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The aspects of knowledge transfer and academic entrepreneurship:

The spinoff organizations

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Title of the thesis:

The aspects of knowledge transfer and academic entrepreneurship: the spinoff organizations

Purpose –

In recent years, the economy system is moving towards to affirmation of the knowledge economy. The knowledge economy is driven by entrepreneurship and, consequently, the entrepreneurial university becomes and important catalyst for regional economic and social development. There is an introduction of an entrepreneurial logic in academia. The need to exploit economically the results of research, the lack of resources between the economic system and the continuous contamination / collaborations and academic system have produced a new form of organization: the spin-offs. In recent years, the spin-off phenomenon has become as a hot topic within the academic and professional debate. Despite the large number of studies on the spin-off products, the complexity of the same has left several aspects still unexplored.

The transfer of knowledge between universities and businesses, academic entrepreneurship and commercialization of research products, are some of the various aspects that characterize the topic under analysis.

Starting from these assumptions, this research work tries to offer a survey on the current "state of the art" of the phenomenon and to highlight the academic aspects of academic entrepreneurship with particular attention to the spin-off. The thesis work consists of three different scientific contributions with the aim of highlighting different aspects of the phenomenon. In the first part of this paper we have tried to analyze and identify the main lines of research on the spin-off and understand the main results and theory in the scientific literature. The literaturere view aims to define the boundaries and characteristics of the spin-off companies, highlighting its importance as a "vehicle" for the transfer of knowledge from universities to the territory. In fact, for the selection of the literature been identified of keywords in order to draw two research drivers: **I.** the concept of spin-off **II**. the mechanisms and the results of transfer of knowledge. The objective of the first research drivers is to give a possible solution to the interpretative phenomenon and represent the main variables that scholars use to analyze the phenomenon. The spinoff may be considered as the main expression of "academic entrepreneurship". This tool comes up against major constraints such as social usefulness (and often public) of research results and the lack of managerial skills in universities. The second driver of research aims to understand the main mechanisms for the transfer of knowledge analyzed by the scholar and the effects on spin-off.

The second part of this contribution, however, was dedicated to understand the various factors and actors that influence the creation, development and management of spin-off. The spin-off organizations are presented as a complex organization, which needs a favourable system for the creation. Starting from these preliminary considerations, the contribution has tried to offer a systemic vision of the relationship between university, industry and government. The second part of the chapter aims the examination of the Italian spin-off system. In particular, starting from a database composed of 1390 spin-off, we tried to understand how knowledge is produced within universities influence the creation of spin-offs and their economic activities. Empirical observation has allowed highlighting the underlying theories. At the same time has tried to identify the distinctive features of the Italian system.

The third and final contribution in this thesis focused on the process of creation of the spin-off with an internal perspective to university. The paper has analyzed the main contributions in the literature on the subject of the process creation of the spin-off and highlighting the main aspects and limitations of each model. The process has similar characteristics to the creation of a start-up. At the same time, the input of the creation of a spin-off is unique and particularly complex. The type of knowledge (research results) and organizational/managerial autonomy of universities (or HEIs) affect the process of spin-off creation. Studies and reflections have led to the formulation of an integration of the main spin-off creation processes.

The reflections and the results shown in this thesis are born from participation in important summer schools, conferences and international conferences. In particular, part of the results were accepted and submitted to 16th and 17th European Conference of Knowledge Management (ECKM), 10th and 11th International Forum on Knowledge Asset Dynamics (IFKAD), Workshop organization studies (WOA). Some results of this thesis have been the subject of publication (or in the process of review) by some international scientific journals: Modern Social Science Journal, Journal of Management Development, Handbook on Research on Sustainable Entrepreneurship and Investment.

Design/methodology/approach – This thesis is composed of three different papers, linked to each other by common purpose to study the phenomenon of spin-off organizations. Although the three papers have the same object of analysis, are differ by methodology used. Specifically are different types of papers presented: review of the literature, practical paper and academic research paper.

The first paper uses a literature review, with the main objective to highlight the main issues addressed in the elaborate. In particular, using the SCOPUS database, are identified approximately 600 paper in line with the research question. The review has highlighted the main areas of research, the essential characteristics and the limits of literature. The theorical part of the study contextualises and defines the phenomenon of spinoff. The study outlines the main theory on the theme of the spinoff organization.
The second paper, using a methodology of qualitative-descriptive type, aims to highlight the "success factors" in the process of creation, development and management of spin-offs. By analyzing brought forward, it was possible to create a "map" of the main actors and factors that influence the creation, development and management of the spinoff.
Starting from the analysis of a sample of 1383 spinoff, it has sought to highlight the "state of health" of the Italian system of spin-offs. The relationship between knowledge produced in universities and spinoff comes easily interpreted from the theoretical point of view is not so immediate in terms of empirical. This part outlines interacting economic, social and political developments in Italian context. The theoretical framing for this study integrates resource-based research and the creativity of action theory.

The last processed that makes up the thesis analyzes the main processes of creation of spin-off. For this reason, starting from an analysis of the literature have been identified the most accepted processes of creation of spinoff. The result of this paper was to provide a review of existing models

Originality/value – The paper presents several aspects of originality. In the first chapter, after review of the literature, it proceeded to provide new parameters for classification. In particular, we tried to offer a personal definition of spin-off and understand how other scholars define the phenomenon.
The second chapter provides a systemic view on the phenomenon of spin-off. The results of the work peddling "success factors" that influence the creation, the birth and development of spin-off. Specifically, it seeks to provide a complete view on the spin-off in the Italian system. The work seeks to offer the first results of a systemic reflection of the phenomenon in Italy.
The third chapter, starting from the spin-off creation models in the literature, seeks to provide a critical view showing the main strengths and limitations. At the same time, we try to offer a personal interpretation of the creation process of the spin-off.
Practical implications – The main objective of this thesis is to give a range of information and reflections for the creation and growth of spin-off, both as a tool for knowledge transfer between universities and the production system both as new entrepreneurship. Reflections both in managerial

terms of analysis of the context can provide guidance for the development of the current condition of the spin-off. This research study provides theoretical insights and empirical evidence for scholars investigating academic entrepreneurship. In addition, it presents policy makers and university administrators with the key resource drivers of entrepreneurial action. It could also assist them in establishing an appropriate role for institutions and organisations in promoting entrepreneurial activities. With such knowledge they could provide academics with the resources required, foster their relevant abilities and get the most out of complementary effects, while acting with against potential trade-offs. Furthermore, the findings show that the activities of academic entrepreneurship is manifested through the spinoff. Moreover, the presence of spinoff is positively linked to economic development.

The results indicate that academic spinoffs are a complex phenomenon in a heterogeneous

Keywords –Spin-off, Academic Entrepreneurship, Knowledge Transfer, Knowledge Management, University*(max 5 words)*

Paper type – phd thesis

Spin-offs and knowledge transfer: critical review of a literature review

Structured Abstract

Purpose –
The spin-offs organizations, have received increasing attention in the scientific debate, because not only generate new innovations, productivity and occupancy for regional economies, but also make a significant contribution for a knowledge transfer from university. In modern economic system, the knowledge became an important factor in the process of creation a competitive advance for firms. There are variety of channels through which academic knowledge and technology is being transferred between universities and industry. The spin-offs are the main mechanisms of knowledge transfer from a parent organization (University or Higher Education Institution) in other system. Since their introduction, the organization of the spin-off attracted the interest of scholars. In recent years, it has created a significant amount of contributions on the subject, demonstrating the relevance of the issue and the need for new analysis. For this reason this study want to comprehensive literature review of the spin-off with particular focus on spin-off as a mechanism of knowledge transfer. We conclude that while the early literature has been mainly theoretical and focused or describing the phenomena, the latter studies have focused on entrepreneurial and managerial effects of the spin-off.

Design/methodology/approach
The review of the literature (Cook et al., 1997; Staples and Mahmood, 2007; Abatecola et al. 2011), has been made on the bulk of publications reached on Scopus, the electronic search platform of journals databases. With reference to the period between the years 2000 and 2016 were identified 784 scientific documents with heterogeneous approaches, this result it has been refined with the search of key-words coherent with aim and topic of this paper. At the end, the analysis focuses on the contribution given by 342 scientific documents that were examined with regard to methodology approach and driver of research. The collection of scientific papers were filtered with a reading of the abstract. After the various phases creaming in order to identify scientific documents coherent with the search target, are n. 132 scientific documents considered.

Originality/value – This paper through the literature review offers an updated picture of the state of the art of the spin-off organizations. Specifically, it contributes at the debate providing an overview of the methods and approaches used in research articles and original classifying of scientific contributions on this topic highlighting 2 research drivers: **I**. the concept of spin-off, **II**. The spin-offs as a mechanisms and results of knowledge transfer.

Practical implications – The paper should helping practitioners to clarify the conceptual boundaries of spin-offs and providing a theoretical framework that could help researchers in framing their research efforts in the area.

Keywords – Spin-Off, Knowledge Transfer, Literature Review, ASOs, University
JEL Classification – L26, J24, M13, D21

1. Introduction

The new competitive paradigms shifted the attention on the strategic value of intangible factors for the creation, growth and survival of firms. The context requires organizations to generate and develop new skills and

knowledge[1]. Under this pressure, the role of the traditional economic/social actors has changed. In particular, universities and research centres, been driven by a growing demand of firms, been forced to support their traditional institutional responsibilities, new methods of knowledge transfer and research exploitation.

The knowledge management plays an important role not only in private organizations (Nonaka Takeuchi, 1997; Alavi and Ledner, 2001 Grant, 1996; Wang et al. 2009; Hilsop, 2013), but also in the public sector (Wiig, 2002). A tool to introduce new knowledge of the economic system by the University is the spinoff way. The term spinoff, increasingly popular in recent years, is a useful vehicle for the exploitation (not only economic) of public research.

The University spinoff constitute a complex phenomenon within the entrepreneurship (Dojkovic and Souitaris, 2006) and knowledge transfer research field. These companies, which evolve from universities through commercialisation of intellectual property and transfer of new knowledge/technology, developed within academic institutions. The spin-offs are an importance source for creation of job opportunities for academic.

Moreover, the spin-off has been widespread in recent years as a mechanism for creation of new entrepreneurship on products with high level of technology. In this context, the spinoff is one way to exploit the results of public research, not only economic view.

The phenomenon of spin-off and transfer of knowledge between universities and the economic system, which in recent years is attracting the most interest from the academic world. There are various approaches and perspectives of analysis in the literature.

The Academic spin-off is a phenomenon that encompasses organizational entrepreneurship with the needs of the knowledge transfer from research.

These organizations, in fact, originate from a parent organization (usually universities or institutes of higher research), and are intended to enhance (economically) products of research made.

Despite their importance as possible sources of wealth creation and job opportunities in the economy (Steffensen, Rogers, & Speakman, 2000), researchers started to focus explicitly on university spinouts only recently.

The change of attention of universities towards commercialisation activities of research combined with governmental and institutional support mechanisms is creating a fertile ground for the creation of initiatives entrepreneurial academic[2].

This growth of activity of spin-off has inspired a recent increase of research interest on the phenomenon. Still we lack studies, which critically review the literature and its theoretical contributions on spin-offs and spin-offs as mechanism of knowledge transfer.

Our literature review is mainly based on the papers published in core management journals, which we identified systematically using SCOPUS databases. This paper is structured in four parts. After this introduction, the second part presents the relevant theory on subject. The third section describes the methodology used in this work. The work follows with principal results and finally closes with first reflections and bibliography

2. Theoretical framework

The modern economic system is increasingly oriented towards an information-based system. This new economic system takes the name of knowledge-based economy[3]. The enterprises in this system based her production, on new knowledge and information. The term knowledge-based economy refers at least two features of the economy: knowledge (in quantitative and qualitative terms), Information and Communication Technologies as drivers of the economy. Consequently, entrepreneurial initiatives linked to innovations and new technology

[1] For further study, please see: Reina R. (2012), "La formazione per la crescita territoriale. Analisi teoriche ed esperienze operative nel sistema delle imprese artigiane in Calabria", Rubbettino Università.

[2] Djokovic, D., & Souitaris, V. (2008). Spinouts from academic institutions: a literature review with suggestions for further research. *The Journal of Technology Transfer*, *33*(3), 225-247

[3]D. Foray"Economia della conoscenza", il Mulino, 2006 e Snieška, V., & Drakšaitė, A. (2015). The role of knowledge process outsourcing in creating national competitiveness in global economy. Engineering Economics, 53(3).

transfer (Jordan and O'Leary 2007). The universities and HEIs are the major creators of new knowledge. There are different types of academic knowledge output like publications and patens seem to be the most important input to industrial innovation (Narin et al, 1997; McMillan et al., 2000; Cohen et al., 2002). Some authors argue that firms consider codified output, such as publications and patents, the most important form of accessible knowledge that is being developed by university. For transfer this new academic knowledge there are different forms e.g. collaborative and contracted research active (Kingsley et al., 1996, Meyer-Krahmer and Schmoch, 1998; Monjon and Waelbroeck, 2003). The most innovative and important channel of knowledge transfer between the relationship university-industry is the spin-off organization (Mueller, 2006). The term "spin-off" is not new term in literature. Different authors have analysed the phenomenon of spin-off so called or with different name (e.g. spillover, spin-out, spinoff, startup from research, etc.).

In economic theory, innovation diffusion has often been described "spillover". This concept is borrowed from macro-economics, where spillovers are the engine of economic growth due to the positive feedbacks they induce in economic development (e.g. Romer 1990). In micro and industrial economics, the concept of technological spillovers was carried over by referring to the public good nature of new technological knowledge. Accordingly, in the incentive-based approaches of neoclassical industrial economics, technological spillovers are considered as involuntary knowledge flows that reduce the incentive to be engaged in costly R&D. However, the negative interpretation of technological spillovers has had an impact on the assessment of collaborations in industrial R&D.

The Universities and other Higher Education Institutions (HEIs) have come to be-regarded as key sources of knowledge utilizable in the pursuit of economic growth through commercialization and transfer of knowledge activities (Huggin and Johnston, 2009; 2015).

The University therefore, not only play a role in the creation of knowledge, but also has a key role in knowledge transfer in the community and in society with the ultimate aim to create value. This situation is well known like "third mission" of University, in which it is possible to consider the set of activities through which Universities and the research institutions come into direct interaction with the company, providing a new form of contribution that accompanies the others traditional University's missions like "teaching" and "research" (source: ANVUR website). It is important to state the heterogeneity of the third mission, which cannot be reduced to a single dimension; but obviously, the focus of this research work is the deepening of the economic exploitation of knowledge, as a specific part of the action program defined. In fact, in this area, one of the most important applications of technology transfer to society and market in a coherent way is through the creation of Academic Spin Offs (ASO, Klofsten and Jones-Evans 2000; Rasmussen et al 2006; Shane and Stuart 2002; Vohora et al 2004; Czarnitzki, Rammer and Toole 2014). Research institutions are considered the center of knowledge creation (Godin and Gingras, 2000) and are pushed to pursue a strategy of technology transfer in order to generate new sources of income. Industries rely, to an increasing degree, on scientific research results (Godin, 1996).

R&D and industrial policy assume that university-industry links are the fuel of knowledge-based economies (Dasgupta and Stoneman, 1987). Universities are supposed to serve a "third mission" in contributing to economic development (e.g. Lee 1996, Meyer-Krahmer and Schmoch 1998, Etzkowitz 2002, Agrawal and Henderson 2002, Schartinger et al. 2002, D'este and Patel 2007).

In recent years, the transfer of knowledge from the university and other Higher Education Institutions (HEIs) to firms has been the focus of academic debate. The main mechanisms for the transfer of knowledge (Bercovitz, J., & Feldman, M., 2006) from universities or HEIs to the market are: Patents and spin-offs.Several authors agree with defining the spin-off represents a new mode of economic exploitation (and not only) of the search results, which consists of a technology transfer process and \ or knowledge to the creation of new businesses promoted by the community scientific (Piccaluga, Chiesa, 1996; Arrighetti, Vivarelli, 1998; Lindholm, 1997).

So, this particular type of firms, combines two different forms of knowledge: research (economically valuable) and entrepreneurship, with different characteristics such as risk propensity, work by objectives and economic evaluation of advantages. The presence of these different forms of "knowledge" characterizes the

spinoff as particularly complex organizations. From the organizational point of view, according to the neo-Schumpeterian approach (Carlosson and Eliasson, 1994; Freeman, 1995; Van Oort and Lambooy 2014) there is the problem to create new learning processes that start from the competence and experience of a single people, represented in the academic spin offs case through the expertise of an academic researcher.

The diffusion and new attention to the phenomenon of spin-off has come in recent years to focus the attention of many scholars and researchers, so that it appears possible to divide the analysis of the literature in two main areas of analysis. In the first, the focus of analysis are the individual characteristics of the entrepreneur and the behavioral variables of the same (skills, know-how, latent capabilities, etc ...). The second area of analysis, instead takes as reference the organization and the environment identified in the dynamics of the industrial context and the policy actions, implemented by local government[4].

Strong emphasis is also being given in the literature to the phenomenon of academic spin off. The study of this phenomenon is characterized by all the main problems of the spinoff entrepreneurial. In particular, the academic spin-off, is a very complex phenomenon as it combines the transfer of knowledge produced by the research on the characteristics of entrepreneurship. This complexity can be found in literature from the point of view of terminology and definitional. There is, in fact, in the literature a number of terms indicating the phenomenon, such as: a spin-off from research, spin-out, start-up academic, academic spinoffs, etc ...

The studies on knowledge transfer are numerous and they are all generally focused on organizations and especially on private enterprise. The copious research on KM and KT, in fact, considered as main reference the private sector and extends rarely in the public.

The management and transfer of knowledge plays an important role in this economic system for firms (Nonaka and Takeuchi 1997; Alavi and Ledner 2001; Grant 1996; Wang et al. 2009; Hilsop 2013) or administration public (Wiig 2002). The studies on knowledge management are numerous and they are all generally focused on organizations and especially enterprise private. The Universities and other Higher Education Institutions (HEIs) have come to be regarded as key sources of knowledge utilizable in the pursuit of economic growth, with commercialization and knowledge transfer activities in Attaining blackberries important role within universities (Huggin and Johnston, 2009). The university therefore, not only have to play a role in the creation of knowledge but also play a role to the transfer of knowledge in the territory and in society with the ultimate aim of create value. One of the most obvious applications of technology transfer to society and the market is through the creation of spin-offs (ASO, see Klofsten and Jones-Evans 2000; Klofsten et al 1999; Rasmussen et al 2006; Shane and Stuart 2002; Vohora et al 2004). The objective of this paper is to understand how the universities, through the transfer of knowledge in ASO, responding community needs.

The knowledge transfer can be defined as a process through which one unit (e.g. group, department, or division) in affected be the experience of another[5]. Another definition of KT can be defined as utilizing knowledge, technology and scientific achievements arose from university to accomplish knowledge flow and knowledge application, and therefore to realize market value of knowledge

There are different level of knowledge transfer. Singley and Anderson (1989) defined the KT at the individual level as "how knowledge acquired in one situation applies (or fails to apply) to another." Although knowledge transfer in organizations involves transfer at the individual level, the problem of knowledge transfer in organizations transcends the individual level to include transfer at higher levels of analysis, such as the group, product line, department, or division. Knowledge transfer in organizations manifests itself through changes in the knowledge or performance of the recipient units. At level of inter organization the transfer of knowledge are often laborious, time consuming and fraught with difficulty, extant conceptions treat them essentially as a time

[4] Ramaciotti L. (2006), "Valorizzazione della ricerca e produzione industriale: Concetti ed esperienze, in Laura Ramaciotti (a cura di) Università Nuova Industria e Sviluppo Locale, Banca Etruria Studi e ricerche, Arezzo.

