Absorptive capacity in startups: 
A systematic literature review

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Abstract

Purpose: Several scholars have pointed out that absorptive capacity (AC) is critical for the innovation process in large firms. However, many other authors consider startups as key drivers for innovation in the current global economy. Therefore, this article aims to identify how the concept of AC has been addressed in the new venture context.

Methodology: A systematic literature review analyzing 220 papers published between 2001 and 2018.

Findings: The systematic literature review identifies three clusters of research addressing AC in startups: Knowledge, Innovation, and Performance, along with the central authors of the discussion, the main contributions, theoretical references, and their future research agenda guidelines.

Implications for theory and practice: This study contributes to the innovation and entrepreneurship literature by connecting the importance of AC and new venture creation, and providing a better understanding of how entrepreneurs could enhance their innovative processes.

Originality and value: Based on the analysis of the literature review, a framework that differentiates knowledge acquisition strategies for new ventures was created. The framework categorizes the strategies according to the knowledge source (i.e., internal or external) and the degree of intentionality (i.e., formal or informal).

Keywords: innovation, absorptive capacity, startups, new ventures, entrepreneurship
INTRODUCTION

Absorptive capacity (AC) is defined by Cohen and Levinthal (1990) as the ability to recognize, identify, assimilate and exploit new external information, and is considered to be critical for the innovation process. Zahra and George (2002, p. 186) defined AC as a “set of organizational routines and processes” including acquisition (to identify and obtain external knowledge), assimilation (to interpret and understand the information obtained), transformation (to integrate and combine existent knowledge with the newly acquired), and exploitation (the application of new knowledge for commercial ends). This ability involves renewing routines, practices, technological paths (March, 1991; McGrath, 2001), but in particular, it involves a learning process (Lane, Koka, & Pathak, 2006).

Previous works have addressed extensively how organizations might benefit from AC. For instance, Patterson and Ambrosini (2015) explored how AC could be configured to support research activities in biopharmaceutical firms, Engelen and colleagues (2014) identified how AC contributes to the strengthening of the entrepreneurial orientation and a firm’s performance relationship, and Lis and Sudolska (2015) studied what role AC plays in organizational growth and competitive advantage. The large number of theoretical and empirical publications addressing the AC construct over the past 30 years has also led to a number of literature reviews with different aims, such as revalidating and reconceptualizing the construct (e.g., Lane et al., 2006; Zahra & George, 2002), identifying major discrepancies among AC’s theoretical perspectives (e.g., Volberda, Foss, & Lyles, 2010), and analyzing the multifaceted dimensions of AC literature (e.g., Apriliyanti & Alon, 2017).

However, unlike these past reviews, in the present study, we propose to analyze AC in the context of new ventures, mainly due to two factors. First, because several authors have argued that startups are better suited to develop radical innovation (Bower & Christensen, 1995; Edison, Smørsågd, Wang, & Abrahamsson, 2018; Spencer & Kirchhoff, 2006). According to Giardino et al. (2014, p. 28), startups are entities “exploring new business opportunities, working to solve a problem where the solution is not well known and the market is highly volatile.” These organizations are characterized by a lack of resources, rapid evolution, small teams, little working experience, third-party dependency, and work under several uncertainties (Giardino et al., 2014). Despite the shortcomings associated with the scarcity of resources and experience (Ambos & Birkinshaw, 2010), these firms are able to launch innovative products and become a ‘game-changer’ in traditional industries, putting incumbent firms under pressure (Edison et al., 2018; Sirén, Hakala, Wincent, & Grichnik, 2017). Second, because, despite being game-changers,
startups operating in technology-intensive industries suffer the permanent threat of premature obsolescence since—and considering the high level of uncertainty—these companies often bet on ‘failed technologies’ (i.e., those technologies that result not to be the ones adopted by the market (Eggers, 2012) and to survive, they must revamp their knowledge to adjust their solutions for which the AC may be crucial. Therefore, we identified a necessity to analyze AC literature within the context of new ventures in order to better understand which topics have been studied in this regard, and try to identify which aspects can be extracted from the main findings to contribute to some extent to the improvement of entrepreneurs’ processes of knowledge renewal and innovation.

The aim of our research is to determine how the concept of AC has been addressed in the new venture context by identifying the clusters of research, the main authors, and findings. To this end, we proceeded to conduct a systematic literature review analyzing 220 papers published between 2001 and 2018. Three clusters of research regarding the importance of AC in the new venture context were identified: Knowledge, Innovation, and Performance. In addition, the central authors of the discussion were reviewed, including their main contributions, theoretical references, and future research agenda.

The text is structured as follows: section 2 reviews the concepts and discussions about dynamic capabilities and new ventures, followed by the methodology in section 3. Our results are presented in section 4, including the bibliometric and content analyses. In section 5, we discuss the findings, and the last section contains the conclusions and suggestions for future research.

LITERATURE BACKGROUND

Authors such as Zahra and George (2002) and Engelen et al. (2014) have recognized AC as a dynamic capability. Dynamic capabilities (DC) enable the firm to evolve and positively influence its competitive advantage (Zahra & George, 2002, p. 185). Given that the present study seeks to connect concepts from the strategic management (i.e., AC and DC) and entrepreneurship fields, it is important to discuss in which way this interaction could be addressed considering the still ongoing debate about these concerns (Arend, 2014). Teece, Pisano, and Shuen (1997, p. 516) defined DC as “the firm’s ability to integrate, build and reconfigure internal and external competences to address rapidly changing environments.” DC is tied to the resource-based theory, in which firms’ differences, such as resources, skills or endowments, are key aspects that help companies to create a sustainable competitive advantage (Barney, 1991). However, DC complements the resource-based theory by
providing the abilities for controlling, configuring, and reconfiguring the resources for long-term survival.

According to Teece et al. (1997), resources and assets are arranged in integrated groups of individuals that perform the firms’ activities or routines. In other words, through functions, routines, and competences, firms take advantage of their resources. However, differently from incumbent firms, new ventures lack functions and routines, so they need to rely broadly on team members’ and entrepreneurs’ idiosyncratic knowledge to operate (Bergh, Thorgren, & Wincent, 2011). In this regard, literature offers some examples of how DC has been addressed focused on individuals. For instance, Teece (2012) points out that there is a group of DC that is based on the individual “skills and knowledge of one or a few executives rather than on organizational routines” (Teece, 2012, p.1). According to the author, capabilities are built jointly by individual skills and collective learning originating from employees working together. In addition, the author notes that entrepreneurial management, besides being concerned about the improvement of existent routines, is more about creating new ones and figuring out new opportunities. Finally, Teece mentioned that the dependency on individual skills usually fades over time after five or ten years.

The individual approach in DC is associated with the concept of micro-foundations, which are one of the aspects that undergird the capabilities. According to Teece (2007, p. 1319), micro-foundations are the mechanisms through which sensing, seizing, and reconfiguring capacities operate; these include “the distinct skills, processes, procedures, organizational structures, decision rules, and disciplines.” Certainly, all these mechanisms widely depend on individual cognition (Helfat & Peteraf, 2015) and individuals’ extant knowledge (Teece, 2007). Helfat and Peteraf (2015) suggest that individual cognitive capabilities may mediate the relationship between changes in the organizational environment and strategic changes, and, therefore, individuals (by the effect of their own capacities) can reshape their organizations.

