

Academic Entrepreneurship and Technological Innovation: A Business Management Perspective

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A volume in the Advances in Educational
Marketing, Administration, and
Leadership (AEMAL) Book Series

Information Science
REFERENCE

An Imprint of IGI Global

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Published in the United States of America by
 Information Science Reference (an imprint of IGI Global)
 701 E. Chocolate Avenue
 Hershey PA 17033
 Tel: 717-533-8845
 Fax: 717-533-8661
 E-mail: cust@igi-global.com
 Web site: <http://www.igi-global.com>

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Library of Congress Cataloging-in-Publication Data

Academic entrepreneurship and technological innovation : a business management perspective / Anna Szopa, Waldemar Karwowski, and Patricia Ordonez de Pablos, editors.

p. cm.

Includes bibliographical references and index.

Summary: "This book provides a wide-ranging overview of the relationship between universities and organizations through the most recent and detailed research on university entrepreneurship"--Provided by publisher.

ISBN 978-1-4666-2116-9 (hardcover) -- ISBN 978-1-4666-2117-6 (ebook) -- ISBN 978-1-4666-2118-3 (print & perpetual access) 1. Academic-industrial collaboration. 2. Technology transfer--Economic aspects. 3. Entrepreneurship. I. Szopa, Anna, 1982- II. Karwowski, Waldemar, 1953- III. Ordsqez de Pablos, Patricia, 1975-

LC1085.A26 2013

378.1'035--dc23

2012013147

This book is published in the IGI Global book series Advances in Educational Marketing, Administration, and Leadership (AEMAL) (ISSN: 2326-9022; eISSN: 2326-9030)

British Cataloguing in Publication Data

A Cataloguing in Publication record for this book is available from the British Library.

All work contributed to this book is new, previously-unpublished material. The views expressed in this book are those of the authors, but not necessarily of the publisher.

Chapter 1

Introduction to Academic Entrepreneurship

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ABSTRACT

The aim of the chapter is to provide practitioners and researchers, who wish to investigate academic entrepreneurship in details, with the basic characteristics of the phenomenon as an introduction to further exploration. As university entrepreneurship is rooted in the broader entrepreneurship theory, the investigation encompassed a set of definitions, types, and processes pertaining to both industrial and academic context. It also provides an examination into the effectiveness of the policy-driven approach in enhancing academic entrepreneurship. This study has been conducted on the basis of the literature review and inductive argumentation, leading to the formulation of a conceptual framework for university entrepreneurship. The key finding is that although the classic forms of academic entrepreneurship, such as organizational creation, renewal, and innovation fit to the academic context, they are not sufficient to reflect the variety of all the forms. In turn, a new definition of university entrepreneurship is provided.

INTRODUCTION

According to the 3 stage model of growth proposed in The Global Competitiveness Report 2008–2009 the most developed countries depend on innovation and business sophistication as the key factors of economic competitiveness (Porter & Schwab, 2008). Because of the role of knowledge in the contemporary innovation-driven

economies, universities become more like regional engines of innovation. Therefore, it is increasingly expected that they should perform other tasks besides teaching and research (Laukkanen, 2003, p.372; Goldstein, 2010). In turn, academic entrepreneurship has an increasing importance in the context of economic development or, better, sustainable development, and becomes a crucial issue to explore.

DOI: 10.4018/978-1-4666-2116-9.ch001

The purpose of this chapter is to examine the leadership role of academic entrepreneurship in the process of creating economic value. Especially, the issue pertaining to the key elements linking academic entrepreneurship with economic growth which should be resolved. Thus, what are the forms of academic entrepreneurship? What are the components of the comprehensive framework of the phenomenon? What are the outcomes of university entrepreneurship? What factors are influencing it? Which of them are facilitators, and which are impediments?

In order to answer those questions, and to provide practitioners and researchers, who wish to explore academic entrepreneurship in details, with the basic characteristic of the phenomenon, the investigation encompassed a set of definitions, types, factors and processes, pertaining to both industrial and academic context, as university entrepreneurship is rooted in the broader entrepreneurship theory. Also, the effectiveness of a policy-driven approach in enhancing academic entrepreneurship has been examined. The study has been conducted on the basis of the literature review and inductive argumentation.

BACKGROUND

The exploration of the basic issues characterizing academic entrepreneurship, in particular the definition, evolution and research fields, forms the background for detailed analysis of the phenomenon, and helps to understand the contemporary relations between academia and business.

Since the term entrepreneur was used probably for the first time about two centuries ago, many definitions of entrepreneurs and entrepreneurship appeared in the discourse, causing confusion and concern (Drucker, 2007, p.19; Storey & Greene, 2010, p. 15-29; Kuratko & Hodgetts 1992, p.3-27; Sharma & Chrisman, 1999). It is appropriate to recall at least a few of them in order to define and understand academic entrepreneurship.

Entrepreneur is a word derived from French *entreprendre* and means “to undertake.” In the classic form entrepreneur is an individual who founds a new company, which is not necessarily based on innovation or a new idea (Sundbo, 2003, p. 22). In contrast, for Schumpeter (1982) it was an innovation that was essential in entrepreneurial activity. Today this approach has changed. There are two necessary (but not sufficient) conditions for entrepreneurship to appear (Storey & Greene, 2010, p. 15-29):

- **Uncertainty:** A situation when knowledge or information about the future is imperfect,
- **Arbitrage:** A situation in which it is possible to take advantage of a price difference (a) between markets (spatial arbitrage), or (b) in periods of time (temporal arbitrage).

Those suggestions fit well to the definition given by Kuratko and Hodgetts, for whom the entrepreneur is:

A catalyst for economic change who uses purposeful searching, careful planning, and sound judgment in carrying out the entrepreneurial process. Uniquely optimistic and committed (...) works creatively to establish new resources or endow old ones with a new capacity, all for the purpose of creating wealth. (Kuratko & Hodgetts, 1992, p. 27)

According to Bercovitz and Feldman (2006, p.175) the phrase “entrepreneurial university” has been coined by Etzkowitz (1983) to describe the changes in relations between universities and business organizations. However, in order to state what is academic entrepreneurship Brennan et al. (2005, p.307) refer to the definitions of entrepreneurship and entrepreneurs given by Sharma and Chrisman (1999), who claim that entrepreneurship is formed by the “acts of organizational creation, renewal, or innovation that occur within or outside an existing organization,” and entrepreneurs are “individuals

or groups of individuals, acting independently or as a part of corporate system, who create new organizations, or instigate renewal or innovation within an existing organization” (p.18). The wider recognition of this definition by the research community (Meyer et al., 2002; Storey & Greene, 2010) acknowledges legitimacy of applying it to the academic context. It fits into the three meanings of academic entrepreneurship presented by Laukkanen (2003), which are: “a general proactive disposition, a trait syndrome of a person, or a wealth-creating business activity, manifested in starting, owning and managing firms” (p.374). It also incorporates the form of corporate entrepreneurship or intrapreneurship (Sundbo, 2003, p.122-124; Kuratko & Hodgetts, 1992, p. 94-120), and the Schumpeterian innovation requirement but not necessarily as an essential component. On the other hand, sometimes the understanding of academic entrepreneurship is being narrowed to a certain type of created organization, which is mainly a spinoff (Shane, 2004; Birley, 2002).

Although the definitions explain what academic entrepreneurship is, they say nothing of its origins, evolution and research field which are necessary to capture the core idea of the phenomenon. This should be explained on the basis of two major concepts - professional science and entrepreneurship as such, because a combination of these concepts stands behind the phrase “entrepreneurial university.”

Professional science and entrepreneurship appeared in the period which Tofler (1989) calls the Second Wave. Professional science, in its beginning, was more like a “gentlemanly activity undertaken by disinterested amateurs” before it turned into “a profession devoted to the discovery of scientific truths” (Etzkowitz, 1983, p.204). This shift started in the seventeenth century and refers to the modern understanding of science. However, the very roots of the phenomenon could be found in ancient Greece, where the Sophists were maybe the first “scientists” teaching for money (Tatarkiewicz, 2009, p.72-73).

