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**Looking at the spin-off process through a social information processing lens a systematic  
literature review**

**ABSTRACT**

Based on a systematic literature review, this paper focuses on academic entrepreneurship to clarify the process of spin-off creation by understanding what is known and still merits further research. Through Social Information Processing Theory, it examines the role of individual and organizational factors in each phase of the spin-off creation process, i.e. opportunity identification, entrepreneurial intentions, and spin-off creation. We find that the most studied factors at the organizational level are entrepreneurship education and the technology transfer office, while those at the individual level are the determinants of the Theory of Planned Behavior and entrepreneurial self-efficacy. In addition, we highlight that not all stages of the process received the same level of attention, with a clear imbalance in favor of entrepreneurial intentions over opportunity identification. Based on these findings, we highlight future research avenues.

**Keywords:** Academic entrepreneurship, Spin-off creation, Social information processing, Entrepreneurial university

## INTRODUCTION

Academic entrepreneurship is the founding of research-based spin-offs, that are firms created to commercialize a patented invention or non-patented expertise (Shane, 2004). It is a widely accepted strategic tool for economic and social growth (Audretsch, 2014; Bolzani, Munari, Rasmussen, & Toschi, 2020). Likewise, research-based spin-offs have been demonstrated to have a determinant impact on the local area they operate, from both economic and social perspectives (Iacobucci & Micozzi, 2015; Vincett, 2010). Indeed, they positively influence the environment around them by strengthening intellectual capital's impact on local economic growth (Mariani, Carlesi, & Scarfò, 2017). Moreover, several studies have demonstrated that acting entrepreneurially positively affects scientists' research performance (Abramo, D'Angelo, Ferretti, & Parmentola, 2012; Van Looy, Ranga, Callaert, Debackere, & Zimmermann, 2004).

Despite this, how a research-based spin-off emerges remains unclear because the extant body of knowledge is fragmented and points to specific aspects of the process, such as the individual characteristics or the surrounding external conditions (Gbadegeshin, 2017). Little research has viewed academic entrepreneurship through the lens of a theory-driven model for the spin-off creation process (Nicolaou & Birley, 2003; Rasmussen, Mosey, & Wright, 2011). This has limited the research progress because of the difficulty in accumulating knowledge (Mrozowski, 2020; Wood, 2011).

In line with the Social Information Processing Theory (Coleman, 1986), we argue that spin-off creation is an individual behavior that occurs within an established organizational setting like the university is (Autio, 2014; Muscio, Shibayama & Ramaciotti, 2021); hence, we cannot deny the impact of the organizational dimension on the process development (Fini, Grimaldi, & Sobrero, 2009). Indeed, the academic setting is a research environment whose influence on individual behavior is widely accepted (Graversen, Schmidt, & Langberg, 2005). Thus, to enhance our understanding of the academic entrepreneurship process, we argue for the need to adopt a holistic

perspective (Müller-Wieland, Muschner, & Schraudner, 2019; Wood, 2011) and to consider both the individual and university levels and how they interact until the spin-off creation.

Since the existing lack of a theory-driven approach, this study conducts a systematic literature review (Tranfield, Denyer, & Smart, 2003) that streamlines the existing literature on research-based spin-off creation through a social information processing perspective and a processual lens of academic entrepreneurship. Specifically, it focuses on the individual and organizational dimensions' roles in the process, considering three entrepreneurial stages commonly accepted in the literature (Gielnik & Wang, 2018): opportunity identification, entrepreneurial intentions, and spin-off creation. Therefore, this work allowed us to address the following research question:

*What do we know and still need to understand about the spin-off creation process? Which is the role of organizational and individual variables in this process?*

The purpose of this study is twofold. First, we aim to depict the state of the art on the studies about the spin-off creation process, assessing how the published articles consider the role of the organizational-level and individual-level factors' impact on process development and how it has been studied in the entire individual process. Second, we aim to open new paths for empirical research, considering what lacks in the extant literature and which aspects should be deepened to understand the phenomenon.

The paper is organized as follows. We explain the fundamental concepts representing contribution's theoretical pillars; after that, we present the methodology adopted to perform the systematic literature review. The findings begin with a descriptive analysis to expose the articles' main characteristics. A narrative synthesis follows to provide a comprehensive understanding of how previous works studied the individual and organizational variables and how each stage of the spin-off creation process has been considered in the literature. Building on the aforementioned findings, we provide a research agenda on important aspects of the entrepreneurial process that should be further investigated within university settings.