Several scholars have also discussed DC from the entrepreneurship perspective (for instance, Arend, 2014; Arthurs & Busenitz, 2006; Boccadelli & Magnusson, 2006; Newbert, 2005; Zahra, Sapienza, & Davidsson, 2006). These works offer different alternatives to connect both of the research strands (i.e., DC and entrepreneurship). For instance, Newbert (2005) proposes the new firm formation process as a dynamic capability, based on a random sample of 817 entrepreneurs; he concludes that there is evidence to support that new firm creation meets the DC conditions placed by Eisenhardt and Martin (2000) (i.e., identifiable, unique, deals with market dynamism, and is affected by learning). Arthurs and Busenitz (2006) set out that after the opportunity identification, when entrepreneurial leadership starts to transition to a more
formal type of management, new ventures need to develop new skills—as mentioned by Teece (2012)—through the usage of DC. Furthermore, Arend (2014) found out that most entrepreneurial ventures have been created based on DC from the beginning, and mainly on an individual level.

RESEARCH METHODS

With the aim of determining how the concept of AC has been addressed in the startups’ context, we conducted a systematic literature review (SLR). This methodology is a rigorous and well-defined approach that enables the identification of the current knowledge and what is known about a given topic (Boell & Cecez-Kecmanovic, 2015). Following Denyer and Neely (2004), we endeavored to develop an accurate process considering the planning, the use of explicit and reproducible selection criteria, and an analysis procedure. Figure 1 summarizes our systematic review process.

![Figure 1. Summary of the systematic review process](image)

**Planning the SLR**

During the planning phase, we determined the purposes of the research and its most important aspects. Our main goal was to identify how past research employed AC in an entrepreneurship and startups context. We did not limit the research to any specific time frame and only peer-reviewed articles were included. We conducted a search in September 2018 on the Web of Science (WOS, Clarivate Analytics) database since it is one of the most complete peer-
review journal repositories on social sciences (Crossan & Apaydin, 2010). We defined two subject areas, “Management” and “Business,” and searched in all the indexes provided on WOS (SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, and ESCI). Given the wide diversity of terms and morphological variety to refer to a “recently created innovative company”, we applied the following Boolean search keywords: “((absorptive capacity) AND (“startup” OR “start-up” OR “start up” OR “new firm*” OR “NTBF” OR “new venture” OR “entrepreneur*”))” in the Topic (title, keywords or abstract) category.

**Sampling process**

The search returned 358 papers. An exclusion filter was applied to select only documents that address AC in the context of entrepreneurship, on the basis of a thorough reading of titles and abstracts. In order to minimize bias in this filter parameter, the documents were reviewed in two rounds by the researchers. The final search process yielded 220 documents published between 2001 and 2018.

**Data analysis**

We performed bibliometric and statistical analyses to provide an overview of the literature, including the publications per year and the main journals. We also carried out a network analysis employing the VOSviewer 1.6.9 Software. The data was extracted directly from WOS, including all the information items (e.g., title, abstract, keywords, publication year, cited references, etc.). Then, we manually removed the non-related documents using Microsoft Excel. These data were exported to a text file (*.txt) and imported to VOSviewer to create the co-occurrence and co-citation networks in order to identify the main theoretical references and central discussions. We used the default settings of the program, as presented in Table 1.

| Parameter                  | Default settings                  |
|----------------------------|-----------------------------------|
| Counting method            | Full counting                     |
| Method of normalization    | Association strength              |
| Layout of attraction repulsion | 2                               |
| Layout of repulsion        | 0                                 |
| Clustering resolution      | 1.00                              |
| Minimum size of clusters   | 1                                 |
| Merging small clusters     | Switched on                       |

**Table 1. Default settings of VOSviewer**
Based on the all keywords co-occurrence network, we identified three clusters of lines of research: knowledge, innovation, and performance. Afterward, we proceeded to classify all the papers of our database into these three clusters using Microsoft Excel. After reading the documents, we selected the most relevant articles that matched the research goal and the clustering parameter as well. A total of 50 papers satisfied these parameters and are discussed in the content analysis. The documents were manually coded using the Mendeley Desktop 1.19 software and Microsoft Excel, considering the following aspects: 1) Authors, 2) Year of publication, 3) Journal, 4) Type of article, 5) Aim of research, 6) Relevance of absorptive capacity, 7) Methodology, sample, and variables, 8) Findings, and 9) Future research agenda. We provide a detailed explanation of the coding process in Appendix A (Knowledge cluster; Innovation cluster; Performance cluster.)

RESULTS

Bibliometric and descriptive analyses

Figure 2 shows the evolution of publications over time. It is observed that the earliest paper in the sample was published in 2001; from 2009, there is an increase in the number of publications, reaching a peak in 2015 with 26 publications. The 220 articles are distributed over 77 journals. Table 2 shows the most representative journals accounting for about 60 percent of the sample.

![Figure 2. Number of papers published on AC and Startups over time](image-url)
Table 2. Most common outlet journals

| Abbreviation | Full Title                                      | Articles |
|--------------|-------------------------------------------------|----------|
| JBV          | JOURNAL OF BUSINESS VENTURING                   | 16       |
| SEJ          | STRATEGIC ENTREPRENEURSHIP JOURNAL              | 12       |
| ET&P         | ENTREPRENEURSHIP THEORY AND PRACTICE            | 11       |
| JSBM         | JOURNAL OF SMALL BUSINESS MANAGEMENT           | 11       |
| IBR          | INTERNATIONAL BUSINESS REVIEW                   | 10       |
| RP           | RESEARCH POLICY                                 | 10       |
| SBE          | SMALL BUSINESS ECONOMICS                        | 9        |
| ERD          | ENTREPRENEURSHIP AND REGIONAL DEVELOPMENT       | 7        |
| JWB          | JOURNAL OF WORLD BUSINESS                       | 7        |
| JTT          | JOURNAL OF TECHNOLOGY TRANSFER                  | 6        |
| R&DMANAGE    | R & D MANAGEMENT                                | 6        |
| SMJ          | STRATEGIC MANAGEMENT JOURNAL                    | 6        |
| IJTM         | INTERNATIONAL JOURNAL OF TECHNOLOGY MANAGEMENT | 5        |
| JMS          | JOURNAL OF MANAGEMENT STUDIES                  | 5        |
| EMJ          | EUROPEAN MANAGEMENT JOURNAL                     | 4        |
| IMM          | INDUSTRIAL MARKETING MANAGEMENT                 | 4        |
| ISBJ         | INTERNATIONAL SMALL BUSINESS JOURNAL           | 4        |
|              | Total:                                          | 133      |

In order to identify the central authors, we performed a co-citation analysis based on cited authors. This analysis builds a network based on the citation link (where one item cites the other). We set this parameter to a minimum of “40 citations of an author,” resulting in 41 central authors, as seen in Figure 3.