[5] Argote, L., & Ingram, P. (2000). Knowledge transfer: A basis for competitive advantage in firms. Organizational behavior and human decision processes, 82(1), 150-169.

consuming and fraught with difficulty, extant conceptions treat them essentially as a costless and instantaneous exploit. When at all acknowledged, difficulty is an anomaly in the way transfers are modelled rather than a characteristic feature of the transfer itself[6].

A very interesting research field on the theme of Knowledge transfer, taking into consideration the strategic alliances between firms. In according to Mowery D.C., et al. (1996), understood as the transfer of knowledge between enterprises as the technology change that occurs between two allied enterprises.

There are many research conducted on the relationship between KT and public universities. Among the empirical studies made within the university, should be cited those as: the relationship between Performance Management Systems (PMSS) and Knowledge in Italian public universities (Esposito et al., 2013); the measurement of intellectual capital within the Spanish public universities (Ramirez et al., 2007); the mechanisms of knowledge transfer between universities and businesses in the UK. (D'Este and Patel, 2007).

3. Methodology

The aim of this work is to describing the findings of a literature review that assessing the interest in the topic, in particular on the concept, the knowledge transfer mechanisms and the employed research approaches and methods methodology. For this reason, this work based on a literature review. The main reference for the data collection is Scopus, the largest abstract and citation databases of research literature (Surulinathi, et al., 2009). This database chosen because is multidisciplinary and supported by different publishers, giving access by this way to a broad variety of academic journals and publications.

As mentioned above, there are different terms for the phenomenon[7]. The use of three terms for research strings "spin-off*", "spinoff*" and "spin off*" by this way we collect all the documents on this topic, whatever is the way in which this concept is written. Indeed, the asterisk stands for finding all combinations of a word or word fragment.

Several authors date back after 1999 the arising of the phenomenon[8]. For this reason, papers published from 2000 are considered and the research has not restricted the literature review to publications only in English.

By the consultation of the database appeared n. 784 papers, which contained in the title, in the abstract, keywords or in the text of our search terms.

We limit the number of publications to those related to the topic of knowledge transfer and, in a broader way, of knowledge management. For this reason it has been added the query command "and knowledge transfer".

In order to render the analysis even more consistent with the research question, the papers selected that had some specific keywords that identify the following key areas: learning and universities, knowledge and technology transfer, Entrepreneurship and business models. We have reduced this way the number of scientific documents to 342.

	Pre abstract analysis	**%**	**Post abstract analysis**	**%**
Technology transfer	33	9,65%	17	12,98%
Academic Entrepreneurship	27	7,89%	12	9,16%

[6] Szulanski, G. (2000). The process of knowledge transfer: A diachronic analysis of stickiness. Organizational behavior and human decision processes, 82(1), 9-27.

[7] Pirnay, F., & Surlemont, B. (2003). Toward a typology of university spin-offs. *Small Business Economics*, *21*(4), 355-369.

[8] Gübeli, M. H., & Doloreux, D. (2005). An empirical study of university spin-off development. European Journal of Innovation Management, 8(3), 269-282.

University Spin-offs	26	7,60%	7	5,34%
Innovation	24	7,02%	5	3,82%
Spin-offs	21	6,14%	4	3,05%
Education	20	5,85%	8	6,11%
Entrepreneurship	16	4,68%	8	6,11%
Academic Spin-offs	12	3,51%	8	6,11%
Industry	10	2,92%	7	5,34%
Knowledge Management	10	2,92%	6	4,58%
Societies and institutions	10	2,92%	6	4,58%
Entrepreneurship education	9	2,63%	5	3,82%
Knowledge transfer	8	2,34%	4	3,05%
Spin-off	8	2,34%	5	3,82%
Spin off	8	2,34%	2	1,53%
University	8	2,34%	2	1,53%
University Spin-off	8	2,34%	2	1,53%
Entrepreneurial orientation	6	1,75%	2	1,53%
Research	6	1,75%	3	2,29%
Academic Spin-off	5	1,46%	2	1,53%
Commercialization	5	1,46%	3	2,29%
Knowledge Based System	5	1,46%	1	0,76%
Human Capital	4	1,17%	2	1,53%
Industrial management	4	1,17%	0	0,00%
International Entrepreneurship	4	1,17%	0	0,00%
Performance	4	1,17%	2	1,53%
Economic and social effects	4	1,17%	0	0,00%
Economic development	4	1,17%	1	0,76%
Ecosystems	4	1,17%	0	0,00%

Empirical Analysis	4	1,17%	1	0,76%
Entrepreneurial university	4	1,17%	1	0,76%
Information management	3	0,88%	0	0,00%
Knowledge	3	0,88%	1	0,76%
Research and development	3	0,88%	1	0,76%
Spin-off companies	3	0,88%	1	0,76%
Technology transfer offices	3	0,88%	1	0,76%
University spinoffs	3	0,88%	1	0,76%
University Technology transfer	3	0,88%	0	0,00%
TOTALE	342	100,00%	131	100,00%

Table 1 – keywords selected – own elaboration

Through the abstract analysis, has been possible to select n. 132 academic documents coherent with line research.

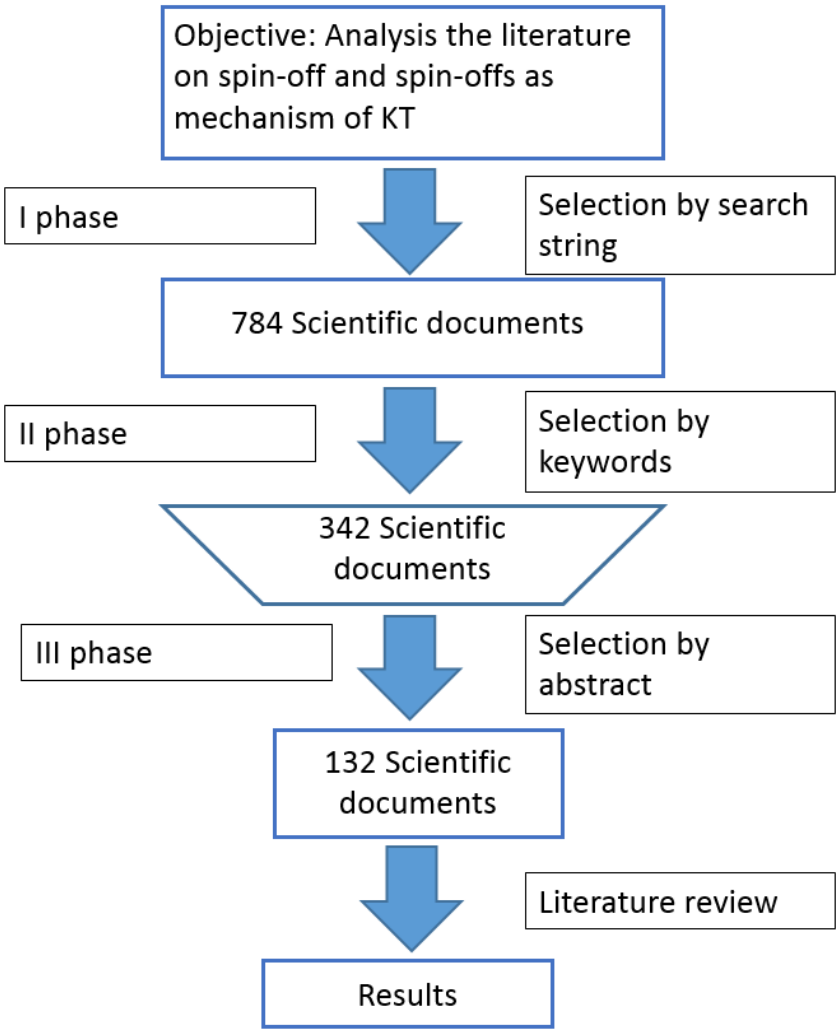

Figure 1. - Objectives and methodology

Are shown below the main results relating to the selected documents

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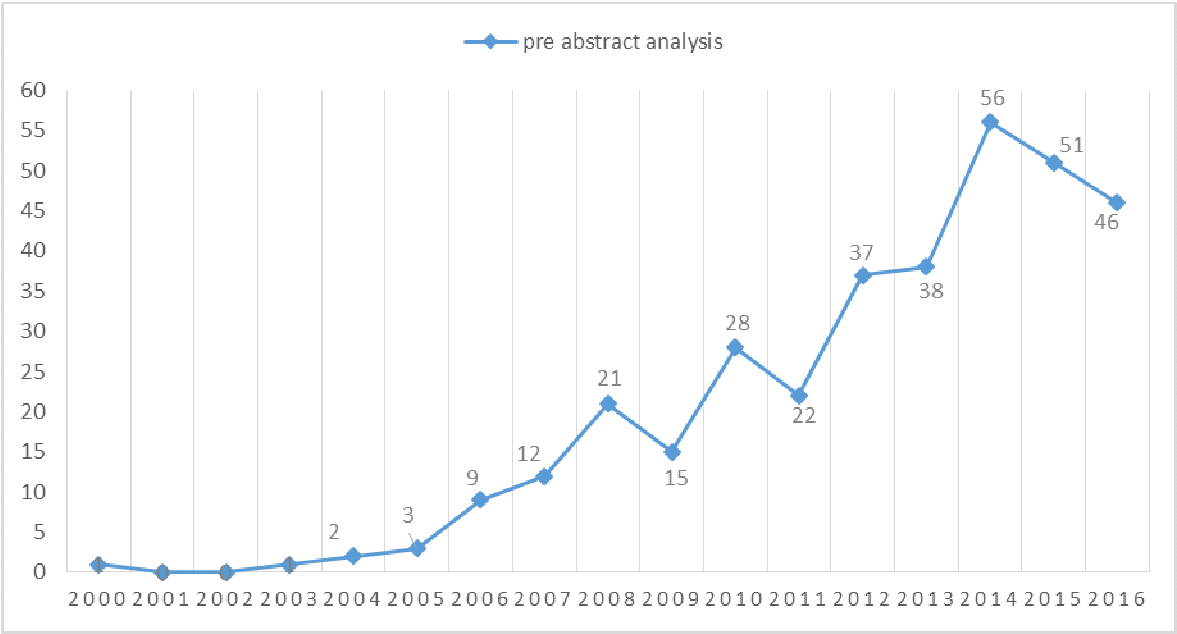
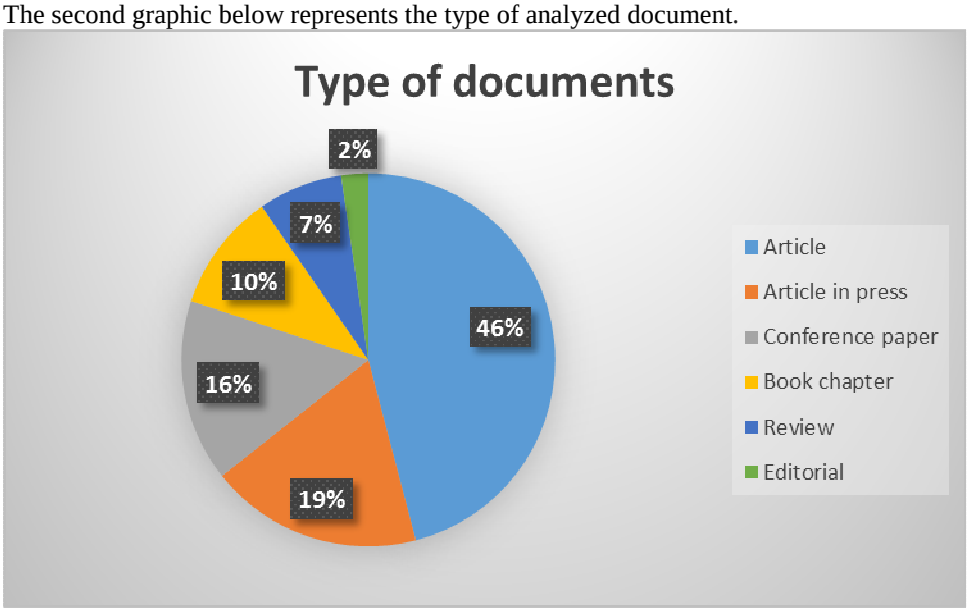


Graph. 1 – Distribution of document through time (pre abstract analysis) – own elaboration

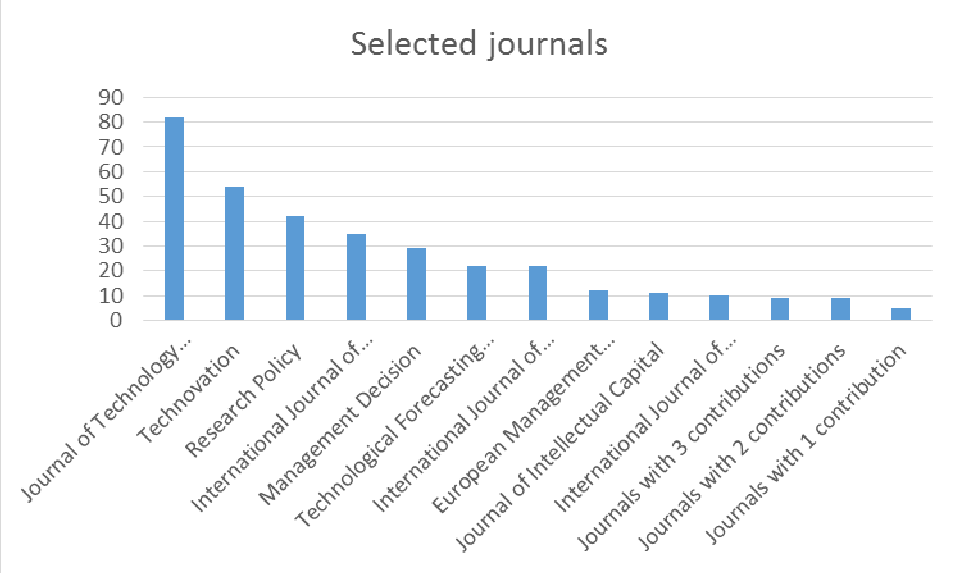
From the above graphic it is possible to understand the distribution of papers through time. The analysis of the data shows that the interest for scholars has increased over time. Especially since 2007, it has been a considerable increase in contributions. Form about 2012 the attention of scholar has grown considerably.

The second graphic below represents the type of analyzed document.



Graph. 2 – Document Type (pre abstract analysis) – own elaboration

This composition show the scientific document in pre abstract analysis. It is visible that the main element of this selection is scientific article (46%). The second element is the article in press (19%); following the conference paper (16%) and Book chapter (10%), review (7%), and Editorial (2%). the graph shows that the main tool for the dissemination of results of research on the subject are the article. Including articles in the press over 50% of the scientific documents considered are in the form of scientific articles



Graph. 3 – Selected journals (pre abstract analysis) – own elaboration

Another preliminary result that is possible to analysed is the selected journals, In the above graphic representation it is possible to understand the journals in which are published the contributions. The analysis shows that most of the contributions (No. 82) are in the Journal of Technology Transfer. Then there are: Technovation (No. 54), Research Policy (No. 42), International Journal of Technology Management Studies (No. 35). Management Decision (No. 29), Technological Foresting and Social Change with International Journal of Knowledge Management Studies (No. 22), European Management Journals (No. 12), Journal of Intellectual Capital (No. 11) and International Journal of Innovation Management with No. 10 contributions. Only nine three journals with No. 3 contribution and No. 2 contribution. Only one journal No. 1 contribution.

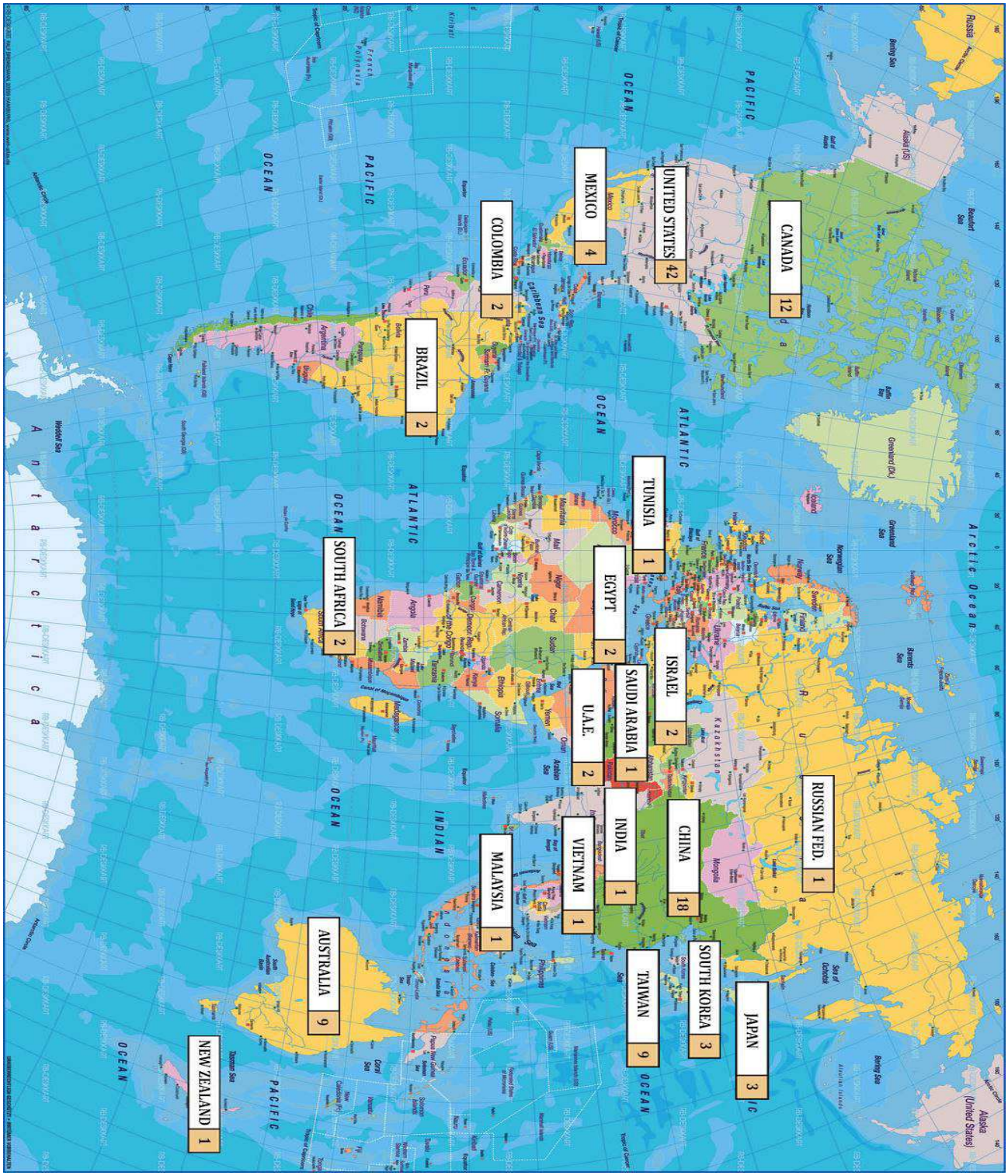


Figure 2.a – Geographical distribution extra - Europe Country (pre abstract analysis) – own elaboration