## THEORETICAL BACKGROUND

The spin-offs' role is widely recognized in extant academic entrepreneurship studies (Autio, 1997; Hayter, Lubynsky, & Maroulis, 2017). Recent contributions shifted the attention not only to academics, but also to students (Siegel & Wright, 2015), since they needed to consider everything that can positively impact the university entrepreneurial environment (Bolzani et al., 2020), such as students' start-ups (Shah & Cox, 2014) or students' involvement in entrepreneurship education programs (Lackéus & Middleton, 2015).

### **Spin-off creation as a combined effect of social-organizational and individual-level factors**

The entrepreneurial process is nested in social processes that should be considered when studying the phenomenon (Gartner, Hall, Carter, & Reynolds, 2003). Drawing on the literature on what we know about intrapreneurship, conceptualized as the creation of a new venture from an already existing organization (Kuratko, Montagno, & Hornsby, 1990), we argue for the relevance of organizational context in the spin-off creation process. Thus, we observe the phenomenon through a social information processing perspective, considering the social-organizational level and individual factors as being the determinants of an individual behavior like spin-off creation (Chatman, 1989).

As exposed in the Figure 1, we consider Coleman's boat as a guiding tool (Coleman, 1986) to theorize the spin-off creation as resulting from a combined effect of social-organizational and individual-level factors.

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Insert Figure 1 about here

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In our social information perspective, the entrepreneurial behavior is affected by both individual and organizational factors jointly impact individual behavior (Chatman, 1989), and it cannot be different for spin-off creation in the academic setting.

## **Entrepreneurial phases of spin-off creation**

We argue that the investigation of spin-offs should be approached as a multi-level process, that is a succession of stages whose evolution implies a role for both the individual and organizational dimensions (Friedman & Silberman, 2003; Mustar et al., 2006). Despite this, few studies have investigated spin-off creation as a process, and they mainly used an atheoretical approach (Nicolaou & Birley, 2003; Ndonzuau, Pirnay, and Surlemont, 2002; Müller-Wieland et al., 2019). In line with previous studies in entrepreneurship, we recognize three steps in the process of spin-off creation: identifying the opportunity, forming entrepreneurial intentions, and creating a research-based spin-off. Each step of the process is laid out in the following section.

***Opportunity identification.*** Widely accepted as the starting point of entrepreneurship (Gielnik & Wang, 2018; Shane & Venkataraman, 2000), it is a cognitive process through which an individual realizes to have identified an opportunity (Ardichvili, Cardozo & Ray, 2003). This construct can comprise opportunity discovery and opportunity creation (Mickiewicz & Kaasa, 2020, creating a bridge between these two contrasting perspectives (Alvarez & Barney, 2007; Wood & McKinley, 2018).

***Entrepreneurial intentions.*** Defined as states of mind that lead to entrepreneurial action (Bird, 1988), two models have commonly been adopted to investigate this construct: Ajzen's Theory of Planned Behavior (Ajzen, 1991) applied for the first time in entrepreneurship by Krueger & Carsrud (1993) and Shapero's Entrepreneurial Event, elaborated in 1982 (Shapero & Sokol, 1982).

***Research-based spin-off.*** A research-based spin-off is a new venture created to commercialize knowledge or a new technology developed within the university (Klofsten & Jones-Evans, 2000; Pirnay, Surlemont, & Nlemvo, 2003).

Considering the theoretical concepts described above and the need to reach a comprehensive and theory driven framework of the spin-off creation process, our work will be driven by the

following research question: *What do we know and still need to understand about the spin-off creation process? Which is the role of organizational and individual variables in this process?*

## METHODOLOGY

By organizing the work around the three building blocks of the entrepreneurial process (Gielnik & Wang, 2018), we use the PRISMA protocol (Moher et al., 2015) to perform a systematic literature review (Hiebl, 2021; Snyder, 2019; Tranfield et al., 2003). This method is useful in contexts where studies should be selected to add specific issues to the understanding of a given phenomenon (Briner & Walshe, 2014; Nightingale, 2009). Thus, this method is well suited for this study since it aims to understand the role of individual and organizational dimensions on the process of spin-off creation.

