

2. ACADEMIC ENTREPRENEURSHIP AS A PROCESS

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Abstract

Academic entrepreneurship is the process by which knowledge spills over from universities and other research institutions in order to be commercialised. Because the development of this process model requires a holistic and integrative perspective, the main objective of this chapter was to develop a process model of academic entrepreneurship. Based on a systematic review of academic literature data, 68 articles were selected, out of which 10 papers were further synthesized for the development of a process model so as to understand academic entrepreneurship. It was assumed that this entrepreneurial process consists of opportunities identification coming from university innovation that is perceived as a mechanism for knowledge spillover with regards to knowledge spillover theory of entrepreneurship. These opportunities are leveraged by the entrepreneurial resources and reconfigured to develop entrepreneurial competences according to the theory of entrepreneurship that consequently lead to knowledge and technology commercialisation. In this way, the proposed process model of academic entrepreneurship presents innovation as created in the university environment and driven by entrepreneurship to create value for knowledge-based economies.

Keywords: model of academic entrepreneurship, knowledge spillover theory of entrepreneurship, theory of entrepreneurship.

Introduction

In most of the literature studies, academic entrepreneurship (AE) covers a broad spectrum of different activities, mainly research and technology commercialisation via patenting, licensing, spin-offs and start-ups creations and university with industry and other stakeholders cooperation (Grimaldi, Kenney, Siegel, & Wright, 2011; Nicolau & Souitaris, 2016). In some scholarly studies, this scope is extended by contract research and consulting, as well as ad-hoc advice (D'Este & Patel,

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2007; Perkmann & Walsh, 2008; Wright, Clarysse, Lockett, & Knockert, 2008), teaching, joint publications with industry, staff exchange or joint student supervision (Schartinger, Rammer, Fischer, & Fröhlich, 2002). Abreu and Grinevich (2013) also recognize financial rewards from research or grant awards as forms of AE. Therefore, Klofsten and Jones-Evans (2000) define AE as any activity besides teaching and basic research (except for collaborative research with industry) that the authors classed as having equal status with those two.

Moreover, this term also refers to the efforts that universities undertake to generate revenues from a range of scientific research, or in other words, efforts to promote commercialisation within the university and in its surroundings hence, acting as a catalyst for their entrepreneurial activities (Siegel & Wright, 2015). Since the introduction of the Bayh-Dole Act in the United States and the Lisbon Strategy of the European Council, universities have experienced a shift from their traditional role in undertaking pure research and teaching, into being entrepreneurial. The idea that knowledge spawned via university research can be used for commercial applications led Etzkowitz (1983) to coin the term “entrepreneurial university” for describing the role that universities play in knowledge-based economies, and with time, entrepreneurial activities have become an integral part of university strategies (Rasmussen & Wright, 2015; Guerrero, Urbano, & Fayolle, 2016). At the same time, the discussion about interactions between academia, industry and government stressed the role of the triple helix paradigm in which the university plays an enhanced role in industrial innovation.

It has been recognized that academic institutional enhanced entrepreneurship can generate many benefits to universities, among others, access to industry laboratories and facilities, as well as know-how (Grimaldi & von Tunzelmann, 2002), opportunities for sponsored research, flow of funds from licensing and consulting, and donations from successful academic entrepreneurs (Quintas and Guy, 1995). Being entrepreneurial may also offer some advantages to academic scientists—such as increases in resources and reputational and societal benefits or greater satisfaction (Lam, 2010).

