ASERS

Journal of Environmental Management and Tourism

Quarterly
Volume X
Issue 1(33)
Spring 2019
ISSN 2068 – 7729
Journal DOI
http://dx.doi.org/10.14505/jemt

ASERS Publishing

Spring 2019
Volume X
Issue 1(33)

ASERS Publishing
http://www.asers.eu/asers-publishing
ISSN 2068 – 7729
Journal DOI: http://dx.doi.org/10.14505/jemt

Table of Contents:

Spring 2019
Volume X
Issue 1(33)

ASERS Publishing
http://www.asers.eu/asers-publishing
ISSN 2068 – 7729
Journal DOI: http://dx.doi.org/10.14505/jemt

Call for Papers
Summer Issues 2019
Journal of Environmental Management and Tourism

Journal of Environmental Management and Tourism is an interdisciplinary research journal, aimed to publish articles and original research papers that should contribute to the development of both experimental and theoretical nature in the field of Environmental Management and Tourism Sciences.

Journal will publish original research and seeks to cover a wide range of topics regarding environmental management and engineering, environmental management and health, environmental chemistry, environmental protection technologies (water, air, soil), pollution reduction at source and waste minimization, energy and environment, modeling, simulation and optimization for environmental protection; environmental biotechnology, environmental education and sustainable development, environmental strategies and policies, etc. This topic may include the fields indicated above, but are not limited to these.

Authors are encouraged to submit high quality, original works that discuss the latest developments in environmental management research and application with the certain scope to share experiences and research findings and to stimulate more ideas and useful insights regarding current best-practices and future directions in environmental management.

Journal of Environmental Management and Tourism is indexed in SCOPUS, RePEC, CEEOL, ProQuest, EBSCO and Cabell Directory databases.

All the papers will be first considered by the Editors for general relevance, originality and significance. If accepted for review, papers will then be subject to double blind peer review.

Deadline for submission:	26th May 2019
Expected publication date:	June 2019
Website:	https://journals.aserspublishing.eu/jemt
E-mail:	jemt@aserspublishing.eu

To prepare your paper for submission, please see full author guidelines in the following file: JEMT_Full_Paper_Template.docx, then send it via email at jemt@aserspublishing.eu.

DOI : http://dx.doi.org/10.14505/jemt.v10.7(33).08

University Spin-Off: A Literature Review for Their Application in Colombia

Andrés José CASTRILLÓN MUÑOZ
University of Cauca, Colombia
andres9@unicauca.edu.co

Alfonso Infante MORO
University of Huelva, Spain
alfonso.infante@decd.uhu.es

Alexander Zúñiga COLLAZOS
University of San Buenaventura, Colombia
azuniga01@usbcali.edu.co

Francisco José Martínez LÓPEZ
University of Huelva, Spain
francis@uhu.es

Suggested Citation:

Castrillón, A.J., *et al.* (2019). University Spin-Off: A Literature Review for Their Application in Colombia. *Journal of Environmental Management and Tourism*, (Volume X, Spring), 1(33): 73-86. DOI:10.14505/jemt.v10.1(33).08

Article's History:

Received September 2018; *Revised* October 2018; *Accepted* November 2018.

Abstract:

This article gathers some of the most important theoretical and conceptual references, systematized from the review and consultation of specialized literature on university Spin Off, through a documentary type methodological qualitative process with a tendency to observe closely, afterwards, the capacity that has the University of Cauca, a public Colombian higher education institution, regarding the organization of knowledge to transfer the results generated by its research groups towards the environment, in alliance with entrepreneurs and other groups of interest, where the following analytical categories among others, are highlighted: The evaluation of the diverse typologies presented by well-known experts based on their heterogeneity. The analysis of different organizational models related to this type of entrepreneurships. The factors of success and the failure of some universities Spin Offs. The stages that might have to be exhausted for the successful implementation of this kind of organizations and the basic aspects to be considered in the relationship between University-Firm-State. As closure, it is suggested that for all legal purposes, a university Spin-Off in Colombia is *"a company based on knowledge, especially the one protected by rights of Intellectual Property, created in the area of the Higher Education Institution (HEI), as a result of research and development activities conducted under their support, in their laboratories and facilities or by researchers who are linked to them, among others"* (Law 1838, Act of 2017).

Keywords: university spin off; academic spin-off; entrepreneurship of technological basis; entrepreneurial university; Triple Helix Model.

JEL Classification: O31; L26; M14.

Introduction

Based on a preliminary review of the literature of University Spin-off and referring to a documentary type methodological qualitative process frame that generated appropriate conceptual references for the state of the art on the subject matter, this initiative will look, afterwards, and by means of the development of a process of applied research, that the University of Cauca, as a national Higher Education Institution, in use of its autonomy and light of the new legislation and the world perspectives on Science, Technology and Innovation, must have

clear policies that allow it to transfer and highlight the knowledge generated by their research groups, by means of an appropriate internal regulation on intellectual property, by preparing and making part of sustainable companies of technological base on the emergent regional, national and global markets with an efficient organizational architecture, through a roadmap supported by a convenient model, and in alliance with world-class investors.

According to the literature that has been consulted and due to the complexity that it takes to comprehend the substantiality of University Spin-Off; an incorrect definition of academic Spin-Off will be incorporated, in order to attempt, afterwards, to study thoroughly and in light of recent studies, the conceptual framework of the academic organizations of technological base known as Spin-Off.

The document *Towards a roadmap Spin-Off: A way of creating University Spin-Off in Colombia* has this definition: "*The companies created by a university or by a member of the university that do not have as purpose the exploitation of the scientific and technological developments generated by these institutions cannot be considered University Spin-Off",* (COLCIENCIAS, 2016).

1. University Spin-Off

What should be understood as a University Spin-Off? The Colombian legislation in its Law 1838 of July 6th of 2017 (first Act), authorizes the creation of technological base enterprises, defining a university *Spin-Off as a company based on knowledge, especially the knowledge protected by intellectual property, developed in the Higher Education Institution (HEI) field, and as a result of research activities conducted under their support, using their laboratories and facilities linked to them, among others.*

According to Castillo-Vergara (2015) quoting Beraza and Rodríguez (2012), these Spin-Off are business initiatives promoted by members of the university community who establish their activity in the exploitation of new processes, products and services on the acquired knowledge and the results obtained in the university.

Clarysse, Wright, et al. 2011; McQueen and Wallmark 1982; Raday 2008, cited by Ospina (2012), suggests that by comparing the different meanings on the subject matter, there is a mainstream that establishes *a university or academic Spin-Off as a new company in which the founders are from the university; in the same context Bathelt et al. 2010; Lockett et al., 2005; McQueen and Wallmark 1982; Raday 2008; Shane 2004; van Geenhuizen and Soetanto 2009; Wright and Lockett 2006, cited by the referred author, highlight that academic Spin-Off purpose is to commercially exploit knowledge, technology or research developed in the university itself.*

According to COLCIENCIAS (2016) four typologies are presented: (Charts 1 to 4).