We refer to Tranfield et al. (2003) as a guiding tool, articulating the work's procedure along with the following stages: research question formulation, keywords identification, study selection, quality assessment, data extraction, and data synthesis. Table 1 presents the visual representation of each stage of the process.

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***Formulating research question.*** Drawing on a social information processing perspective, we look at the role of organizational and individual variables in the spin-off process, considering it as individual behavior in an established organizational setting like university. The review's scope is synthesized by the research question that drives this contribution:

*What do we know and still need to understand about the spin-off creation process? Which is the role of organizational and individual variables in this process?*

***Identification of keywords.*** Three different combinations of keywords have been identified, corresponding to the entrepreneurial process's main stages (Gielnik & Wang, 2018). We expose the selected keywords in the Table 2.

***Selection of studies.*** The search was performed in October 2020 and included the articles written in English and published in peer-reviewed journals. In line with previous literature reviews (Perkmann et al., 2013) and other relevant contributions of spin-off creation within academic context (Smilor, Gibson, & Dietrich, 1990), we considered the time interval ranging from 1990 to 2020 to search relevant papers in academic entrepreneurship .

The first search returned 159 articles for opportunity identification, 759 articles for entrepreneurial intentions, and 292 for spin-off creation. Table 2 presents the synthetic view of the search performed.

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***Quality assessment.*** The qualitative assessment (Eveleens, Rijnsoever, & Niesten, 2017; Tranfield et al., 2003) has been based on a specific inclusion criterion (Hiebl, 2021): we reviewed only the empirical contributions that considered the individual or organizational macro-dimensions (or both) on one stage of the process, considering samples of scientists or students (or both). Moreover, we excluded the studies that used students as a convenience sample, since we were interested in understanding the role of students as actors of the academic entrepreneurship phenomenon. As an example, we did not include the works of Marvel (2013) and Gilsing, Van Burg & Romme (2010) in the review, since the former's sample was not formed by scientists or students only, and the latter studied only the policy actions to foster high-tech entrepreneurship, without considering the individual and organizational-level.

Overall, we selected 82 papers, 8 of which have been selected for opportunity identification, 47 for entrepreneurial intentions, and 27 for spin-off creation. Table 3 provides a detailed flowchart of the selection process.

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**Data extraction.** To extract data from the papers (Tranfield et al., 2003), we used a simple matrix (Torraco, 2016; Webster & Watson, 2002). Each stage of the spin-off creation process (i.e., opportunity identification, entrepreneurial intentions and spin-off creation) have been put in the horizontal axis at the head of the table. In contrast, the variables identified have been placed in the vertical axis at the left side of the table. When the same study addressed more than one stage of the process, we considered it by occupying more than one line.

**Data synthesis.** We proceeded with an integrative review, developed as an analysis in two stages: a *Descriptive analysis*, exposing the characteristics of the papers included, and a *Narrative synthesis*, that addresses the need to define a clear picture of the topic.

The descriptive analysis gives the reader a general idea about academic entrepreneurship's scientific area, whereas the narrative analysis aims to comprehensively assess the state of art. Specifically, we were interested in understanding how the individual and organizational variables have been studied and how each stage of the spin-off creation process has been studied. Table 4 presents the total visual synthesis of the most considered variables.

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### **DESCRIPTIVE ANALYSIS**

Of the total 82 articles, 84 % of the contributions adopt a quantitative design, whereas 16% opt for a qualitative approach. Furthermore, 18% of the studies perform a longitudinal analysis, whereas others opt for a cross-sectional one.



For the sample, 34% of the review studies base their analysis on students, 60% on scientists, and 1% use mixed samples. Finally, 5% adopt a purely organizational perspective, focusing on the number of spin-offs created.

Focusing on the evolution in the study of spin-off creation, it emerges that the last years have seen an increasing interest in the field, coherently with the findings of previous bibliometric analysis (Secundo, Rippa, & Cerchione, 2020; Skute, 2019).

Of the total of 47 scientific journals publishing research in academic entrepreneurship, only three of them gather around 25% of all the contributions: *Journal of Technology Transfer* (13%), *Research Policy* (8.5%), and *Small Business Economics* (4.5%).