The concept of entrepreneur was discovered by the French economist J.B. Say around 1800 (Drucker, 2007, p. 19). By the end of the XIX century it was developed into a first theory of innovation and entrepreneurship by the French sociologist G. Tarde, who wanted to explain all social change with the innovation concept. Later, in the beginning of XX century, it was used in the economic theory of the Austrian-American economist J. Schumpeter. This was the moment when innovation and entrepreneurship became widely recognized (Sundbo, 2003, p. 48-56).

The evolution of the mutual relations that universities and scientists had with enterprises is in fact partly depicted by their forms. The following examples, in which factual order of appearance is not well documented and certain, support this conclusion (Etzkowitz, 1983; Sundbo, 2003, p. 60-62):

- Few scientists have individual contacts with entrepreneurs or government supporting their research,
- The idea of a research laboratory is copied by other universities, government supports research in such laboratories and helps with contacts between scientists and entrepreneurs,
- Financial support of research from sources external to the university becomes a standard,
- Many scientists have individual contacts with entrepreneurs or government supporting their particular research projects,
- Applied research is conducted by groups of scientists, the research is financed or co-financed by business organizations, government or foundations,
- Contracts and grants from the government, administrated by universities as institutions and by professors through academic research institutes,
- Scientists are hired by enterprises to conduct industrial research,

Table 1. Academic entrepreneurship components and research fields

Stages	Components of academic entrepreneurship	Research stream
I	A competence of technology-based firms is based on specialist knowledge	A) Technology-based firms;
	Academic credibility concerning innovation is determined by the discipline context	B) Role of the universities in society;
	Organizational knowledge capital and individual capital are being increasingly recognized by universities	C) Commercialization of discipline knowledge;
II	Universities create, support or own science, engineering and technology-based firms	A) Technology-based firms; B) Role of the universities in society;
	Universities commercialize organizational knowledge	B) Role of the universities in society; C) Commercialization of discipline knowledge;
	Engagement of academics with technology-based firms independent of the host universities	A) Technology-based firms; C) Commercialization of discipline knowledge;
III	Balance between scientific research in a discipline and the transfer of technology and exploitation of intellectual capital through technology-based firms;	A) Technology-based firms; B) Role of the universities in society; C) Commercialization of discipline knowledge;

Source: adapted from Brennan et. al. 2005, p. 310-311.

- Scientists start up their own scientific firms to conduct research and commercialize research results outside of the university or the former firm.

Brennan et. al (2005) indicated seven components of academic entrepreneurship, based mainly on three distinct but interrelated fields of research, such as technology-based firms, the role of the universities in society, and the commercialization of discipline knowledge. Regrouping these components (Table 1) shows, that on the one hand the line between them is blurred, but on the other that all together they create a coherent picture of academic entrepreneurship evolution stages with its initial (I), interim (II) and mature (III) forms.

The more general and recently updated research streams concerning academic entrepreneurship, which emerged in the literature between 1980 and 2005, encompass entrepreneurial research universities, productivity of technology transfer offices (TTOs, or industrial liaison office – ILO as in Jonas-Evans, 1998), new firm creation and environmental contexts including networks of innovation (Rothaermel et al. 2007).

A glance at definitions, evolution and research streams concerning entrepreneurship in the uni-

versity context pointed out several fields to be explored in details, in order to capture the leadership role of academic entrepreneurship in the process of creating economic value. Those components of entrepreneurship cover organizational creation, renewal and innovation. Exploration of those fields will lead to the extension of characteristics of in university research and technology commercialization.

CLASSIC FORMS OF ENTREPRENEURSHIP AND THEIR ACADEMIC CONTEXT

There are three main processes of entrepreneurship, related to the acts constituting this phenomenon, which apply to academic context (Brennan et. al, 2005, p.312):

- **Opportunity Seeking:** Based on the acts of organizational creation and venturing.
- **Advantage Seeking:** Focused on organizational renewal.
- **Novelty Seeking:** Directed at innovation implementation.

Each of them has been researched in a twofold manner. One has been based on the corporate setting studies, the other in turn, on the university setting. A comprehensive research overview of both streams exceeds the capacity and purpose of this chapter and book. Due to the abundance of research on organizational creation, renewal and innovation pertaining to the first manner, and modest literature devoted to the second area, only chosen issues have been presented. The intention was to provide the reader with basic knowledge and signalize the fields for further exploration.

Organizational Creation and Venturing

Gartner (1985, p. 697) defines new venture creation as the organizing of new organizations, but refers to Weickian understanding of organizing which is “to assemble ongoing interdependent actions into sensible sequences that generate sensible outcomes” (Weick, 1979, p. 3). For Van de Ven et al. (1984) it is “a collective, network-building achievement that centers on the inception, diffusion, and adoption of a set of ideas among a group of people who become sufficiently committed to these ideas and transform them into a social institution” (p. 95). The first one emphasizes that it is a process, while the second one states that creating an organization involves the development of both, ideas and relationships. Alternatively, it may be perceived as an effort by a group of people, who are pursuing common goals, to harmonize their cooperation and assets, in a standardized, formalized and/or institutionalized form.

Several types of new ventures creation were identified in the literature. One of the basic classifications suggests the division to (Gartner, 1985, p. 698):

- An independent entity,
- A new profit center within a company which has other established businesses, or

- A joint venture, if the following criteria have been met: (a) its founders acquired expertise in products, process, market and/or technology, (b) expected period of results to appear exceeds a year, (c) competitors consider it as a new market entrant, and (d) potential customers regard it as a new source of supply.

However, Zajac et al. (1991) distinguish several types of joint ventures, such as traditional joint ventures, internal corporate venturing, and internal corporate joint ventures.

Also, some more comprehensive frameworks can be found in the literature. Gartner (1985) claims, that creation of a new venture is a multidimensional phenomenon, thus describing the phenomenon cannot embrace a single dimension only. Rather, it should encompass four interrelated dimensions, such as: individual(s), organization, environment and new venture process. Each of them is characterized by several variables (Table 2).

The last dimension pertains to the process of new venture creation, which in turn has been deeply explored by Bartunek and Betters-Reed (1987). They proposed a model of the process of organizational creation, consisting of three stages - first ideas, commitment and early planning, and implementation (Table 3).

Presented frameworks are complementary, rather than contrasting. Together they give a basic picture of the phenomenon.

Supplemental issues, important especially from the managers' perspective, are the strategies applied in the organizational creation process, especially adequateness of applying traditional strategy typologies in the new ventures has been questioned (Williams & Lee, 2009; Carter, et al. 1994). For instance Carter et al. (1994) revealed six generic strategy archetypes, such as:

Table 2. Gartner's dimensions of organizational venturing

Dimensions	Characteristic
Individual(s)	<ul style="list-style-type: none"> • Psychological characteristics (the need for achievement; locus of control; risk taking propensity), • Background, experience, and attitudes (job satisfaction; previous work experience; entrepreneurial parents; age; education),
Organization	<ul style="list-style-type: none"> • Competitive strategies (overall cost leadership, differentiation or focus), • Competitive entry wedges (the new product or service; parallel competition; franchise entry; geographical transfer; supply shortage; tapping unutilized resources; customer contract; becoming a second source; joint ventures; licensing; market relinquishment; sell off of division; favored purchasing by government; governmental rule changes),
Environment	<ul style="list-style-type: none"> • Factors stimulating entrepreneurship (venture capital availability; presence of experienced entrepreneurs; technically skilled labor force; accessibility of suppliers; accessibility of customers or new markets; governmental influences; proximity of universities; availability of land or facilities; accessibility of transportation; attitude of the area population; availability of supporting services; living conditions), • Characteristics of the area (high occupational and industrial differentiation; high percentages of recent immigrants in the population; a large industrial base; larger size urban areas; and availability of financial resources) and • Porter's Five Forces (barriers to entry, rivalry among existing competitors, pressure from substitute products, bargaining power of buyers, and bargaining power of suppliers),
New venture process	<ul style="list-style-type: none"> • Locating a business opportunity, • Accumulating resources, • Marketing products and services, • Producing the product, • Building an organization, • Responding to government and society,

Source: Adapted from Gartner (1985).

