 and 2016, INADEM has invested more than 26,968 million pesos (El Financiero 2016).

6.4.3 The Role of Higher Education Organizations as Drivers of Entrepreneurship and Innovation Activities in Mexico

In the majority of socioeconomic scenarios, universities play a relevant role in entrepreneurial innovation processes, not only by reinforcing a governmental strategy to stimulate economic development (Hoskisson et al. 2000; Guerrero et al. 2015) but also by providing adequate environments in which the university community can develop innovative and entrepreneurial initiatives (Audretsch 2014; Guerrero et al. 2015). In this regard, several authors such as Guerrero and Urbano (2012), Urbano and Guerrero (2013), and Audretsch (2014) have shown the current higher education organizations' missions: education and training to community members, knowledge generation and transference, and fostering entrepreneurship and innovation.

In this regard, our previous section provides some insights into the relevant role and alignment of universities in the evolution of Mexican innovation and entrepreneurship ecosystems. Some of those insights have also been shown in previous studies about the interaction channels between universities and industry in Mexico (De Fuentes and Dutrénit 2012). However, in-depth analysis is still required of the efficiency/productivity relationships among the agents involved in both innovation and entrepreneurial ecosystems, particularly, how Mexican universities are facing their roles/strategies to drive entrepreneurial innovations. Nevertheless, we also need to take into account that in emerging economies, the participation of universities as the promoter of entrepreneurial innovations has been limited and it is not homogenous.

In the Mexican case, higher education organizations have a relevant presence in both innovation and entrepreneurship processes. According to INEGI (2015), there are 5739 higher education organizations, 443 research centers, and 21,259 business units in Mexico that provide other linked services, such as professional, scientific, and technical services. Unfortunately, not all those higher education organizations are working simultaneously toward the three missions (teaching, research, transference, and commercialization) or their transformation process. Only 10% of higher educa-

Pillar	US-Bay Area	US-Others Cities	United States	United Kingdom	Switzer-land	Ireland	Spain	Singapore	Pakistan	India	Australia	Mexico
Accessible Markets	92%	83%	86%	82%	89%	79%	67%	70%	78%	72%	71%	52%
Human Capital Workforce	93%	87%	90%	79%	67%	74%	90%	50%	92%	72%	79%	65%
Funding and Finance	91%	76%	82%	68%	61%	53%	43%	65%	22%	44%	67%	52%
Mentors/Advisers/Support Systems	91%	72%	79%	68%	56%	53%	29%	40%	58%	28%	54%	48%
Regulatory Framework/Infrastructure	67%	57%	61%	57%	61%	63%	48%	80%	31%	28%	54%	52%
Education and Training	80%	62%	70%	61%	61%	37%	62%	40%	39%	22%	33%	30%
Major Universities as Catalysts	88%	67%	75%	68%	67%	37%	38%	65%	22%	11%	38%	35%
Cultural Support	90%	64%	75%	50%	39%	42%	24%	40%	25%	17%	29%	22%
Average Score	86%	71%	77%	67%	63%	55%	50%	56%	46%	37%	53%	45%
Heat Map Key	Highest % of Respondents											
	Approximately Half % of Respondents											
	Lowest % of Respondents											

Fig. 6.4 Entrepreneurial ecosystem heat map by country. Pillars most important (World Economic Forum 2013, p. 13)

tion organizations and 17% of research centers are registered in the National Register for Scientific and Technological Organizations and Enterprises (CONACYT 2015c).

Applying the World Economic Forum benchmarking approach,[5] in comparison with other ecosystems from more advanced economies, Fig. 6.4 shows that the Mexican entrepreneurial ecosystem suffers from several deficits in the majority of the pillars, particularly, in cultural support, education/training, and universities such as catalysts of entrepreneurship (World Economic Forum 2013). Therefore, in order to develop human capital, generate knowledge, and foster innovative/entrepreneurial initiatives (Guerrero et al. 2015), Mexican higher education organizations need to introduce diversified support mechanisms (Bramwell and Wolfe 2008); to act proactively in the entrepreneurship innovation, enhancing links with all the agents involved in those ecosystems (Mian 1997; Etzkowitz 2003; Mueller 2007; Perkemann and Walsh 2007); and to generate more competitive collaborations for value creation (Chesbrough et al. 2006). Definitely, higher education organizations could bring competitive advantages (resources and capabilities) to drive entrepreneurship innovation activity in Mexico. Those competitive advantages could be encouraged by talent, human capital, incubators, accelerators, open innovation collaborations, generation and transference of knowledge, as well as value creation for socioeconomic development.

6.5 Conclusion

The analysis of the involvement of Mexican higher education organizations in innovation and entrepreneurship ecosystems reflects the existence of incentives to accomplish their triple mission but also a poor participation in the involvement of

[5] The World Economic Forum (2013) recognizes the importance to create and operate an entrepreneurial ecosystem as well as proposes some pillars to the growth/success of ventures such as accessible markets, human capital, funding, support systems, regulatory framework, education/training, and cultural support.

innovation and entrepreneurial activities. A plausible explanation is that the Mexican higher education system context is complex, diverse, and contrasting. In addition, the majority of Mexican higher education organizations are only attending to teaching, and only some of them are also focused on research. As a result, only a few universities are using their resources/capabilities to transform themselves into competitive organizations that contribute to the generation of talent and qualified people, higher-quality research, strong knowledge transfer and commercialization, and value creation (Amit and Schoemaker 1993; Barney 1991; Boyd 1991; Grant 1991; Wernerfelt 1984). Successful examples include the CINVESTAV, the IPN, the Tecnológico de Monterrey, and the UNAM.

Based on this evidence, the main implication of this chapter is oriented toward policy makers. Of course, the efforts made by CONACYT and the Ministry of Economy in the configuration of the Mexican innovation and entrepreneurship ecosystems are recognized. However, the obtained results are not sufficient due to the lack of participation among enterprises, higher education organizations, and research centers. It is necessary that each participant works together systematically and systemically, using an open innovation approach, to capitalize in a complementary way on each other's resources and capabilities to generate entrepreneurial innovation activity. Both the Ministries of Education and Economy must recognize the relevant role of universities and encourage, motivate, and involve universities in the development and implementation of innovation and entrepreneurship strategies.

This work only explores the role of higher education organizations in innovation and entrepreneurship activities. Therefore, this work also illuminates a good research opportunity to continue the exploration of this phenomenon using different theoretical/methodological approaches, particularly, to understand why Mexican higher education organizations are only attending to teaching and training activities; to identify which factors influence the main outcomes of innovation and entrepreneurship supporting programs; to recognize which are the best practices of most representative Mexican entrepreneurial universities to understand the reasons and factors that drive their success; and finally to determine which types of collaboration among production agents and knowledge agents are more adequate to stimulate economic development by government agencies.

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