The map shows the number of citation links (represented by the number of lines) and the link strength (represented by the distance between items), which refers to a similarity measure normalized by the association strength (van Eck & Waltman, 2010). Zahra S. is the author with the most citation links (412) and total link strength (6082) followed by Cohen W. with 233 and 3067, respectively. The number of links and total link strength of the central authors is displayed in Table 3.
Figure 3. Co-citation author network

Table 3. Citation link and link strength of the co-citation author network

| Author             | Citation link | Link strength | Author            | Citation link | Link strength |
|--------------------|---------------|---------------|-------------------|---------------|---------------|
| Acs Z.             | 58            | 841           | Kogut B.          | 97            | 1653          |
| Ahuja G.           | 67            | 1103          | Lane P.           | 121           | 1879          |
| Audretsch D.       | 101           | 1290          | Lumpkin G.        | 66            | 1261          |
| Autio E.           | 56            | 1100          | March J.          | 72            | 1214          |
| Barney J.          | 54            | 874           | McDougall P.      | 44            | 827           |
| Baum J.            | 40            | 605           | Miller D.         | 95            | 1747          |
| Burt R.            | 44            | 823           | Nelson R.         | 47            | 727           |
| Chesbrough         | 41            | 500           | Nonaka I.         | 69            | 1097          |
| Cohen W.           | 233           | 3067          | Oviatt B.         | 69            | 1366          |
| Coviello N.        | 40            | 829           | Podsakoff P.      | 87            | 1537          |
| Covin J.           | 105           | 2012          | Rothaermel F.     | 51            | 709           |
| Dess G.            | 42            | 771           | Sapienza H.       | 53            | 984           |
| Dyer J.            | 48            | 947           | Shane S.          | 116           | 1694          |
| Eisenhardt K.      | 99            | 1487          | Shumpeter J.      | 46            | 728           |
| Grant R.           | 86            | 1469          | Stuart T.         | 42            | 603           |
| Gulati R.          | 51            | 975           | Teece D.          | 123           | 1888          |
| Helfat C.          | 61            | 995           | Tsai W.           | 72            | 1278          |
| Hitt M.            | 58            | 1015          | Wiklund J.        | 58            | 1208          |
| Jansen J.          | 49            | 887           | Yli-renko H.      | 41            | 814           |
| Johanson J.        | 74            | 1444          | Zahra S.          | 412           | 6082          |
| Knight G.          | 47            | 914           |                   |               |               |
Top 10 Co-citation references network

We also built another co-citation network but based on the analysis of cited references to find commonalities in the theoretical background. The resultant network, exhibited in Figure 4, contains the top ten cited references. We present a brief description of these publications below.

Figure 4. Top 10 Co-citation references network

Cohen and Levinthal (1990, p. 128) introduced the term AC to refer to the “ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends.” The authors argue that AC is critical to the firms’ innovative capabilities, and it requires prior related knowledge to evaluate and utilize the outside new knowledge. Similarly, March (1991, p. 83) suggested that knowledge “makes performance more reliable,” and learning and technological changes might improve competitive advantage. In this study, March popularized the idea that firms must enhance their technological explorative and exploitative abilities and look for a balance between them in order to ensure survival and achieve better performance. In this regard, Barney (1991), aiming for a more comprehensive understanding of sustained competitive advantage, proposed that some resources and characteristics (such as heterogeneity, valuable, rareness, or inimitableness) are crucial for a firm’s competitiveness, and they may vary over time.
To Kogut and Zander (1992), one central aspect of the competitive dimension is the ability to transfer knowledge within the firm. The authors drew on the perspective that organizations are repositories of tacit and explicit knowledge, skills, and social networks, which enable companies to learn new abilities by recombining their existent resources and capabilities. In this same vein, Grant (1996) explores how to integrate the specialized knowledge of individuals into firms. Drawing on the resource-based theory, Grant (1996, p. 110) conceptualizes the knowledge-based view as a new perspective to understand a company, placing knowledge as “the most strategically important of the firm’s resources.” Additionally, he identified the key characteristics of knowledge in order to create value: transferability (the capacity of transference across individuals), capacity of aggregation (the potential to add new knowledge to the existing one), and appropriability (the ability of the owner of a resource to receive a return).

Alternatively, Lumpkin and Dess (1996) explore the relationship between entrepreneurial orientation (EO) and firm performance. The authors defined EO as the practices, processes, and decision-making activities that lead the firm to enter new or existing markets, and is characterized by the “propensity to act autonomously, a willingness to innovate and take risks, and a tendency to be aggressive toward competitors and proactive relative to marketplace opportunities” (Lumpkin & Dess, 1996, p. 137).

In order to address the question of how firms achieve sustained competitive advantage, Teece et al. (1997) proposed the dynamic capabilities concept. As discussed in section 2, this perspective “emphasizes the development of management capabilities, and difficult-to-imitate combinations of organizational, functional and technological skills” (Teece et al., 1997, p. 510). Similarly, from the basis that not all firms have equal chances to acquire knowledge, Lane and Lubatkin (1998) reconceptualized the construct of AC as a dyad-level construct and established some conditions for this interaction to occur: the specific type of knowledge, similarities in practices, logic and organizational structure, and familiarities between the firms. Zahra and George (2002) also reconceptualized AC as a dynamic capability related to knowledge creation and exploitation in order to gain sustained competitive advantage. Additionally, they proposed that AC is built upon two capacities: potential capacity (knowledge acquisition) and realized capacity (knowledge transformation and exploitation). Ending this top ten references network, Podsakoff et al. (2003) present an important methodological review about biases in behavioral research methods that are often employed and cited by AC researchers. The authors summarized the most common sources of method biases, their effects, and techniques to control them.
Content analysis

Finally, we created the co-occurrence map using all keywords as the unit of analysis, as presented in Figure 5. We used the default parameter of a minimum of 10 occurrences of a keyword (Eck & Waltman, 2018). According to Gomes et al. (2016), keywords maps are widely used by researchers and help to establish a general idea on a certain subject. From this map, three clusters of lines of research addressing AC in startups were identified: knowledge (26 articles), innovation (11 articles), and performance (13 articles). Based on these clusters, we performed our data analysis and identified the following codes: 1) Authors, 2) Year of publication, 3) Journal, 4) Type of article, 5) Aim of research, 6) Relevance of absorptive capacity, 7) Methodology, sample, and variables, 8) Findings, and 9) Future research agenda.

Figure 5. Co-occurrence map using all keywords
Knowledge cluster

New knowledge is an essential input factor for innovation and new firm's progress (Mueller, 2006; Prashantham & Young, 2011; Sullivan & Marvel, 2011; McKelvie, Wiklund, & Brattström, 2018; Bingham & Davis, 2012) by offering the possibility of renewing existent skills, technological paths, and developing innovative capabilities to improve competitive advantage and stimulate growth (Zahra, Filatotchev, & Wright, 2009; Agarwal, Audretsch, & Sarkar, 2010). Several authors recognize R&D as a major vehicle to acquire new knowledge (Acs, Braunerhjelm, Audretsch, & Carlsson, 2009; Mueller, 2006). However, very often, new and small firms do not have the resources to structure an R&D department; thus, partnerships with institutions such as universities or research laboratories are crucial to develop new knowledge (Hayton & Zahra, 2005; Hayter, 2013; Carayannis, Provance, & Grigoroudis, 2016; Dai, Goodale, Byun, & Ding, 2018). Sullivan and Marvel (2011) emphasize that technology and market knowledge is highly important to achieve positive results and enhance the innovative process. In any case, direct inter-personal contacts and proximity to the environment are useful to access knowledge (including tacit knowledge) faster and more successfully (Mueller, 2007, p. 356).