Table 3. Stages of organizational creation

Stage / Characteristic	I. First Ideas	II. Commitment and Early Planning	III. Implementation
Characteristic tasks	<ul style="list-style-type: none"> • Perceiving a not adequately addressed problem, • Thinking of organizational arrangements concerning the problem, • Designing a mission, • Testing and revision of the ideas (tentative and informal), 	<ul style="list-style-type: none"> • Developing first ideas into an organization, • Developing the plan for the organization, • Establishing relationships among parties, such as originator, planners, and environmental groups, 	<ul style="list-style-type: none"> • Selecting new members, (including the new leader), • Choosing and preparing the physical setting,
Common experiences and feelings	<ul style="list-style-type: none"> • Discomfort (about the problem), • Excitement (about First Ideas), • Perceiving the First Ideas as better than other approaches, 	<ul style="list-style-type: none"> • Originator and planners negotiate the "ownership" of the created organization, • Environmental problems appear, • Planner uncertainty and appearance of conflict concerning the form the organization, 	<ul style="list-style-type: none"> • Excitement (about closure), • Discovery that resources are inadequate for the plans, • Difficulties in relationship between planners and new organizational members,
Critical issues	<ul style="list-style-type: none"> • Creativity and thoroughness related with formulating the First Ideas; • Relationship that originator has with the ideas 	<ul style="list-style-type: none"> • Creativity and thoroughness related with planning; • Originator and planners commitment to the organization; • Relationships between originator and planners; • Planners' relationship with the environment 	<ul style="list-style-type: none"> • Resources adequacy, • Correspondence between use of resources and mission, • How the first ideas and plan are transmitted to new members and the new leader, • Relationship between "first" leader and new members,

Source: Adapted from Bartunek & Betters-Reed (1987).

- **Quality Proponents:** Focused on products in narrow product segments, in particular consumer services,
- **Niche Purveyors:** Pursuit marketing in narrow industry segments, like retail and construction,
- **Technology Valuers:** Focused on broad market and product differentiation, applied mainly in consumer services and manufacturing,
- **Price Competitors:** Directed at broad segments and marketing orientation, common in business services and manufacturing,
- **Equivocators:** With lack of cohesive strategy and modest resources, preferences skewed mostly towards newness, popular in manufacturing,
- **Super Achievers:** With more opulent resources, focused on numerous strategic foci, preferences skewed mostly towards adolescence, common in distributive services and business services.

Not only are they more appropriate to the organizational creation of the context but also clearly show that new ventures strategies vary according to industry segment.

Moving to the academic context of venturing, it is noteworthy that the entrepreneurial form which best fits to organizational creation is a university spinoff. Moreover, it is also the most impactful and mature form of academic entrepreneurship (Shane, 2004; Wright et al., 2008). Shane (2004) defines a university spinoff as a “new company founded to exploit a piece of intellectual property created in an academic institution” (p.4). Similarly Wright et al. (2008) understand the phenomenon – as “new ventures that are dependent upon licensing or assignment of an institution’s IP [intellectual property] for initiation,” which is also consistent with the definition of Association of University Technology Managers (AUTM) (p.4). Some more definitions can be found in O’Shea et al. (2008). Provided one explains the phenomenon well, although there is a critical issue which Shane (2004) and Wright et al. (2008) emphasize – not

always the IP is owned by the university, and not that it seldom happens, that companies build upon informal and not codified knowledge. On the one hand it is much easier to track down the effects according to the narrow definition of a spinoff, and on the other it misses an important part of the reality (Shane, 2004; Wright et al., 2008).

Various types of spin-outs have been explored in the literature. Bathelt et al. (2010) distinguished sponsored and unsponsored university spinoffs. Rothaermel et al. (2007, p. 749) recall typologies based on such criterion, as:

- **Transferee:** Spin-offs are classified into “technology only,” “technology and personnel,” and “personnel only”
- **Business Activities and Resource Requirements:** Spin-offs are categorized as “consultancy,” “intellectual property licensing,” “software,” “product,” and “infrastructure creation.”

Shane (2004, p. 166-175) identified several steps in the process in which university technology developments lead to the formation of spin off: (1) Use of funded research, (2) Creation and disclosure of innovation, (3) Decision to seek intellectual property (IP) protection, (4) Marketing the technology, (5) Licensing decision, (6) Decision to spin off. In the process of spinoff creation at least three issues appear emergent to notice. First, that creation and development phases should be distinguished. Second, that the presented venturing framework applies to university spinoffs only to some extent, thus there are also important differences, in particular those concerning the forms of intellectual property protection and the role of technology transfer offices. Third, that in comparison with typical start-up companies, university spinoffs are in the worst position from the beginning, due to the lack of “reducing to practice,” business plan, management, and capital to create a firm (Mustar et al., 2006; Shane, 2004).

The most important areas, in which the numerous factors impact spinoff creation, are: university policy; faculty; technology transfer offices; un-

derlying technology; investors; founding teams; networks in which a firm is embedded; external conditions; to affect the creation of new firms (Rotheamel et al., 2007, p. 749). Rasmussen et al. (2011) proposed another approach, focusing on academic founders competencies. They noticed that opportunity refinement, leveraging, and championing significantly increase the chances of venture to gain credibility, and that the competences need to be developed or acquired (Rasmussen et al. 2011), which corroborates the prior findings, that the role of an individual is crucial (O'Shea et al., 2008), and the training in entrepreneurship is necessary (Bercovitz & Feldman, 2006; Evans-Jonas, 1998, p. 40). The number of university spinoffs depends also on the condition, if the faculty members are allowed to work in spinoffs, and to take leave of absence to run their firms (Giacon, 2009, p.482).

Also the strategies identified for corporate spinoffs may play a signpost role in managing academic ventures, however some university spinoff directed ones were identified. Clarysse et al. (2005) proposed three strategies: Low Selective, Supportive and Incubator models. In this context, the crucial conclusion is that universities and regions must formulate and implement coherent and feasible technology transfer/commercialization strategies (Siegel et al., 2007a).

As organizational creation is only one of the acts constituting entrepreneurship, and thus university entrepreneurship, the others require basic exploration.

Organizational Renewal

Pöyhönen (2004a) defined organizational renewal ability as “the collective capacity of an organization to maintain, replicate, develop and innovate knowledge assets in a manner consistent with its strategy and business environment.” She also identified the main tendencies in perceiving organizational renewal (Pöyhönen, 2004b, p.127) based on:

- **Knowledge Management Approach:** Which considers renewal as a process of using, developing and creating knowledge,
- **Strategic Management Approach:** Which considers renewal as a capability that produces a competitive advantage,
- **Intellectual Capital Approach:** Which considers renewal as a static asset to be measured.

Hitt (1995) in turn, associates organizational renewal with the concept of learning organization, which strives for excellence through organizational renewal understood as “continually expanding its capacity to create its future” (p. 17). For Santos and Garcia (2007, p. 336) organizational renewal means internal reorganization conducted as a response to environmental evolution.

The main types of renewal are maintenance, incremental development and radical innovation (Pöyhönen, 2004b, p.54), similar to renewal strategies - institutional, revolutionary, and evolutionary (Mezias & Glynn, 1993, p.78). Although, Lester and Parnell (2001, p.60) recall two paths of renewal – turnaround and revitalization, the purpose is to avoid projected demise.