Since university research output is considered as a knowledge spillover source (Acs, Braunerhjelm, Audretsch, & Carlsson, 2009) that can be commercialised, Audretsch and Keilbach (2007) describe knowledge spillovers between parties of “incomplete commercialisation”, as a source of entrepreneurship. Consequently, building on the notion of knowledge spillovers, the theory of entrepreneurship and the endogenous growth theory, the knowledge spillover theory of entrepreneurship (KSTE) has been introduced. What distinguishes KSTE from other theories of entrepreneurship is that “the source of the entrepreneurial opportunities involves knowledge spillovers” (Shane, 2000). As argued by Acs and Sanders (2013), KSTE advances the microeconomic foundation of the endogenous growth theory by providing a new framework clarifying the unobserved heterogeneity of growth

rates between regions and nations. Romer (1990) assumed in the endogenous growth theory, that knowledge spills over automatically, while Audretsch, Keilbach and Lehmann (2006) and Acs and Sanders (2012) suggest that instead, the automatic spillover of knowledge is impeded by a knowledge filter, meaning all barriers that inhibit the conversion of knowledge produced in R&D laboratories into commercialised knowledge (e.g. legal restrictions and regulations). KSTE is also concentrated on variables that shape entrepreneurship, namely, research organizations and incumbent firms (i.e. knowledge incubators) that create knowledge but are not fully commercialised, a variables shaping knowledge spillover to other economic agents—entrepreneurs.

According to Friedman and Silberman (2003), AE is not a single event, but rather a continuous process comprised of a series of events that leads to sustainable and ongoing revenue generation for universities, research institutions and their industry partners. Therefore, consistent with this statement and KSTE, in this chapter, academic entrepreneurship is defined as a process, during which knowledge spills over from universities and other research institutions in order to be commercialised through mechanisms such as academic start-ups, spin-offs, university patents, licensing, sold technologies and other forms of university-industry collaborations—including consulting and contract research (Lockett & Wright, 2005; Phan & Siegel, 2006; Siegel, Veugelers, & Wright, 2007; Fini, Lacetera, & Shane, 2010; Grimaldi et al., 2011). Because the development of a multi-stage process model that recognizes the key actors, activities and successful drivers requires a holistic and integrative perspective and the literature on AE is rather fragmented (Wood, 2011), the main objective of this chapter was to develop a process model of academic entrepreneurship based on systematic literature studies. This process model is embedded in the theory of entrepreneurship and KSTE and, accordingly, explains entrepreneurial value creation through “entrepreneurial intention and the discovery of entrepreneurial opportunities”, to develop “entrepreneurial competences and the appropriation of the entrepreneurial reward” (Mishra & Zachary, 2014).

Building upon this assumption, this chapter was organized as follows. In section 2, a conceptual framework was laid out that is followed by a description of the applied method. In section 3, “the discovery of entrepreneurial opportunities” was discussed, taking into account motivations and intentions of academic community to AE, as well as university innovations as a source of entrepreneurial opportunities. Section 4 provides an overview of the entrepreneurial competences and different forms of knowledge and technology transfer and research commercialisation. Section 5 summarizes all the other sections and presents a process model of academic entrepreneurship as well as conclusions.

2.1. Conceptual framework

Academic entrepreneurship is seen as a mechanism by which faculty members and (in some literature sources) also students, technicians and alumni (Chrisman, Hynes, & Fraser, 1995) convert scientific information into products and services. As it was described before, this corresponds with the commercialisation process. Throughout this chapter, only faculty members are considered as the key unit of observation. According to Balven, Fenters, Siegel and Waldman (2018), this term refers to all academic scientists and engineers who are engaged in university research. The role of other individuals, including the staff of knowledge transfer intermediary organizations, is also taken into consideration, as faculty member relationships with such individuals represent the most basic level at which decisions to engage in AE are made. Moreover, only formal technology transfer is discussed wherein faculty members officially disclose their inventions to the university, e.g. via technology transfer offices. Since, the definitions of entrepreneurship often comprise individuals, opportunities, context and the process over time (Rasmussen, 2009), academic entrepreneurship can also be seen as a process. In this process, research-based idea or opportunity leads academics to create the necessary properties for direct or indirect commercialisation.