Based on Huber (1991), De Clercq et al. (2012) categorized knowledge acquisition (KA) into five types: experiential learning (learning from experience), vicarious learning (learning by observing others), searching (learning by searching for specific information), grafting (learning by incorporating entities that possess knowledge), and congenital learning (drawing on intrinsic knowledge gained from founders or personal experience). Differently, Carayannis, Provance, and Givens (2011) proposed to classify KA into two groups regarding the form of acquisition: (1) formal KA and arbitrage (referring to the intended ability to manage and apply knowledge for a specific purpose), and (2) informal KA and serendipity (referring to the unintended rewards of enabling knowledge from different sources).

Friesl (2012) identified four knowledge acquisition strategies: “low key” in which there are low levels of collaborative and internal learning and low performance as well; “mid-range,” where the emphasis is on collaborative and market-based learning but low levels of internal learning; “focus,” where the firms’ efforts concentrate on both collaborative and internal learning; and “explorer,” in which firms have high mean values for all knowledge acquisition categories (i.e., collaborative, internal, and market-based learning). In this latter group, firms have a particular interest in renewing their knowledge base in order to achieve the highest level of performance.

We identified three recurrent research topics in the present cluster: entrepreneurial internationalization (EI), spin-offs, and identification of
opportunities. The first topic, EI, explores how new firms go about looking to expanding their activities into foreign markets (De Clercq et al., 2012; Bruneel, Yli-Renko, & Clarysse, 2010; Yu, Gilbert, & Oviatt, 2011). Considering that entering foreign markets might entail the obsolescence of existing knowledge and capabilities, to acquire new knowledge becomes crucial to successful internationalization (De Clercq et al., 2012; Prashantham & Young, 2011; Bruneel et al., 2010; Fernhaber, McDougall-Covin, & Shepherd, 2009; Tolstoy, 2009). Therefore, AC emerges as a cornerstone for new venture survival and a critical factor for growth (Mueller, 2007; Qian & Acs, 2013; Moon, 2011). Some studies point out that networks and alliances may enable and accelerate initial commercial activities in new markets (Bruneel et al., 2010; Yu et al., 2011; Sullivan & Marvel, 2011; Perez, Whitelock, & Florin, 2013), and support the absence of in-house translators of new knowledge as suggested in AC theory (Cohen & Levinthal, 1990).

The second topic of research studies is the creation of spin-offs as a vehicle to commercialize new knowledge developed in public research institutes, in large incumbent firms, or in universities (Knockaert, Ucbasaran, Wright, & Clarysse, 2011; Qian & Acs, 2013; Hayter, 2013; Patton, 2014). Qian and Acs (2013, p. 191) argued that the level of knowledge spillover in entrepreneurship depends not only on the speed or level of knowledge creation, but also on entrepreneurial absorptive capacity (EAC), defined as the “ability of an entrepreneur to understand new knowledge, recognize its value, and subsequently commercialize it by creating a firm.” Different from Cohen and Levinthal’s AC concept, EAC focuses on the entrepreneur’s abilities—not on the firm’s abilities—and involves the capacity to build a new business.

The third and last topic considers AC as a means to identify opportunities and enhance the firm’s performance (McKelvie et al., 2018; Saemundsson & Candi, 2017). Due to the fact that existing knowledge base might become obsolete within a short period of time, new ventures must intensively promote the search for novel knowledge, primarily in market and customer knowledge (McKelvie et al., 2018). Regarding the principles of AC set by Cohen and Levinthal (1990), to absorb new knowledge requires certain existent abilities. This is probably a challenge for startups because, in many cases, they are building new markets and customers have not been identified at all. In this respect, McKelvie et al. (2018) suggest that new ventures may not overly on external knowledge acquisition, especially when the firm works in a highly dynamic sector. Furthermore, Saemundsson and Candi (2017, p. 43) proposed to divide potential AC into “problem absorptive capacity, i.e. the ability to identify and acquire knowledge of the goals, aspirations and needs of current and potential customers, and solution absorptive capacity, i.e. the ability to identify and acquire external knowledge of solutions to fulfill
them.” The authors found out that changes in problem absorptive capacity are a stronger trigger for identification of new opportunities than changes in solution absorptive capacity.

**Innovation cluster**

According to Dushnitsky and Lenox (2005a, 2005b), Corporate Venture Capital (CVC) carry a potential innovative benefit. The authors suggest that the greater the firm’s AC, the greater the firm’s investment in entrepreneurial new ventures and, therefore, the firm’s innovation rate (Dushnitsky & Lenox, 2005b, 2005a). Nevertheless, the role of AC is not restricted to an enabler of innovation. In fact, access to new information provided by CVC can improve the AC of the firms (Wadhwa & Hall, 2005), although this strategy may limit the knowledge created. Similarly, Lee, Kim, and Jang (2015) argue that the firm’s knowledge diversity enables corporate investors to acquire and maximize useful knowledge.

On the other hand, Winkelbach and Walter (2015) found out that prior knowledge held by the firms has a non-significant effect on value creation. Knowledge creation and knowledge-related learning capabilities (which are moderated by AC) enable firms to deal with dynamic environments to create value and develop innovation. Scholars approach the pursuit of new knowledge by firms to promote innovation in different ways. For instance, human mobility across national borders may foster knowledge creation (Liu, Wright, Filatotchev, Dai, & Lu, 2010). The new knowledge may come from scientists and engineers that return from abroad to start up a new venture in their native countries (Liu et al., 2010). Regarding the type of source of new knowledge (i.e., internal or external), Kamuriwo, Baden-Fuller, and Zhang (2017) point out that external knowledge development is more associated with breakthrough innovations and with a faster time-to-market.

Nevertheless, existing literature suggests that there are some setbacks related to knowledge acquisition and innovation. Marvel (2012) pointed out that sometimes knowing less is better to create innovation. His findings suggest that acquiring the knowledge of ways to serve markets is “negatively associated with innovation radicalness” (Marvel, 2012, p. 464). Therefore, the less knowledge about existing offerings in the market and how they work, the greater the chances for developing breakthrough innovations.

Knowledge acquisition can also stem from universities in the form of academic entrepreneurship, technology transfer, and research commercialization. Using the AC perspective, two multiple case studies explored the Proof of Concept (PoC) process within a University Science Park Incubator (UK) and provided evidence that AC plays a crucial role in obtaining
commercial outcomes (McAdam, McAdam, Galbraith, & Miller, 2010; McAdam, McAdam, & Brown, 2009).

Finally, network market orientation is found to make a significant contribution to the development of AC in international new ventures. Monferrer, Blesa, and Ripollés (2015) showed that network market orientation facilitates the development of dynamic adaptive and absorptive capabilities, which influence their capacity to develop innovative, dynamic capabilities.