Hitt (1995 p. 24) discerned several critical success indicators of organizational renewal, such as: cross-functional teaming, new networks, teaming with customers, suppliers and other organizations, staff development, investment in R&D, process redesign, re-engineering and continuous improvement. The more complex explanation of the factors facilitating organizational renewal was given by Lester and Parnell (2001, p.60), who identified four areas, such as:

- **Decision-Making Style:** Embracing participation and level of decentralization;
- **Structure:** Encompassing information processing procedures, decentralization of authority and departmental differentiation,
- **Strategy:** Including for instance such strategies as: (a) prospectors, focused on innovation to strive in new markets, (b)

analyzers, directed at assuring cost-effectiveness but also maintaining pro-innovative approach, (c) defenders, concentrated on narrow markets and cost reduction, and (d) reactors striving to maintain the proper balance and change according to external factors,

- **Situation:** Which broadly speaking refers to the state of organizational affairs, including both internal and external factors influencing the organization.

These areas indicate that organizational renewal depends heavily on the role of top management, what has been corroborated (Santos & Garcia, 2007). In contrast Sparrow and Ringland (2010) claim that “renewal seldom comes from grand central initiatives, but from many repeated small steps which collectively add up to purposeful, directed change” (p.37). These authors presented a more complex and coherent framework of Purposeful Self-Renewing Organization (PS-RO), which encompasses five qualities (Sparrow and Ringland, 2010, p. 34-35):

- **Insight:** Knowledge about how the operating environment works and how it may soon change,
- **Options:** Changes of the portfolio by generating new ideas, innovations or their evaluation,
- **Values:** The element of cultures or sub-cultures of stakeholders,
- **Machinery:** Knowledge management infrastructure, human resources and the “processes that drive Insight, define Values, direct the investigation of Options.”
- **Narratives:** Which exist in every organization.

The university context can be considered in two dimensions. The first emphasizes that innovation which impacts firm’s renewal is derived from the university knowledge or transferred technology (Bercovits & Feldman, 2006, p. 181). The second, more appropriate to the discussed topic, is pertain-

ing to renewal of the university itself. It concerns the shift from the traditionally regarded mission, embracing teaching and pure scientific research, to the mission incorporating various forms of for-profit relations with commercial organizations (Etzkowitz, 1983; Laukkanen, 2003). The organizational renewal of the university may be perceived in the same categories as presented by Sparrow and Ringland (2010) or Pöyhönen (2004). Supplemental findings are pointing toward several groups of factors impacting entrepreneurial attitudes of the university, such as (Rothea et al., 2007, p. 708-740):

- **Incentive System:** Pertaining to faculty, department and intermediary agents, e.g. technology transfer office or incubators,
- **Status:** Public or private, prestige, departments,
- **Location:** Proximity to high-tech firms or industries,
- **Faculty:** Status, disclosure decision, exposure to external agents,
- **Nature of The Technology To Be Commercialized**
- **Culture:** Differences between US, Europe and Japan,
- **Policy:** Concerning intellectual property.

The reactions of university authorities and employees, including other researchers, to the entrepreneurial attempts of scientists are sometimes very contrasting. The problem may be perceived through the analogy with Herzberg’s Motivation-Hygiene Theory, discerning two types of factors impacting the motivation of an individual (Griffin, 2004, p.524-525):

- **“Hygiene factors”:** Necessary to avoid dissatisfaction,
- **“Motivators”:** Necessary for satisfaction.

The key issue is that “Hygiene factors” by themselves do not provide satisfaction. Analogically, on the one side there are all the negative reactions, pursuing the elimination of academic

entrepreneurship attempts, like colleagues opposition or establishing rules that prohibit some forms of participation in industrial involvement (Etzkowitz, 1983, p.200,223). In turn, the positive ones are on the other side, pursuing encouragement of entrepreneurial activities, for instance in the form of enterprise trainings, TTOs activation etc. (Evans-Jonas, 1998, p.40). Thus, stimulation of the university renewal may require both, diminishing the “Hygiene factors” and increasing “Motivators.” Assumed correlation would require an empirical proof, however the link seems to be logical and accurate.

Also, there is a link between organizational renewal and innovation. For instance, Dougherty (1992, p. 77) noticed that product innovation is a primary means of corporate renewal, and Mezias and Glynn (1993, p. 78) associate corporate renewal with the innovation process. Thus, innovation requires a glance.

Innovation

Although innovation has been deeply explored over the last couple of decades, its definition still causes problems (Cooper, 1998; Białoń 2010), mainly due to several different fields of research, such as business and management, economics, organization studies, innovation and entrepreneurship, technology, science and engineering, knowledge management and marketing (Baregheh et al. 2009).

Some classic definitions, like Schumpeter’s (1934, p.66), consider an innovation as: (a) an introduction of a new production method, product or its quality, (b) the opening up for of a new market or a new source for raw materials or semi-manufactures, or (c) the creation of a new organizational structure in industry. Also many quoted definitions were given by Damanpour (1996), who conceives innovation as:

A means of changing an organization, either as a response to changes in the external environment or as a pre-emptive action to influence the

environment. Hence, innovation is here broadly defined to encompass a range of types, including new products or services, new process technology, new organization structure or administrative systems, or new plans or programs pertaining to organization members. (Damanpour, 1996, p. 694)

A more contemporary approach presented in the Oslo Manual (2005) defines an innovation as “the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations” (p.46). This definition, however useful and widely applied in research, does not include two crucial issues: differentiating innovation from changes, inventions or creativity, and the purpose of implementation. Moreover, it is not flexible to use in other contexts, like social or cultural. Therefore, it is better to use the definition of workplace innovation, which may be considered as a broad definition of innovation – “the intentional introduction and application within a role, group or organization of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to significantly benefit the individual, the group, the organization or wider society” (West & Farr, 1990, p. 9).

Three attempts of presenting a comprehensive picture of innovation are noteworthy. One because of its simplicity, and in turn the other, due to their complexity and the extent of conducted research. The approaches are presented more insightfully in Table 4.

Cooper (1998) claims that every innovation is defined at the same time by three dichotomous dimensions, however some innovations appear to be uni- or even bi-dimensional in nature. Berghah et al. (2009) examined 60 definitions from aforementioned fields, and synthesized six attributes of the innovation process. As a result of their studies they defined innovation as “the multi-stage process whereby organizations transform ideas into new/improved products, service or processes, in order to advance, compete and differ-

Table 4. Multi-dimensional frameworks of innovation

Authors	Framework components
Cooper (1998)	Three dichotomous dimensions: product versus process, radical versus incremental, and technological versus administrative
Berghah et al. (2009)	<ol style="list-style-type: none"> 1. Stages of innovation: creation, generation, implementation, development, adoption 2. Social context: organizations, firms, customers, social systems, employees, developers 3. Means of innovation: technology, ideas, inventions, creativity, market 4. Nature of innovation: New, improve, change 5. Type of innovation: Product, service, process, technical 6. Aim of innovation: succeed, differentiate, compete.
Crosnan & Apaydin (2010)	<p>The model encompasses three determinants (1-3) and two dimensions (4-5) of innovations, which were described as:</p> <ol style="list-style-type: none"> 1. Individual and group level focused on leadership, encompassing: Chief Executive, Officer's, Top Management Team's and Board of Directors' ability and motivation to innovate; 2. Organizational level focused on managerial levers, embracing: (a) mission, goals and strategy, (b) structure and systems, (c) resource allocation, (d) organizational learning and knowledge management and (e) organizational culture; 3. Process level focused on business processes, including: (a) initiation and decision-making, (b) portfolio management, (c) development and implementation, (d) project management, (e) commercialization; 4. Innovation as a process, comprising: (a) individual, group or firm level, (b) driver, such as resources or market opportunity, (c) top-down or bottom-up direction, (d) source, such as invention or adoption, (e) locus – firm or network, and (f) tacit or explicit nature; 5. Innovation as an outcome, embracing: (a) form, such as product, service, process or business model, (b) incremental or radical magnitude, (c) referent, such as firm, market or industry, (d) administrative or technical type, tacit or explicit nature.