Among various forms of academic entrepreneurship, that which often is directly related to the process approach, is the establishment of academic spin-offs and start-ups. Firms that use university derived innovations, started or co-founded by faculty members, also have the greatest impact on economic growth. Based on Lockett, Siegel, Wright and Ensley (2005), in such ventures, knowledge understood as intellectual property (scientific and technical knowledge), as well as organizational knowledge, have become key resources. Therefore, most of the attention applied in this process model of academic entrepreneurship development is directed towards the process of spin-off formation. Still, better understanding of the AE process requires holistic perspectives in which other forms of AE are taken into account, so as to develop a multi-stage process model that identifies the key actors and activities (Wood, 2011). As such, the proposed process model of academic entrepreneurship presents university generated innovations (as driven by entrepreneurship) becoming crucial engines in driving change processes in the society, while at the same time this entrepreneurship is becoming a mechanism “through which temporal and spatial inefficiencies in an economy are discovered and mitigated” (Shane & Venkataraman, 2000).

2.2. Research method

To explore the process model of AE conceptually, a systematic review of academic literature was undertaken in the manner put forward by Petticrew and

Roberts (2006). In the first step, a scientific literature repository search using keywords was carried out and subsequently expanded from the resulting articles, conference proceedings and book chapters, to their reference lists and citations to identify further articles. The focus was on those articles that explicitly used the terms: “academic entrepreneurship”, “technology transfer”, “entrepreneurial university”, “university spin-offs”, “academic spin-offs”, “knowledge transfer”, “commercialisation”. In step 2, the resulting 718 articles from the Scopus database were scrutinized using the following inclusion criteria: the publication had to be a peer-reviewed academic paper in the field of business, management and accounting; social sciences and economics, econometrics and finance studies, as well as thematically oriented to academic entrepreneurship. Abstract reading resulted in an initial selection of 178 papers, of which 52 articles were included into step 3 that involved “forward and backward citation snowballing”. Thus, 68 articles formed the material for systematic review, out of which 10 papers were synthesized for the development of the process model of AE (Table 2.1).

Table 2.1. Papers selected for the development of the process model of academic entrepreneurship

Author	Model type	Stages included in the model	Reference to the theory
Ndonzuau, Pirnay, & Surlemont, (2002)	graphical, descriptive, spin-off formation model	generation of business ideas from research—finalization of new venture projects out of ideas—launch of spin-off firms from projects—the creation of economic value by spin-off firms	did not mentioned
Rasmussen (2009)	graphical, descriptive, spin-off formation model	development of a technology or business opportunity from being an idea to becoming an independent new venture—individual entrepreneur in the business development process—institutional context (university)—university spin-offs	process theories
Rasmussen (2011)	graphical, descriptive, spin-off formation model	research—opportunity framing—proof of viability—post start-up	process theories
Wood (2011)	descriptive, AE as a commercialisation process model	innovation disclosure and intellectual property protection stage—awareness and securing industry partnerships stage—commercialisation mechanism selection stage—commercialisation stage	theory of the growth of the firm
Secundo and Elia (2014)	graphical, descriptive, input-output model	design and implementation of research based, innovation oriented and entrepreneurial capital initiatives—opportunity recognition and elaboration of inventive concept—early stage technology development—product and service development and commercialisation—profit and harvesting	did not mentioned

Table 2.1 – cont.

Author	Model type	Stages included in the model	Reference to the theory
Simmons and Hornsby (2014)	graphical, descriptive, stage based model	motivation—governance—mode selection—competition—performance	agency theory, transaction costs theory, network theory
Backs, Günther and Stummer (2019)	descriptive, agent-based model of spin-off out of patent formation	invention—patenting—spin-off companies	did not mentioned
Del Bosco, Chierici and Mazzucchelli (2019)	descriptive, spin-off formation model	innovation development, including intangible intellectual properties transformation into patents, prototypes, or tangible properties—venture creation and development, including selection of the new startup entrepreneurial team members, access to additional financial resources and business development support by technology transfer intermediary organization	did not mentioned
Shepherd and Gruber (2020)	graphical, descriptive, lean start-up formation model	finding and prioritizing opportunities—designing business models—validated learning—building minimum viable products—preserve or pivot	social theory
Thomas, Bliemel, Shippam and Maine (2020)	graphical, descriptive, spin-off formation model	invention—entrepreneurial capabilities pre-formation: technology-market matching, claiming and protecting the invention, attracting and mentoring the founding team, strategic timing—science commercialisation—science-based spin-off formation	dynamic capabilities theory

Source: Own work.