**Performance cluster**

AC might also moderate the firm’s performance (Nielsen, 2015; Zahra & Hayton, 2008). In our review, we found two perspectives of performance: addressed as a capability to innovate and as a financial output. Typically, firms engage in activities such as acquisitions, alliances and CVC when pursuing growth and profitability. Yet, it is not completely clear how these activities may influence the firm’s performance. To that end, Zahra and Hayton (2008) suggest that AC moderates this relationship. According to their findings, after studying 217 global manufacturing firms, the investments made for building AC positively influence the firm’s performance benefits derived from international venturing. Conversely, Benson and Ziedonis (2009, p. 330) argue that “internal technological capabilities remain a critical determinant of success in innovation-driven acquisitions.” A limit on CVC investment is imposed by the acquirer’s total R&D expenditures, and beyond this limit, the firm’s performance starts to improve at a diminishing rate. Wales, Parida, and Patel (2013) posit that the relationship between AC and financial performance is mediated by Entrepreneurial Orientation (EO) referred to as the “strategy-making practices, management philosophies, and firm-level behaviors that are entrepreneurial in nature” (Anderson, Covin, & Slevin, 2009. p. 220).

Based on an individual perspective of AC, Nielsen (2015) proposes that individuals with higher levels of education have also higher absorptive and learning capacities that leverage the likelihood of firms’ survival and growth. Additionally, some authors (for instance, Rhee, 2008; Witt, 2004) claim that, in general, the social network represents the theoretical lenses used to investigate performance and startup success. Surprisingly, Rhee (2008) found that social networks of the startup’s team members do not help their ventures to reap superior performance. By comparing university and corporate spin-offs, Clarysse, Wright, and Van de Velde (2011) revealed that different characteristics in the technological knowledge base (e.g., specificity, newness, or tacitness) influence the spin-off’s performance and growth. According to Simsek and Heavey (2011), corporate entrepreneurship impacts positively the knowledge-
based human, social, and organizational capital and is also positively associated with the firm’s performance (i.e., profitability and growth).

Considering international sales performance, Javalgi, Hall, and Cavusgil (2014) argue that AC has a positive relation with customer-oriented selling and performance in international B2B settings. Furthermore, Un and Montoro-Sanchez (2011) define performance as the development of new technological capabilities through investments in R&D. Their research uncovered that the prior capabilities enable the firm to develop new technological ones. In another approach, Zheng, Liu, and George (2010) suggest that a key performance indicator is the valuation or market value, which is influenced by the innovative capability and the network heterogeneity of the firms.

Dynamic and operating capabilities must interact to enable entrepreneurship (Newey & Zahra, 2009). AC may be a key knowledge-based mechanism, which connects learning at both product development and portfolio planning levels. Finally, Deeds (2001) suggests that there is a positive relationship between a high technology venture’s R&D intensity, technical capabilities, and AC and the amount of entrepreneurial wealth created by the venture.

**DISCUSSION**

On the basis of the issues raised in the previous section, we observed a relationship between the three clusters: firms employ and develop their AC in order to identify and transform new knowledge into innovation projects, which in turn leads to performance improvement and growth (see figure 6). This relationship is confirmed by authors such as Mueller (2006), who emphasizes the contribution of new knowledge and knowledge exploitation as valuable inputs for economic regional growth. Moreover, Zahra et al. (2009) reinforce the idea that for a startup to grow, it is necessary to revamp its skills, replace its dated capabilities, and build up new ones. In this regard, AC plays an important role as an enabler for integrating knowledge from different sources. Another approach that supports the relationship presented in Figure 6 is the innovation capability because this construct integrates the creation or appropriation of new knowledge, the transformation of that knowledge into new or improved products, and the firm’s progress or performance enhancement (Aas & Breunig, 2017).
We identify that there are open discussions about different aspects. The first is the favorability of certain types of knowledge sources (i.e., internal or external) for developing innovations. McKelvie et al. (2018) argue that in highly dynamic environments, the payoff attributed to investments in externally acquired knowledge is not significant. In this same vein, Marvel (2012) found out that knowing less is better to create innovation; the less knowledge about existing offerings in the market, the greater the chances for developing breakthrough innovations. Conversely, Kamuriwo et al. (2017) claim that external knowledge development is more associated with breakthrough innovations and with a faster time-to-market. The second aspect is the role of prior knowledge. On the one hand, Winkelbach and Walter (2015) identify the sole reliance on prior knowledge may foster traps and hinder the ability to foresee opportunities. On the other hand, Un and Montoro-Sanchez (2011) argue that prior stock of knowledge and capabilities enable the development of new ones and thus ensure value creation. Finally, there are some mismatches related to the volume of new knowledge required for developing breakthrough innovations; in the discussion set out by Marvel (2012) it is not clear whether large amounts of knowledge are favorable or not in the development of radical innovation products.

There are three major reasons for companies to engage in knowledge renewal: to address the evolving character of environmental conditions and customer’s preferences for enabling growth (Marvel, 2012; Perez et al., 2013; Zahra et al., 2009), to enter into foreign markets (i.e., internationalization) (Prashantham & Young, 2011; Rhee, 2008; Tolstoy, 2009), and to identify entrepreneurial opportunities (McKelvie et al., 2018; Saemundsson & Candi, 2017). Regarding the types of strategies for knowledge acquisition, we identified two of the former: formal and informal (Carayannis et al., 2011), and two of the latter: internal and external (Friesl, 2012) (see Figure 7).
Internal–formal strategies comprise four categories: experiential learning (learning from experience), vicarious learning (learning by observing others, for instance, customers or competitors), searching (learning by searching for specific information), and congenital learning (drawing on intrinsic knowledge gained from founders or personal experience) (De Clercq et al., 2012). On the other hand, external–formal strategies include grafting (learning by incorporating entities that possess knowledge) (De Clercq et al., 2012), human mobility (i.e., knowledge transfer from the exchange of experience as a result of human mobility across national borders) (Liu et al., 2010), partnerships with universities and technology institutions (Clarysse et al., 2011; Mueller, 2006), social networks (Newey & Zahra, 2009; Witt, 2004), and acquisitions and alliances (Dai et al., 2018; Yu et al., 2011; Zahra & Hayton, 2008). Both internal–informal and external–informal are based on the serendipity approach, which refers to the unintended rewards of enabling knowledge from different sources (Carayannis et al., 2011).

From the review, we highlight three recommendations for startups concerning absorptive capacity. First, considering the resource limitations of startups, developing partnerships with institutions such as universities or research laboratories could enhance the capacity for identifying and gathering new knowledge (Hayton & Zahra, 2005; Hayter, 2013). Second, networking, direct inter-personal contacts, and proximity to the environment are useful to access knowledge and become crucial to successful internationalization (De Clercq et al., 2012; Mueller, 2007). Finally, in order to improve the opportunities recognition, new firms should emphasize the problem
absorptive capacity, in other words, in identifying and acquiring knowledge related to the aspirations and needs of current and potential customers, instead of on existent solutions (Saemundsson and Candi, 2017)

Additionally, some common issues among researchers were identified. First, there is wide adoption of the definition of AC proposed by Cohen and Levinthal (1990) as the mechanism through which firms identify, acquire, and exploit new knowledge in order to achieve more sustainable levels of growth. Second, internal capabilities enable the firm to transform new knowledge into value. Third, intellectual property rights may inhibit the openness to acquire external knowledge and limit the offers to receive venture capital.

CONCLUSION AND FUTURE RESEARCH AGENDA

The purpose of this paper was to identify how the concept of AC has been addressed in the new venture context. We selected 220 documents and applied a systematic literature review method that evidenced three clusters of research: knowledge, innovation, and performance. We concluded that the AC construct first conceived by Cohen and Levinthal in 1990 still stands as an important theoretical lens. Several scholars used the concept in its original context, but others extended it to other research fields, such as the role of AC in universities and research institute spin-offs, corporate venture capital, entrepreneurs’ networks, and as a crucial factor to new venture performance.