Source: Own elaboration based on (Crosnan and Apaydin, 2010; Berghah et al., 2009; Cooper, 1998).

entiate themselves successfully in their marketplace” (p.1334). In turn, Crosnan and Apaydin (2010) presented the most complex multi-dimensional framework of innovation, based on broad literature studies consisting of 525 most cited or up-to-date positions. The model encompasses three determinants impacting on two dimensions of innovations. Additionally, the most recently presented in literature, the multilevel model of innovation, depicts how an individual innovation evolves into societal innovation with a global impact (Sears and Baba, 2011).

Presented frameworks and definitions already embraced the most important division of innovations. First typology, widely recognized and applied, distinguishes product, process, marketing and organizational innovations (Oslo Manual, 2005, p.47-52). Among other numerous classifications (Białoń, 2010, p. 21-22; Janasz & Koziół, 2007, p. 27; Świtalski, 2005, p. 89-105) two are essential to mention, dividing innovations into (a)

radical and incremental, and (b) based on novelty (original) or adoption.

Why innovation is important and what is its relation with entrepreneurship and university? The impact of innovation on economic growth has been well recognized (Solo Manual, 2005; Green Paper on Innovation 1994), therefore the source of innovation is a matter of increasing interest. Through interactions with universities a firm can gain access to knowledge which may complement its portfolio and lead to innovation (Bercovitz & Feldman, 2006, p.181; Arvanitis & Woerter, 2009, p.1071). Taking into account the significant role of academia, it directs the attention to university - a “storehouse” of inventions.

Primarily, the academic context of innovation concerns the environment and networks of innovation, as university entrepreneurship is a result of being embedded in networks of innovation influenced by the larger environment (Rothaermel et al., 2007). In particular, four areas in which factors directly influencing university entrepreneurship

Table 5. Factors directly influencing innovation networks and university environment

Element	Description	Some key findings
Innovation networks	People, institutions and companies that are inside or outside the firm, who are intellectual assets that companies can link up with to solve problems and find ideas.	<ul style="list-style-type: none"> • Involvement in innovation networks enhances a firm's embeddedness in social networks and increases its survival • Several means to develop are: informal and formal collaborations, facility sharing and deep and reciprocal knowledge sharing • Firm's choice and behavior concerning development of innovation networks impacts firm's development
Science parks	Property-based organizations with identifiable administrative centers focused on the mission of business acceleration through knowledge agglomeration and resource sharing	<ul style="list-style-type: none"> • They provide links of technology transfer through spin-offs, research collaborations, and informal points of accessibility to various resources, including human resources, • Their growth can be modeled using the adoption of the innovation model, • Membership in science parks is not a factor in contributing to a firm's economic performance, however it may impact on factors that lead to higher economic performance, such as motivation of founders, cooperation, and networking opportunities with universities.
University's Technology Business Incubator (UTBI)		<p>Several main issues have been recognized:</p> <ul style="list-style-type: none"> • The key success factors of UTBIs, • Their value added, • Best methods to assess their performance, • Sources of UTBI impact.
Geographic location	Geographical proximity to universities and technology setting of the region	<ul style="list-style-type: none"> • An important issue is whether universities are part of a regional technology cluster, • Geographical proximity of start-ups to universities is determined by the need to transfer tacit knowledge, • Proximity to universities has an impact on the competitive advantages of new technology-based firms.

Source: Own elaboration based on (Rothaermel et al., 2007, p.765-777; Phan et al., 2005; Knowledge@Wharton, 2007).

were identified. These are: innovation networks, science parks, incubators and geographic location. Their description and some key findings are presented in Table 5.

The improvement of the firm's innovation and economic performance is influenced by the choice of knowledge and technology transfer strategy (Arvanitis & Woerter, 2009), which is embedded in the process of university R&D and technology transfer interaction leading to its commercialization (Conceicao et al., 1998). According to Conceicao et al. (1998, p.623) the framework consists of four components, which depict the process (numbers do reflect the logic of the process): (1) university R&D embracing a discovery; (2) technology transfer encompassing securing IP rights, assessing valuation of technology opportunity,

and implementing transfer strategy; (3) technology development, consisting of prototyping, consent proofing, ongoing IP protection, site testing, establishing a business plan, and raising seed capital; (4) technology commercialization, including finalizing the product, capital acquisition, and the initiation of launching on to the market.

Although the three basic acts constituting broadly understood entrepreneurship can be applied to the academic context, are they comprehensive enough to cover all the forms of university entrepreneurship? What are they in particular? What are the consequences of academic entrepreneurship in general? These issues need to be resolved if the introduction to academic entrepreneurship should be completed.

EXTENDED CHARACTERISTIC OF ACADEMIC ENTREPRENEURSHIP

The extended characteristics of academic entrepreneurship encompass several issues. The classification of the elements describing AE allows to understand better the complexity of the phenomenon and interdependences between the factors constituting and impacting it. Recognition of enablers and barriers helps to improve the management processes. The benefits and threats depict the impact of the research and technology commercialization not only on the economy, but in a wider context of sustainable development and corporate social responsibility, which managers must take into account (Lewandowski, 2011). Thus, the assessment of how the policy-driven approach has been effective in enhancing academic entrepreneurship is provided. Finally, the overview of the models lead to the creation of a framework, summing up the findings presented in this chapter. Exploring all those issues is useful to formulate recommendations for researchers, managers and policy programmers.

Typologies

Numerous typologies of entrepreneurship appear in the literature (e.g. Webster, 1977; Hisrich et al., 2007), but only very few directly concern academic entrepreneurship (Table 6).

Three types of academic entrepreneurs identified by Dickson et al (1998) depict the differences in intensity on the business focus of scientists. For an academic entrepreneur, entrepreneurial activity is adjunct to academic work while an entrepreneurial scientist is fully involved in business ventures but also strongly devoted to his or her scientific interests. The scientific entrepreneur operates in a venture but treats science as business (Dickson et al 1998, p.35). To some extent, supplemental is the classification of the scientific research methods discerned by Stokes (1997) and called “Pasteur’s

Quadrant.” Birley (2002) pointed out three types based on spinouts classification, where orthodox, one type is a company founded by academics who left the university for this purpose, technology spinout is when an investor buys or leases the intellectual property from the university and forms a new company. Hybrid spinout contains both forms. This approach also concerns forms of academic entrepreneurship, however this is narrowed to the classification of one type – spinout. Typology presented by Giacon (2009) is focused on motivations of entrepreneurial decision.

Louis et al. (1989, p.115) presented extended typology based on the criterion of academic entrepreneurship form, and discerned:

- **Large-Scale Science:** Considered as large research projects, groups or laboratories, usually founded from grants,
- **Supplemental Incomes Augmentation:** Contains mainly consulting, private practice or “lecture circuit,”
- **Industrial Support for University Science:** Support of initiating, linking and managing research projects and ventures,
- **Patenting:** Reserving patents for commercially applicable results of research,
- **Direct Commercial Involvement:** Mainly creation and ownership (sole or partial) of firms.