2.3. The discovery of entrepreneurial opportunities

The traditional role of universities was attributed to education, basic research and knowledge promotion. Although these are still central parts of the university mission, but in recent years, there has been increasing pressure on universities, to shift from mainly teaching and performing research, to add and equivocal Third Mission (TM) meaning contributing to society (Wissema, 2009). From a general point of view, it consists of wide-ranging concepts such as “entrepreneurial university”, “technology transfer” and “Triple Helix Model (THM) partnerships” (Trencher, Yarime, McCormick, Doll, & Kraines, 2014). On the other, the Third Mission refers to an extensive array of Higher Education Institutions (HEI) activities which seek to transfer knowledge to society in general, as well as to promote entrepreneurial skills, innovation and social welfare (Compagnucci & Spigarelli, 2020).

Because of the universities' third mission, academics are facing a new phenomenon of linking their work more closely to economic needs and to becoming important engines for development and economic growth. Therefore, some academic scientists commit to spin-off and start-up creation, some chose less entrepreneurial paths like licensing or patenting and some tend to remain in their traditional occupational choices as full-time scientists (Bercovitz & Feldman, 2008). It was therefore recognized that only some faculty members driven by entrepreneurial intention or/and aspiration for entrepreneurial reward, are actively interested in commercialisation.

D'Este and Perkmann (2011) found four motivations for researchers to engage in AE activities: commercial exploitation of science; gaining new insights and receiving feedback on research through engagement with industry; access to private funding; and access to external resources such as industry-provided equipment, materials and data. Thus, academics involved in AE may not be motivated primarily by an entrepreneurial vision to maximise profits. Fini, Grimaldi and Sobrero (2009) argue that the most important incentive for AE is the enhancement of academic status, but, Guerrero and Urbano (2014) suggest that there are other relevant motivational factors, namely, attitude towards entrepreneurship and perceived behavioral control (ease or difficulty of becoming an entrepreneur), that acts as knowledge filters from the individual perspective of the KSTE. Similarly, Lam (2011) emphasized the importance of the scientist's intrinsic motivation for AE, as some might become "barriers inhibiting the conversion of knowledge produced in R&D laboratories of incumbent firms and in universities into commercialised knowledge" (Ghio, Guerini, Lehmann, & Rossi-Lamastra, 2015, pp. 9–10).

Clarysse, Tartari and Salter (2011) argue that the key predictors of academic scientists' entrepreneurial engagement are the individual-level attributes and prior experience. Other studies highlighted the importance of demographic factors, like age (ambiguous effect on collaboration with business partners), gender (male academics are significantly more likely to engage with industry) and seniority (positively related to collaboration) (Perkmann et al., 2013). Hence, deeper understanding of these individual characteristics determines different AE approaches. Würmseher (2017) assumes that some scientists prefer to become entrepreneurs and refers it to "the inventor entrepreneur model", while some prefer to let go of their inventions to others interested in their commercialisation ("the surrogate entrepreneur model"). There is also an intermediate model, which the author calls "founding angel model", where inventors cooperate with other co-founders who provide finance, new venture experience, networking or technological knowledge (Festel, Breitenmoser, Würmseher, & Kratzer, 2015). According to Shane (2004), "the inventor entrepreneur model" is the most common in practice, which in fact assumes that the inventor becomes an entrepreneur (O'Shea, Chugh, & Allen,

2008; Kenney & Patton, 2009). Based on Jensen and Thursby (2001), an academic entrepreneur is someone engaged in formal commercialisation activities that often lead to patent creation, license sales or the derivation of new venture. However, Meyer (2003) and Bicknell, Francis-Smythe and Arthur (2010) assume that some faculty members participate in a wider range of engagements, such as collaboration with industry e.g. by consulting, and so recognize them as entrepreneurial academics that are often driven by the research related motivations described above, but who are not primarily motivated by an entrepreneurial vision to maximize profits.