Bibliometric analyses showed an increasing interest in AC in the context of new firms. In spite of the earliest paper being published in 2001, the main concepts (which currently prevail) were proposed during the decades of the 1990s (Cohen & Levinthal, 1990; Grant, 1996; Kogut & Zander, 1992; Lumpkin & Dess, 1996) and the early 2000s (Zahra & George, 2002). We identify three inter-related clusters of research regarding the importance of AC in the new venture context: knowledge, innovation, and performance. The relationship between the clusters reflects how firms employ and develop their AC in order to identify and transform new knowledge into innovation projects, which in turn leads to performance improvement and growth.

Content analysis revealed three main concerns related to knowledge obsolescence: growth and dynamic environment and markets, entrepreneurial opportunities, and internationalization. Firms can apply several strategies, internal or external, in order to acquire knowledge, and also might follow both formal and informal processes to address the strategies.

Regarding future research, we identify three avenues exhibit in Table 4. The first avenue contemplates AC from the individual perspective to follow the multilevel approach set by some management areas, which started with
the firm level, business unity, project, and ended on an individual level (e.g., uncertainty management; Gomes et al., 2019). The second avenue centers on bibliometric analysis and literature reviews aiming to identify pivotal studies, which have changed or incorporated content into the AC literature. Finally, the third avenue is related to the strategies for knowledge acquisition in order to clarify the conflicting aspects identified in our content analysis.

Table 4. New avenues for future research

| Avenues for future research | Potential research questions |
|-----------------------------|------------------------------|
| The individual perspective  | • Which are the micro-foundations and individual cognitive aspects associated with AC and knowledge renewal?  
• Which mechanisms can contribute to the enhancement of AC? For instance:  
  - Exposure to new experiences  
  - Involvement with different areas of knowledge  
  - Access to education and training programs |
| Bibliometric analysis and literature review | • How has the AC concept evolved, and which are the pivotal studies that have changed or incorporated content to the AC literature? |
| Strategies for KA | • Which are the barriers and constraints for KA during the different stages of the startup formation?  
• What is the effect of the type of strategy for KA (internal or external) on the degree of radicalness of the innovations of the startups?  
• What is the relationship between the type of strategy for KA and the appropriateness for determining the problem (customer concerns) or the solution (product concerns)? |

In addition, we identify some suggestions from the literature: empirical research for validating models or propositions, considering larger samples, longitudinal analysis, different sectors, cultures, and regions. Furthermore, the authors propose to conduct further studies analyzing the types of networks, the interdependencies between the innovation strategies, public policy on innovation, and incorporating different measures of AC.

We contribute to the innovation and entrepreneurship literature in different ways. First, we have connected the importance of AC and new venture creation, to provide a better understanding of how entrepreneurs could enhance their innovative processes. Second, we have established an overview of the existing literature on AC in startups, highlighting the main authors and drivers. Third, we have clustered the pertinent literature with distinct research themes regarding the entrepreneurial AC found in our systematic review and have also proposed a framework that differentiates
knowledge acquisition strategies for new ventures. Finally, we have suggested future research opportunities on entrepreneurship and absorptive capacity.

The results also allow us to identify some practical implications. The analyzed literature suggests that there are certain strategies that entrepreneurs may adopt in order to acquire and absorb new knowledge. We categorize these strategies according to the knowledge source (i.e., internal or external) and the degree of intentionality (i.e., formal or informal). This effort is aimed at persuading entrepreneurs and practitioners to bear in mind a wide range of strategies that mediate between acquiring knowledge and achieving growth objectives and expansion into new markets.

Finally, some limitations must be considered regarding the systematic literature review method. First, concerning the sampling procedures, the keyword selection, which includes only articles published in English and databases from one specific scientific citation indexing service, can limit the resulting sample. In addition, there is some subjectivity involved in the selection of articles for analysis; this is mainly because it relies on the authors’ interpretations from reading titles and abstracts. Furthermore, the concept of startups is not very precise. We noticed that it still remains ambiguous and unclear since it is defined differently among the authors. Therefore, it can be difficult to filter the sample in order to restrict the analyses to one specific type of firm.

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Appendix A. Coding process of the three clusters of research guidelines

Knowledge cluster

| AUTHORS | YEAR | JOURNAL | TYPE | AIM OF RESEARCH | RELEVANCE OF AC | METHODOLOGY | SAMPLE | VARIABLES | FINDINGS | FUTURE RESEARCH AGENDA |
|---------|------|---------|------|-----------------|-----------------|-------------|--------|-----------|----------|------------------------|
| Zafra et al. | 2006 | JOURNAL OF BUSINESS VENTURING | Conceptual | To provide an evaluative overview and evaluation of published research on the effects of learning on the outcomes of early internationalization. | Literature review | Multiple: 1984-2010 | AC allows knowledge creation and utilization that enhances a firm's ability to gain and sustain a competitive advantage. | Further studies regarding the individual learning level, center the analysis on how a venture realizes learning advantages when internationalizing. |
| Acs et al. | 2008 | SMALL BUSINESS ECONOMICS | Empirical | To develop a knowledge capital theory of entrepreneurship to improve the understanding of learning outcomes of early internationalization. | Longitudinal panel study, OLS, regression techniques, fixed effects | Startups data from World Bank across 1997-2004 from 10 countries. | Entrepreneurs and their new ventures benefit from the exploitation of knowledge related to internationalization. | Entrepreneurial activities are based on the creation and the management of knowledge spillovers, also the exploitation of knowledge spillovers is the main source of growth. |
| Henderson and Young | 2011 | ENTRPRNERSHIP THEORY AND PRACTICE | Conceptual | To explore the causal role of learning and knowledge in firm growth. | Literature review | Startups data from 1997-2004 from 10 countries. | The process of internationalization varies according to new ventures' capabilities in accumulating and utilizing knowledge through exploitative learning. | Explode the exploration about how opportunities arise from, how inter-temporal knowledge spillovers occur, and the dynamics of internationalization leading to the new firm formation. |
| Brunswik et al. | 2010 | STRATEGIC ENTREPRENEURSHIP JOURNAL | Empirical | To address how firms can accumulate and leverage their knowledge and skills required for sustainable international growth and how young firms may compensate for their lack of firm-specific knowledge and experience utilizing other learning channels. | Survey, multiple regression, and sensitivity analysis | Startups data from 1997-2004 from 10 countries. | The firm's performance is determined by an international mindset and the exploration or exploitation of new opportunities. | Examine other empirical research on learning and internationalization in other regions and industries, and also longitudinal studies to explore the dynamics of learning and internationalization. |

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Exploring the Link Between Entrepreneurial Capabilities, Cognition, and Behaviors