## **NARRATIVE SYNTHESIS**

We will exhibit a narrative synthesis to describe the state of the art in the study of individual and organizational variables, and of each step of the spin-off process.

### **Which is the role of organizational and individual variables in this process?**

In this work, we intend the individual factors like the personal and psychological characteristics that identify the single researcher or student. In contrast, the organizational variables are the tangible and intangible characteristics influencing an established individual's behavior and attitudes (Lu, Leung, & Koch, 2006).

Here, we provide an overview of the variables that captured scholars' attention, considering that the first review's finding is a list of the most considered individual and organizational variables (Table 5).

On the individual side, the widest attention has been received by the determinants of the Theory of Planned Behavior (Ajzen, 1991), namely the entrepreneurial attitude (N= 18, 21% of the reviewed articles), the perceived behavioral control, and the subjective norms (N = 13, 15% of the total).

Another psychological variable that has been highly considered is entrepreneurial self-efficacy (N = 12, 14% of the total reviewed articles), defined as the individual's perception about their ability to act entrepreneurially (Mcgee, Peterson, Mueller & Sequeira, 2009; Bandura, 1977). Noteworthy, the role recognized to the gender as a demographic variable (N = 6, 7% of the reviewed articles).

Synthesizing what emerged from the analysis of the individual-level variables, we found that a significantly minor attention has been provided to the demographic variables, if compared with the psychological ones.

On the organizational side, the most considered variable has been the entrepreneurship education (N = 25, 33% of the reviewed articles), mainly considering its presence as a stimulating factor for spin-off creation.

Additionally, the role of the technology transfer office was highly studied (N = 20, 24% of studies reviewed), mainly considering its presence (N = 5) and the support provided (N = 5).

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### **What do we know about the spin-off creation process?**

In this paragraph, we provide a synthesis of each stage of the process, namely the opportunity identification, the entrepreneurial intentions and the spin-off creation.

***Opportunity identification.*** The vast majority (75%) adopt a quantitative and cross-sectional research design to investigate the phenomenon, and four of the eight articles on this stage study a sample of scientists.

Concerning the individual dimension, only entrepreneurial self-efficacy has been included in these studies (Hassan, Saleem, Anwar, & Hussain, 2020). On the organizational side, a prominent role is covered by entrepreneurship education (Puni et al., 2018; Hassan et al., 2020).

What emerges is an insufficient attention on this stage and a relatively ambiguous and poorly addressed relationship the other process' stages, with only a few contributions trying to fulfill this gap (Ofstedal et al., 2017; Hassan et al. 2020), as well as an insufficient attention

***Entrepreneurial intentions.*** All the 47 works that investigate entrepreneurial intentions adopt a quantitative approach with cross-sectional analysis. They are mainly based on the Theory of Planned Behavior (Ajzen, 1991). As far as the sample is concerned, 51% of the articles study scientists, whereas 47% analyze students. Only one contribution considers a sample of students and scientists.

Most contributions (N = 13, 28% of the reviewed studied on entrepreneurial intention) use the determinants of the Theory of Planned Behavior (Gieure et al., 2019; Guerrero, Urbano, & Gajón, 2020; Trivedi, 2016), often combined with other individual variables.

On the organizational side, a significant consideration has been given to entrepreneurship education's impact (N = 10, 21% of the articles about this phase), both as a direct (Müller-Wieland et al., 2019) and a mediated predictor (Urban & Chantson, 2019).

The formation of entrepreneurial intentions is the most studied stage of the spin-off process. Nonetheless, a further investigation is needed to understand how it is linked with the opportunity identification and the creation of a research-based spin-off.

***Spin-off creation.*** Regarding the research design, 59% of articles opt for a quantitative approach. Concerning the type of analysis, 56% have adopted a cross-sectional analysis. A large part of the contributions – namely 78% - studied a sample of scientists.

On the individual side, a significant portion of the contributions builds on motivations (N = 3, 10,34%). Considering the organizational dimension, it appears clear that there is a deep attention toward the presence of technology transfer office (N = 4, 14% of the works on spin-off creation) and the support provided by it (N = 5, 17% of the contributions about this topic).

What generally emerges for the spin-off creation stage is a significantly greater attention for the organizational variables compared with the individual dimension.

## RESEARCH AGENDA

This work contributes to theory development by proposing a research agenda for topics that deserve further attention in future research.