All motivational factors are captured by entrepreneurial intentions that influence behaviour. Miranda, Chamorro-Mera and Rubio (2017), based on studies in Spanish universities and relying on the theories of planned behaviour, found entrepreneurial intentions as the key to understanding the first step in the AE process. As indicated by Bird (1988), entrepreneurial intentions are the most proximal predictors of the decision to become an entrepreneur, and as Krueger, Reilly and Carsrud (2000) add, even if someone may have potential, he or she will refrain from making the transition into entrepreneurship when he or she lacks the intentions. As antecedents of the AE construct, Miranda and others (2017) consider creativity, perceived utility (e.g. the income anticipated, the amount of work effort anticipated to achieve this income, the risk involved), self-confidence, previous business experience, entrepreneurship training and the perception of an enabling environment for entrepreneurship. Prodan and Drnovsek (2010) found that entrepreneurial self-efficacy, type of research, perceived role models, number of years spent at an academic institution and the number of patents generated are significantly related to the formation of academic entrepreneurial intentions.

For knowledge or technology-based AE, the opportunity for any kind of AE activities is usually recognized in knowledge or technology that potentially can be developed into highly innovative products or services. D'Este, Mahdi, Neely and Rentocchini (2012) suggest that the creation of such opportunity is driven by scientific excellence. Hence, according to Wood (2009, p. 930), university research can lead to new innovations defined as “any invention, new technology, idea, product, or process that has been discovered through university research that has the potential to be put to commercial use”, and in his subsequent paper (Wood, 2011), argues that the AE process just starts with university derived innovations and scientific discoveries. Therefore, university-origin innovation as entrepreneurial opportunity is assumed as the first step in the presented process model of academic entrepreneurship, and, referring to Acs et al. (2009), the use of university-produced innovation is a mechanism for knowledge spillover with regards to KSTE, in which, as described above, some academics motivations act as knowledge filters (Figure 2.1).

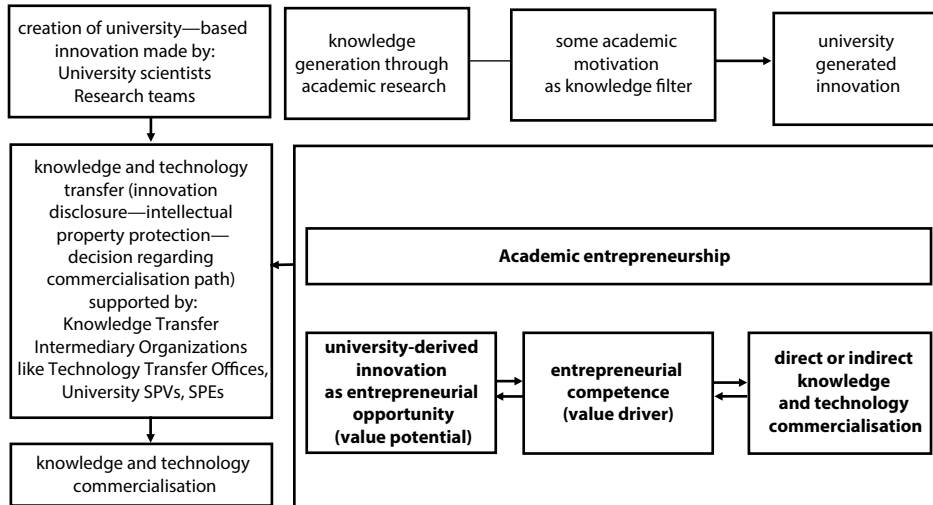


Figure 2.1. The process model of academic entrepreneurship during which knowledge spills over from universities in order to be commercialised

Source: Own work.