Marta Gancarczyk & Anna Ujwary-Gil (Eds.)
| Authors          | Year | Journal                          | Type            | Aim of Research                                                                 |
|------------------|------|----------------------------------|-----------------|---------------------------------------------------------------------------------|
| Fennelbeke et al | 2009 | STRATEGIC ENTREPRENEURSHIP JOURNAL | Empirical article | To develop a knowledge-based model of internationalization to investigate the role of external sources of international knowledge. AC is recognized as an organizational mechanism for integrating internal and external sources of knowledge. Longitudinal panel study: interval regressions and correlations. 204 U.S. high technology new ventures between 1996-2000. Dependent: New venture internationalization. independent: partner's knowledge, Venture Capital's knowledge, market knowledge. 41% of variance. Independent: New venture internationalization. dependent: knowledge spillovers. Additional results: knowledge spillovers associated with a stronger level of internationalization. The nature of external sources of knowledge is also important. The level of internationalization is also dependent on the adoption of international knowledge by the new ventures teams. |
| Yu et al.        | 2011 | STRATEGIC MANAGEMENT JOURNAL     | Empirical article | To examine the role of networks in accelerating new venture sales into foreign markets. To help young entrepreneurs learn new knowledge in foreign markets. Longitudinal panel study. Use proportional hazard model, competing risk, and survival analysis. Longitudinal panel study: interval regressions and correlations. 204 U.S. high technology new ventures between 1996-2000. Dependent: Venture sales. independent: Entrepreneur's knowledge, learning sequences, a type of technology, alliance partner's knowledge, Marketing alliances, with foreign firms, with internationally experienced domestic firms, Network cohesion, firm size, knowledge spillovers. Knowledge derived from entrepreneurial knowledge technology and marketing channels, knowledge spillovers, and internationalization are important for process knowledge and to exploit international opportunities. |
| Waghala and Davis| 2013 | ACADEMY OF MANAGEMENT JOURNAL    | Conceptual article | To understand whether the distinct learning processes that organizations use (i.e., social and error learning, vicarious learning, experimental learning, and what the study calls 'implicit learning') combine over time in ordered way(s). To identify and capture new knowledge. Theory-building (Davenport, 1982) and evidence-based (Bengtsson et al., 1993) research methods. Semistructured interviews, Case study. 9 entrepreneurial firms with headquarters in the U.S. and Finland. - Learning sequences (US: metric, metric, and linear) are influenced by initial conditions. US firms have simpler sending and scaling patterns. These 2 patterns vary across firms, and the firms' internationalization influences their adoption. Empirical studies with a broader sample. |
| Sullivan and Meruelo | 2011 | JOURNAL OF MANAGEMENT STUDIES   | Empirical article | The article examines how an entrepreneur's acquisition of different types of knowledge and reliance on their networks for knowledge create value to their new venture and its team. AC allows entrepreneurs to understand, assimilate, and apply new knowledge more effectively. Survey, OLS regressions, sensitivity analysis and hierarchical multiple regression analysis, tests of the model. 151 venture founders from 16 technology clusters in the USA. Dependent: Entrepreneur's knowledge. independent: Knowledge acquisition. Entrepreneur network reliance on acquiring technology, and new venture's market knowledge. Acquiring technology knowledge has positively effects to the success of the new ventures. Entrepreneur's use experience on acquiring new network's knowledge. New empirical studies focusing on other high-tech industries, and other characteristics. To study how a new venture's alliance network influences its degree and scope of internationalization through longitudinal analyses. |
| Appelqvist et al. | 2013 | STRATEGIC ENTREPRENEURSHIP JOURNAL | Conceptual article | To develop a model of the link between knowledge spillovers and strategic entrepreneurship and identify key topics, themes, and issues for future research. The ability to identify and when new ideas, including those of supply-side agents. Literature review - - Knowledge spillovers and strategic entrepreneurship are linked to each other, and examining this relationship is important. In an understanding of the causes and consequences of internationalization and the identification of knowledge, and the potential for process knowledge and to exploit international opportunities. To conduct other studies focusing on larger samples in other regions, expand the understanding of the role of the network in the entrepreneurial and the potential AC. |
| Neeber et al.    | 2007 | SMALL BUSINESS ECONOMICS         | Empirical article | To identify whether or not entrepreneurship is an important vehicle for knowledge generation and economic growth. To identify, capture, and exploit new knowledge. Longitudinal panel study. Cointegration, production function estimating and regressions. 78 planning regions in West Germany (1990-2002). Dependent: Regional economic growth. independent: Entrepreneurship, knowledge creation. A strong regional knowledge stock is correlated to economic growth. New knowledge in private firms is more likely to be converted into new products or services. However, research in public organizations is often characterized by basic research which is very important for the regional and national knowledge stock. Empirical studies with a broader sample. |
| Knockeart et al. | 2011 | ENTREPRENEURSHIP THEORY AND PRACTICE | Conceptual article | To assess how knowledge can be assessed and employed in knowledge-based entrepreneurial firms (KBEs) in order to enhance its performance. To identify use, and transfer knowledge successfully. Longitudinal qualitative case study approach. 91 KBEs from 5 microelectronics clusters, Europe. - - Total knowledge is better transferred. To the early stages that a startup faces and knowledge becomes known to the new ventures. Further research is needed to understand which specific types of knowledge is crucial to enhance skill performance. |

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Exploring the Link Between Entrepreneurial Capabilities, Cognition, and Behaviors
Marta Gancarczyk & Anna Ujwary-Gil (Eds.)
| AUTHORS | YEAR | JOURNAL | TYPE | AIM OF RESEARCH | RELEVANCE OF AC | METHODOLOGY | SAMPLE | VARIABLES | FINDINGS | FUTURE RESEARCH AGENDA |
|---------|------|---------|------|----------------|----------------|-------------|--------|-----------|----------|------------------------|
| Saemundsson et al. | 2011 | ASIAN JOURNAL OF TECHNOLOGY INNOVATION | Empirical article | To examine the factors that influence AC absorption from external sources of knowledge in the Korean service sector | Knowledge absorption from external sources | Survey, Negative binomial regression, Tobit regression | 208 Korean service new firms | Dependent: Degree of knowledge acquisition from external sources, Independent: Overall tightness of appropriability of a firm. | The appropriability of the share of employees with graduate degrees, whether a firm is a startup firm or not. The use of intellectual property rights may not be effective in preventing access to external knowledge in Korean service industries. It may eventually restrict the incentive to use external knowledge. | To develop the understanding of the role of AC and capital still and to compare the determinants of appropriability in the manufacturing and service sectors. |
| Companioni et al. | 2016 | JOURNAL OF TECHNOLOGY TRANSFER | Empirical article | To address how the ability of a firm to acquire and integrate diverse knowledge in new ventures impacts new venture formation. | The ability of a firm to acquire new knowledge. | Simulation/methodology: 3 runs in 3 cross-measures of AC and internal knowledge. | 316 new ventures in the Yangtze River Delta, China. | Dependent: New venture formation. Independent: Level of new venture’s knowledge. | The increase in the front networks’ diversity has a positive impact on the survival of new ventures and on the entrepreneurialism of a region. | To develop and understand the mechanisms that contribute to new ventures in terms of human and qualitative and quantitative researches. |
| Dae et al. | 2018 | JOURNAL OF MANAGEMENT STUDIES | Empirical article | To examine how new ventures access and use knowledge from different external sources and, thereby, influence their strategic flexibility. | The ability of a firm to acquire and integrate diverse knowledge. | Survey, ANOVA, correlation, multiple regression analysis, AMOS and West’s (2011) procedure to decompose the interdependence terms. | 149 high-tech ventures in the Shefﬁeld–Oxford–Bristol area, UK. | Dependent: Strategic flexibility. Independent: General market knowledge, external knowledge, internal knowledge generation, Market knowledge, External know ledge, Institutional support. | New studies aim to investigate how new ventures with different perceptions about the external environment, the more likely they are to continue their entrepreneurial activities and develop more new ventures within the same industrial sector have different perceptions about the market and technological environments, these perceptions are important for understanding knowledge development processes. New studies using a longitudinal panel approach in order to capture temporal differences in the length of time. Future research involving decision-making and new product development. | To investigate the roles of new ventures in the transfer of knowledge and technology to the region. |
| Semmern and Lacken | 2017 | TECHNOLOGY | Empirical article | To investigate the influence of knowledge and opportunities on new ventures and how potential AC is related to the identification of opportunities in new technology-based firms (NTBFs). | To acquire, assimilate and build (internal) AC knowledge for innovation. | Survey collected twice, one year apart. Three-step hierarchical regression analysis, correlations, interactional diagram. | 94 NTBFs in Northern Europe. | Dependent: Strategic flexibility, Institutional opportunities, Problem absorption capacity, Antecedents absorptive capacity. Independent: Problem absorption capacity. | Changes in problem AC serve as a trigger for new opportunities identification or solution AC. | Further research employing a longitudinal design with the use of archival data. New empirical studies considering other high-tech industries, environments and characteristics. |