Table 1. University Spin-Off of Type I suggested for Colombia

A researcher creates a Spin-Off based on the transfer of results of the HEI	
Role of the HEI in the creation of Spin-Off	a) HEI does not participate as a partner; b) Transfer of *Know How* as an object of commercialization through a contract between Higher Education Institutions (HEI) and researcher; c) The researcher leads and manages the process of establishment and set up of *Spin Off* (SO) with the mentoring of HEI; d) HEI ensure that there are no conflicts of interest between the HEI and the researcher.
The Entrepreneur	Researcher or Group of Researchers linked to the HEI
Type of exploited knowledge	a) Results of research, as object of protection through intellectual property (products or processes are exploited); b) Exploitation of *Know How* through the provision of services
Responsibility in the business management of Spin-Off	The transfer of technology between the HEI and the researcher is formalized in writing; the conditions are agreed and the researcher conducts the business management and therefore the risks that it implies
Relationship between Spin-Off and HEI after the implementation	The transfer of technology between the HEI and the researcher formalized in writing
Funder of the current project and implementation	The researcher or researchers
Economic activity to be conducted	Exploitation of new or better products in the market, processes or services as a result of the research projects

Source: Hoja de Ruta para las *Spin-Off* en Colombia, COLCIENCIAS (2016)

Table 2. University Spin-Off of Type II suggested for Colombia

Spin-Off on their own - The HIE create a Spin-Off on their own or with the participation of a researcher	
Role of the HEI in the creation of Spin-Off	a) The HEI participate as a partner in the Spin-Off; b) They lead and manage the process from the beginning until the implementation; c) They facilitate the participation of the researcher according to their interests and institutional politics; d) They transfer the know-how commercialization to the Spin-Off through a license agreement
The Entrepreneur	The HEI promote the creation of Spin-Off taken by the HEI and the researchers together
Type of exploited knowledge	a) Results of research, object of protection through intellectual property (products or processes are exploited); b) Exploitation of *Know How* through the provision of services
Responsibility in the business management of Spin-Off	a) If the HEI constitute the Spin-Off on their own, then they will take a 100% of responsibility and risk; b) If the Spin-Off involves both the researcher and the HEI, then the responsibility and risk of the business management is shared
Relationship between Spin-Off and HEI after the implementation	Once the Spin-Off is created, the relationship between the researcher and the HEI is sustained through the use of their scientific infrastructure, technological assistance, continuous training, recruitment of researchers, financial support, among others
Funder of the project and implementation	The HEI or the researcher with the HEI, as the case may be. If the researchers do not wish to be involved in the implementation of the company or whether they do not have the expertise or skills related to business management, then the HEI will look for an external team that complies with this type of profile. In such a case, the researchers give technical or technological orientation to the Spin-Off – It's possible the funding through venture capital of public entities without shareholding
Economic activity to be conducted	Exploitation of new or better products in the market, processes or services as a result of the research projects

Source: Adapted from the document. *Towards a roadmap Spin-Off: A way of creating University Spin-Off in Colombia.*

Table 3. University Spin-Off of Type III suggested for Colombia

The HEI and a third party create a Spin-Off	
Role of the HEI in the creation of Spin-Off	a) The HEI may or may not be a partner of the Spin-Off; b) The HEI define the participation to a management level jointly with the partnered company, as well as the participation of investigators and other university staff; c) The HEI transfer the know-how as an object of commercialization to the Spin-Off through a license agreement; d) The HEI manages the setting-up and implementation of the Spin-Off in cooperation with the partnered company; e) The HEI defines and settles the linkage of the university in the short, medium and longer term through an agreement with the partnered company
The Entrepreneur	The HEI, as an institution, fosters the creation of Spin-Off seeking a third party
Type of exploited knowledge	a) Results of research, object of protection through intellectual property (products or processes are exploited); b) Exploitation of *Know How* through the provision of services
Responsibility in the business management of Spin-Off	Both the HEI and the third party take responsibility and risk in the business management
Relationship between Spin-Off and HEI after the implementation	Once the joint venture is established, a close contact is maintained with the HEI in order to develop collaborative activities of R&D or research contracts that generate additional financial resources for the HEI
Funder of the project and implementation	a) The financial resources are provided by the partners, namely the university and the third party; b) The funding through venture capital or private funds can be sought. In this case it is possible the participation of a third party as a partner or as a shareholder
Economic activity to be conducted	Exploitation of new or better products in the market, processes or services as a result of the research projects

Source: Adapted from the document. T*owards a roadmap Spin-Off: A way of creating University Spin-Off in Colombia*

Table 4. University Spin-Off of Type IV suggested for Colombia

A third party creates the Spin-Off in order to exploit the results of the HEI	
Role of the HEI in the creation of Spin-Off	a) The HEI does not participate as a partner; b) The HEI transfer the know-how as an object of commercialization to the Spin-Off through a license agreement; c) The HEI defines and settles the linkage of the university in the short, medium and longer term through an agreement with the partnered company; d) The partnered company manages the setting-up and implementation of the Spin-Off.
The Entrepreneur	It is defined as an industrial partner that seeks a new university technology for its development and commercialization; such development or exploitation being established as the main purpose for the society
Type of exploited knowledge	a) Results of research, object of protection through intellectual property (products or processes are exploited); b) Exploitation of *Know How* through the provision of services
Responsibility in the business management of Spin-Off	The HEI do not take the responsibility for the management of the Spin-Off; through a license agreement they transfer the technology to the new company and they continue providing services of R&D. The company takes responsibility and risk in the business management
Relationship between Spin-Off and HEI after the implementation	The new Company could be in contact with the HEI in order to develop activities of R&D in collaboration or research contracts
Funder of the project and implementation	The Company provides the financial resources needed to implement the Spin-Off
Economic activity to be conducted	Exploitation of new or better products in the market, processes or services as a result of the research projects

Source: Adapted from the document. T*owards a roadmap Spin-Off: A way of creating University Spin-Off in Colombia*

According to Beraza Garmendia (2012) the university Spin-Off tend to be mixed phenomenon whose frontiers may vary significantly according to the perception that the actors implied have about the field and the authors. They identify different criteria in the specialized literature that show the different phenomena regarding the concept of university Spin-Off