### **Which is the relevance of the research outcome in research-based spin-off creation?**

It is still unclear what explains why a scientist decides to behave entrepreneurially and another one does not take the same decision, despite the increasing scientific attention toward the phenomenon.

A number of reviewed contributions have highlighted the role of research as a starting point for the spin-off creation process (Fernandez Perez, Alonso Galicia, Fuentes Fuentes, & Rodriguez Ariza, 2014; Galati et al., 2020), but we still do not know whether the research results are a necessary condition to trigger the spin-off process. In conclusion, what still lacks is an understanding of how the spin-off creation process starts.

### **Which is the relationship aiming the stages of the spin-off creation process?**

The scientists' journey towards spin-off creation is unclear, with a fragmented body of knowledge characterized by cross-sectional studies focused on one stage (Hannibal, Evers, & Servais, 2016; Israr & Saleem, 2018). Still lacks a comprehension about the relationships between the research outcome, the opportunity identification, the entrepreneurial intentions and the spin-off creation, and it leads to a still weak theoretical explanation of the phenomenon.

All this considered, we claim to further investigate the process development through the three stages, addressing the need to clarify the relationship between them.

### **How important are the organizational and individual variables and which is their impact on the entrepreneurial process of research-based spin-off creation?**

This work's findings have shown that several individual and organizational factors have been studied as predictors of the different stages of the spin-off process, even if they have been considered in different measures.

What is still unclear is whether their relevance change or not along the process. Indeed, it is still needed to develop our understanding of the importance of these dimensions on the whole process of spin-off creation. It is still unknown in which measure they impact the research outcome, identifying opportunities, forming entrepreneurial intentions, and the spin-off creation. A better comprehension of this topic would lead to theory advancing since

## CONCLUSION

This work aimed to assess the current stock of knowledge on the unfolding of the spin-off creation process, addressing the claim for a holistic vision in academic entrepreneurship research (Wood, 2011). We adopted a social information processing perspective to consider the role of individual and organizational variables. Addressing a research agenda (Hedström & Wennberg, 2017; Post et al., 2020), this work is also generative because it goes beyond a mere synthesis of the extant literature by proposing new avenues for future research on the topic (Post et al., 2020).

### **Limitations and future research.**

This work's findings should be extended in two main ways. At first, future research should address academic entrepreneurship in a wide sense, also considering other activities such as patenting, licensing, and contract research, and how these are related to the process of spin-off creation. Moreover, future contributions should perform a search on other databases such as Scopus to extend our findings.

### **Implications**

This work contributes to theory advancement in several ways. First, we adopted the theoretical lens of social information processing and considered spin-off creation as a process, addressing the need to integrate individual and organizational factors in academic entrepreneurship studies (Davidsson & Wiklund, 2001).

We also contribute to the comprehension of intrapreneurial process, defined as entrepreneurship within existing organizations (Antoncic, Hisrich, & Western, 2001), by opening the black box of the interaction between individual and organizational factors and their impact on the intrapreneurial action (Hornsby et al., 1993). We also address the theoretical need to understand the components of the environment in which intrapreneurship occurs (Kuratko, Montagno, & Hornsby, 1990).

Our study is also a critical ring to generate new theory for management studies (Fini, Rasmussen, Wiklund, & Wright, 2019). Considering this, it can be useful for a further theoretical understanding of how a new venture can be created over time. Moreover, this study can be useful for the studies about the antecedents of organizational goals (Kotlar, Massis, Wright, & Frattini, 2018) and a better understanding of the conflicts between different stakeholders during the spin-off process (Clarysse, Wright, Lockett, Velde, & Vohora, 2005; Mustar et al., 2006). Furthermore, it can lead to a better comprehension of a process, implying the transition from a non-commercial to a commercial environment (Fini et al., 2009; Mustar et al., 2006).