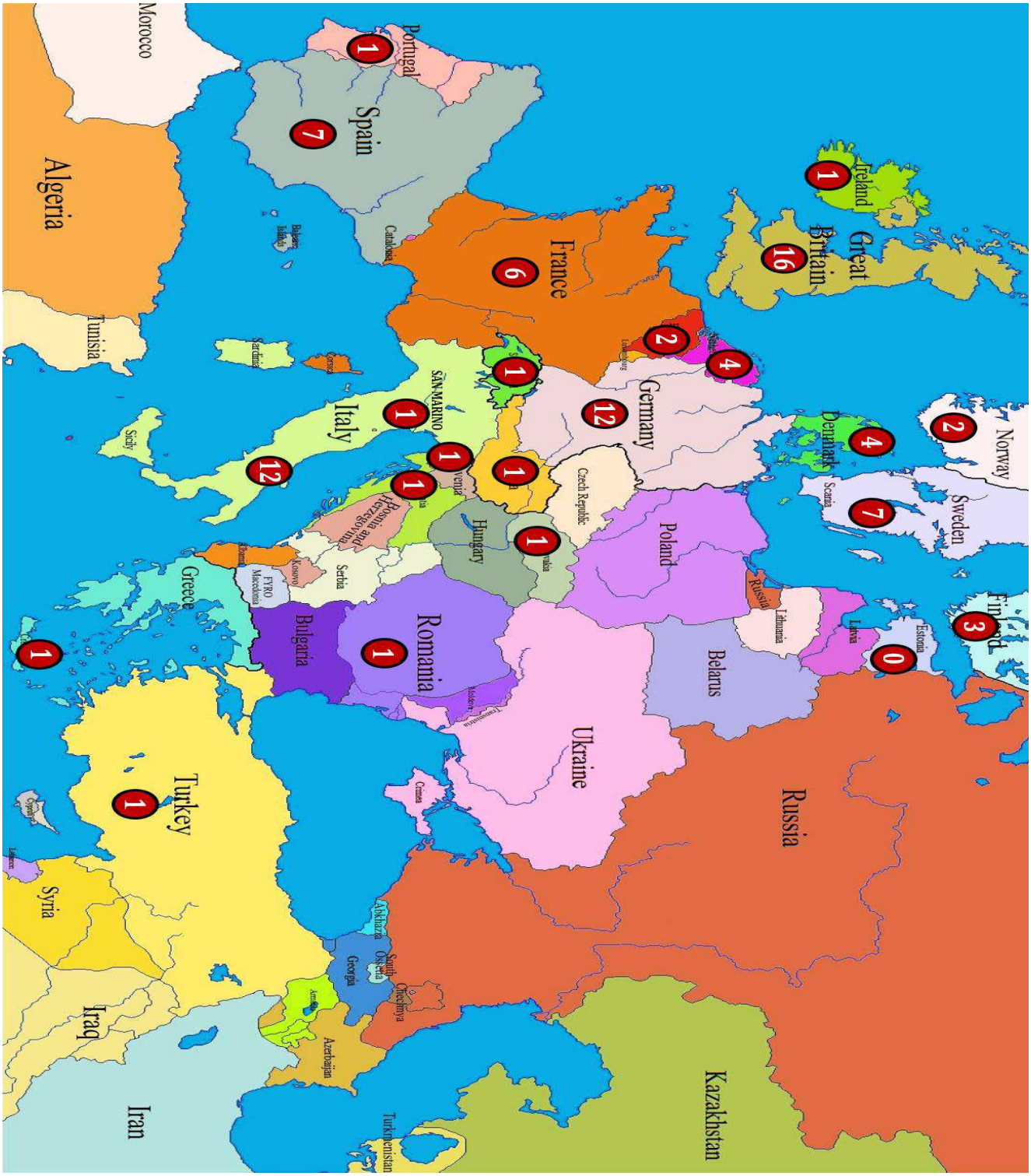


Figure. 2.b – Geographical distribution - Europe Country (pre abstract analysis) – own elaboration

The above chart highlights the contribution of the countries in the academic debate. The data shows that the largest contributions coming from the United Kingdom (55) and United States (42). Followed by Germany and Italy (26), China (18) and Spain (17).

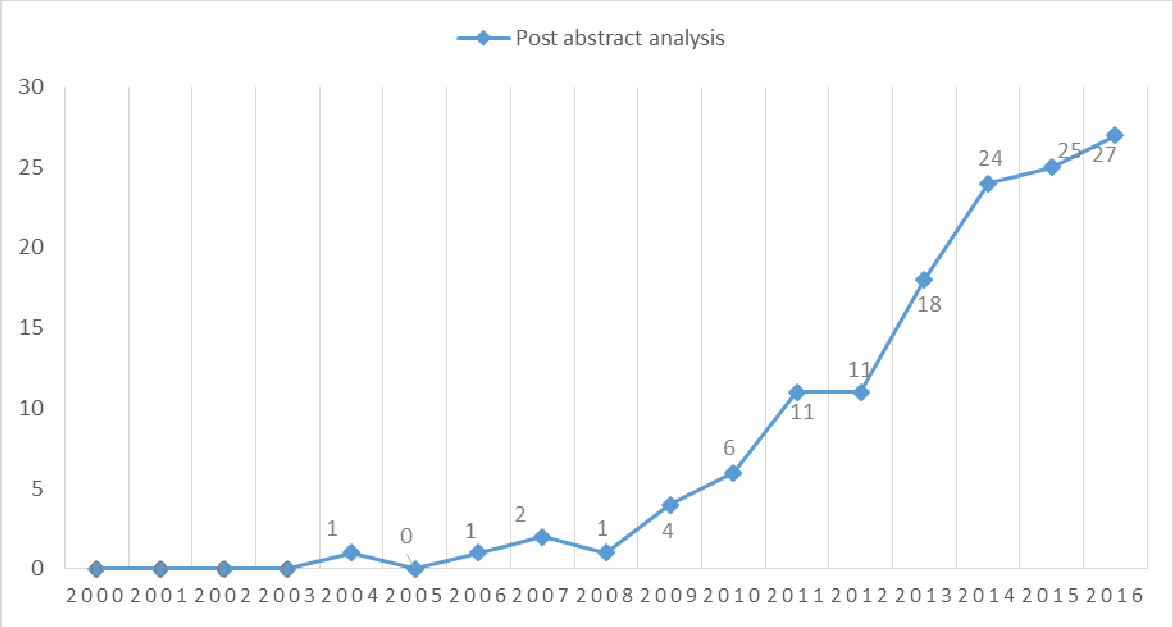
Once described the types and the *loci* of publication of contribution on spin-offs, the process of analysis has proceeded with the exam of the abstracts, doing a screening based on the coherence with the aim of this paper. The search by keyword, although respecting the criterion of completeness, in the same time, has the disadvantage of being too general.

All the abstract of the found articles were object of a first reading, so to judge the respect of relevance and quality parameters using the approach "fit for purpose" (Boaz et al., 2003), that considers the process of revision and the nature of all available evidence.

In the second phase, we have collected the articles deemed relevant to the investigation, and they are analyzed in detail the content. In order to select the paper more coherent with the objective of research, have imposed some parameters. The first parameter imposed was to identify the "Subject Area" reference: it was decided to select the subject area "Business, Management and Accounting", as the area looks more consistent with the purposes of research.Then, it has been created special database on an Excel worksheet that has allowed selecting and incorporating the various titles of the articles examined and theories contained in them.

From the analysis of the 342 abstracts, only 132 document were selected, focused on concept and knowledge transfer mechanisms of spin-offs.

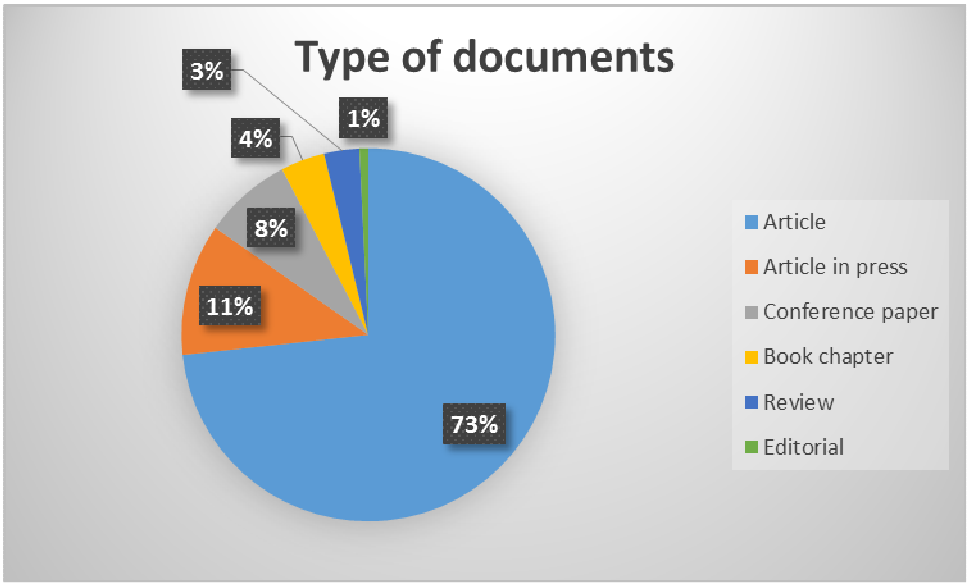
Analyzing the selected papers has been possible to highlight the results described in the following section.



Graph. 4 – Distribution of document through time (post abstract analysis) – own elaboration

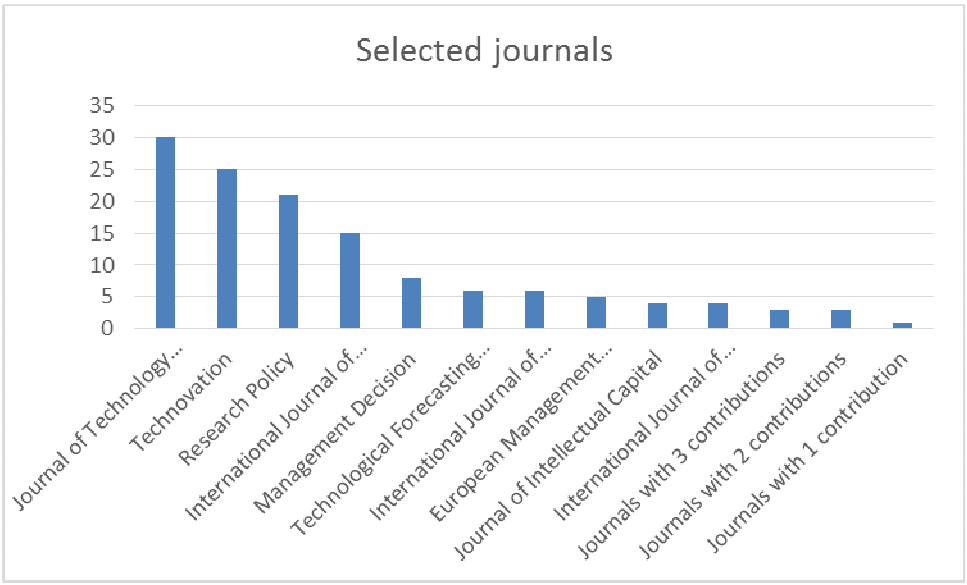
The Graph. 4 shows the distribution through time of selected papers. Since 2004 (the year of publication of the first selected paper), it is evident the growing interest of scholars on the subject. The number of papers grows over time by touching the peak in 2016.

Further preliminary result is to understand the type of scientific document.



Graph. 5 – Type of document (post abstract analysis) - own elaboration

The graphic 5 emphasizes the types of scientific documents used. The majority of the analyzed documents (73%) are scientific article. The percentage rises considering also the "Article in Press" (11%). Other forms of scientific publication (Review, Conference Paper e Book Chapter), represent the 16%.



Graph. 6 – Selected Journals (post abstract analysis)- own elaboration

The above graphic highlights the journals in which there are the selected papers. In total, the journals are consulted 17.

In Appendix 2 we provide the main parametric information about the top 5 selected Journals.

Understanding the geographical distribution of the papers under analysis it is interesting.

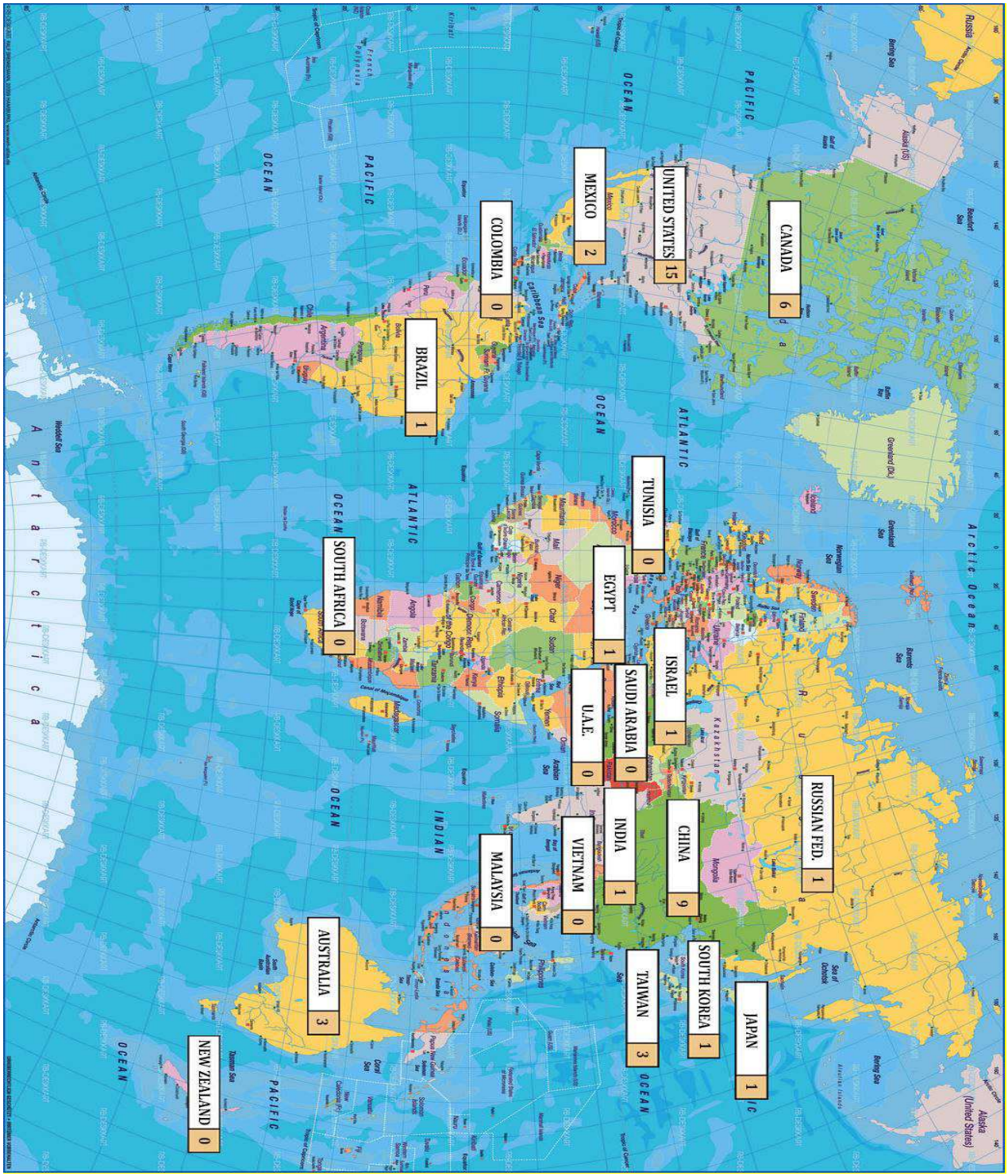


Figure 3.a – Geographical distribution extra - Europe Country (post abstract analysis) – own elaboration

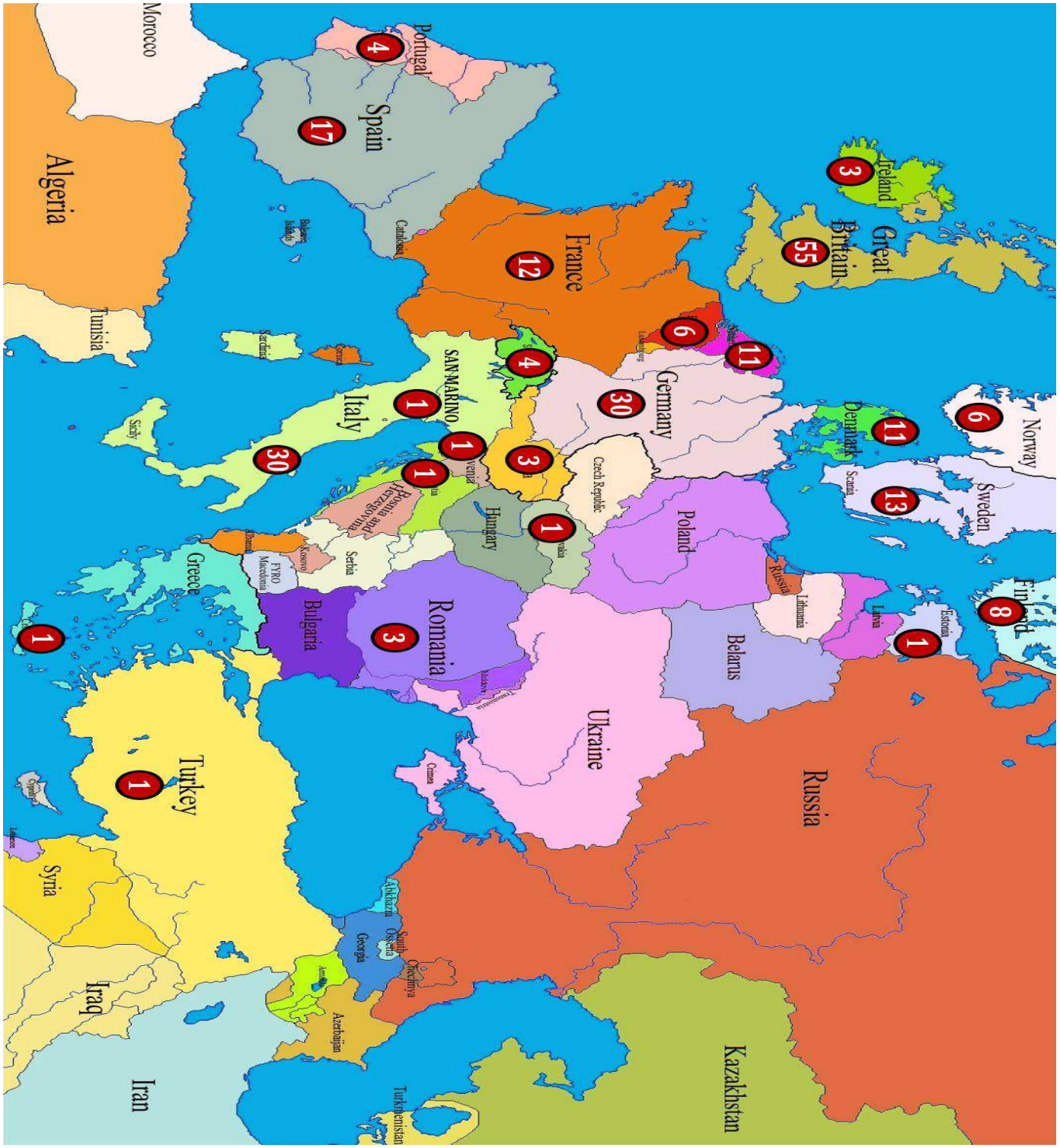


Figure 2.b – Geographical distribution - Europe Country (post abstract analysis) – own elaboration

From the above figure, it is evident that the main contribution coming from the United Kingdom (16 documents) and the United States (5 documents). The third country is Germany with a contribution of No. 12 documents like Italy. Follow we have China (No. 9) and Spain (No. 7).