2.4. The entrepreneurial competences as value drivers

Relying on the theory of entrepreneurship, the entrepreneur discovers an opportunity that is leveraged by the entrepreneurial resources and reconfigured to develop entrepreneurial competences (Mishra & Zachary, 2015). Rasmussen and others (2015) described three competences required to succeed in new academic venture creation. First—identification and development of an opportunity (opportunity development competency). Second—the need for championing individuals that provide business, managerial expertise and energy to the entrepreneurial process (championing competency). Third—the need to access the resources for commercial exploitation of the opportunity (resource acquisition competency). Other prior studies have focused on scientists commitment to AE and their entrepreneurs' attributes such as risk-taking, opportunity recognition, the ability to identify market potential of their research output, creativity, perseverance, expertise knowledge, team building skills, ability to organize financial resources and technical facilities, ability of customer needs analysis, networks building and self-confidence of the members of the scientific team (Clarysse et al., 2011; Morris, Webb, Fu, & Singhal, 2013; Soetanto & Jack, 2016; Wang, Soetanto, Cai, & Munir, 2021).

At this point, however, it should be noted that a vast number of literature studies emphasize that the entrepreneurial opportunity recognition is not only attributed

to the scientist himself, but, very often is dependent on commercial expertise, networking between science and industry or management of the university intellectual property provided by different knowledge transfer intermediary organizations such as technology transfer offices (TTO), special purpose vehicles (SPVs) or special purpose entities (SPEs), science and technology parks or university business incubators (Agrawal, 2006; Shane, 2004; Rasmussen, Mosey, & Wright, 2011). In addition, other competences can be supplemented by knowledge transfer intermediary organizations, especially complementary resources needed for commercial exploitation of opportunity like laboratory equipment, office space, information technology infrastructure or access to financial resources. Szulczewska-Remi and Nowak-Mizgalska (2021), in the aforementioned work, based on Polish and Czech studies, showed that other entrepreneurial competences are provided by these intuitions, mainly evaluation of an invention's commercialisation potential, team building and business model development.

2.5. Knowledge and science commercialisation

Commercialisation of research results is a derivative of university-based innovation and a multidimensional process that enables the innovator (the creator of innovation) to achieve economic benefits from the implementation of scientific research results into business practice. In-depth recognition of the inventions' advantages and assessment of its market potential are indispensable elements of the commercialisation process. Therefore, commercialisation is a process where innovation flow from the basic research to commercial entities and then to public use (Van Norman & Eisenkot, 2017). Moreover, commercialisation occurs via academic entrepreneurship with the objective to commercially exploit an invention, or in some cases, a body of expertise (Shane, 2004).

To support commercialisation, higher education institutions have established two ways of commercialisation through direct (setting up Technology Transfer Offices that, for example, assist in gaining a patent and/or license for the developed solution or arrange different forms of university-industry collaborations like consulting) or indirect commercialisation (creating a company that was founded by inventors coming from the same scientific institution in a form of spin-off or start-up through the support of Special Purpose Vehicles (SPVs) or Special Purpose Entities (SPEs)) (Szulczewska-Remi, 2016). As noted earlier, universities establish Technology Transfer Offices, SPVs or SPEs to manage the commercialisation of intellectual property arising from the faculty research. Academics, who wish to patent, licence, or form a new company formally disclose their inventions in order to start the process of intellectual property protection (e.g. patent application), while technology transfer organizations very often advise on the selection of the

commercialisation path (selling the outcome of research, grant licensing of R&D outcomes or making contributions of research to the firms). The entrepreneurial impact of university sourced innovations is further measured as a result of commercialisation process in terms of number of patents and/or corresponding licensing agreements, contracts with industry or spin-off/start-up companies (Figure 2.1).