Very similar types were identified by Evans-Jonas (1998) and Klofsten and Evans-Jonas (2000), who were researching several European countries. These may be considered as a more detailed and a little extended version of Louis et al (1989) findings. Comparing those typologies with the origin forms of academic entrepreneurship discerned by Etzkowitz (1983) leads to a conclusion that the forms have not changed very much since the university-industry relations emerged. However, the scale of the phenomenon has increased significantly over the last few decades (Shane, 2004, p.1; Hong & Walsh, 2009). Other

Table 6. Types of academic entrepreneurship, entrepreneurs and their work

Author	Criterion	AE types
Dickson et al (1998)	Extent of involvement in entrepreneurship	Academic entrepreneur, Entrepreneurial scientist, Scientific entrepreneur
Giacon (2009)	Extent of involvement in entrepreneurship	Consultant, Former academic, Hybrid entrepreneur, Pro-active entrepreneur
Birley (2002)	Source of entrepreneurial activity	Orthodox spinout, Technology spinout, Hybrid spinout
Stokes (1997)	Scientific research methods	Pure basic research, Use-inspired basic research, Pure applied research
Louis et al. (1989)	Form of science-business relation	Large-scale science, Supplemental incomes augmentation, Industrial support for university science, Patenting, Direct commercial involvement
Evans-Jonas (1998)	Form of science-business relation	Large scale science project, Contract research, Consulting, Patenting and licensing, Spin-off, Services in general
Klofsten & Evans-Jonas (2000)	Form of science-business relation	Large scale science project, Contracted research, Consulting, Patenting/licensing, Spin off firms, External teaching, Sales, Testing
Berovitz & Feldmann, (2006)	Form of science-business relation	Sponsored research, Licenses, Hiring of students, Spinoff firms, Serendipity
Brennan et al. (2005)	activity towards the discipline knowledge and academic-university relationship	Hero, Maverick, Broker, Prospector
Link et al. (2007)		Formal and informal

Source: Own elaboration based on (Dickson et al, 1998, p.35; Evans-Jonas, 1998; Klofsten and Jones-Evans, 2000; Louis et al., 1989, p.115; Brennal et al., 2005; Stokes, 1997; Giacon, 2009).

forms of academic entrepreneurship encompass networking with practitioners, joint publications with industry, staff exchange and joint student supervision (Girmaldi et al., 2011). Link et al. (2007) distinguish formal (e.g. patent, license or royalty agreement) and informal (e.g. technical assistance, consulting, and collaborative research) technology transfer mechanisms. Also, some forms of academic entrepreneurship overlap with the methods of knowledge and technology transfer, e.g. university researchers' participation in firm R&D, long-term research contracts or consulting (Arvanis & Woerter, 2009).

The more complex typology presented by Brennan et al. (2005) is focused on the profiles of academic entrepreneurs and takes into consideration entrepreneurs' approach to the discipline knowledge and relationship with their host university (Table 7).

Those two dimensions reflect the four key themes describing academic entrepreneurship. These are work relationships, knowledge production, acquisition, and organizational orientation. These themes are based respectively on the following questions: What are the work relationships whilst undertaking entrepreneurship? How discipline knowledge is used to produce new knowledge? In which way the knowledge networks are used? How the relationship with the host university institution is being regarded and managed? (Brennan et al., 2005, p.313-314).

Finally some other types of entrepreneurship, such as: potential entrepreneur, team entrepreneur, nascent entrepreneurs, female entrepreneurs, retiree entrepreneurs or fatherless entrepreneurs (Hisrich et al, 2007) may also apply to the context of academic entrepreneurship. Additionally, a noteworthy context is pertaining to the social economy phenomenon (Benkler, 2008). In turn,

Table 7. Academic entrepreneur's profiles

Profile	Work relationships	Main focus of knowledge production	Knowledge acquisition	Organizational orientation
Hero	Social	Discipline fore-front	Institutional network	Host university and external entrepreneurial environment
Maverick	Social	Application of discipline knowledge and interdisciplinary knowledge exchange	Own scanning network	External entrepreneurial environment
Broker	Social	Application of discipline knowledge and interdisciplinary knowledge exchange	Institutional and own scanning network	Host university and external entrepreneurial environment
Prospector	Individual	Application of discipline knowledge and interdisciplinary knowledge exchange	Own scanning network, small use of institutional network	External entrepreneurial environment

Source: Derived from Brennan et al, 2005, s.314-315.

social entrepreneurship should be taken into account in the university context as well, because an academic entrepreneur might be a social academic entrepreneur. It extends the academic entrepreneurship outcomes to intangible, socially important impacts. This approach complements the triple perspective consisting of Dickson's et al. (1998), Klofsten's, Evans-Jonas's (2000) and Brennan's et al. (2005) typologies, and in turn makes a relatively complex picture of the phenomenon, depicting the major issues.

General Enablers and Barriers

One of the main research areas includes the barriers and instruments supporting academic entrepreneurship. Although several factors influencing organizational creation, renewal and innovation in the university context has already been identified, some more general factors also exist. The literature overview provides the following implications:

- National culture and academic socialization can influence the degree to which individual scientists participate in technology-transfer activities (Bercovitz & Feldmann, 2006, p.180);
- Training effects, leadership effects and cohort effects strongly influence the decision

of an individual to participate in technology transfer through the process of disclosing inventions (Bercovitz & Feldman, 2004);

- Resources, reporting relationships, autonomy and incentives of technology licensing offices shape both licensing university-created knowledge and seeking additional sponsorship for R&D projects (Bercovitz & Feldmann, 2006, p.180);
- Changes in university management, including mission, decentralization, funding research, human resource management, and evaluation processes (Bernasconi, 2005);
- Better university brands enables better opportunities for consulting and higher rates in the market (Bernasconi, 2005);
- Undertaking several initiatives by university, such as: Innovation networks, campus companies, enterprise training, research contracts, patenting/licensing, career services/training, service provision, industrials professorship (Jones-Evans, 1998);
- Providing a protected environment where students can experiment with new ideas and follow their passions (e.g. the beginning of Dell or Yahoo!) (Grimaldi et al., 2011).

Also, the impediments of academic entrepreneurship have been provided in the literature. Several of them pertain to:

- Obtaining faculty disclosures may be influenced by (a) unwilling to risk delaying publication in the patent and license process, (b) unwilling to spend time on the applied research and development that is often needed for businesses to be interested in licensing university inventions, (c) perception of the proper role of academic scientists and engineers (Thursby & Thursby, 2002, p. 93);
- Conflicting opinions over the university system's mission (Rothaermel et al. 2007, p.706);
- Organizational pathologies, such as: (a) the familiarity trap - favoring the familiar, (b) the maturity trap - favoring the mature, and (c) the propinquity trap - favoring the search for solutions near to existing solutions, inhibit breakthrough inventions (Ahuja & Lampert, 2001);
- Public sector pay-scales, which make it difficult to recruit qualified technology transfer personnel (Grimaldi et al., 2011, p.1047);
- The conflict of interest between the traditional academic reward system (focused on peer reviewed publications of basic research), and the technology transfer reward system (focused on revenue generation from applied research) (Siegel et al., 2007b, p.497).

There are numerous factors influencing academic entrepreneurship and each of its forms. However, knowing them is useless without recognizing the outcomes first.

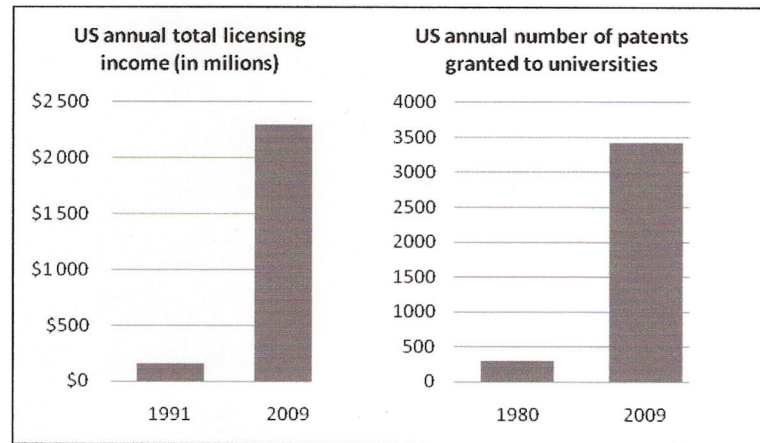
AE Policy-Driven Approach Assessment

In order to assess how the policy-driven approach has been effective in enhancing academic entrepreneurship in higher education institutions and the innovation system, it is essential to point out the major policy instruments. In the broad context of innovation system developments the significant issues are the formulation of a Green Paper on Innovation (1995) by the European Commission, and the publishing of the Oslo Manual (firstly in 1992) by OECD. The first document emphasized the role of innovation in increasing the industrial competitiveness of the European Union, and was a genuine European strategy for the promotion of innovation (Green Paper..., 1995). The second document provided a comprehensive system of measurement for scientific and technological activities (Oslo Manual, 2005).