After these scremature and preliminary valuation, we categorised the scientific documents in two groups: "primary" and "secondary" spinout literature. In according to Djokovic and Souitaris, the primary spinoff literature included 73 papers, which deliberately and solely aimed to study the spinoff phenomenon conceptually or empirically. Instead, the 59 papers in the secondary literature did not exclusively focus on spinouts.

A very interesting preliminary result is the most used scholars' method. We have divided the literature revised in qualitative or quantitative method. In according to Silverman (2006) the quantitative method encoded in rules derived from the statistics. These rules cover how to select cases and how to analyze the data collected. The qualitative method include a wide range of techniques that fall outside the quantitative method (Yin, 1999)
Moreover, from the review of the literature realized, different methods used to analyse the phenomenon.
In particular, the qualitative method is more used than quantitative method to analyse the spinoff organization. The scholars' prevailing method is case study or multiple case study[9]. The **Appendix 1** show these results.

4. The results of the review

4.1 The concept of spin-off

What is a "*spinoff*"? This is the first question that this review of literature proves to answer.

First observation shows that the spinoff is a complex phenomenon, analyzed from different perspectives of research and identified from the literature with different terminology. Some terms that we have found in the literature are: spillover, spin-out, start-up from research, academic start-up, ASOs, etc...

The first result emerges from the analysis of the phenomenon that there is a presence of several perspectives of research. The preliminary consideration is the prospects of analysis increased and change through time.

For example, the first term and definition that we find in literature (in chronological order) is "technological spillover". By this term, the scholars in economic theory define an important source of a country's economic growth (Romer, 1993). In according to Romer's theory, the technological spillover is a factor of endogenous growth. By Lucas's model (1988), the author notes that people with human capital migrate from places where it is abundant to place where it is scarce, is as powerful a piece of country growth. The study of Romer continues with the affirmation that in a country with main mechanism of technology transfer and institutional arrangements for encouraging the production and use of new knowledge we have a major trend of growth. Other terms that we found by this literature review are: University spin-off and Academic spinoff.

The authors most often use the terms as synonyms. Some authors (Bigliardi, et al. 20013; Ricardo et al., 2015) define *the academic spinoffs as a very special start-up companies that founded by an academic inventor with the aim to exploit the results of academic research*.

Concerning the definitions of spin-offs used in the paper analyzed has been possible to create a classification. In literature there are different variables used to give a classification of spin-off[10]. For this reason, it have been taken in considerations two dimensions.

[9] please see the appendix 1 above

[10] For example please see Smilor R. W., et al. (1990), which defines only the spin-off entrepreneurial initiatives that a) the founder is a member of the academic community or the academic staff or a student; b) it is based on the use of an idea on a

The first dimension is the value of human role. In according to Antonelli, G. (2004), we hypothesized that the role occupied within the university (University students, researchers, Phd or phd student, technical staff or professors) influence the characteristics of the spin-off. This dimension is divided in two sub-dimension: Faculty members (professor, research, phd and student with high level of education) and administration staff or student with degree. The second dimension of analysis is the exploitation of academic research results. This dimension is divided in two sub-dimension: explicit and tacit knowledge. In particular, in according to Nonaka and Takeuchi (1995) the explicit knowledge is that form of knowledge that can be expressed in a natural or symbolic language and transferred in verbal and written communication in any social context. The explicit knowledge[11], distinguishes of the articulation characteristics and communicability. The tacit knowledge is highly personal and hard to formalize, making it difficult to communicate or to share with others. In others word the tacit knowledge[12] (or implicit), is a non-codified knowledge, not contained in books or manuals, difficult to transfer in the short term This latter dimension, can be interpreted in a broader sense as exploitation of research or exploitation of academic research results.

technological project developed in the university. Further classification is given by Chiesa V. & Piccaluga A.(2000), that define the new spin-off companies

[11] For futher information, see: Vicari, S. (2011). Conoscenza e impresa. *Sinergie Italian Journal of Management*, (76), 43-66, and Fontes, M. (2005). The process of transformation of scientific and technological knowledge into economic value conducted by biotechnology spin-offs. *Technovation*, *25*(4), 339-347.

[12] Nonaka, I., & Takeuchi, H. (1995). The knowledge-creation company: How Japanese companies create the dynamics of innovation.

EXPLOITATION OF ACADEMIC RESEARCH RESULTS		VALUE OF HUMAN ROLE	
		ACADEMIC PERSONNEL	ADMINISTRATION STAFF
	EXPLICIT KNOWLEDGE	- Hindle and Yencken. (2004); - Sulej and Bower (2006) - Englis, et al. (2007); - Bekkers, et al. (2008); - Krabel, (2009); - Morales-Gualdròn, et al. (2009) - Cosh, et al. (2010); - Landry, et al. (2010); - Miller, et al. (2011); - Van Geemhuizen and Soetanto (2012); - Pazos, et al. (2012); - Van Der Sijde, et al. (2013); - De Cleyn, et al. (2013); - Schleinkofer and Schume (2013) - Clausen and Rasmussen (2013) - Visitin and Pittino (2014); - Stephan (2014); - Rizzo (2015); - Aaboen, et al (2015) - Huyghe and Knockaert (2015); - Hayter (2015); - Pucci (2015); - Segui-Mas, et al. (2016); - Arenas and Gonzàlez (2016); - Hannibal (2016); - Martens, et al. (2016); - Vogel and Jochemich (2016); - Martens et al. (2016);	- Malecki, (2009); - Chan, et al. (2010); - Zhao, et al. (2010); - Ahrweiler, et al. (2011); - Bathelt, et al. (2011) - Meyers, et al. (2011); - Wennberg, et al. (2011); - Dahl and Sorenson (2012) - Bjørnåli, and Aspelund (2012); - Yagüe-Perales, and March-Chordà, (2013); - Terra, et al. (2013); - Swamidass, (2013); - Bolzani, et al (2014); - De La O Barroso-Gonzàlez, et al (2014); - De Cleyn, et al. (2014); - Peterková, and Wozniaková, (2015); - .Parath et al. (2015); - Martin and Plonski (2015); - Savva and Taneri (2015); - Micozzi, et al (2015); - Jelfs, (2016); - Meoli and Vismara (2016); - Boh, et al. (2016); - Evers, et al. (2016); -
	TACIT KNOWLEDGE	- Todorovic, et al. (2011); - Deste, et al. (2012); - Karnani (2013) - Fich, et al (2014); - Fryges, et al. (2014) - Scholten, et al. (2015); - Festel (2015); - Vinig and LIps (2015); - Conceição, et al. (2016)	- Uzunca, (2011); - Pickernel, et al. (2011); - Fikirkoca and Saritas (2012); - Caiazza and Volpe (2014); - Guerrero and Urbano (2014); - Clarysse, et al (2014); - Lautenschläger (2015); - Rasmussen and Wright (2015); - Franco-Leal,et al. (2016); - Buenstorf (2016)

Table. 2 – Classification of terms – own elaboration

The table has tried to offer a classification of the definitions to the phenomenon that the some authors (directly or indirectly) have used.
The exploitation of explicit knowledge there appears a common element in most of the definition of spin-off and the academic personnel involvement.

Only a few authors (e.g. Todorovic, et al., 2011; Vining and Lips, 2015) consider a spin-off as a new firm where at least professor shares his tacit knowledge with other actors. The Table show that the human capital created in the university is the key to the performance of university technology transfer (Hsu, et al., 2015). There are elements in common between the definitions. The spinoff is a new firm created to transfer the academic knowledge in economic system.

The analysis of literature has demonstrated interesting dimensions of spinoff. In particular, the dimension of internationalization, entrepreneurship skill, regional innovation system and intellectual capital. The theories and the results found in papers can be traced to two main areas of analysis.

The first area of research focuses on the analysis of the characteristics and motivations that drive researchers to start a spin-off. The second area of analysis focuses the relationships that develop between the university and local business system.

In the first area of research, include, in particular, Krabel & Muller (2009) that have considered as a spin-off a firm founded by academic scientists for the exploitation of research results. These authors, trying to understand what are the factors that influence the decision of academic scientists to start a business. An analysis the personal views of scientists on the benefits associated with commercialization activities is the entrepreneurial potential and the commitment of the state shown academic scientists in enterprise creation. The conclusions of this study are that work experience in the private sector does not seem to be important indicating that the knowledge gained with private firms is more stimulative to entrepreneurial activity.

Several studies have also set the purpose of trying to explain the phenomenon of spin-off using the scales of - measurement of entrepreneurial skills. In the study of Todorovic, et al. (2011), is used the scale ENTRE-U. The ENTRE-U scale to measure the entrepreneurial orientation of university departments. The results of the study shows that ENTRE-U successfully predicts commercialization outcomes from computer sciences, health sciences, and engineering departments.

The concept of entrepreneurship is often used in the literature on subject. In fact, the study of the "third mission" has shown the great heterogeneity in terms of involvement in academic entrepreneurship. Huyghe A., et al. (2013), demonstrated how organizational culture and climate affect EI in academia, thereby adopting an institution perspective. This study has relevant implications. First, for policy makers, who base university funding upon evaluation criteria including a mix of research, teaching and entrepreneurial activities (Etzkowitz et al. 2000), it may be useful to understand how the universities they finance could enhance their commercialization output. Second, for university management, this research shows that it is beneficial to incorporate academic entrepreneurship in the university. On theme of motivation, Morales-Gualdron, et al. (2008), propose a model to analyse entrepreneurial motivation that comprises six major dimensions: personal, Relating to business opportunity, to scientific knowledge, to the availability of resources to create a new firm, to the organization of origin, and to the social environment. The results of this study show that the dimension entrepreneurial opportunity is not part of the entrepreneurial motivation. The motivations related to scientific knowledge are important in the decision to create an academic spin-off.

The understanding of this aspect of the phenomenon makes it possible to make the best decisions to appreciate, support and increase the knowledge transfer benefits. Precisely knowledge is the main resource to be transferred to firms in knowledge economy. Landry, et al. (2010), propose by their paper of explore the six broad categories of knowledge transfer activities undertaken by academics. The six categories are: creation and diffusion of knowledge through publications, transmission of knowledge through teaching, informal knowledge transfer, patenting, spin-off formation and consulting activities. The results of this study suggest that there are complex interactions among multiple forms of mutually reinforcing knowledge transfer activities that lead to an enhanced performance in the knowledge transfer of academics.

Interesting are the studies carried out by Santos Rodrigues, et. Al. (2015), that propose a model for analyze the relationship between leadership, intellectual capital (human, structural, and relational), and their contribution to economic renewal. Universities and HEIs are no-profit oriented organizations, but with a high value of knowledge

asset. Therefore, these organizations have been forced to enter into a competitive system. Leadership development therefore can be a lever for economic exploitation of research. From the results of this model emerges that leadership has an important influence on structural capital, relational and human capital. In general, it is assumed that scientific knowledge can play an essential role in innovation and economic development[13]. Along the same lines are the results presented by Pickernell, et al. (2011) that proposed to investigate the phenomenon of entrepreneurship among graduate e non-graduate. In according to Rae, et al. (2010), entrepreneurial graduates are considered to be essential in terms of future national economic success and universities and higher education (HEIs). There is also a need, to investigate the potential beneficial outcomes of graduate entrepreneurship. A major output posited from increased numbers of graduate entrepreneurs and entrepreneurship is business growth (Acs and Armington, 2004).

The ISBA Review (2004) reported that entrepreneurship education is now embedded in regional and national policy as an important factor contributing to the growth of entrepreneurial activity and enterprises. There is also a possible, though unclear link between graduate entrepreneurship and intellectual property. Kitching and Blackburn (1998) noted that entrepreneurs recognised the importance of their intellectual property to their enterprise's opportunity for survival and prosperity. The results of this study demonstrate that, as well as graduate entrepreneurs focusing on specific (knowledge intensive services) industries, and to be non-male majority owned, they are also more likely to be younger and have newer firms, potentially implying that enterprise education could assist in the process of producing a greater number of new start-ups through basic awareness-raising. Graduate entrepreneurs are also more likely (than non-graduate entrepreneurs) to have gained prior experience in a multinational enterprise and less likely to have gained prior experience through business ownership.

From the paper selection emerged the study of Danskin Englis, (2007), that focuses on the pre-start-up process. The global start-ups are ventures that pursue opportunities around the globe from the moment the business idea is first discovered (Oviatt and McDougall, 1995; Dominguinhos, 2002; Wakkee, 2004). The founders of global start-ups use their network to develop a knowledge base during the pre-venture phase to accommodate the changing knowledge needs during the different phase of the start-up process. The knowledge-needs change during the global start-up process.

The literature agrees that scientific skills of the academic staff (in the strict or broad sense) should be combined with entrepreneurial skills often external to the university[14].

In this area of research, a large number of papers alongside the phenomenon of spinoff to academic entrepreneurship. The spinoff under the academic entrepreneurship profile has a dual role. Under the first role the spinoff is a synonymous with academic entrepreneurship (Soetanto and Jack, 2016; Hayter, et al. 2016; Teixeira and Coimbra, 2014). In other hand the spinoff is considered the main effect of academic entrepreneurship (Su and Sohn, 2015; De Cleyn, et al, 2014; Fich, et al. 2014). The main conclusion of this second role is the strong relationship between academic knowledge and entrepreneurial skills. The empirical evidence of this perspective is contained in the study of Franco-Leal, et al. (2016). This study by analysing a sample of Spanish spinoff firms (and not spinoff firms) analyses the competitive advantage in international markets. The academic spin-offs often penetrate international market through their innovative products and technology. The interesting results emerged from this study demonstrate the importance of the selection and identification of soft skills during pre-start-up phase.

In particular, the spin-off is a container for two types of knowledge: academic knowledge and Entrepreneurial skills. The authors state that the role of non-academics was crucial for supporting the internationalization of the spin-offs. With regard to the percentage of non-academics in founding team, the authors found that their impact

[13] Fritsch, M. and V. Slavtchev, *Universities and Innovation in Space.* Industry and Innovation, 2007. 14(2): p. 201-218.
[14] Walter, A., Auer, M., & Ritter, T. (2006). The impact of network capabilities and entrepreneurial orientation on university spin-off performance. *Journal of business venturing*, *21*(4), 541-567.

was more relevant to the performance goals than to innovativeness. Another relevant aspect the presence of a difference competence and knowledge (academic and entrepreneurial), can cause conflict inside the firm. From the study of Diànez-Gonzalez and Camelo-Ordaz, on 167 Spanish academic spin-offs, results show that the presence of non-academic managers within management teams is a key factor in the academic spin-offs' exhibitions of higher level of entrepreneurial orientation and, on the other hand, that conflict fully mediates the relationship between management teams' age heterogeneity and entrepreneurial orientation. The size of non-academic networks contributed significantly not only to the performance goals but also to innovation. Other authors have tried to analyse the USOs' growth strategies. In particular, Andersson and Berggren (2016) have focused their efforts on the business model adopted in spinoff organizations in international and local context. The study shows that research entrepreneurs'ventures start as born globals, but that these firms do not continue to grow. In the same line of research is the study of Rodriguez-Gulias, et al. (2016). The small size of USOs, are an important element in the study of spinoff's business model.

The entrepreneurial orientantion is an important strategic asset and an important organisational resource. About an empirical study of Su and Sohn (2015), show that there are three dimensions of EO: Innovativeness (EN), Proactiveness (PR) and risk-taking (RT)

In the second area of research, which studies the relationship between universities and firms, and the economic system. The transfer of knowledge into the economy through the spin-off creates an impact on the local economy[15]. The spin-off, at the same time, become the point of connection and dialogue between universities and local economy [16]. In terms of relationships with other firms lingers Ahrweiler, et al. (2011). The links between University and Industry are very important to generate value for economic system. The spread of the spin-off and enhancement of academic knowledge generates new types of market, for example the innovation network. As Castells (1994) showed in his analysis of technolopes of the world: attachment to academia does not lead automatically to a high innovation performance. However, the causal relationship may not be the obvious one. There is a tendency for university spin-offs to be lacking in business skills and commercial capabilities (Meyer 2003; Shrader and Siegel 2007). These firms seem to be less profit-oriented and less engaged with growth strategies than firms without university affiliation are. Since innovation networks consist of many heterogeneous actors following diverse rule sets located in a large parameter space of environmental conditions, there is a need to capture the non-linear dynamics in a model and to experiment with it.

The results of Ahrweiler, et al. (2011), show that having co-operating universities raises the knowledge and competence levels of the whole population of actors, increases the variety of knowledge among the firms, and increases innovation diffusion in terms of quantity and speed. Furthermore, firms interacting with universities are more attractive for other firms. The results show the important and positive impact that university-industry linkages exert on the overall industry and knowledge dynamics. In particular the spin-off effect on entrepreneurship deservers much more emphasis in the design of policy instruments: in any university-firm, co-operation new business opportunities might be detected. Several studies focus on environmental variable. The geographical environments for entrepreneurship takes care Malecki, (2009). Through his study aims to understand the role of the geographical environment on entrepreneurship. Besides the Italy country, scholars consider the Sweden a special case. The spin-off phenomenon also affects China and Brazil (Salomao and Ary Plonski, 2014; Do Santos and TOrkomian, 2014), United Kingdom (guerrero, et al., 2015), Germany (Sinell, et. Al., 2015), Russia (Klimova and Malyzhenkov (2014). With regard to Italy, several studies have focus on specific regional context as Emilia-Romagna (Rizzo, 2015).

The environment consists of a quantitative part, which include the number of people and the existing network on the local system. A qualitative part includes the informal links that people maintain in their lives. Even the

[15] Dahlstrand, Å. L. (1997). Growth and inventiveness in technology-based spin-off firms. *Research policy*, *26*(3), 331-344.

[16] Porter, M. E. (2000). Location, competition, and economic development: Local clusters in a global economy. *Economic development quarterly*, *14*(1), 15-34.

cultural and social influences (difficult to measure), remain central to the new entrepreneurship training process. Interesting are the empirical studies carried out by Calcagnini and Favaretto (2015), that analyze the knowledge transfer indicators.

The element that emerges, directly or indirectly, in all the analysed papers is the need to combine the university's skills (tacit or no-tacit knowledge), with entrepreneurial skills[17].

The reputation of the university is presented as a key element in increasing the profitability of the spin-off. Consequently, results are expected to be transformed into marketable products via licensing technologies or firm founding to exploit the inventions (Etzkowitz, 2003; Mansfield and Lee, 1996). The Regional differences in innovation have spurred the development of the concept of the Regional Innovation System as a specific application of the original innovation system concept. The Regional Innovation System (RIS) approach (Cooke, 1992,2001) developed from the empirical observation that innovation is not equally distributed in space but rather a regionally bounded phenomenon. The studies on RIS far have not embraced social network analysis techniques as a valuable analytical and empirical tool. A study similar to the previous one is to Chan A., et al. (2009) that focuses on knowledge transfer in Science Park Firms. The Science parks is not a recent phenomenon. The first science-based park was founded in the Standford Industrial Park in the 1951.

A Science Park is an organisation managed by specialised professionals, whose main aim is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions. To enable these goals to be met, a Science Park stimulates and manages the flow of knowledge and technology amongst universities, R&D institutions, companies and markets; it facilitates the creation and growth of innovation-based companies through incubation and spin-off processes; and provides other value-added services together with high quality space and facilities[18]

The science parks are considered as important drivers of regional economic development that facilitating the entry of new firms in the economy system. The exchange of knowledge in science parks is presented as a flow of knowledge.