The World Bank's report on the prospects for the development of the knowledge-based economy in Poland indicates that also in our country it has become important to establish universities' units dedicated to the commercialisation of technologies (Goldberg, 2004). As noted, the role of intermediary organizations is systematically growing, and their importance is emphasized by all the most important strategic documents in the country (Bąkowski & Mażewska, 2015; Byczko & Trzmielak, 2013).

2.6. The process model of academic entrepreneurship

Applying the AE definition proposed in this study, AE is seen as a process that may serve to moderate the impact of university derived innovation (input) on knowledge and technology commercialisation outputs consistent with Secundo and Elia (2014) input-output model for AE. With regards to KSTE, the university-introduced innovation is a mechanism for knowledge spillover and some academic motivations act as knowledge filters in the creation of university-born innovation, while some are captured by entrepreneurial intentions. Although Simmons and Hornsby (2014) have introduced a stage based model of AE, in which individual faculty members, university, industry and government motivations are seen as the first stage in this process, according to most references found when researching for this model development (Ndonzuau et al., 2002; Rasmussen, 2009; Rasmussen, 2011; Wood, 2011; Secundo & Elia, 2014; Thomas et al., 2020), university-sourced innovation alone initiates the process of AE.

As was stated before, this entrepreneurial process involves the identification of opportunities from university initiated innovation (step 1) and matching the entrepreneurial resources at hand with the opportunity to effectuate an entrepreneurial competence (step 2); acquiring external resources, if necessary; creating sustained value through the commercialisation and as was suggested by Ndonzuau and others (2002) in their four-stages spin-off process, strengthening the economic value. In this manner, AE is recognized as a process of value creation explaining the transformation of academic research into value creation. The process is driven by the entrepreneurial intentions and entrepreneurial capabilities described by Thomas and others (2020). In turn, entrepreneurial capital resources include knowledge capital, social capital or tangible capital (financial and physical assets)

(Mishra & Zachary, 2015), very often provided by a technology transfer intermediary organization.

Del Bosco et al. (2019) in their spin-off model based on Italian case-studies, described the role of technology transfer intermediary organization. Similarly, Backs et al. (2019) introduces two agents: researcher and technology transfer office, which are involved in the spin-off of the patenting process. Moreover, Shepherd and Gruber (2020) propose a lean start-up formation model, in which business model and minimum viable product formation were included, besides opportunity recognition and entrepreneurial search. Therefore, the proposed process model of academic entrepreneurship covers the discovery of opportunities from university-derived innovation that has potential value wherein in the second stage, entrepreneurial competences drive the value creation and lead to knowledge and technology commercialisation. This model presents academic entrepreneurship as a process that enables (Padilla-Meléndez, Del Aguila-Obra, & Locket, 2012) knowledge spillover through knowledge creation, knowledge transfer and knowledge commercialisation (Guereo & Urbano, 2014) (Table 2.1 and Figure 2.1). Moreover, academic entrepreneurship refers to the efforts and activities that universities undertake in the hope of commercialising the outcomes of HEI research (Wood, 2011). Accordingly, it relates to the transition from the known “ivory tower” to the entrepreneurial university (Etzkowitz, Webster, Gebhardt, & Terra, 2000).

Conclusions

Innovations stemming from university research are a growing source for the ideas and new technologies that drive entrepreneurial endeavors through academic entrepreneurship. For the purpose of this chapter, academic entrepreneurship was defined as a process during which knowledge spills over from universities and other research institutions in order to be commercialised through mechanisms such as academic start-ups, spin-offs, university patents, licensing, sold technologies and other forms of university-industry collaborations, including consulting and contract research. Still, the process of AE has not been well articulated, thus, based on selected academic papers, the process model of AE was developed and presented graphically.

This entrepreneurial process creates sustained value through the identification of opportunities from university-based innovation that is perceived as a mechanism for knowledge spillover with regards to KSTE. Building on the theory of entrepreneurship, these opportunities are leveraged by the entrepreneurial resources and reconfigured to develop entrepreneurial competences that drive value creation and lead to knowledge and technology commercialisation.

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