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Table 1. Flowchart of the adopted procedure

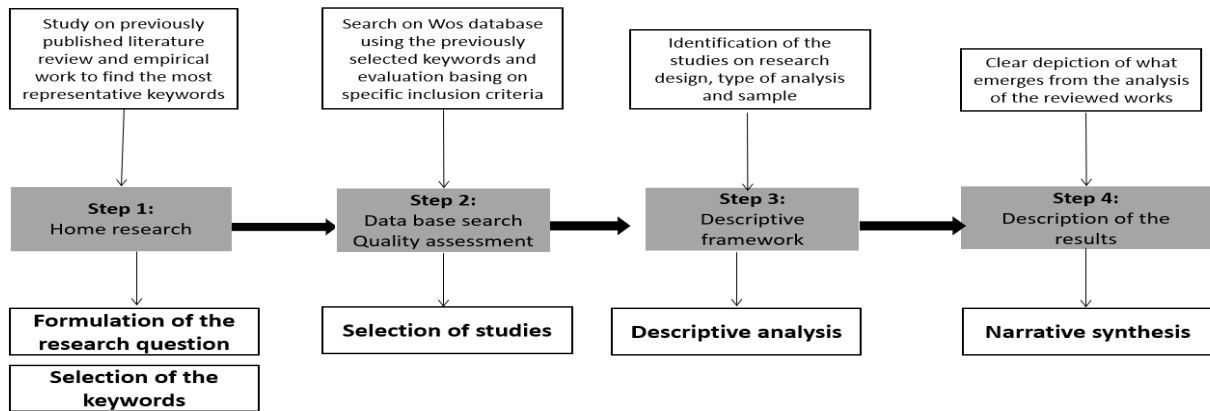


Table 2. WoS Database Search Query

<b>Concept</b>	<b>Search Terms</b>	<b>No.</b>
<b>Opportunity Identification (OI)</b>	('opportunity recognition' OR 'opportunity identification') AND ('academic entrepreneurship' OR 'acemi* spin*' OR 'universit* spin*' OR 'acemi* commercialisation' OR '*universit* commercialisation')	159
<b>Entrepreneurial Intentions (EI)</b>	('entrepreneurial intent*') AND ('academic entrepreneurship' OR 'acemi* spin*' OR 'universit* spin*' OR 'acemi* commercialisation' OR '*universit* commercialisation')	759
<b>Spin-Off Creation</b>	('academic entrepreneurship OR entrepren* acemi*') AND ('entrepreneurial behavior' OR 'Entrepreneurial action*' OR 'spin* creation' OR 'spin* foundation')	292
<b>Language</b>	English	
<b>Publication types</b>	Articles	
<b>Publication date</b>	October 2020	

Table 3. Protocol adopted for the review process (Moher et al., 2015)

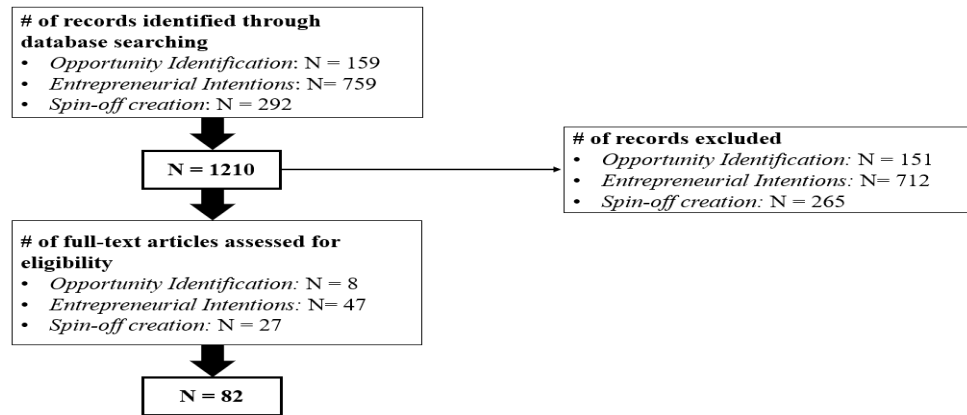


Table 4. Flowchart of the procedure adopted in the review.