Table 5. Typology of the Spin-Off according to Beraza and Rodriguez

Typology	Characterization	Authors
According to the attitude of the university	Spontaneous *Spin Offs,* passive or *pull Spin-Offs* are those created by members of the university community without having received any support from the institution of origin	Steffensen *et al.* (2000); Matkin (2001); Pirnay (2001)
	Planned *Spin-Offs,* active or push Spin Offs are those created in the context of a voluntary policy of support, conducted by the universities, in order to encourage and promote the transferring of knowledge and the entrepreneurial initiatives of their members	
According to the status of the members of the university community in which the idea was originated	Academic *Spin-Offs:* Created by one or more members of the scientific community or even persons that are not related to the university community, in order to commercially exploit a part of the knowledge developed in the context of their research activities. Within this collective, teachers, helpers, researchers, doctoral students, etc., are included.	Pirnay (2001); Smilor *et al.* (1990); Rappert *et al.* (1999); Bellini *et al.* (1999); Carayannis *et al.* (1998); Steffensen *et al.* (2000); Birle (2002); Rubiralta (2003)
	Student *Spin-Offs:* Are those created by students who at the end of their university studies have decided to constitute their own Company with the aim of taking advantage of their knowledge through the provision of services or through productive activities with the object of exploiting a business opportunity in sectors that have weak entry barriers and lack technological components. Within this collective, new and former graduate students or lifelong learners are included	Pirnay (2001); Smilor *et al.* (1990); Rappert *et al.* (1999); Bellini *et al.* (1999)
Depending on whether the student who is in the origin of the idea becomes an entrepreneur or not.	*Intraprenurial Spin-Offs:* Academic Spin-Offs created by one or more members of the university scientific community, in order to commercially exploit a part of the knowledge developed in the context of their research activities	Van Dierdonck and Debackere (1988)

Typology	Characterization	Authors
	Extrapreneurial Spin-Offs: Academic Spin-Offs created by persons that are not related to the university scientific community, in order to commercially exploit a part of the knowledge developed in the context of their research activities	
	Orthodox Spin-Offs Academic Spin-Offs in which a transferring to the new company occurs, both of the technology and the inventor.	Nicolaou y Birley (2002)
	Hybrid Spin-Offs: Academic Spin-Offs in which a transferring to the new knowledge company occurs but the inventor stays in the university, even though the inventor somehow participates in the scientific assessment to the company.	
	Technology Spin-Offs: Academic Spin-Offs in which a transferring of knowledge to the new company occurs but the inventor stays in the university and does not keep any connections with it.	
According to whom performs the biggest effort to establish the Spin-Off	*Inventor-led Spin-Offs:* Academic Spin-Offs in which the effort for their creation is conducted by the inventors of the technology they are exploiting.	Shane (2004)
	Shopper-led Spin-Offs: Academic Spin-Off in which the effort for their creation is conducted by external entrepreneurs interested in creating companies that exploit university inventions by means of a license given by technology transfer unit of the university	
	Investor-led Spin-Offs: Academic Spin-Off in which the effort for their creation is conducted by investors, usually venture capital entities interested in creating enterprises that exploit university inventions by means of a license given by technology transfer unit of the university and who seek, afterwards, an entrepreneur who takes care of their creation	

Source: Adapted from Beraza Garmendia & Rodriguez Castellanos (2012).

Tabla 6. Typology of the Spin-Off according to Beraza & Rodriguez – II

Typology	Characterization	Authors
Depending on whether the transferred knowledge has been licensed or not	*Assigned technology based Spin-Offs:* University Spin-Off created to exploit the license of a patented technology for the university	Grandi and Grimaldi (2005); McQueen and Walmar (1982); Hague and Oakley (2000); Steffensen *et al.* (2000); Shane (2004); Lockett and Wright (2005); HEFCE (2008)
	Non-assigned technology based spinoffs: University Spin-Off created to exploit a non-patented knowledge by the university, usually more generic or based on an expertise or in a know-how	Grandi and Grimaldi (2005); McQueen and Walmark (1982); Hague and Oakley (2000); Steffensen *et al.* (2000); Shane (2004); Lockett and Wright (2005); HEFCE (2008); Smilor *et al.* (1990); Rappert *et al.* (1999); Klofsten and Jones-Evans (2000); RedOTRI (2004).
Depending on whether the capital stock of third-party shareholders of the university environment participate or not	*External equity backed Spin-Offs:* Academic Spin-Off that in their early stage, receive funding of big companies, business angels or venture capital entities	Lockett and Wright (2005)
	Non-external equity backed Spin-Offs: Academic Spin-off that in their early stage, does not receive funding of big companies, business angels or venture capital entities	
Regarding the type of activity developed	*Consultancy and R&D contracting:* Academic Spin-Off that exploit the key competencies of	Stankiewicz (1994)

Typology	Characterization	Authors
	the researchers through an extension of their research activities. The venture capital is necessary and the risk assumed for its creation is low. They do not require big entrepreneurial abilities, unless the company grows and reaches full success and it drifts apart from the university. They do not usually bring new products or processes. These are usual Spin-Off of a linear model of innovation	
	Product oriented mode: Academic Spin-Off created around the concept of product or process which they develop, produce and commercialize. These Spin-Off correspond to the classical model of entrepreneurship. From the beginning they need to have abilities for the development of the technology and the product, access to networks, experience and familiarity with the market they will direct the product to. These abilities are critical in order that the Spin Off can survive and be developed. These Spin Off are between linear models and nonlinear models of innovation.	
	Technology asset oriented mode: Academic Spin-Off created in order to develop technologies that will be commercialized afterwards through different mechanisms like: the creation of Spin-Off, licensing, joint ventures and other types of alliances. Its business model is based in the creation, development and technological asset management. To that end, the research results and the technologies involved have to be well enough "packed" to make them marketable. Its strategic objective will be to develop a technology to the point where its market value becomes ideal. The necessary skills for its development can range from the protection of intellectual property to the identification, or even the creation of a market. These skills go beyond the traditional experience and abilities of an entrepreneur that is why they require exceptional commitment in every level of the project. These Spin-Off can be based in linear models and nonlinear models of innovation.	