A widely acknowledged instrument of political intervention directed at the role of university in fostering economic growth is the enactment of the Bayh-Dole Act in 1980 by the USA (Wright et al, 2008; Litan et al. 2007; Shane, 2004). In particular, the legislation unified patent policy across federal agencies, removed many restrictions on licensing, mainly by expanding university rights to patent and license inventions from federally funded research, and introduced a requirement of disclosing inventions based on researches founded from federal grants to the technology licensing offices (Grimaldi et al, 2008; Thursby & Thursby, 2002, p. 92, 101). The Bayh-Dole Act was also underlying to similar changes in the law systems in several European and Asian countries (Grimaldi et al., 2008; Lacetera, 2009). Lacetera (2009) also points to the Federal Technology Transfer Act in 1986, and Link (2006) the R&E tax credit enacted in 1981, and the National Cooperative Research Act legislated in 1984.

The effectiveness of a policy driven approach in the US may be depicted by numerous indicators, two chosen ones were used for this purpose

Figure 1. Annual licensing income generated by universities and patents granted to universities in US.



– annual total licensing income, and the number of patents granted to universities (Figure 1).

Source: own elaboration based on data obtained from (Siegel et al, 2007a; www.autm.net).

However, Litan et al. (2007) are critical about the pragmatic part of the reform, which pertains to the implementation and to the organization of technology transfer offices in particular. They claim that;

with new rights have come new layers of administration and often bureaucracies. Rather than implementing broad innovation and commercialization strategies that recognize different and appropriate pathways of commercialization, as well as multiple programs and initiatives to support each path, many universities have channeled their innovation-dissemination activities through a centralized technology transfer office (TTO). (Litan et al, 2007, online)

The numbers, although only two indicators were presented, do not cover all the anticipated results and unexpected implications of the policy, which should be taken into account whilst during its assessment.

Outcomes of academic entrepreneurship may be perceived from different points of view. The triple helix model, which gives a perspective of three sub-systems: university, industry and government (Leydesdorff & Etzkowitz, 1998) could be applied for this purpose, however it would require additional perspectives to be more comprehensive. Thus, “*agathos* effectiveness” conception based on eight modifiable perspectives (Lewandowski, 2011) is more useful. Moreover, it emphasizes the ethical context in terms of “accountability against,” not only “accountability for,” which better fits to the managerial perspective of the book. According to this approach some academic entrepreneurship outcomes have been assessed (Table 8). The question mark “(?)” indicates fields of research hardly explored.

The analysis encompasses general benefits and threats, but due to the variety of academic entrepreneurship forms not all of them have been considered (authors do not always refer to the specific forms, however spinoff is the most unquestionable).

Table 8. Balance of academic entrepreneurship outcomes according to the “agathos effectiveness” conception adapted to the university context

Authors	Etzkowitz, 1983; Jones-Evans, 1998; Laukkanen, 2003; Shane, 2004; Bercovitz & Feldmann, 2006; O’Shea et al. 2008; Lach & Schankerman, 2008; Kivimaa, 2008	Giacon, 2009; Sundbo, 2003; Laukkanen, 2003; Etzkowitz 1983; Hong & Walsh, 2009; Fabrizio, 2007;
Effectiveness - perspective of	Benefits	Threats
Society	<ul style="list-style-type: none"> • Enhancing quality of life • Providing products that satisfy customers needs • Growth of knowledge • Facilitating the training of students • Employment of students and graduates (giving job) 	<ul style="list-style-type: none"> • Creative destruction (innovations oust old products and processes, which has a great social impact) • Danger for scientific neutrality, objectivity and open science
Employees	<ul style="list-style-type: none"> • Increased income for academics • Career outside of the university for young scientists 	Experiencing mental conflicts by some scientists
Organization	<ul style="list-style-type: none"> • Extra funds for scientific projects • Employment of students and graduates (obtaining workforce) 	<ul style="list-style-type: none"> • Limited communication and lower transfer of knowledge between academics caused by the anticipation of future profits
Natural environment	<ul style="list-style-type: none"> • e.g. pollution control technologies 	(?)
Law	(?)	(?)
Other organizations	<ul style="list-style-type: none"> • Increased growth and profits for firms 	(?)
Economy	<ul style="list-style-type: none"> • Generating economic value, • Encouraging economic development at national and local level, • Enhancing economic stability, • Reinforcing endogenous self-renewal and growth of regions, • Revival of the economies in cities, regions and countries • Contribution to GDP 	<ul style="list-style-type: none"> • University patenting may be an impediment for industrial innovation
Policies	<ul style="list-style-type: none"> • Labor policy (creating jobs) • Development policy • Environmental policy 	(?)

Source: Own elaboration based on (Lewandowski, 2011; Hong & Walsh, 2009; O’Shea et al. 2008; Kivimaa, 2008; Lach & Schankerman, 2008; Fabrizio, 2007; Bercovitz & Feldmann, 2006; Shane, 2004; Laukkanen, 2003; Sundbo, 2003; Jones-Evans, 1998; Etzkowitz, 1983).

Models

Considering all aforementioned characteristics of academic entrepreneurship, a need for a comprehensive framework becomes appropriate. Moroz and Hindle (2011) identified 32 models of entrepreneurship. This abundance may impede the conceptualization of academic entrepreneurship as well as the fact that none of them refer directly to academic context, although at least a few of them

could be applied to some extent, like Gartner’s (1985) for instance.

Regarding academic context Bercovitz & Feldmann (2006) provided the model of the university-industry relationship, depicting transactions between university environment and commercial firms, also including the individual researcher. Additionally to their explanations, some other explorations derived from the reviewed literature are supplemental.

The central element – transactions – may be described by the forms of academic entrepreneurship provided by Louis et al. (1989, p.115), Evans-Jonas (1998), Klofsten and Evans-Jonas (2000) or Bercovitz and Feldmann (2006), presented in the typology section in this chapter. In turn, an individual researcher and his or her relations with the university and firms may be described by the profiles and key themes explored by Brennan et al. (2005). Lacetera's (2009) model focusing in detail on the choice and timing of commercialization of research by academic entrepreneurs in comparison with industry entrepreneurs is supplemental. His findings show that academic and non-academic scientists select different projects, in particular that academic researchers will tend to forsake commercial projects with positive but small commercial value. Instead, they will pursue the purely scientific ones because of the direct benefit from performing research, in the form of publication and peer recognition in the scientific community. Therefore, in some cases they are more reluctant to commercialize research if they do not want to resign from these benefits. However, in other cases academic scientists may commercialize faster than a profit-seeking firm would, and perform less basic research (Lacetera, 2009).

Also, the comprehensive framework should incorporate the situation in which an individual researcher may commercialize intellectual property without disclosing the invention to the university - "through the back door" as Shane (2004, p. 4) calls it. Moreover, the conceptualization of academic entrepreneurship must include not only the directly impacting factors, but also more general ones, like social and cultural context, industry characteristics or policy programs (Bercovitz & Feldmann, 2006; Patzelt & Shepherd, 2009; Baker et al., 2005; Etzkowitz, 1983; Hofstede & Hofstede, 2007).

Also, the very insightful work of Rothaermel et al. (2007) is helpful in conceptualizing academic entrepreneurship. In their detailed and expanded literature studies they discerned different

elements forming a university entrepreneurship conceptual framework, such as: environmental context including networks of innovation, new firm creation, productivity of technology transfer offices, entrepreneurial university and facilitating the process. They also emphasize that there is currently no literature review providing an overarching framework to encompass the different pieces making up university entrepreneurship, such as: technology transfer, university licensing, science parks, incubators, university spin-offs, technology transfer offices etc (Rothaermel et al., 2007, p.706).