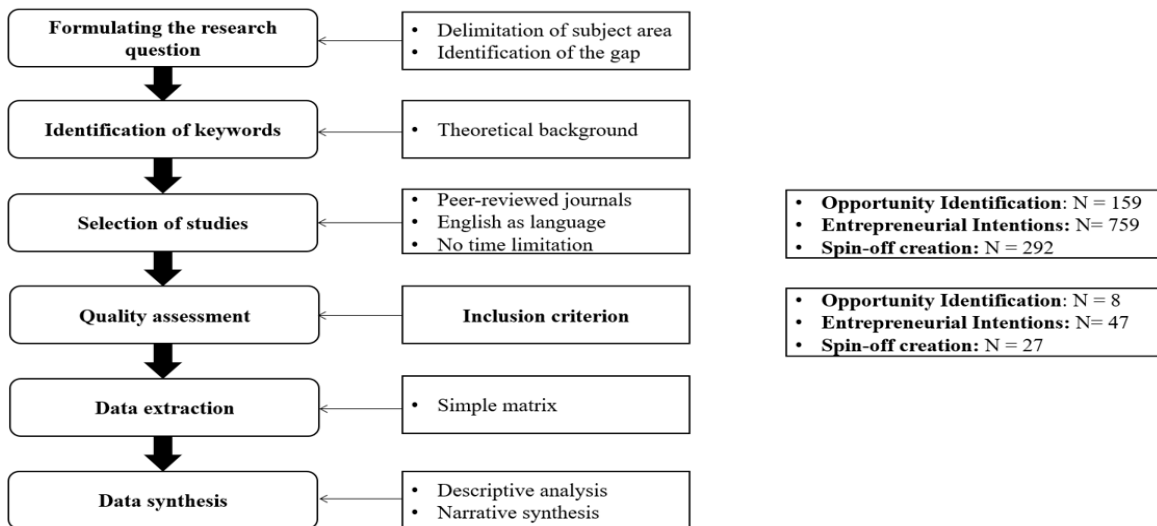


Table 5. Individual and organizational variables

<i>Variables</i>	<i>Articles (N)</i>
<b>Individual variables</b>	
Entrepreneurial attitude	18
Perceived behavioral control	13
Subjective norms	13
Entrepreneurial self-efficacy	12
Gender	6
Perceived feasibility	3
Perceived desirability	3
<b>Organizational variables</b>	
Entrepreneurship education	25
Technology transfer office	20
Concept development support	5
Business development support	5
Support for inization	3
Support for development	3
Active support	3
University policies and incentives	4

Figure 1. Conceptual model for spin-off creation

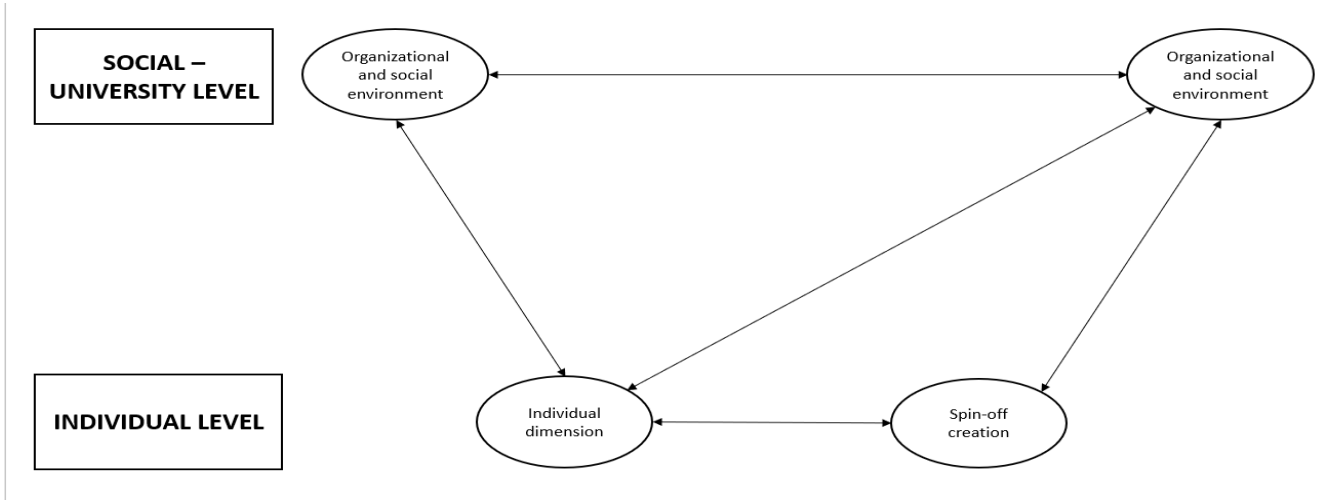


Figure 2. Visual synthesis of the findings