Source: Adapted from Beraza Garmendia & Rodriguez Castellanos (2012)

Table 7. Typology of the Spin-Off according to Beraza and Rodriguez – III

Typology	Characterization	Authors
According to the type of activity and the resources required to develop it	*Consultancy and research services:* These types of activities permit the rapid access to the market. They are very closely related to the academic work of the researcher-entrepreneur and usually they are not based on patents nor they require a meaningful technological development. *License of intellectual property*: Its purpose is	Druilhe and Garnsey (2004)

Typology	Characterization	Authors
Regarding the development model	to develop and license the technological resources by means of the rights of intellectual property or selling a technology in order to take it from the pre-competitive phase to the market and in that way obtaining the return of results in the research through licensing. It is the route chosen by the Spin-Off dedicated to develop new drugs that do not have the intention of dedicating their production due to economies of scale. *Software:* It has similarities with the previous case since the software product may lead to license agreements, but it distinguishes from the previous case in the fact that it usually includes a process of software production because in this case there are low economies of scale *Product:* it also has similarities with the previous cases but the efforts made to elaborate the product based on the research results, require significant capital investments in infrastructure. That is why this activity is probably aloof from the experience and knowledge of the researcher. *Growth Spin-Offs:* Academic Spin-Off that seek a global market for technology. They are characterized by having a strong capitalization and also because external specialized institutions participate. They possess highly professional management teams with strong focus on growth and their goal objective is the quest for profit through dividends or capital gains. *Lifestyle Spin-Offs:* Academic Spin-Off that seek a sufficient market demand in order to sustain the founder's life and their family. They are characterized by having small-cap, the capital in the hands of the founder, low management capacity, little focus on growth and their goal objective is survival	European Commission (2002)
Growth Spin-Off but in an unfavorable entrepreneurship environment where the university does not provide support	These Spin-Offs are created in an early stage without having a solid business model; their basis is the scientific knowledge of their founders. They are characterized by having mid-cap and the capital in the hands of the founder and any external investor. As time goes by, they acquire experience and management skills that allow them to define the business model and to grow faster.	Degroof (2002)

Source: Adapted from Beraza Garmendia and Rodriguez Castellanos (2012)

Ospina (2012) when conceptualizing the academic Spin Off, he references the following authors: Iglesias (2010) who says that according to the entity of origin, they are classified in institutional and business Spin Off, the former are those generated in education institutes or through public or private research; in this category the university-academic or university Spin Off are a subtype. Trott *et al.* (2008) state that the Academic Spin Off (ASO) are synonyms to Univeristy Spin Off (USO). Shane (2004) categorizes it as a new company created to exploit a part of the intellectual property created in an academic institution. For Van Geenhuizen and Soetanto (2009) they are a particular group of Spin-Off created with the purpose of commercially exploit a new technology or research results developed in the university. Muegge, Sharma and Kumar (2005) claim that it is a new

company created in order to exploit an innovation developed in a university campus, the initial resources for its development are derived from the university itself. Clarysse *et al.* (2011) claim that it is a new company composed by teachers, staff members or doctoral students who left the university or the research organization, in order to fund the company whose main technology is transferred by the matrix organization. Lockett *et al*. (2005) and Wright and Lockett (2006) characterize it as a new company that licenses or uses the intellectual property of a public research institution. McQueen and Wallmark (1982) and Raday (2008) point out that the university Spin-Off are characterized by 3 aspects. The first one is that the founders of the company are from the university or related to it; the second one is that the company must be based on ideas or developed technology in the university, and finally, the transferring of knowledge must happen through a direct link between the Spin-Off and the universities, avoiding intermediaries.

According to Naranjo (2011) quoted by Perdomo Charry (2014) the university Spin-Offs are defined as companies created to capitalize on academic research and translate them into business value, they emerge from the university and their main objective is to disseminate and to seize the knowledge by linking it to the environment.

Spin-Off Colombia COLCIENCIAS (2016) determine the university Spin-Off as a company based on knowledge and research results, a company based on knowledge, especially the one protected by rights of Intellectual Property, created in the area of the HEI, as a result of research and development activities conducted under their support, in their laboratories and facilities or by researchers who are linked to them, among others.

According to Barrera (2012) the university plays a key role in the new era of university entrepreneurship, because it evolves from being a regular university focused on teaching and research to being an entrepreneurial university that interferes in the needs of the productive sectors and delivers both tangible and intangible results aligned to fulfill such needs in the science and technology fields.

According to Seguí-Mas (2013), *the creation of a Spin-Off under a cooperative as a type of company is not very common in these types of companies, since the vast majority are constituted as public limited companies.*

According to Rodeiro Pazos (2012) in the last few decades, the number of university Spin Off created in the Spanish University System has increased significantly. However, these companies have to deal with problems, such as the lack of funding or the entrepreneurial skills of the funders. From the results of a survey applied to 72 *Spin-Offs* created in Spain, the researchers try to identify and analyze the most common problems that the companies deal with and propose possible solutions. On the one hand, a set of practical initiatives of organizational design and human resource policies is presented and on the other hand and from financial point of view, they propose the venture capital as a possible funding instrument

Renau Piqueras (2008) presents a doctoral thesis whose basic objective is the analysis of a development situation of academic Spin-Off in Spain, focusing on the profile study of the academic entrepreneur and their motives to become such.

Soto Vargas (2010) presents a degree project based on a revision of models of promotion and creation of Spin-Off in three universities of the United States, two in Spain, one in Chile and one in Japan; policies of promotion, participation, conflict of interests and divestment were found.

Zúñiga (2013) suggests different elements and referents for future investigations about the conditions that should be created in the universities in favor of the Spin-Offs as mechanisms of technology transfer in the academic communities interested in this type of tool, considering that the universities in the country and in Antioquia have started the study of this mechanism with projects of formalization of businesses based on the research results.

Cáceres Carrasco (2015) based on a data base gathered from a survey made in the nine public universities that conduct promotion strategies in the creation of university Spin-Off, an analysis of the Andalusian universities was made through a contrast with the already existent bibliography. It is reflected, as well, on the future evolution of the companies created from the strategies of business incubation implanted by the universities and their relationship with such strategies. As a result, the strategies developed in the Andalusian universities differ from the models analyzed in the literature.

The existence of a new stage in the promotion strategies of the creation of Spin-Off is the main observation; it is considered as a pre-strategic phase of the same. Likewise, certain factors of the environment can be associated with the most successful cases of Spin-Off. As a conclusion, the universities should value the resource availability that they have, before developing a business incubation, especially the availability of a scientific and technological park.

Pombo Romero (2016) from a sample of 20 Spin-Offs and the analysis of their financial statements and public assistance or subsidies obtained during their five years of activity, they seek the possibility to differentiate

two types of Spin-Offs whether they are oriented to the market or not, or whether this direction from the first stages of the Spin Off can affect the risk exposure from the point of view of the investors. They assert that the companies created from the universities (Spin Off) have lower growth rates than other types of Star-Ups. The results obtained suggest that even though a significant number of Spin-Off are not market-oriented, it cannot be inferred from the initial economic-financial information of the company. This may result in a "risk of orientation", defined as the impossibility for investor to know whether there is an orientation to the market of Spin-Off.