At last, several studies have analyses what factors may support the growth and development of spinoffs. Soetanto and Jack, have focused on understanding about how incubation support and innovation strategy can determine the performance of academic spin-offs. Using a sample of spinoffs from the United Kingdom, the Netherlands and Norway. The empirical results of this study demonstrate that several considerations. The first result is that the spinoff need a strategy for technology exploitation (2) incubation support in the form of networking and entrepreneurial support has a positive effect on the performance of spin-offs; (3) networking support moderates the relationship between an exploitation strategy and spin-off performance while entrepreneurial support moderates the relationship between a market growth strategy and spin-off performance. There is a trade-off between the scientific productivity and engagement with industry (Pucci, 2016). Both the research area consider the spinoff as a main agent of change (in terms of entrepreneurship culture and technology) inside the economic system.

Some papers analyzed, are both areas of research. It was not possible to classify some articles scientific. For example, Fernández-Alles, et al. (2014), shows the aspects of both research areas. The authors, departing from the resource-based view, path dependence theory, and the stage-based model, and inspired by Vohora et al. (Res Policy 33(1):147–175, 2004), have tried to identify the resources and competences critical for ASO development. Another aspect brought forward in the research was the analysis of the actors from the academic and market contexts needed critical for ASO development. The study conducted on 555 ASOs created in Spain during period 2003-2011 derive interesting practical implications. The universities must take a more active role in the stimulus

[17] Degroof, J. J., & Roberts, E. B. (2004). Overcoming weak entrepreneurial infrastructures for academic spin-off ventures. *The Journal of Technology Transfer, 29*(3-4), 327-352.
[18] IASP, http://www.iasp.ws, Retrived on 19/11/2008

of academic entrepreneurship, establishing closer relationships with market actors, modifying their structures, and focusing their strategies to assist researchers. Specifically, TTOs should be professionalized, through the recruitment of professional managers, non-academics with proven business competences and experience (Muscio, 2010; Siegel et al. 2007). Another example of paper which analyzes both the area is the paper of Alexander, *et al.* (2015), Which analyzes the academic aspects of entrepreneurship and the effects on society.

Another interesting aspect is the so-called "European paradox". By this term indicates that EU countries lack the capability to transfer science into commercial innovations, knowledge transfer from academia to industry. The study of Czarnitzki, D., et al. (2009), suggest that European firms lack the absorptive capacity to identify and exploit academic inventions that are further away away for market applications.

One aspect that emerges from analysis of selected literature is the constant reference to the concept of innovation. In the spirit of Schumpeter (1954) and Solow, innovative new businesses are regarded as the driver of economic growth. In this perspective, the researchers (or academic) can be considered as policy makers which can support and increase the processes of innovation in entrepreneurial activities (Krabl and Mueller, 2009).

4.2 The mechanism and results of KT in spin-off

The transfer of knowledge represents the main driver for the creation of spin-offs. By creating spinoffs implies economic exploitation of university research results. Several empirical studies have analysed the process of knowledge transfer between universities and firms by focusing on several different aspects of this process. Moreover, the intensity of the international competition is continuously increasing, universities and HEIs are pressed to improve their capabilities to rapidly generate and disseminate knowledge (Fisher, 2001; Gyeung-Min and Eun-Sook, 2008)

On cooperation between different authors companies and universities have focused. In particular, Feria, V. & Hidalgo A., pose the purpose of analyzing the cooperative relations between business and universities. The figure below shows the main relationships.

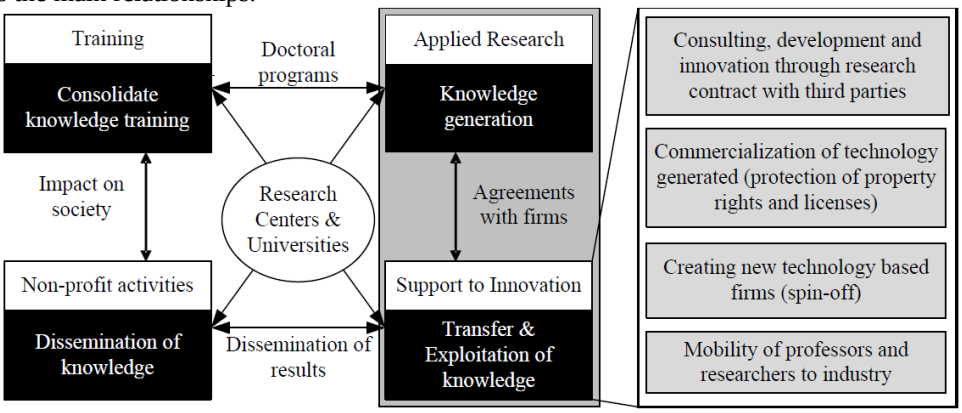


Fig. 1 – Cooperative activities related to KT and the third mission of the university – Source: Feria, V. & Hidalgo A. (2011)

The authors in the figure above highlight the cooperation activities in the transfer of knowledge.

The creation and development of interaction paths between research centers and enterprises is directly linked to the benefits both for the University and for companies. According to the scheme, above, it is possible to understand the different ways of knowledge transfer. For example, in the top of the chart it is possible to understand the effects of training on applied research. All paths are connected and interdependent between them. The graph on the right leads activities related to businesses.

Other authors, for example Bekkers R., & Freitas I.M.B, (2008), regarding knowledge transfer, in their paper analyze the concept of channels between universities and industry. The results shown in the work of the authors,

lead to interesting reflections. In particular, the different channels of knowledge transfer generate immediate benefits for both companies and for universities. Interesting from the point of view of policy implication is that the use of a specific instrument of transfer of knowledge must be linked to refer to the environment. In addition, the authors come to the conclusion that overemphasize one single channel (such as patents, spin-offs or contract research) can represent a leak of efficiency for the economic system. This could lead to use of the instruments of transfer of knowledge is not consistent and appropriate to the environment.

Another aspect of analysis in terms of knowledge transfer and spinoffs is the innovation process (new knowledge) on Organization-wide. On the concept of disorder or barriers to the transfer, has focused Kathoefer D.G. & Leker J. (2010). The presence of barriers to knowledge transfer, can result in a loss of knowledge. When knowledge transfer is disturbed or hampered, the complete knowledge generation process may fail. Knowledge transfer barriers are manifold and likewise, several different classifications exist in literature (e.g. Szulanski 1996; Husted and Michailova 2002; Greiner and Franza 2003; Rosen et al. 2007). For spin-off could become into a loss of competitiveness.

The transfer of knowledge from the university, is transmitted through entrepreneurship academics (Calcagni G., & Favaretto I., 2015). University technology transfer è a process based on a precise program. In addition, the skills and knowledge of spin offs creators are the main factors for the transfer of knowledge (Horta et al).

There are several studies that focus on the organization of KTOs (Knowledge Transfer Office). In literature the KTOs are indicate with difference terms: TTOs (Technology Transfer Offices), ILOs (Industrial Liaison Offices) OTLs (Offices of Technology Licensing) and UTTOs (University Technology Transfer Offices). The authors Brescia F., et al. (2014), starting from the center role that universities covering in the creation of new knowledge system, focuses on the structure of KTOs. In the first analysis, these structures can be internal or external to the organization of the University. The first form (Internal), is the traditional model which it is integrated in the departments within the university. Carries out administrative tasks. The structure (external), is configured as a not-for profit foundation. The functions it performs are independent from universities. Carries out to encourage the marketing of the results of academic research. In the above form, the KTO often take the form of network.

There is also a hybrid model, that is, a KTO in which part of the structure is part of both internal and external structure. The form of knowledge flow between university and industry also seems to vary across disciplines (Martinelli et al., 2008).

In literature, there are several studies that analyze the development and the results of differences forms of knowlege transfer. The study of KT is present in several scientific sector, regards their vision not organic. (Agrawal, 2001). The theme of transfer of knowledge from universities to firms creates the problem of measuring the performance of university technology transfer (UTT). This aspect is delicate. A good functioning of UTT is correlated to creation of spinoffs. Vining and Lips (2015), by a multivariate regression techniques state that the spinoff with the support of parent organization generating first revenues than another type of organization. The main characteristic that influences the spinoff is the presence of a parent organization. In fact, according several studies (Criaco, et al., 2014; Klimova and Malyzhenkov, 2012; Wallin, 2012) the spinoffs penetrate more quickly into the market. The knowledge transfer between parent organization and spinoff can be tacit and indirect. In particular, this research area (Slavtchev and Göktepe-Hultén, 2015) focuses on the impact of parent organization in the early (nascent and seed) stage of creation of spin-offs from public research. The concept of the relationships network established around the spinoff is a recurring concept in the scientific literature. A particular example is the network of relationships created between spinoff and CNR (Italian National Research Council). The study of Finardi and Rolfo (2015) analysed the Technological and Industrial Implications of this network (geographical distribution, local research and industrial context).

The heated debate on spinoffs has produced studies on different aspects of these organizations. The study of Micozzi, et. al. (2015), analyses the gender bias. Thought a database of all academic spin-offs set up in Italy from 2002 to 2007, the authors show that the general gap in academic spin-offs is relevant. Furthermore, the italian spinoffs have a low percentage of women especially during the startup funding phase. The cultural factor is the main entry barrier for women in the academic world of entrepreneurship.

From literature review emerge a lack of studies of European academic entrepreneurship. The lack of studies about the academic entrepreneurship out the formal IP system. The difficulty of delineating the phenomenon has generated the impossibility to analyze the different effects on institutional arrangements.
Some study analyses the impact of university culture and climate on entrepreneurial intentions. In particular the study of Huyghe and Knockart (2015) take in consideration a sample of 437 research scientists from Swedish and German universities.

Conclusions

The realization of this study on the literature has allowed us to understand the phenomenon of spin-off and transfer of knowledge at the international level. The systematic revisions of the literature help us to see the profile of the spinoff as knowledge transfer. The contribute to the literature review is understand how the authors define the spin-off phenomenon and the relationship with the transfer of knowledge. In this study, different definition and terms of spin-off have been analyzed. Many relevant point are revised.

Some authors[19], starting from the premiss that knowledge is a resource, pose reflections on the subject of the allocation. Knowledge management, therefore, is regarded as a problem of resource allocation between parent and spin-offs. Also they emerged of profound reflection on the organizational structure of the paper, in particular Wulf J. (2009), It relates the allocation of resources (including the Knowledge) in the M-form organizations. The study highlights the generation of inefficiencies and higher costs in the spin-off.

The field of analysis is relatively young. Knowledge management has often been the subject of studies in the private sector. The spin-offs are the result of knowledge transfer from public sector to private sector. The literature on the subject in fact is even with different aspects unexplored. The phenomenon is characterized by the strong complexity. In fact, by analyzing the papers it was possible to confirm both the use of various terms, both different definitions. By the classification used, it was possible to understand the definitions most commonly used.

The spin-offs are enterprises that base their competitive advantage in the market on knowledge developed in universities. Knowledge is presented as the main resource in the knowledge economy.

From the literature review it emerged different aspects on knowledge transfer mechanisms. In particular, Kathoefer D.G. &Leker J. (2012), focuses its attention on knowledge transfer barrier: The Not-Invented-Here Syndrome (NIH). By definition, NIH infection leads to an incorrect evaluation of external knowledge and a consequential suboptimal use of external ideas (Mehrwald 1999). This misjudgment further often results in a poor project performance and a failure of knowledge integration (Clagett 1967; Katz and Allen 1982). The results of this study shows that The more professors regard science as a technology-generating activity, the lower is their NIH value. Analogously, the more research projects faculty have done, the lower their NIH value is. In contrast, the number of publications per year does not show any impact on NIH.

Another aspect comes from the reading of selected papers is the relationship between KT and technology. The technology is intended as a tool for the transition of knowledge between a company and a spin-off.

Under the aspect of the organizational structure, additional issues raised are those relating to the role of the entrepreneur and team work. All firms, including spin-offs, are born of small groups, composed by entrepreneur and a few other people (Klepper and Sleeper, 2005). Other studies have focused comparing the different forms of organization and coordination skills. Interesting, even if marginal, they are studies that focus on the sense of membership of the employees from the mother organization moving in the spin-off. This area of

[19] Cyert, R. M., & Kumar, P. (1996). Economizing by firms through learning and adaptation. *Journal of Economic Behavior & Organization*, *29*(2), 211-231.

research, consider the transfer of employees from the parent firm to the new organization as a tool for the transfer of knowledge, focusing its attention on the effects (often negative) on employees with a strong sense of membership to the organization.

In parallel to the transfer of knowledge, in the literature has developed a series of studies regarding to the transfer of technology from a larger firm to a smaller (generally a spinoff). The creation of a spin-off, becomes a form of technology transfer of tacit knowledge, based on the sale of a patent (codified knowledge) in order to protect the inventor (Cesaroni, Gambardella, 2001). In this context, takes on particular importance to the management of intellectual property and in particular patents (Baglieri D., 2011), that could be in deep analyzed in a further step of analysis.

The firms in order to survive and grow in a highly competitive environment, should begin a process of reaction to change, starting to generate new knowledge and innovation: these studies demonstrate the strategic importance of knowledge management, especially in highly competitive and complex organizations such as the spin-off.

The reflections of scholars, have also concerned the impact on the public offering in spinoff organization . In this case, the spinoff, represent the restructuring of large companies that want diversify their activities. In this research area, the KM is seen as a factor in assessing the value of the spinoff.

The study has set itself the main objective of understanding the phenomenon of knowledge management (KM) in the spin-offs. Spin-offs are as complex entrepreneurial activity. The characteristics of this enterprise is the presence of highly qualified personnel, enhancement of a search result and the profit orientation.

This study has some limitations. In the first instance, the selection of the papers is limited to a specific period of time (2000-2016) and a specific category of papers, with an international diffusion and collected in a specific database (Scopus).

The choice to increase the number of journals, it can to increase to the capacity of the dataset to created and suggest new insights into analysis.

Secondly by selecting keywords like "Spin-off*" and "knowledge management", excluding other contributions of research using other search terms, with interesting scientific value.

Several secondary aspect have emerged from this review have emerged that deserve further study: the process of creation of spinoff; the entrepreneurship education and the performance. Furthermore, the process of internalization of academic spinoff has received short attention from scholars (Franco-Leal, et al., 2016). This literature of limit can be explained in part by the lack of maturation of the spinoff organizations from an international perspective.We believe that the evaluation of spinoff as creation of new job for scholars and their entrepreneurial orientation deserves further research attention in the future.

The limitations of this study consists of the non-application of other technical approaches for the analysis of literature review: such as the snowball sampling research (Van Meter, 1990). Other techniques could have been used, like a citation analysis to identify scholars that have a great impact on the topic, or a content analysis to identify most recurring terms. These aspects could have addressed by future studies.

To conclude, this review of the literature has set as main research question: “what is a spinoff”?. From the literature review the spinoff appears as a complex organization with unique characteristics. First of all, the spinoff is a new entity created for the exploitation of academic knowledge. The main element of this organization is that requires two different types of knowledge (academic and entrepreneurial). Have a low index of women’s enterprises. They can more easily reach a competitive advantage on the market, thanks to the university's reputation. At the same time, these organizations do not tend to grow and rarely entry in international market.

it is necessary to highlight that the spinoff is recognized, by a large number of authors and empirical evidence, such as a valid mechanism for the transfer and exploitation of university research results.

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The determinants of spinoff: a systemic view and suggestions

Structured Abstract

Purpose – The Spinoffs organizations are the main mechanism of knowledge transfer from universities and/or High Educational Institutions (HEIs) to economic system. The importance and the role of spinoff are recognized from scholars, practitioners and police makers. For this reason, the presence of a large number of spinoffs in a specific economic context creates conditions for competitive growth. The spin-off firms are a complex phenomenon that need for particular conditions to its creation, survival and development. For this reason, in the last decade, the scientific debate focused on the identification of factors able to create a favourable environment for spinoff.

Through a review of a main literature on subject, we want to identify the main factors and actors that impact on creation, survival and development of spinoffs. This study is divided in two-step. In the first step, we want to highlight the main elements and factors, identified in the literature as "success factors" for creation, development and management of spin-offs.

In the second step, we try to offer a panoramic view on the Italian spin-off system.

Design/methodology/approach – In this work, we use a qualitative and descriptive method. The methodology is divide in two steps. The first step, from an analysis of the literature, we identified the main elements and actors that constitute the environment of the spin-off. In second step, we proceed to an empirical investigation, through a descriptive statistics we offer an

overview on the Italian spin-off system in order to understand its strengths and weaknesses.

Originality/value – The originality of this investigation lies in its ability to offer a picture and first analysis about main factors of the spin-off environment. In particular, we observed the existing factors in specific Italian context and their impact on the creation of spinoff.

Practical implications – Highlighting the characteristics of the spin-off system allows us to formulate new policies for the growth of these organizations. The study of relationships of spin-offs and success factors, in specific context, can offer useful information for the development of a research-innovation-enterprise system. This study want to offer a first consideration about an interpretation of "success factors" for spin-offs creation.

Keywords – University Spin-offs, Academic Entrepreneurship, Italian context, spinoff system.

Paper type –Practical Paper

Introduction

The innovation and new knowledge have become the main competitive levers in the modern economic system (Nonaka and Takeuchi, 1995; Leonard-Barton, 1995; Acs, et al., 2002; Chesbrough, 2006). For this reason, the firms to survive and develop are forced to invest in innovations and R&S (Gurbiel, 2002).

In the modern economic systems, the generation and the application of the new ideas from firms and scientific knowledge are the fundamental prerequisite for the economic development, job creation and the formation of a competitive industrial structure (Gwyneth, 2006; Atasu, et al, 2009; Lazzarini, 2015; Beneito, et al., 2015).

The Universities and Higher Education Institutions (HEIs) are the main producers of new knowledge and innovation within the economic system. There are several mechanisms that universities (or HEIs) can be used to transfer the academic knowledge to companies. In according to Grimaldi, et al., (2011), the main types of academic research are: Patents, licensing, collaborative research, contract research and consulting and academic spinoff. A common and accepted definition in the literature defines the spinoff as new firms founded by one or more academics who choose to work in the private sector Doutriaux, (1987) and transfer the technology from universities to market (Samson and Gurdon, 1993; Steffensen, et al., 2000).

The Spin-offs are the important means of commercializing new technologies and knowledge.

The spin-offs from Universities (or HEIs), according to numerous empirical evidence are developed in sectors with high technology content

(Dahlstrand, 1997; Carayannis, et al., 1998; Rasmussen and Wright, 2015; Boschma, 2015). The main economic sectors in which are active the spin-offs are influenced by the type of academic knowledge produced from universities (Vesperi, et al., 2016) as biotechnology, medical technologies, information technologies, and their main activities are related to the transfer of technology and knowledge form university to industry (Bigliardi, et al., 2013).

The presence of spin-off within an economic system can lead to economic growth and development of the system. For this reason, the ASOs have received, in recent years, a growing attention from both scholars and both policy-makers. Identify and understand the "success factors" of spin-offs are a complicated matter.

The main studies on creation of spin-off and academic entrepreneurship, has focused on different aspects: entrepreneurial competencies (Rasmussen, et al., 2014; O'Shea, 2014) the motivation of founders (D'orazio, et al., 2012; Erdős, et al., 2013) and local context (Prencipe, 2015; Audretsch, et al., 2016).

These results have important implications for the management of university spin-off, policy makers and practitioners.