Recognizing all those issues and the contribution of the authors, a conceptual framework of academic entrepreneurship has been developed (Figure 2).

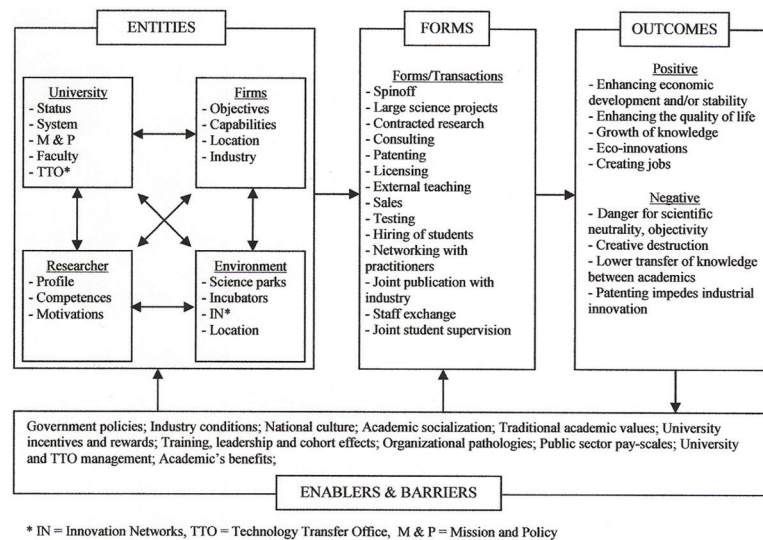
Source: Own elaboration based on literature review used in this chapter.

The presented model does not reflect the main processes of entrepreneurship related to the acts constituting this phenomenon – organizational creation, renewal and innovation. However, it encompasses most of them or their components. It is also sufficient to provide some solutions and recommendations for practitioners.

Solutions and Recommendations

The positive results of the academic entrepreneurship are unquestionable, in particular their economic impact. Therefore enhancements should be maintained or even expanded. It pertains to government, local and university policies. The general framework of "Hygiene Factors" and "Motivators" seems useful, the first group should be minimized, whilst the second one increased. For instance, universities should try to downsize the bureaucracy and increase the number of entrepreneurial attempts made among academics by introducing some incentives and recognition for individuals. They should also focus more on students, as they can generate very innovative ideas. Government in turn, should provide legis-

Figure 2. Conceptual framework of academic entrepreneurship



lation facilitating the easiness of using particular forms of academic entrepreneurship, instead of building hypertrophied controlling systems. Also, the Bayh-Dole Act is an example worth building upon, especially for the countries which need to develop their intellectual property laws.

Another important field is the cooperation between universities, firms and local government to support local and regional development is essential. On the one hand the clustering initiatives could be facilitated, on the other the profession of each party (businessman, administration officer, scientist) engaged in the process might be considered as a sub-culture. Therefore some intercultural management and communication theories are noteworthy to test in this context.

Moreover, the development of instruments encouraging implementation of innovations which bring socially important, intangible outcomes, should be put into an agenda. Forming a special fund for socially relevant innovations, opened for inventions derived from social sciences and humanities is another noteworthy idea.

FUTURE RESEARCH DIRECTIONS

From the conducted literature overview some emergent issues pertaining to academic entrepreneurship appear. They encompass many questions, from which only a few were raised. For instance, how to successfully maintain the relationship between university and a firm and what is the role of partnerships? What strategies are being applied in different forms of AE and with what effects? What are the relationships between those forms? What organizational structures and management models best fit to particular forms of AE? What is the potential and the current contributions of student's ideas in enhancing academic entrepreneurial activities? Also, there is a need for a more comprehensive framework capturing the processes of various forms of academic entrepreneurship, as well as their critical success factors.

One of the most important questions concerns not only the indirect impact of university spinoffs on economic value, as Shane (2004, p. 20) suggests, but also the direct and indirect effects of

all the AE forms in a broader context. Especially, the threats require a further insightful exploration, in particular those concerning some more contemporary consequences of creative destruction in the international context (Bauman, 2004), and the postponed results of innovations underlying its progress in terms of the future meaning of “trans-human” and “post-human.”

A widely unexplored field is pertaining to potential outcomes of social academic entrepreneurship, focused on the socially relevant outcomes. Academic entrepreneurs create not only business ventures but also non-governmental organizations (NGO). Moreover, the transferred knowledge and technology, to remain socially relevant, thus culture relevant, must be opened for the contribution of social sciences and humanities.

CONCLUSION

The research on academic entrepreneurship is grounded in the broader entrepreneurship theory. Traditional acts constituting entrepreneurship are more limited when pertaining to university. For instance, organizational creation seems to be narrowed to university spinoffs, and renewal to the shift in perceiving a university mission which leads to an openness for commercialization of the scientific research and better knowledge management in academia. Also the topic of innovation is narrowed to the participation of university in the innovation networks, incubators or science parks in order to generate more innovations.

The classic categories, such as organizational creation, renewal and innovation, apply to the academic context, but do not give the full and comprehensive picture of the phenomenon. Apart from those typical forms there are some others more nested in the university context and not necessarily institutionalized. Those encompass formalized activities, such as large scale science projects, contracted research, consulting, patent-

ing/licensing, external teaching, sales, testing, hiring of students, or even more. However, patenting and licensing are usually a part of innovation and spinoff creation processes. Therefore, university spinoffs seem to be the most mature, comprehensive and impactful form of academic entrepreneurship. Also, it is noteworthy that the academic entrepreneurship forms have not changed very much since university-industry relations emerged.

As the acts of organizational creation, renewal and innovation are not sufficient to depict the phenomenon of academic entrepreneurship, the definition requires updating. It can be understood as the process of transferring university-based knowledge or technology to industry and/or society through diverse forms of activity, initiated by the decision made in uncertain and arbitrage conditions and undertaken by individuals or organizations in order to provide benefits to engaged parties and/or public interest. The provided conceptual framework of academic entrepreneurship captures the most important entities, forms and outcomes of the process, as well as some factors influencing it.

Also, several recommendations and solutions were formulated. For instance some of them concern cooperation between universities, firms and local government to support local and regional development, whilst other pertain to engage students in entrepreneurial activities, or to facilitate the inventions derived from social sciences and humanities.

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KEY TERMS AND DEFINITIONS

Academic Entrepreneur: An individual rooted in the scientific institution, engaged in the process of transferring university-based knowledge or technology to industry, through one or multiple instruments, in order to provide benefits to engaged parties and/or public interest.

Academic Entrepreneurship Forms: A set of diversified instruments underlying the process of transferring university-based knowledge or technology to industry, encompassing in particular but not exclusively: spinoffs, large science projects, contracted research, consulting, patenting, licensing, external teaching, sales, testing, hiring of students, networking with practitioners, joint publications with industry, staff exchange and joint student supervision.

Academic Entrepreneurship: The process of transferring university-based knowledge or technology to industry or society, through diverse instruments, initiated by the decision in uncertainty and arbitrage conditions, and undertaken by individuals or organizations in order to provide benefits to engaged parties and/or public interest.

Entrepreneurship: Undertaking the activity encompassing acts of organizational creation, renewal, or innovation, inside or outside an organization, initiated by the decision in uncertainty and arbitrage conditions, in order to provide benefits to engaged parties and/or public interest.

Innovation: Intentional implementation of ideas, processes, products or procedures, new to the relevant unit of adoption, pursuing significant benefits for the individuals, organizations or public interest.

Organizational Creation: An effort of a group of people, who are pursuing common goals, to harmonize their cooperation and assets, in an standardized, formalized and/or institutionalized form.

Organizational Renewal: Internal reorganization conducted as a response to environmental evolution, where knowledge assets play a key role, in order to avoid projected demise of organization.