Beraza Carmenóla (2014) notes different models of support programs for the creation of Spin-Off in the universities of Great Britain and Spain, their different characteristics are analyzed from the data gathered through a survey made to the people in charge of the support programs in the universities of those countries. As a result, three different types of support programs in the creation of Spin Off were found; all different in terms of experience, resources, engagement of the university, proactivity, selectivity, involvement in the management and success rate. Furthermore, they found a type of program considered as a successful one, characterized by having an intermediate policy between proactivity and selectivity; they note a country-of-origin effect (COE) in the characteristics of the university support programs in the creation of the most successful Spin-Off. Finally, the importance given by the literature to the existence of an environment favorable to the success of these programs, is confirmed.

Perdomo Charry (2014) presents the methodological elements for the construction of a business model of inter-institutional Spin-Off in Software Engineering, initially supported in traditional methodologies of creation of technology-based companies until achieving the real comprehension of the minimum viable product through agile methodologies like *Lean Canvas*. Four versions are presented for the *Business Model Canvas* until getting to the approach of the knowledge management – *Social Lean Canvas* as a strategy for the creation of new knowledge from the research results gathered in the institutional groups involved in the project.

Aceytuno Pérez (2009) suggests a table for the analysis of university Spin-Off taking as reference the four more relevant aspects of the recent years in the literature about this topic: the concept of university *Spin-Off*, the typology of university Spin-Off, the process of creation on university Spin-Off and determinants of Spin-Off.

Barrera (2012) suggests an institutional policy of support to the creation and sustainability of university Spin-Off companies, taking as case study the Universidad Tecnológica de Bolívar, Colombia, (UTB), their characteristics and the focus of their activities aimed to strengthen the research, the development and innovation in the university and the region through different transfer mechanisms of knowledge and technology that permit at the same time, the realization of the research and the encouragement of the technological innovation.

Fernández Villarino (2008) adds a guide for the creation of university Spin-Off companies, taking the promotion of the relationship university-society, the transfer of knowledge to the society and the entrepreneurial culture, among others as references; in order to consolidate the entrepreneurial capacity of teachers and students, to enhance an entrepreneurial mindset between students and researchers. And finally, considers the results depending on the number of companies based on knowledge and created in the university.

1.1 Stages for the Creation of University *Spin-Off*

Ospina (2012) cites different models of stages of different authors that must happen in order to constitute the Spin-Off, as follows:

Table 8

Stage models by Ndozuau, Pirnay and Surlemont (2002)
Stage 1: The production of ideas of businesses and the proposals within the scientific community for its commercial exploitation.
Stage 2: The ideas are taken from the previous phase and the most promising ones are transformed into a coherent and structured project of business start-up (business plan).
Stage 3: The implementation is made according to the opportunity found. This company is managed by professional team and supported with the availability of resources.
Stage 4: The strengthen of the Spin-Off is made. The companies, in this phase, have the capability to generate tangible benefits (creating economic value: employment, investment, taxes, among others) and intangible benefits (economic renewal, entrepreneurial dynamism, establishment of centers of excellence, among others)
Model by Vohora, Wright and Lockett (2004)
This model possesses a detailed process in the creation of university Spin-Off in which the different phases for the development that this process suffers are explained: research, delimitation of the opportunity, pre-organization, re-orientation and sustainable incomes. Likewise, it establishes four different critical moments that need to be overcome if success is the objective: recognition of the window of opportunity, entrepreneurial engagement, credibility and sustainability (Vohora, Wright and Lockett 2004).

Model of phases by Helm & Mauroner (2007)
The emergence of a Spin-Off company from a matrix organization is a process that starts from an idea and finishes up as a business enterprise. The stages in the process of Spin-Off are similar to a process of entrepreneurship because it includes the pre Spin-Off phases, pre Spin-Off, launch of Spin Off and post Spin-Off, as seen in figure 4 (Clarysse and Moray 2004; Helm and Mauroner 2007). The first stage (pre Spin-Off): In this stage, the ideas and the business opportunity are searched. The business plan will be developed, the initial capital is negotiated and the entrepreneurial team is created. At the end of the first stage, a critical moment happens; the formal set up of the company is made, as stipulated by Clarysse and Moray (2004). Second stage (Launch of Spin-Off): In this phase, the company conducts their first actions as a company, it enters the market and generates sells. When the Spin-Off is launched, adjustments are made. This stage finishes when an increase in the capital is obtained after a reorientation of the strategy of the company (Helm and Mauroner 2007). Third stage (post Spin-Off): In this last stage, the Spin-Off is considered as mature because it is established in the market and is characterized by: obtaining income, having technical developments for the product, the structural change in the company, the professionalization of the organizational team, the growth of the external funding and the obtainment of tangible advantages (Helm and Mauroner 2007).

Source: Adapted from Ospina Sánchez (2012)

The author organizes the literature consulted from the Helm & Mauroner model, taking into account c, as follows:

Table 9. Factors of success in the pre – Spin-Off stage according to the model of phases by Helm and Mauroner (2007)

Criteria	Authors
Close relationship with the universities – Support: staying in touch or keeping a close relationship with the university, will allow the access to different networks, in order to bring venture capital (Peng 2006). Likewise, every type of support provided from such institution to the new company is fundamental.	(Bagi and Balint 2009; Clarysse, Tartari and Salter 2011; Clarysse, Wright *et al.* 2011; Gómez *et al.* 2007; Kroll and Liefner 2008; Raday 2008; Steffensen *et al.* 1999; Trott *et al.* 2008; van Geenhuizen and Soetanto 2009; Wood 2009; Zhang 2008)
Entrepreneurial competences: It is the capability of taking risks or being susceptible to this (Helm *et al.* 2010; Seo *et al.* 2008; Walter *et al.* 2006), the identification of opportunities (Seo *et al.* 2008; Steffensen *et al.* 1999), authonomy and proactive assertiveness (Walter *et al.* 2006)	(Bagi and Balint 2009; Grandi and Grimaldi 2005a; Helm *et al.* 2010; Rasmussen *et al.* 2011; Steffensen *et al.* 1999; Vohora *et al.* 2004; Walter *et al.* 2006)
Environment (Cluster, parks, universities): the creation of an environment that facilitates the creation of a business initiative is necessary (Seo *et al.* 2008). Within the environment is possible to identify clusters, universities, organizations of public research and research parks that prepare the entrepreneurs for the venture capital investments; they provide technological spaces and resources for the new company (Raday 2008). – the government or university policies that adopt it, will allow the boost in the creation of USO (Kroll and Liefner 2008). Kroll y Liefner (2008) emphasize that certain policies are successful giving the conditions of the environment (resources and good regional economy)	(Algieri, Aquino and Succurro 2011; Gilsing *et al.* 2010; Gómez *et al.* 2007; Helm and Mauroner 2007; Peng 2006; Raday 2008; Rasmussen *et al.* 2011; Rodeiro *et al.* 2010; Seo *et al.* 2008; Steffensen *et al.* 1999; Zhang 2008)
Entrepreneurial team	(Clarysse and Moray 2004; Fini, Grimaldi and Sobrero 2009; Grandi and Grimaldi 2005a; Gómez *et al.* 2007; Helm and Mauroner 2007; Muegge *et al.* 2005; Raday 2008; Rasmussen *et al.* 2011; Vohora *et al.* 2004)
Business ideas that appeal in the market: The investors consider as key points that the company has the following elements: a business plan, the management skills of the funder/s, significant investments and strict contractual terms (Raday 2008).	(Grandi and Grimaldi 2005a)
Capacity to innóvate	(Bagi and Balint 2009; Helm *et al.* 2010; Wood 2009)
Characteristics of the business	(Helm and Mauroner 2007; Peng 2006; Wood 2009)