The objective of the current paper is to examine the connection between the creation and development of spin-off and the factors that comprise the economic environment. The paper is structured as follow: section 2 provides the main definition and issue about academic spin-offs phenomenon and competitive context. Then, the section 3 describes the research methodology adopted, that was a combination of literature review (first step) and empirical investigation (second step). The results from these steps are proposed in section, together with the research framework obtained as results from our study. Finally, section 5 concludes the paper and discussing

the results of our work, and indicating some possible development and the limits of our research.

Theoretical framework: the academic spinoff and environment

The universities and HEIs in the last decades added to their traditional missions (education and research) a new mission: transfer new knowledge and exploitation of research results. This new mission is the third mission called (Laredo, 2007; Daraio, et al. 2011; Wu and Zhou, 2012; Baldini, et al., 2015).

Academic entrepreneurship, requires specific organizational units. These organizational units assumes characters, form and terminology based on context. Examples are the Industrial Liaison Offices (ILO) with the task of supporting and creating institutional networks[1] between university and entrepreneurial system; the Technology Transfer Office[2] (TTO) have the aim similar to the ILO to transfer new technology from universities to businesses. There are also the patent offices[3] with the primary aim to codify the tacit knowledge in patent and intellectual property rights. Empirical

[1] Jones-Evans, D., Klofsten, M., Andersson, E., & Pandya, D. (1999). Creating a bridge between university and industry in small European countries: the role of the Industrial Liaison Office. *R&D Management*, *29*(1), 47-56.
[2] Porcel, C., Tejeda-Lorente, A., Martínez, M. A., & Herrera-Viedma, E. (2012). A hybrid recommender system for the selective dissemination of research resources in a technology transfer office. Information Sciences, 184(1), 1-19.
[3] Picard, P. M., & de la Potterie, B. V. P. (2013). Patent office governance and patent examination quality. Journal of public economics, 104, 14-25.

evidence shows a great heterogeneity[4]. Each university, depending on its financial and organizational autonomy, can define the functions, structure and the name of the office.

The transfer of knowledge can assume many forms: patents, licensing, collaborative research, contract research and consulting and the academic spinoff (Grimaldi, et al., 2011). One of the most methods used in recent years for the economic exploitation of research results and the consequent transformation of knowledge into new businesses is the creation of spin-offs (Hewitt-Dundas, 2012; Berbegal-Mirabent, et al., 2013).

Although there is a vast literature on the phenomenon of spin-off organizations it is complex and not easy to interpret. The Academic Spin-offs (ASO) also called University spin-offs (USOs) are a very special firm, and are not fully comparable to other companies or start-ups. The scholars proposed over the years different definition of spin-off (Roberts and Malone, 1996; Antonelli, 2003) as: academic spin-off, university start-up, start-up from research, etc…

The ASOs combine both the traditional problems associated with the start-up of a new business and the difficulties associated with the development of new technologies (Oakey, et al., 1996).

At the same time, it is difficult to find a common definition to the spin-off phenomenon.

In according to Shane, (2004) defined spin-offs as "those companies that germinate form University. Where a group of researchers compose the

[4] Holthausen, R. W., Larcker, D. F., & Sloan, R. G. (1995). Business unit innovation and the structure of executive compensation. Journal of Accounting and Economics, 19(2), 279-313.

entrepreneurial unit aiming at the exploitation of skills and results from the research developed within the University".

The spin-off can be defined as the process in which the know-how of individuals, for various reasons members of the academic community, is protected and enhanced through a new company created. Through the creation of spinoff the researchers assume the role of entrepreneur-research (Argote and Fahrenkopf, 2016). Several studies (Amendola, 1992; Daval, 1999; Luggen and Tschirky, 2003; Del Palacio Aguirre, et al., 2006; García, 2015) confirm that the firms generated by academic knowledge are configured in the form of new technology based firms (NTBF), namely the youngest and most innovative enterprises than the average of the sector.

According to several authors the spin-off within an economic context, contribute directly and indirectly to the generation of new knowledge, the dissemination of new technologies to improve productivity in the traditional sectors and the creation of new jobs opportunity. For this reason, the policy maker and scholars focused focus their attention on creating support paths to the creation of spin-off. There are different classifications on the literature of the factors that influence the spin-off (Souitaris, 2008; Corsi and Prencipe, 2015): macro level (focused on the macro economic environment), the meso level (focused on the university and the Technology Transfer Office) and the micro level (focused on the firms, the individual entrepreneurs and human relations). To achieve the objective of our work, we decided a different way to classify the factors influencing the spin-off.

The creation and the presence of academic spin-offs within a business environment is strongly influenced by the presence of external factors (Hansen, 1995; Meyer, 2003; Walter, et al., 2006; Hessels and Van Lente, 2008, Bathelt, et al., 2010) organizational factors (Clarysse and Moray,

2004; Gras, et al., 2008; Rasmussen, 2011; Guerrero and Urbano, 2012) and internal factors university (Ndonzuau, et al., 2002; Pirnay and Surlemont, 2003).

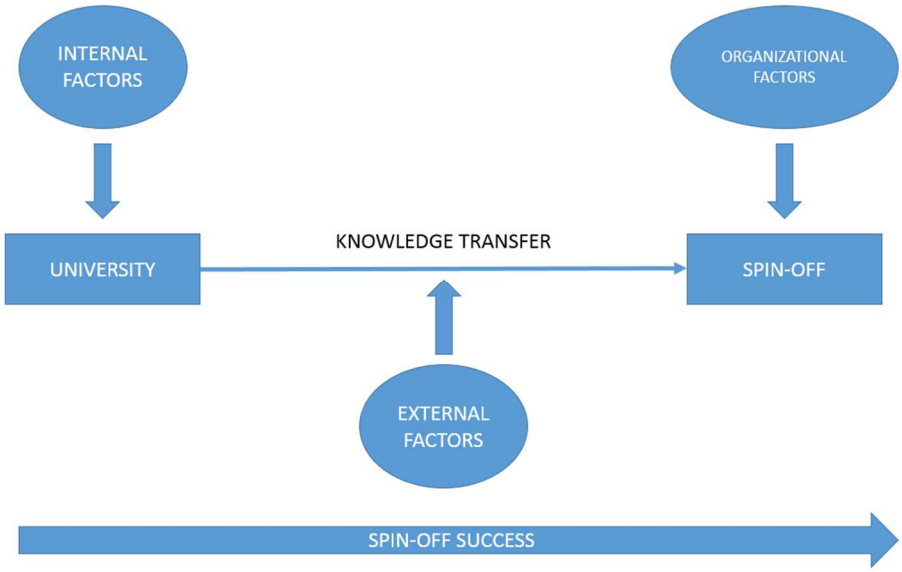


Figure 1 – The classification of "success factors" of spin-off – own elaboration

Methodology

This study is based on a qualitative and exploratory descriptive methodology. The methodology is divide in two steps. In the first part of the study, through the analysis of the principal reference literature we identified the "success factors" for spin off. The "success factors" for spin off for scholars are the main elements and actors that constitute the environment of the s-pin-off. The aim of this part is to identify the factors, collect the main scientific contributions on the subject and theorize their connection

In second part, we proceed to an empirical investigation, through a descriptive statistics we offer an overview on the Italian spin-off system in order to understand its strengths and weaknesses.

Results

From the analysis of the literature, there are interesting studies that have highlighted the factors that influence the creation of spin-offs (Guerrero and D'Urbano, 2012; VanPerkmann, et al., 2013). The literature has often focused on the identification of factors that determine the success (in terms of performance) of the spin-off. The objective of this work is based on the assumption that some factors influence the creation, development and management of the spin-off. Identify these factors in addition to determining the best performances for the spin-off, can lead to the creation of a greater number of spin-offs with respect to another context without these factors.

In literature, several scientific papers have focused on the factors that contribute or detract from the success of the university spin-off[5].

Assuming that the spin-off is a knowledge transfer mechanism (Fig. 1), analyzing literature we tried to classify the major factors that influence the growth, development and management of spin-off into three main categories. For each macro category we have identified 5 most significant variables.

The first macro category are the internal factors at university. This category includes all the factors that are governed by the university or HEIs (parent

[5] Hayter, C. S. (2013). Harnessing university entrepreneurship for economic growth factors of success among university spin-offs. Economic Development Quarterly, 27(1), 18-28.

organization) and affect the process of creation and development of spin-off. In according to Di Tommaso, et al., 2010, the university with its organizational and financial autonomy, have adopted various regulations and rules to encourage the creation of spin-offs and encourage entrepreneurship researchers. Several empirical evidences analysed the impact of the set of university rules on the creation process of spinoff (Langford, et al., 2006; Ramaciotti, et al., 2015; Muscio, et al., 2016). One aspect related to the drafting of rules for the creation of spin-off is the presence of organizational isomorphism (Lockett, et al., 2005). This aspect represents a cost for the spin-off organization. The second variable takes into account the financial involvement and incentive of parent (university or HEIs). Within the literature on subject, is possible found the term "academic capitalism" (Slaughter and Leslie, 2001; Ylijoki, 2003; Renault, 2006). It is meant by this term the economic and financial commitment that universities assume to support the development of spin-off. In recent years, universities have adopted a homogeneous behavior. Universities enter into share capital of the spin-off (generally acquiring generally a non-majority share) for the first few years of life. After the startup phase (3 or 5 years) if the spin-off is successful on the market sell the shares to the market or to management. The university therefore, adopt an investment strategy (Slaughter and Rhoades, 2004; Rhoades and Torres-Olave, 2015). The third identified variable is inherent on a university intellectual property policy. The protection of intellectual property is the first element for the creation of spinoff (Goldfarb and Henrkson, 2003; Siegel, et al., 2007). The protection of intellectual property takes a strategic value (Doutriaux, 1991; Teece, 2000; Monotti and Ricketson, 2003; Fini, et al., 2009). The next identified variable considers the university's reputation and the type of academic knowledge created by the university. The university's reputation is a

distinction between the spin-off and other start-up (Pirnay and Surlemont, 2003; Gras, et al., 2008). A good reputation enables the university spin-off to immediately generate an economic return (Mustar, et al., 2008). Allo stesso tempo, non tutti i tipi di conoscenza generata dall'università è in grado di generare spin-off (Sapienza, et al., 2004; Wright, et al., 2008; Bekkers and Freitas, 2008; Bergh, et al., 2015). The last identified variable for this macro area is referred to competent staff of TTO. There are several studies on the subject in the literature. In particular, a very interesting study is the line of study based on resource based view (Link, et al., 2007; Piccaluga and Balderi, 2012). The universities and TTOs need individuals with a greater expertise and social network for support the academic inventor (Lockett, et al., 2003; Powers and Mc Dougall, 2005). The TTO oblige universities to open their organizational boundaries (Bozeman, 2000; Bianchi, 2012; Berbegal-Mirabent, 2015).

The second macro category are the external factors of university that can not be controlled by spin-off or university. In this macro category includes all environmental factors and context. According to Iacobucci, et al., (2011), the regional infrastructure have a strong impact in creating a spinoff. The characteristics of the local economic system may affect the creation of the spin-off process. An important line of study focused on regional innovation system (Charles, 2006; Leydesdorff and Meyer, 2006; Youtie and Shapira, 2008). Another element identified by the review of literature is the presence of high entrepreneurial skill within the economic system (Vohara, et al., 2004; Helm and Maurorer, 2007; Clarysse, et al., 2011). These skills have strategic, particularly it allows the spinoff out of the university to acquire resources (entrepreneurial skills) it needs to develop.

The next variable is the characteristics of the industrial sector (Andersson and Klepper, 2013; Perkeman, et al., 2013; Franceschi and Mariani, 2015). At the same time, it appears necessary for the development and creation of spinoff, the ability to genered a social networking (Johannisson and Mønsted, 1997; Shane, 2004; Wang and Xu, 2008). This variable is the spin off capacity to enter into the local economic system. The last variable is the identification of market and demand potential (Buenstorf and Fornahl, 2009; Zhang, 2009; Bruneel, et al., 2010).

The last macro category, however, are all organizational factors (or internal) the spin-off. In according to Villanueva, et al., (2005), the motivation that drives the researcher to start a spinoff comes fundamental. There are several contributions in the literature (Colombo and Delmastro, 2002; Klepper, 2009; Dahl and Sorenson, 2013) that have analyzed the various aspects of entrepreneurial motivation. The second variable takes in consideration the number and intensity of formal contacts between spinoff and parent organization (university or HEIs). Several empirical evidence have highlighted various forms of contacts, through courses, formal collaboration or with the use of technologies or laboratories (Rothaermel, et al., 2007; Bekkers and Freitas, 2008; Philpott, et al., 2011; Teixeira and Mota, 2012; Rasmussen, et al., 2014; Giunta, et al., 2015). The third identified variable is the founder's (or team) career orientation. Smilor and Matthews (2004), showed that the success of creation and development of spinoff organization must consider the orientation of the researcher carrier. In particular, in recent years the creation of spinoff was seen as an opportunity to create a new job opportunity (Franke and Lüthje, 2004; Henry, et al., 2005; Hindle, 2007; Bae, et al., 2014). The variable of founder's (or team) professional experience and education is aimed at understand the human capital present

within the spinoff (Wright, et al., 2007; Hmieleski and Baron, 2009; Taheri and Van Geenhuizen, 2011; Bjørnåli and Aspelund, 2012; Zhao, et al., 2013). The last variable identified from the literature, is the business model. The business model is the set of organizational and strategies solutions adopted by the spinoff for achieve the competitive advantage (Osterwalder, et al., 2005; Ostervalder and Pigneur, 2010; Zott, et al., 2011; Onetti, et al., 2012; Vesperi, et al., 2015). The business model unloks latent value of academic knoledge and technology (Chesbrough and Rosenbloom, 2002).

INTERNAL FACTORS		
Name of Factor	**References**	**Name of variable**
Rules and regulations	Lockett, et al., 2005; Langford, et al., 2006; Di Tommaso, et al., 2010; Ramaciotti, et al., 2015; Muscio, et al., 2016	X_1
Financial involvement and incentive of parent	Slaughter and Leslie, 1997; Ylijoki, 2003; Slaughter and Rhoades, 2004; Renault, 2006; Rhoades and Torres-Olave, 2015	X_2
University intellectual property policy	Doutriaux, ,1991; Teece, 2000; Monotti and Ricketson, 2003; Goldfarb and Henrkson, 2003; Siegel, et al., 2007; Fini, et al., 2009	X_3
Academic knowledge and reputation of university	Pirnay and Surlemont, 2003; Sapienza, et al., 2004; Gras, et al., 2008; Mustar, et al., 2008; Wright,	X_4

	et al., 2008; Bekkers and Freitas, 2008; Bergh, et al., 2015	
Competent staff of in Technology Transfer Officies	Bozeman, 2000; Lockett, et al., 2003; Powers and Mc Dougall, 2005; Link, et al., 2007; Bianchi., 2012; Piccaluga and Balderi, 2012; Berbegal-Mirabent, 2015	X_5
EXTERNAL FACTORS		
Name of Factor	**References**	**Name of variable**
Regional infrastructure	Charles, 2006; Leydesdorff and Meyer, 2006; Youtie and Shapira, 2008; Iacobucci, et al., 2011;	X_6
Access to high Entrepreneurial skill	Vohara, et al., 2004; Helm and Maurorer, 2007; Clarysse, et al., 2011	X_7
Characteristics of the industrial sector	Andersson and Klepper, 2013; Perkeman, et al., 2013; Franceschi and Mariani, 2015	X_8
Networking	Johannisson and Mønsted, 1997; Shane, 2004; Wang and Xu, 2008	X_9
Market and demand potential	Buenstorf and Fornahl, 2009; Zhang, 2009; Bruneel, et al., 2010	X_{10}
ORGANIZATIONAL FACTORS		
Name of Factor	**References**	**Name of variable**

Founder's (or team) motivation	Colombo and Delmastro, 2002; Villanueva, et al., 2005; Klepper, 2009; Dahl and Sorenson, 2013	X_{11}
Formal contacts between parent and spin-off	Thorburn, 2000; Goldfarb and Henrekson, 2003; Gübeli and Doloreux, 2005; Narayanan, et. Al., 2009	X_{12}
Founder's (or team) career orientation	Smilor and Matthews, 2004; Franke and Lüthje, 2004; Henry, et al., 2005; hindle, 2007; Bae, et al., 2014	X_{13}
Founder's (or team) professional experience and education (human capital)	Wright, et al., 2007; Hmieleski and Baron, 2009; Taheri and Van Geenhuizen, 2011; Bjørnåli and Aspelund, 2012; Zhao, et al., 2013	X_{14}
Business model	Rothaermel, et al., 2007; Bekkers and Freitas, 2008; Philpott, et al., 2011; Teizeira and Mota, 2012; Rasmussen, et al., 2014; Giunta, et al., 2015	X_{15}

Table 1 – the factors of success for creation, development and management of spin-off – own elaboration

From the above table it is possible to understand the main factors (internal, external, and organizational) that influence the creation, development and management of the spin-off. Is possible theorized, at this point, a multiple regression formula that allows understanding the impact of each variable on the spin-off.

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} + \beta_{13} X_{13} + \beta_{14} X_{14} + \beta_{15} X_{15} + \varepsilon_i$$

The result of the above regression is a composite index for the growth, development and management of the spinoff.

The Italian context

In Italy the phenomenon of academic spin-off is recently phenomenon[6]. Is possible to find in Italy a number of factors that impede the creation of spinoff organizations and making them the result of spontaneous initiatives of sporadic groups of researchers that, in several cases, have left the academic world. The main obstacles that are found are: the reluctance of researchers to economically exploit the results of their research[7]; the absence in the universities of an interface structure between basic research, applied research and technology transfer[8]; the inability to exit and enter from the university system after have spent time for

[6] Lazzeri, F., & Piccaluga, A. (2014). Le imprese spin-off della ricerca pubblica in Italia: cosa fare dopo le prime mille?. Sinergie quaderni di ricerca, (17).
[7] Binkauskas, G. (2012). Academic entrepreneurship: Barriers and fears versus wishes and opportunities. International Journal of Technology Management & Sustainable Development, 11(3), 231-244.
[8] Bozeman, B., Fay, D., & Slade, C. P. (2013). Research collaboration in universities and academic entrepreneurship: the-state-of-the-art. The Journal of Technology Transfer, 38(1), 1-67.

entrepreneurial experiences; the scarce presence of Venture Capitalist[9] to help researchers in the first steps of their business activities; the feeling that the business failure marks the reputation of entrepreneurs (Consiglio, Antonelli, 2000).

Several studies that have focused on the study of the spin-off in Italian system, in particular on the factors of the pull or push[10] that generate them. One of the first studies on the phenomenon of spin-offs in Italy dates back to the end of the twentieth century (Amendola, 1992), in which is supported the view that the creation of academic spin-offs companies is strongly linked to the quality of the university system of belonging. In reviewing the main studies in the field of spin-offs in Italy, according to the authors Chiesa and Piccaluga, 1997 on the basis of their study that about 50 spin-offs firms, they were created with different characteristics compared to the reference at the university. In addition, several authors have identified in the Italian system, some elements of "obstacle" to the creation of spin-offs: the permanent employment of the professor and freedom in research. Continuing in the discussion of the empirical studies of the Italian context, Grandi and Grimaldi (2003) analyse the role of formal and informal

[9] Lockett, A., & Wright, M. (2005). Resources, capabilities, risk capital and the creation of university spin-out companies. Research policy, 34(7), 1043-1057.
[10]Lazzeri, F., & Piccaluga, A. (2012). Le imprese spin-off della ricerca pubblica: convinzioni, realtà e prospettive future. Economia e società regionale, 1, 43-65.