Criteria	Authors
Raise venture capital and investors: Gaining credibility from the leader entrepreneur or group of entrepreneurs allows the raising of venture capital from the investors. If the financial resources augment sufficiently, there is a greater possibility to acquire other needed resources, it is possible to go from the creation of the company (considered a success in this phase) to accomplish productive activities (launching of the company) (Rasmussen *et al*. 2011; Vohora *et al.* 2004).	(Peng 2006; Raday 2008; Rasmussen *et al.* 2011; Trott *et al.* 2008; Vohora *et al.* 2004)
Policies	(Algieri *et al.* 2011; Gilsing *et al.* 2010; Grandi and Grimaldi 2005a; Gómez *et al.* 2007; Kroll and Liefner 2008; Rodeiro *et al.* 2010; Sørheim *et al.* 2011)
Existence of networks	(Gilsing *et al.* 2010; Seo *et al.* 2008; Trott *et al.* 2008; van Geenhuizen and Soetanto 2009; Vohora *et al.* 2004; Walter *et al.* 2006)
Technology	(Gilsing *et al.* 2010; Shane 2004)

Source: Adapted from Ospina Sánchez (2012), P.30

Similarly, said author organizes the factors of failure of the scientific literature, under the parameters of the model, as follows:

Table 10. Factors of failure in the creation of university Spin-Off according to the model of phases of Helm and Mauroner (2007)

CRITERIA	AUTHORS
Absence of entrepreneurial characteristics (organizational structure of the company): The low profile of the university generates a weak environment that allows the creation of academic Spin-Off (Kroll and Liefner 2008).	(Kroll and Liefner 2008)
Lack of support in the creation of Spin-Off: Absence of incentives for the commercialization of university research, support mechanisms, absence of incentives for the creators, venture capital to invest in new creations from the universities (Grandi and Grimaldi 2005a).	(Algieri *et al.* 2011; Grandi and Grimaldi 2005a; van Geenhuizen and Soetanto 2009)
Commercial failure (of the product)	(Muegge *et al*. 2005)
Difficulty in providing the financing: It is the principal obstacle for the creation of USO. This is affected by the high levels of investment and the uncertainty that the company possesses when it is created. Thereby, the supply and demand of the private venture capital sldies from one side into the other, forming a financial gap for the USO, generating very few university Spin-Off (Sørheim *et al.* 2011).	(Sørheim *et al.* 2011; van Geenhuizen and Soetanto 2009)
Inability to sustain the innovation	(Wood 2009)
Obstacles of management and administration	(Van Geenhuizen and Soetanto 2009)
Very little entrepreneurial characteristics	(Kroll and Liefner 2008; van Geenhuizen and Soetanto 2009)
Financial problems	(Van Geenhuizen and Soetanto 2009)
Obstacles related to the market	(Van Geenhuizen and Soetanto 2009; Wood 2009)
Lack of resources	(Trott *et al.* 2008)
Excessive support	(Trott *et al.* 2008)
Lack of networking	(Raday 2008)
High cultural barriers	(Grandi and Grimaldi 2005a)
Absence of characteristics of research university	(Kroll and Liefner 2008)

Source: Adapted from Ospina Sánchez (2012), P.32

1.2 Relationship University-Firm-State (UFS)

Naindorf (2002) reflects on the critical positions surrounding the triple helix model: University-State-Firm (USF) alluding to certain works published in books, scientific magazines of mass dissemination, lectures, papers

presented at congresses, written by scientists or people in charge of the creation or implementation of scientific policies in Latin-American countries and the rest of the world.

These positions report the dialectical academic culture that distinguishes the universities of the twenty first century. On the search of new balances that permit the establishment of USC links that become favorable for their participants, given that institutions with different goals, functions and criteria faced obstacles.

According to Gutiérrez Ossa (2011), the relationship University-State-Firm (USF) defined through eight committees created in Colombia in order to give the research a central role in this context, it implies the revision of the paper that the companies and universities have to follow for its success. The case scenario has gaps that require to be solved. The systemic methodology outlined in the epilogue of the order of the organizations, stipulates that these can function together when they understand each other's structures and their work. However, a whole reconciliation worksheet, understandings and issues are still pending to be revised in light of the USF

In a recent document, the author Gutiérrez Ossa (2013) considers the possibility of achieving a new roadmap directed to the creation and employment opportunities in science and research through a University-State-Firm (USF) relationship. The reference framework that is conditioned to the USF relationship involves verifying the conditions to which the alliances created have an impact in the creation of jobs. The organizations created for the protection of the triad are decision-makers when it comes to jobs of science and research. Finally, the bases on which both topics have the same amount of professional opportunities, must be proposed.

According to Ramírez (2010) the actors of the economic development in Colombia – the University, the firm and the state- are interacting articulately in joint projects in order to promote different types of innovation for the economic sectors of each region. Colombia has taken the right path using synergies and applying successful experiences of these dynamics in other countries. The three actors must stay committed, having a clear vision for the support of management initiatives, the entrepreneurship and innovation of the researchers and entrepreneurs that have been involved in joint innovation projects.

The *Observatorio Iberoamericano de la Ciencia, la Tecnología y la Sociedad (OCTE-OEI), and the Red Iberoramericana de Indicadores de Ciencia y Tecnología* RICTT (2017) suggests a flexible methodological proposal adjustable to each unique institution in order to *"design, develop and implement a system of indicators capable of reflecting the wide range of interactions through which the Ibero-American universities relate to the environment… in order to equip the academic institutions with measuring instruments of their own linkage-related activities, additionally to equip the governments with tools that allow the development of public policies and to define strategic resource allocations"* …so that this information allows the different economic and social actors to orient their strategies of searching linkages with the universities.

2. Methodology

This research work corresponds to a qualitative and interpretive design of documentary type that allowed the process of selection, access and registration of the documentary sample.

An Excel matrix was used in order to incorporate 500 documents, such as: journals papers, research works, books and degree projects obtained running a data base available in the Universidad del Cauca, the internet and other related documents provided by experts. Thanks to the filters available in such data base, and exploring the internet with key words, 32 documents were chosen from 92 initial references for the sake of supporting the content of the article.

Afterwards, a thorough reading of the chosen documents took place and were narrowed down in 6 categories: Regulatory framework of Spin-Off in Colombia: Typologies of university Spin-Off, Organizational models related to university Spin-Off; Factors of success and failure of university Spin-Off; Stages of implementation of university Spin-Off (models); Relationship University-Firm-Sate. From this procedure, the summaries of the content gave the argumentative support used in the final document.

Conclusion

When it comes to characterize the meaning and reach of the university Spin-Off, the specialized literature collects different criteria, as follows:

- The attitude of the university toward this type of organizations
- The status of the members of the university community where the idea was originated
- Whether the researcher who originated the idea becomes an entrepreneur or not
- Depending on who conducts the biggest efforts to establish the Spin-Off
- Depending on whether or not the transferred knowledge has been licensed

- According to the participation in the share capital of third parties in the university environment
- According to the activity developed
- The type of activity and the resources required to develop it
- According to the model developed
- Oriented to the growth but in an unfavorable entrepreneurship environment where the university does not provide support

The different senses have in common the basic objective of this type of organizations that points towards the transfer of research results generated by research groups in their own campuses and with their own resources, achieving the interest of an external investor that finds appeal the commercialization and valuing the results and turning them in technologically-based business ventures, through precise and clear protocols regarding intellectual property and copyright.

The specialized literature stipulates various models that show the stages that might have to be exhausted for the successful implementation of the university Spin-Offs, starting from the idea and the escalation of the initiative in the context of a business model to the implementation in the innovation market

Certain authors have collected the success and failure factors inherent in these types of organizations: Regarding the success factors in the pre-Spin-Off phase are highlighted: Close relationship with the universities; Entrepreneurial competences; Favorable environment; Characteristics of the business; Raise venture capital and investors; Policies; Existence of networks; Technology.

When it comes to Failure factors, they go as follows: Absence of entrepreneurial characteristics; Lack of support in the creation of Spin-Off; Commercial failure of the product; Difficulty in providing the financing; Inability to sustain the innovation; Obstacles of management and administration; Very little entrepreneurial characteristics; Financial problems; Obstacles related to the market; Lack of resources; Excessive support; Lack of networking; High cultural barriers; Absence of characteristics of research university.

The necessity of revising the relationship University-Firm-Sate places value in the environment, the results generated in the university because according to different authors, the gaps that require to be solved.

For the Colombian case, according to recent research studies, in this type of relationships the actors are interacting in an articulated manner with joint projects that promote different types of innovation for the economic sectors of each region, creating synergies trough successful experiences.

For the Colombian case, the university Spin-Offs have been classified in four specific typologies, as follows: Type I: A researcher creates a Spin-Off based on the transfer of results of the Higher Education Institution (HEI); Type II: Spin-Off on their ow - The HIE create a Spin-Off on their own or with the participation of a researcher; Type III: The HEI and a third party create a Spin-Off; Type IV: A third party creates the Spin-Off in order to exploit the results of the HEI.

For all legal purposes, (Law 1838, Act of 2017), in Colombia should be understood that a university Spin-Off is *"a company based on knowledge, especially the one protected by rights of Intellectual Property, created in the area of the Higher Education Institution (HEI), as a result of research and development activities conducted under their support, in their laboratories and facilities or by researchers who are linked to them, among others"*

The previous considerations present a proper analytical framework in order to characterize the state of the Universidad del Cauca as an organization of knowledge capable to promote Spin-Offs, if the conditions required to create technologically-based business ventures, through an appropriate organizational structure and specific regulations on intellectual property that can support it.

References

[1] Aceytuno Pérez, C. C. 2009. Elementos para elaboración de un marco de análisis para el fenómeno de las Spif-Off Universitarias. *Revista de Economía Mundial, 25*: 23-52.

[2] Barrera, S. 2012. Diseño de Políticas Institucionales para la creación y sostenibilidad de Spin Off en las universidades emprendedoras de Colombia. Caso de estudio: Universidad Tecnológica de Bolívar. Cartagena de Indias, Bolívar, Colombia: Universidad Tecnológica de Bolívar, Facultad de Ingeniería.

[3] Beraza Carmenóla, R. C. 2014. Los programas de apoyo a la creación de Spin-Off universitarias en el Reino Unido y España: Una tipología. *Revista de Economía Mundial,* 36*:* 181-209.

[4] Beraza Garmendia and Rodriguez Castellanos 2012. Tipología de las Spin-Off en un contexto universitario: una propuesta de clasificación. *Cuadernos de Gestión* I2(1)*:* 39-57.

[5] Cáceres Carrasco., F. R.-T. 2015. Estrategias de promoción de las Spin-Offacadémicas: el caso de Andalucía. *Cuadernos de Gestión,* 15(2): 113-142.

[6] COLCIENCIAS. 2016. Hacia una hoja de ruta Spin-Off: Un camino para la creación de Spin-Off universitarias en Colombia. 37.

[7] Fernández Villarino, R. 2008. *Guía práctica para la creación de empresas "Spin-Off" Universitarias.* Huenval, España: Servicio de Publicaciones de la Universidad de Huelva.

[8] Gutiérrez Ossa, J. A. 2011. Punto de inflexión entre empresas y universidades ante la relación Universidad, Empresa y Estado en Colombia. *Revista Universidad & Empresa*, 167-191.

[9] Gutiérrez Ossa, J. A. 2013. Universidad, empresa y Estado frente a la empleabilidad de los trabajadores de la ciencia en Colombia. *Revista Ecos de Economía, ISSN 1657-4206 I Año 17 I No. 36 I enero-junio 2013- I Medellín-Colombia*, 69-98.

[10] Mauricio Castillo-Vergara, A. A.-M. 2015. La Transferencia de Investigación en Instituciones de Educación Superior Mediante Spin-Off. *Actualidades Investigativas en Educación*, 3.

[11] Naindorf, J. 2002. En torno a la vinculación científico -tecnológica entre la Universidad, la Empresa y el Estado. Desarrollos teóricos de una agenda crítica. *Fundamentos en humanidades Universidad Nacional de San Luis., Año III- N° 1-2 (5-6/2002)*, 7-22.

[12] Observatorio Iberoamericano de la Ciencia, la Tecnología y la Sociedad (OCTE-OEI), Red Iberoramericana de Indicadores de Ciencia y Tecnología (RICTT). 2017. *Manual Iberoamericano de indicadores de vinculación de la Universidad, con el entorno socioeconómico.* OET Observatorio CTS.