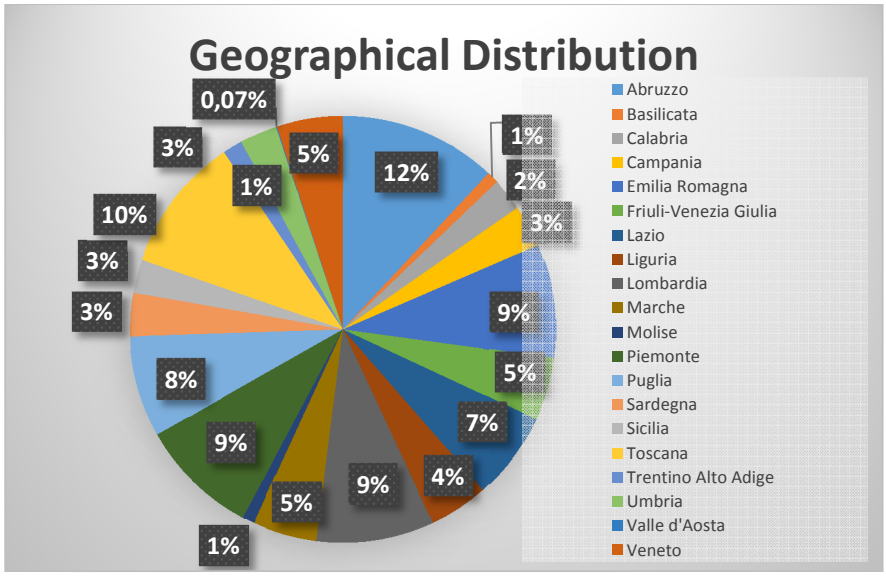
relationships that spin-off companies (and therefore the university) have with the local business system and other organizations. Although several authors have highlighted as the Italian academic firms, characterized by a low growth rate, the same are able to survive for a long period. Particular importance appears the study conducted by Fini et al. (2010), in which it is shown that the involvement of academic staff (in the creation of a spin-off) does not seem to arise so much from an innate entrepreneurial attitude, but rather by expectations of generating improvements in the position held in the university. Furthermore, the spin-offs Italian system characterized by its complexity. As already discussed in the introduction of this paper, the phenomenon of spin-offs characterized by a complexity also from the terminological point of view. In Italy, the large number of terms to define the phenomenon increases. Under commonly found in the literature added: spin-off "certificates" and spin-offs "in fact" (the former are approved/certified by the university's mother); Spin-off "partecipate" or "non partecipate" by the universities; Spin-off of "production" of products/services and spin-off of "consulting" (according to the reference sector). There are different definitions of spin-offs adopted by each university through a special regulation. At the same time, the Italian universities may decide to activate particular processes to create spin-offs. Of particular importance in this regard is the University "Magna-Graecia"

of Catanzaro[11], has realized the high-level training courses, which combine an advanced training course (Master) aimed at the creation of new spin-off.

In the second phase of the study, we will proceed with a descriptive analysis, through the revision of a database created by the collaboration between the Center for Entrepreneurship and Innovation at the Polytechnic University of Marche, Netval and the Institute of Management of the School Superiore Sant'Anna, which collects all the spin-offs Italian. The data were observed until the date of 03/09/2016 (mm/dd/yyyy). At that date, the spin-offs appear to be no. 1383. The large number of sample being analyzed has allowed highlighting different aspects of the phenomenon.

An element of analysis is to understand the geographical distribution of spin-offs in Italy. The geographical distribution shown in Graphic 1.

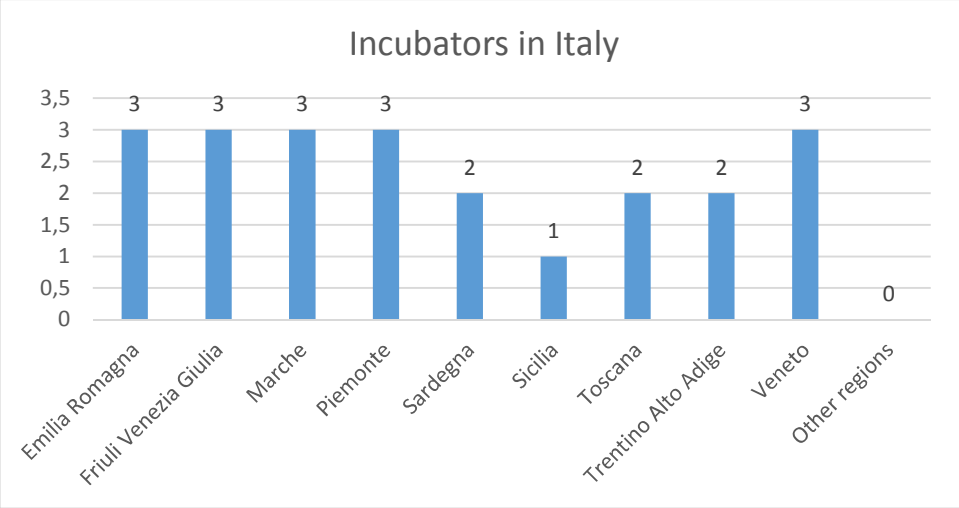
[11]Vesperi, W., Reina, R., & Gentile, T. (2015, September). Academic Knowledge Vs Enterpreneurship: The Spin off way. In *European Conference on Knowledge Management* (p. 828). Academic Conferences International Limited.



Graph. 1 – own elaboration

By the geographic view, is possible to distinguish three categories of regions. The regions attractive, which is concentrated in a percentage ranging from 8% to 12%, which are: Abruzzo (12%), Toscana (10%), Lombardia and Piemonte (9%) and Puglia (8%). These five regions representing 54% of Italian spin-offs. The second category regions averagely attractive are between a percentage ranging from 3% to 7%, and they are: Lazio (7%), Friuli-Venezia Giulia (5.6%), Marche (5.4%), Veneto (5%) and Liguria (4%). Finally, the third category, regions less attractive, ranging from a percentage from 0% to 3% we have: Sicilia, Sardegna, Umbria and Campania (3%), Calabria (2.6%), Molise (1.6 %), Basilicata (1.4%), Trentino Alto Adige and Valle d'Aosta (1%).The concentration of a large number of spin-offs in some regions can be explained by analysing the characteristics of the innovation network. To understand the mechanisms of transfer, the three categories of regions (attractive, averagely attractive and less attractive), have been compared with the number of universities and HEIs in the territories. The comparison shows that, in attractive regions,

there are 40 universities and HEIs. On averagely attractive regions are concentrated just half of Universities and HEIs that is 26. In the last category, regions less attractive, only 25 universities and HEIs. By analyzing the geographical component to understand the external factors that affect the university entrepreneurship, we have decided to analyze the presence of incubators and business accelerators present in the Italian regions. From the analysis of the data of RegistroImprese[12] shows the following situation.



Graph. 2 – own elaboration

The above charts, shows the processed data of certified incubators in Italy and registered in the Italian chamber of commerce. The certificate incubators, in according to *Decreto Legge* 18 Octobre 2012, n. 179, are company Private Limited Company also formed a cooperative according to Italian law or a *Societas Europaea*, resident in Italy. Analysing the data, it appears there is a correlation (even if little) between regions with a high concentration of university entrepreneurship initiatives and the presence of

[12] RegistroImprese is a public register that is required by Italian law. Starting in 1996, it collects all data of the Italian companies registered with the Chambers of Commerce.

certified incubators. It is necessary to highlight that the number of certificates incubators is very limited. In Italian territory, there are a larger number of incubators. We considered other data untrusted sources; in contrast, *registroimprese* is a reliable and trusted source.

The Technoloy Transfer Offices (TTO) are an external factor that influence the entrepreneurial university. Several are the studies that analyse the system of TTO in Italy (Cesaroni and Piccaluga, 2003; Muscio, 2010; Algieri, 2013; Muscio *et al*., 2016). An interesting study[13] on TTO in Italy show the main features of the system and regarding the geographical location. According to this study, that considered a sample of 58 universities and TTO in Italy there is a relationship between the presence of TTO, the size of the University and entrepreneurial activities. It is possible to divide universities into five groups on based on the number of students taken from the data of the Ministry of Education - Office of Statistics data on National Register of University Students, updated to May 2, 2016. The groups are small (until 10.000 students), medium (10.000 to 20.000 students), big (20.000 to 40.000 students), mega (over 40.000 students) and Polytechnics.

This methodology also used by the Censis report. Following this classification and this data is possible to note that there is a concentration of polytechnics in the regions attractions. Furthermore, there are all sizes of universities. In the regions less attractive, there are a concentration of big, medium and small universities. An updated picture on the Italian entrepreneurial university system given by the Netval report[14]. The TTO or Industrial Liaison Office (ILO) in the 88.7% of the cases is a special office

[13] Algieri, B., Aquino, A., & Succurro, M. (2013). Technology transfer offices and academic spin-off creation: the case of Italy. *The Journal of Technology Transfer*, *38*(4), 382-400.
[14] Cantamessa, M., Corrieri, S., De Marco, A. M., Feola, R., Iacobucci, S., Loccisano, R., ... & Tiezzi, R. (2016). XIII Rapporto Netval sulla Valorizzazione della Ricerca Pubblica Italiana. Ricerca, valorizzazione dei risultati ed impatto.

of university, and that deals with the exploitation of research results. According the study of Algieri, *et al.* (2013), the principal policies of technology transfer set out by TTOs mainly address the creation of spin-offs.

Conclusions and discussions

The ASOs are firms founded by an academic inventor (or research group) with the aim to exploit the academic knowledge that origined within a University to develop new products or new services. The extant literature highlights the important of spin-off for economic system.

The objective of this research was twofold, to fill the gap identified in literature on "success factors" for creation, development and management of spin-off.

The study, wanted to highlight the main factors and actors that influence the creation, development and management of a spinoff. The results have wanted to offer new insights into the scientific debate and managerial practices. In particular, through the analysis of the literature has been possible to identify the main factors and actors that influence the spin-off. The study confirms that the spin-off is a complex organization, which needs special system conditions. Numerous interactions generate spinoff within the economic system. We classified the factors and actors into three macro categories: external, organizational and internal university factors.

The identification of interactions, allowing policy makers and scholars to understand better the variables that affect the spin-off organizations. preliminary considerations, in quantitative perspective, on the interactions between the different factors identified (external, internal

and organizational) open future reflections on the creation of a sintetito indicator on the spin-off system.

Second, the empirical evidence of the Italian spinoff system highlighted the characteristics. By empirical evidence, the spinoff of the Italian system presents still in a growth phase with different criticality. In particular, small size and low propensity internalisation are the main obstacles.

The work presents a series of limitations. Specifically, the study does not presume to identify all the actors and factors that influence the development and management of spinoff. The study has been limited to identify the most relevant and analyzed factors in the literature. In addition, the lack of expertise within the university offices on intellectual property determines a delay in the creation of spin-off. The study demonstrates that the creation of spin-off, both influenced the type of knowledge that is produced within the university. The type and size of the parent organization have significant consequences on entrepreneurship academic.

At the same time, the theory of the formula requires empirical evidence to test the goodness of the model. We recognize that the identification of the variables is limited. The phenomenon is complex and very varied. Therefore, it is impossible to identify the variables that most influence the phenomenon without neglecting other aspects. The next step of this research of spin-offs will consist in validation within a sample of spin-offs, in order to test its results.

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The spinoffs' creation process

Structured Abstract

Purpose – The academic spin-offs (ASOs) is a very interesting firm that are founded by an academic with the main ambition to exploit the results of academic research. In the last two decades, the ASOs have received increasing attention in academic debate. The empirical studies on phenomenon have shown that these firms have different characteristics from traditional firms. For this reason, much of the studies available in literature on this matter, have focused on business model, University-industry relationship, research and education, performance, etc… We identify a literature gap in (1) spin-off creation process and (2) mechanism for creation of spin-off. Thus, the aim of this study is twofold: first, to fill this gap in academic literature. Second, we propose an integration of model to the creation of spin-off.

Design/methodology/approach – In this work, we use a qualitative and descriptive method. The methodology is divide in two steps. The first step, from a brief analysis of the literature, we identified the main stages of the spin-off's creation process. In second step, we proceed to implement and integrate the models in the literature on the creation of the spinoff process, through an analysis of the university regulation for creation of spinoff we identify the main mechanism to encourage the spin-off.

Originality/value – This methodology puts in evidence new elements of analysis of the spin-off's life cycle. In particular, the study offers a new

model that take into consideration the first phase of life (from research idea to business idea) and the mechanism.

Practical implications – The results of this study suggest that the theories on spinoff creation process hypothesized in the scientific literature several needing integration. The many results of this research offers a complete analysis about the process of spinoff creation and new indications for police maker and TTO

Keywords – Spin-off, Life Cycle, ASOs, Process Creation, University *(max 5 words)*

Paper type – Academic Research Paper

Introduction

During the past two decades there has been growing interest about spin-off organizations. The phenomenon has become an international phenomenon (Clarysse, et al., 2005) and continues to animate academic and policy debate reguarding the spinoffs' creation process (Chatterjee, 2016). The academic entrepreneurship has emerged on the initiative by policy-makers encouraging universities to develop a "third mission" as an action towards commercialization of academic knowledge, and research in addition to the traditional roles of education, and research as direct contribution to social, and economic growth (Etzkowitz, 2000; 2003; Rothaermel et al., 2007; Perkmann, et al., 2013).

In the scientific literature is can possible find different definitions of spinoff. There is a significant heterogeneity of the positions of scholars on the concept of spin-off (Antonelli, 2004). There is no common definition of spinoff literature. In fact, is possible to find different definition of spinoffs phenomenon, given by the authors according to the analytical perspective used. The confirmation of this appears from the large number of terms with which is called the spin-offs: spin-out, spillover, academic startup, spinoff, ASOs, etc... For simplicity, in this study we will use all terms as synonyms. In the definition of the phenomenon can be found some common elements. Many authors agree in defining a spin off as a process through which it constitutes a new autonomous organization that involves individuals who work at a university or Higher Education Institutions (HEIs). Another common aspect in a large part of literature and authors consider the spinoff as a mechanism of economic exploitation of research results by academic researchers. Indeed the basis for creating of a spinoff enterprise, there is a research (or research groups) that demonstrate the desire to exploit the

results of their research. For the purpose of this article the spinoff is defined according to the two definitions above.

Academic spinoff is based on an intellectual property protected and specifies the order to economically enhance it and transfer from the university (or HEIs) the economic system. To these two purposes, in recent years a third purpose is flanked or outplacement of the researcher (Nosella and Grimaldi, 2009; Friedman and Silberman, 2003; Rizzo, 2015).

Several studies in literature examine the step of spinoffs' creation process, and necessary resources.

The university spinoff has different stages of birth than other companies. In fact, the design and creation of spinoff are different from those of another. The scholars are only focused on some stages of creation of the spinoff, neglecting some essential steps that characterize the spinoff. Recently, pioneering studies have examined university spin-off firm formation form a process perspective. These studies have mainly relied on stage models (Clarysse and Moray, 2004; Vohora et al., 2004), or used a resource-based view as a theoretical framework (Druilhe and Garnsey, 2004; Heirman and Clarysse, 2004; Lockett and Wright, 2005; O'Shea et al., 2005; Vohora et al., 2004).

However, stage models are linear and have been critiqued for being too rigid (Neergaard, 2003), not allowing for heterogeneity among firms and oversimplifying the dynamics of the entrepreneurial process.

At the same time, universities have launched programs and rules to encourage the creation of spinoff and academic Entrepreneurial activities Generally (Debackere and Veugelers, 2005; Di Gregorio and Shane, 2003; Galàn-Muros et al., 2015; Siegel and Wright, 2015). The universities are autonomus within the definition of regulations. Thus there may be material differences in the process of creation a spinoff from different universities.

The findings suggest that different process theories are more salient at different times in the spinoff process, and that each theory inherently focuses on different aspects of the process. As a result, many research issues in entrepreneurship would benefit from using a combination of process theories. This article adds to the entrepreneurship literature by developing a framework showing how different results of academic research process theories shed light on different aspects of the university spin-off process.

The study is inserted in the filed of research related to academic entrepreneurship and the relationship between universities and industry and wants to offer new reflections on the spinoffs' creation process.

This paper is structured as follows. After this introduction, in the next section, we present methodological approach. The section 3 the main theoretical framework and empirical studies on the spinoff's process creation. Finally, in the last section we present discussion, results and main implication for practitioners and policy makers and limitations of this study.

Objectives and methodological approach

The main objective of this paper is to offer a new analysis on the process of formation of the spinoff. In particular, the scientific debate has focused only on the phases after the firm's creation, instead on the early stages.

The methodology used in this article is divided into two ideals parts. In the first, we proceeded to a review of the literature to understand the phases of the creation process of spinoff. This step is crucial to understand the phases that comprise the process and the resources necessary for spinoff. Through the review of the literature we identify and analyze the models offered. In the second step, starting from the model offered by Ndonzuau, et al. (2002) we integrated the phases to the creation of spinoff and we tried to highlight

the main phases, element and actors that support the creation of spin-off in the early stages of life and the impact on the organization of these.

Theoretical framework

The academic spin-offs are a result of a long and complex development paths (Roberts. 1991; Ewens, et al., 2013; Feldman, 2015) nevertheless these organisation have several benefits to offer to the university and local economy (Pitsakis and Soutaris, 2015; Conceição, et al., 2016). The distinctive features of the spinoff, understood as a process for the commercialization of university research results it apart from other organizations. The existing literature assert that the initial development process of ASOs plays a critical role in their further development (Vohora, et al., 2004). Although the literature is recognized the complexity of creating a spinoff process, there are theoretical references that compare this process to that of any other enterprise[1]. According to the literature this part of the process of creating a spinoff, is characterized by a series of operations in time sequence linked to each other by means of the final goal of creating a new organization.

The most simple and general model that can be found in the literature is the model developed by Claysse and Moray (2004). According to this scientific contribution, there are several stages leading to start-up of the spin-off. The authors focus their attention on the stage of approval of the ideas of spin-offs that ideally passes through three stages.

[1]Grandi, A., & Grimaldi, R. (2005). Academics' organizational characteristics and the generation of successful business ideas. *Journal of Business Venturing*, *20*(6), 821-845.

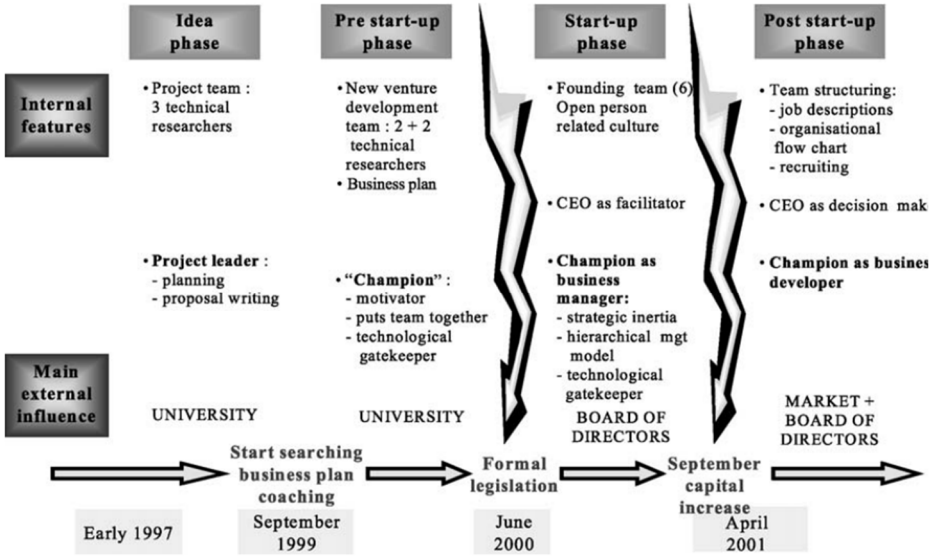

Fig. 1 – Development of the venture along the organizational life cycle – Clarysse and Moray (2004)

The model allows selects the ideas developed within the University. In the second step, invest resource (not only economic) only on the most promising ideas. During the first phase, the research phase, a large number of ideas and projects are developed. The first restriction is related to the entrepreneurial potential of the idea. Only a few projects are approved[2]. During the approval stage are outlined technical aspects of the business idea. In this stage starts the implementation of the business plan. Is important to note that the next generation process is accompanied by that of funding.