[13] Ospina, N. R. 2012. *spinÉxitos y fracasos en las spinÉxitos y fracasos en las spinÉxitos y fracasos en las spinÉxitos y fracasos en las spinÉxitos y fracasos en las spinÉxitos y fracasos en las spinÉxitos y fracasos en las spin Éxitos y fracasos en las spinÉxitos y fracasos.* Medellín: Universidad Nacional de Colombia.

[14] Perdomo Charry, W. C.-a. 2014. Modelamiento Spin-Off interinstitucional para la oferta de servicios en ingeniería del software. *Revista virtual Universidad Católica del Norte*, 194.

[15] Pombo Romero, R. P. 2016. El riesgo de orientación en la inversión en Spin-Offuniversitarias ¿Existe? ¿Es posible identificarlo en los primeros años de vida? *Cuadernos de Gestión,* 16(2): 29-48.

[16] Ramírez, M. d. 2010. La Alianza Universidad-Empresa-Estado: una estrategia para promover innovación. *Revista Escuela de Administración de Negocios - EAN, 68:* 112-133.

[17] Renau Piqueras., J. 2008. El emprendedor académico y la decisión de crear Spin-Off: Un análisis del caso español. *El emprendedor académico y la decisión de crear Spin-Off: Un análisis del caso español - Tesis Doctoral*. Valencia, Valencia, España: Universidad de Valencia - Facultad de Economía.

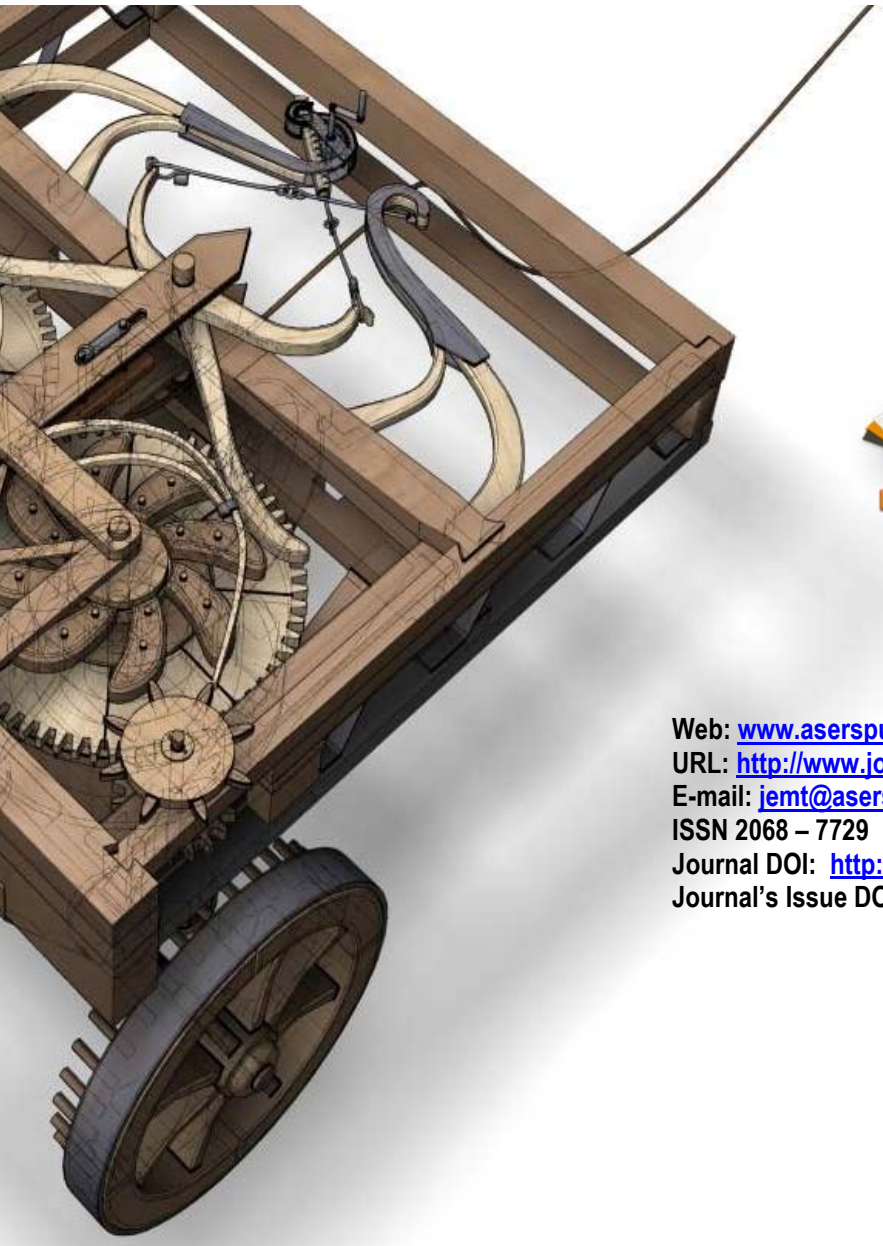
[18] Rodeiro Pazos, C. B. 2012. La gestión empresarial como factor clave de desarrollo de las Spin-Offuniversitarias. Análisis organizativo y financiero. *Cuadernos de Gestión,* 2(1): 59-81.

[19] Seguí-Mas, S.-V. e. 2013. Estudio del emprendimiento académico bajo fórmulas de economía social: análisis de las Spin-Off universitarias Cooperativas. *CIRIEC-España, Revista de Economía Pública, Social y Cooperativa, CIRIEC-ESPAÑA Nº 78/2013*, 101.

[20] Soto Vargas, C. 2010. Políticas relevantes en la creación de una Spin-Off y planteamiento de una propuesta que pueda ser adoptada por la Pontificia Universidad Javeriana. *Políticas relevantes en la creación de una Spin-Off y planteamiento de una propuesta que pueda ser adoptada por la Pontificia Universidad Javeriana*. Bogotá, Bogotá D.C., Colombia: Pontificia Universidad Javeriana - Trabajo de Grado.

[21] Zúñiga, A. C. 2013. Las spin-off en el contexto universitario colombiano: consideraciones generales. *Journal of Engineering and Technology,* 2(2): 82-95.

ASERS



ASERS Publishing

Web: www.aserspublishing.eu
URL: http://www.journals.aserspublishing.eu/jemt
E-mail: jemt@aserspublishing.eu
ISSN 2068 – 7729
Journal DOI: http://dx.doi.org/10.14505/jemt
Journal's Issue DOI: http://dx.doi.org/10.14505/jemt.v10.1(33).00