In the later stages, next to the proponent subjects skills, is necessary to identify other individuals with knowledge and skills such as managerial and financial.

[2] Degroof, J. J., & Roberts, E. B. (2004). Overcoming weak entrepreneurial infrastructures for academic spin-off ventures. The Journal of Technology Transfer, 29(3-4), 327-352.

The model developed by Degroof and Roberts (1994) is divided in phases. The authors propose a process consisting of three phases:

- Origination phase;
- Concept testing phase;
- Start-up support phase.

The main innovation introduced by the model of the authors is to identify four different types of spin-offs in relation to existing support policies.

ORIGINATION **Opportunity identification**	**CONCEPT TESTING** **Opportunity testing**	**START-UP SUPPORT** **Exploitation of opportunity**
Opportunity identification Opportunity selection	IP protection testing Business concept testing Selection	Internal advising capability Network support

Fig. 2 – Framework to analyze academic spin-off processes – Degroof and Roberts (2004)

Starting from the model offert by Ndonzuau, et al., (2002), di "Black box of economic value creation from university research" that identifies and analyses the main steps in creating o spinoff organization. From the in-depth analyses evidenzia four stages relevant in explaining the transformation of academic research results into economic value.

The four different levels of support and intervention of the universities and institutions in the spin-offs process (absence of policies; minimal selectivity/support; intermediate selectivity/support; comprehensive selectivity/support) that affect the activities described in the three stages that become more intense and concrete with increasing involvement intensity

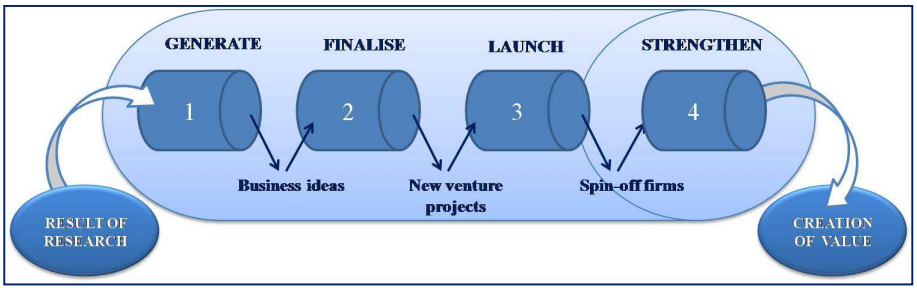

Fig. 3 – The black box model – Ndonzuau, et al. (2002)

The model is an input-output model with four stages: (1) to generate business ideas from research; (2) to finalize new venture projects out of idea; (3) to launch spin-off firm form projects; (4) to strengthen the creation of economic value by spin-off firms. In this model, in the first step the research evaluate the results of the research not only from the point of academic view but overall from a point of commercial view. The next step (2), the researcher (often supported by a specialized structure as TTO) translated the research results in business idea. The third step, the results of research is transformed into a spinoff organization. The last step (4), the organization is mature and the main scope is consolidates and strengthens the competitive advantage.

In according to authors, the starting point of this model is “The black box”, The process ends with the ultimate goal of creating value. The model offered by Ndonzuau, et al., (2001), is not the only development model of the spin-off in the literature.

Another very popular model in the literature is the model proposed by Vohora, et al., (2002). The Vohara’s model is divided in five phases:

(1) The phases of research: in which the idea or creating intellectual propriety (IP) is defined; the actors involved are researchers;

(2) The phase of identification of the opportunity: the university offices or researchers analyze the possibilities to exploit the intellectual

property (IP); the main actors are researchers and the university office responsible for issues related to intellectual property management;

(3) The phases pre-organizational: it defines the object and entrepreneurship characteristics and identify the necessary resources;

(4) The phase of reorientation: it create the first operational routines and redesign it;

(5) The phases of sustainable growth: the organization becomes autonomous from the academic structure.

Furthermore the authors highlight how these stages require a high level of institutional learning [3].

A last scheme is that proposed by Consiglio and Simoni (2000).

LABORATORIO DI RICERCA	IMPRESA LABORATORIO	IMPRESA SPERIMENTALE	IMPRESA DI NICCHIA	IMPRESA MERCATO
	I passaggio	***II passaggio***	***III passaggio***	***IV passaggio***
	-Sviluppo di dimostrazioni della tecnologia - Test sulle *customer utility functions* - Realizzazione di fatturati da sperimentazione	- Sviluppo di un'offerta sperimentale di segmento - Acquisizione di una vision del mercato - Sviluppo di partnership - Necessità di allineamento tra investimenti e fatturato	- Sviluppo di un'offerta strutturta di segmento - Definizione di una strategia di marketing -Capitalizzazione delle attività di impresa e sviluppo del fatturato	- Ampliamento dell'offerta a più segmenti - Definizione di una strategia multitarget - Ampliamento del raggio d'azione e delle dimensioni aziendali

[3] Hitt, M. A., Li, H., & Worthington, W. J. (2005). Emerging markets as learning laboratories: Learning behaviors of local firms and foreign entrants in different institutional contexts. *Management and Organization Review*, *1*(3), 353-380.

Figure 2 – the development of a spin off from research – Consiglio e Simoni (2000)

About the authors[4], the transition from scientific research to spinoff consists of four steps. According Antonelli (2011), the figure above shows in his first three phases the substantial difference with another startup. In particular, the first three steps (research group, laboratory of enterprise and experimental enterprise), this steps are critical steps for creation and gestation of spinoffs. This last phase is very complex and long. The complexity is due to the internal rules of universities [5].

The fourth phase is the phase of the organization startup. In this phase the enterprise, generally of small size and little structured, enters the economic system and generating the first profits. The financial resources are usually reinvested for new research projects. The next step, from laboratory enterprise to experimental enterprise, the organization begins to develop more structured organization and seeks to increase its competitive advantage. The next step that marks the transition from experimental enterprise to niche business, the management of researchers and entrepreneurs, consider increasing the size of the organization and investment. In according several authors (Rasmussen, et al., 2011; Klofsten and Lundmark, 2016; Wright and Fu, 2016), in this phase becomes critical to the spinoff realize a business plan aimed at investors and new partners. The business plan is a strategic document[6] that combining qualitative and quantitative aspects and highlighting the critical elements of success. In this

[4] Consiglio S., Simoni M. (2000), "Metodologia e risultati della sperimentazione", paper del Comitato Tecnico del Progetto "La tua ricerca per la tua impresa" di Sviluppo Italia, 27/06;

[5] Berbegal-Mirabent, J., Ribeiro-Soriano, D. E., & García, J. L. S. (2015). Can a magic recipe foster university spin-off creation?. *Journal of Business Research*, *68*(11), 2272-2278.

[6] Upton, N., Teal, E. J., & Felan, J. T. (2001). Strategic and business planning practices of fast growth family firms. *Journal of small business management*, *39*(1), 60-72.

time, the proponent subjects are compared on issues concerning related to legal form, estimate the potential economic initiative results and definition of necessary resources[7]. Within the business plan has analysed the market, potential competitors of the spin-offs, the strengths and weaknesses of the project[8]. It becomes necessary then produce a series of documents and investigation[9] that allow to focus on the context in which the spinoff will operate.

The next phase, the organization becomes a spinoff market oriented[10], with the aim of consolidating its competitive advantage. The management starts to take dimensional and organizational development paths and expand the offer to customers. In literature, may be encountered different contributions that analyze and study early-stage of spinoff.

In particular, an emerging line of research focuses on the analysis of social networks and graduate teachers and entrepreneurs. Hayter (2016) gives an interesting contribution in this area of study, as the author analyzed the dimension of the academic and non-academic social relations put in the spin-off in a social network, may can determine the success of the business.

[7] Walter, A., Auer, M., & Ritter, T. (2006). The impact of network capabilities and entrepreneurial orientation on university spin-off performance. Journal of business venturing, 21(4), 541-567.

[8] Chen, X. P., Yao, X., & Kotha, S. (2009). Entrepreneur passion and preparedness in business plan presentations: a persuasion analysis of venture capitalists' funding decisions. Academy of Management Journal, 52(1), 199-214.

[9] Mason, C., & Stark, M. (2004). What do investors look for in a business plan? A comparison of the investment criteria of bankers, venture capitalists and business angels. International Small Business Journal, 22(3), 227-248.

[10] Man, T. W., & Lau, T. (2000). Entrepreneurial competencies of SME owner/managers in the Hong Kong services sector: A qualitative analysis. Journal of Enterprising Culture, 8(03), 235-254.

The model proposed by the authors have limitations. The main limitation is that it does not explain why some research results are transformed into spinoff. According to the above models, each of the research result should be able to generate spinoffs. At the same time, let assume that there is a directly proportional relationship between investment in research and the creation of new spin-off companies. A further limitation of most of the models that study the spinoffs' creation process is the failure to consider of the knowledge and the skills[11] necessary at different stages of spinoff. In addition, several models do not explain what motivates a researcher to undertake a business activity[12].

To overcome these limits, it is necessary to take in consideration the competence-based competition theory (Hamel, 1989, 1991; Heene and Thomas, 1996; Hamel and Heene, 1994; Gorman and Thomas, 1997; Freiling, 2013; Lin and Wu, 2014). According to this theory the firm is seen as a learning organization using resources (assets), It employs knowledge and expertise (skills) to achieve its strategic objectives[13]. The spinoff, under the perspective of competence-based competition theory may be considered as a container, which in early-stage builds the necessary skills and knowledge to be able to start the business. The theory of competence-based show how organizations can develop sustainable competitive advantage in a systematic and structural way[14]. In the first moment, the spinoff

[11] Need, W. C. D. H. P. (2006). Human resource management: Gaining a competitive advantage.

[12] Zahra, S. A., Van de Velde, E., & Larraneta, B. (2007). Knowledge conversion capability and the performance of corporate and university spin-offs. Industrial and Corporate Change, 16(4), 569-608.

[13] Sanchez, R., & Heene, A. (1997). Reinventing strategic management: New theory and practice for competence-based competition. European Management Journal, 15(3), 303-317.

[14] Sanchez, R., & Heene, A. (2004). *The new strategic management: Organization, competition and competence*. Wiley.

accumulates academic knowledge through patents, research results and academic staff. Later the spinoff seeks to accumulate entrepreneurial skills.

Another fundamental aspect in the process of academic entrepreneurship is the intellectual property rights (IPR) on research findings (Geuna and Rossi, 2011, p. 1068). In the last decades, the majority university and institution of research follow an institutional ownership model making the university the first owner of the research findings where the researcher is employed (Geuna and Rossi, 2011, p. 1068).

The integration of "Black box" model

With these theoretical bases, it can integrate the model proposed by Ndonzuau, et al., (2002).

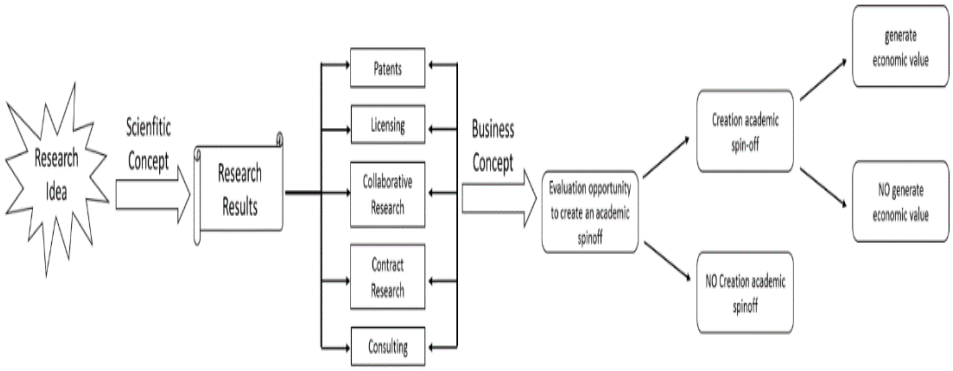

Figure 2 – New spinoffs' creation process –own elaboration

This new model highlights a number of considerations before not clearly highlighted. In particular, the figure 2 proposed above can be seen that the process of creating the spinoff of the research idea. The peculiarity of the

spin-off organizations is the starting input, that is to say the phase of development of the idea of research. This step is the result of an academic reasearch activity [15] carried out by university professors or research groups. The output of academic research is the initial input of the academic spinoff. From these initial observations, it is possible to understand the first difference between the spinoff and any other organization. Necessary at this early stage skills and knowledge are highly qualified and focused on research aspects. Objective of this phase is not oriented economic return but the accumulation of knowledge within the university [16] and its staff. The main parties involved in this phase are researchers and research groups. The research idea is the fundamental element that distinguishes it from other organizations spinoff. In fact, in scientific literature all authors[17] agree in defining the research idea as the basic and distinctive element of spinoff. La research idea is processed through a scientific concept for the achievement of scientific results. The academic research and her results are a public good (Book, 1990; Etzkowitz, 1998; Burke, 2005). In according to Grimaldi, et al., (2011), the main types of academic research are: Patents, licensing, collaborative research, contract research and consulting. The authors add this list of types of academic research the academic spinoff. In our vision the spinoff is an indirect result of scientific research, but rather is a vehicle for the transfer and exploitation of knowledge. To transform the results of research in a firm (spinoff) is necessary processing it through a business

[15] Smilor, R. W., Dietrich, G. B., & Gibson, D. V. (1993). The entrepreneurial university-the role of higher-education in the United-States in technology commercialization and economic-development. *International Social Science Journal*, *45*(1), 1-11.
[16] González-Pernía, J. L., Kuechle, G., & Peña-Legazkue, I. (2013). An assessment of the determinants of university technology transfer. *Economic Development Quarterly*, 0891242412471847.
[17] Klepper, S. (2009). Spinoffs: A review and synthesis. European Management Review, 6(3), 159-171.

concept. The transition from academic research to a business oriented of result of research is not simple or automatic. First of all is necessary include further aspects. The first aspect is to understand what types of result has led research. Indeed, not all research results generate business idea; not all ideas amount to opportunities for new venture projects (Bhave, 1994; Wennenberg and DeTienne, 2011; Vesperi, et al., 2015). Moreover, the second aspect is to understand the reason wht the academic (or research group) want to start a spinoff process. In the majority spinoffs' creation model present in the literature, not taken into consideration this aspect. The motivation for the creation of a spinoff can have individual character (that is related to the professor or research group) or collective (related to university). Several authors (Erdős, 2013; Audretsch, 2013; Rasmussen, et al., 2014; Casati and Genet, 2014; Leloux, et al., 2017), have provided different studies on the subject of motivation. About Lazzeri and Piccaluga (2014) until the first part of the eighties the researchers that constituted a spinoff were viewed with suspicion and distrust. Today the motivation that push the researchers to start-up a spinoff are different[18]: Achievement, Independence, Research, and Necessity.

Other side the reasons that push the universities (or HEIs) to enter in the spin-offs company can be traced to the "third mission" of universities. The third aspect includes the resources that have already possesses of spinoff (economic, financial, knowledge and skills). It is necessary to understand the gap between resources owned and not owned resources. The actors involved in this phase are beyond the researcher and the research team even the university offices predisposed to exploitation of research results (TTO).

[18] Adam, N. (2014). Motivation And Success Of Academic Spin-Offs: Evidence From Hungary. Annals of Faculty of Economics, 1(1), 1212-1219.

In this regard the drafting of a business plan that allows bridge the gap between academic knowledge and Entrepreneurial skills will be needed.
By organizational design of spinoff and evaluation of the resources needed, the researcher or university[19] can decide whether to continue or not to continue with the creation of a new firms. In this phase, several actors are involved: the researcher and the research team, the university offices for the exploitation of research (TTO) and the entrepreneurs.
In the case is created a new spinoff, it may generate economic value or no generate economic value. The difference between a spinoff that generates economic value and one that does not generate economic value is the entrepreneurship skill.

Conclusions

The international academic debate and the university system from the time show an increasing attention to the phenomenon of creation of spin-offs. Moreover, the attention and the evolution of technology imposes a development of the role of universities in the social and economic system. Next to research and education it prompted the university to also cover the exploitation of research (so-called Third Mission). The spinoff, appears the most appropriate tool and common to perform this new task. At the same time, the spin-off is presented as a complex organization with traits not yet analyzed. There are numerous contributions in the literature on the topic of creation and development of spin-off. From the brief review of the literature highlighted in this work, there were valid and interesting creation and development models. All models feature innovative characters and often

[19] Smilor, R. W., Gibson, D. V., & Dietrich, G. B. (1990). University spin-out companies: technology start-ups from UT-Austin. *Journal of business venturing*, *5*(1), 63-76.

uncommon with each other, the result of the different perspectives of analysis used by the authors. Analyzing the creation of models and development of an enterprise spinoff, it emerges that it moves from one stage to another (Bhava, 1994; XU, et al., 2012; Bergh and Sharp, 2015). Therefore, we conclude that in the literature the process of creating the spinoff consists of several steps.

By focusing on the prospect of the academic knowledge and the'entrepreneurial skills, with the theoretical support of competence-based competition theory we have tried to offer an integration and a new model. The proposed model, seeks to explain why not all the academic knowledge (ie research results) become spin-offs. Introduction of variables such as the entrepreneurial education, the motivation and the social networks (Link and Scott; 2005; Walter, et al., 2006) first not considered, give a preliminary response. The model presented show a series of insights that allows professionals and universities to understand how the spinoffs are created within the academic system.

First of all, the actors involved in the process are a researcher, entrepreneur and universities. They must interact with each other for the development of a social network to support the activities of spinoff. In particular, the academic knowledge and the skills of actors involved, are fundamental elements for the creation of spinoff.

The model also presented, beyond the traditional opposition between "economic" conception and "scientific" conception (McMillan, et al., 2000). The opposition is in the model is exceeded by in-time model. The research ideas are not sufficient for starting a spinoff organization and able to achieve a competitive advantage.

There are several limitations of this study. In the first instance, future studies could focus on the many actors involved in the different stages of

development, the objectives and strategies to facilitate the creation of new businesses. A further limitation of the model is to not consider all the context variables that can affect the development of a spinoff. The model must be built and strengthened especially in its final phase.

By future empirical evidence of this model will be possible to understand whether the model can be used in all areas of science. Moreover, it is evident that the internal rules of universities is influential in this process.

The connection between the world of research and the economic system now seems insoluble. The spin-off is the simpler and natural response to knowledge-based economy. The spinoff answers the requirements of competition on the market, internationalization and innovation of enterprises. The main promoter of this knowledge transfer mechanism are the universities must actively work together with the social and economic system (local authorities, companies and trade associations) in order to create a successful social network.

To achieve this result, universities have to reduce bureaucratic processes that lead to the approval of the spin-off, with an orientation to new public management.

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