**Journal of Entrepreneurship, Management and Innovation** Volume 17, Issue 1, 2021: 57-95
### Innovation cluster

**Exploring the Link Between Entrepreneurial Capabilities, Cognition, and Behaviors**

Marta Gancarczyk & Anna Ujwary-Gil (Eds.)

**Volume 17, Issue 1, 2021: 57-95**

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| AUTHORS | YEAR | JOURNAL | TYPE | AIM OF RESEARCH | RELAVENT OF AC | METHODOLOGY | SAMPLE | VARIABLES | FINDINGS | FUTURE RESEARCH AGENDA |
|---------|------|---------|------|-----------------|----------------|-------------|--------|-----------|----------|------------------------|
| Doshi et al. | 2003 | JOURNAL | Empirical Article | Do firms that invest corporate venture capital (CVC) learn about and appreciate new equity benefits from the technologies of other firms? | The impact of venture capital on innovation in high-tech firms in China? | Acquisitions and exit strategies. | 112 high-tech firms in Beijing Zhangzhaoyuan Science Park between 2000-2003 | The number of patents per employee of the firms, the proportion of sales from new products, R&D, sales intensity, returnee entrepreneurs, MNEs' R&D activities, management, firm age, firm size, ownership, export intensity, imported technology, industry R&D intensity | To compare the efficacy of the knowledge of the high-tech firms in China. |
| Malhotra, Kotha, & Wright | 2003 | JOURNAL | Empirical Article | What is the impact of returnee entrepreneurs and their knowledge spillovers on innovation in high-tech firms in China? | The impact of returnee entrepreneurs and their knowledge spillovers on innovation in high-tech firms in China? | Acquisitions and exit strategies. | 112 high-tech firms in Beijing Zhangzhaoyuan Science Park between 2000-2003 | The number of patents per employee of the firms, the proportion of sales from new products, R&D, sales intensity, returnee entrepreneurs, MNEs' R&D activities, management, firm age, firm size, ownership, export intensity, imported technology, industry R&D intensity | To compare the efficacy of the knowledge of the high-tech firms in China. |
| McAvoy et al. | 2010 | JOURNAL | Empirical Article | What is the role and influence of the Principal Investigator (PI) in the Process of Concept (POC) generation within National Science Park incubator-setting using an ACAP perspective? | How does the Principal Investigator (PI) play a critical role in shaping the success of the innovation process? | Multiple-case analysis of POC interpretative research. | 112 high-tech firms in Beijing Zhangzhaoyuan Science Park between 2000-2003 | The number of patents per employee of the firms, the proportion of sales from new products, R&D, sales intensity, returnee entrepreneurs, MNEs' R&D activities, management, firm age, firm size, ownership, export intensity, imported technology, industry R&D intensity | To compare the efficacy of the knowledge of the high-tech firms in China. |
| Doshi et al. | 2005 | JOURNAL | Empirical Article | Do firms that invest corporate venture capital (CVC) learn about and appreciate new equity benefits from the technologies of other firms? | The impact of venture capital on innovation in high-tech firms in China? | Acquisitions and exit strategies. | 112 high-tech firms in Beijing Zhangzhaoyuan Science Park between 2000-2003 | The number of patents per employee of the firms, the proportion of sales from new products, R&D, sales intensity, returnee entrepreneurs, MNEs' R&D activities, management, firm age, firm size, ownership, export intensity, imported technology, industry R&D intensity | To compare the efficacy of the knowledge of the high-tech firms in China. |
| Doshi et al. | 2005 | JOURNAL | Empirical Article | Do firms that invest corporate venture capital (CVC) learn about and appreciate new equity benefits from the technologies of other firms? | The impact of venture capital on innovation in high-tech firms in China? | Acquisitions and exit strategies. | 112 high-tech firms in Beijing Zhangzhaoyuan Science Park between 2000-2003 | The number of patents per employee of the firms, the proportion of sales from new products, R&D, sales intensity, returnee entrepreneurs, MNEs' R&D activities, management, firm age, firm size, ownership, export intensity, imported technology, industry R&D intensity | To compare the efficacy of the knowledge of the high-tech firms in China. |

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Future studies using measures of AC (such as R&D expenditure).

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Miller, K; Galbraith, B; McAdam, R; Wright, M; Lu, JY; Filatotchev, K; Lenox, MJ; Dushnitsky, G; Lenox, MJ...
Ximena Alejandra Flechas Chaparro, Ricardo Kozesinski, Alceu Salles Camargo Júnior / Journal of Entrepreneurship, Management and Innovation Volume 17, Issue 1, 2021: 57-95

Table 1: Summary of the research

| AUTHORS | YEAR | JOURNAL | TYPE | AIM OF RESEARCH | RELIEFANCE OF AC | METHODOLOGY | SAMPLE | VARIABLES | FINDINGS | FUTURE RESEARCH AGENDA |
|---------|------|---------|------|----------------|------------------|-------------|--------|-----------|----------|------------------------|
| Winkelbach, A; Walter, A | 2015 | INDUSTRIAL MARKETING MANAGEMENT | Empirical article | What is the intensity between AC, prior knowledge, and value creation? | AC moderates the intensity between complex knowledge and value creation; AC is a prior technological knowledge. | Survey; moderated hierarchical regression | Database of 127 science to industry R&D projects in technology-based markets. | DV: transfer value IV: knowledge, attribute complexity, prior knowledge, absorptive capabilities, adaptive capabilities CV: firm's market orientation, firm size, industry characteristics. | Prior knowledge has no significant effect on value creation; instead, the impact of complex technological knowledge on value creation is enhanced at higher levels of value prior knowledge and absorptive capabilities. | Future studies can replicate our research using longitudinal designs, which could eliminate several biases including the potential for omitted variable bias. Additionally, future studies could incorporate a multi-dimensional perspective into studies about science-to-industry technology transfer projects. Finally, it will be worthwhile to analyse our framework in other national contexts because cultural and context-related aspects can increase the influence of specific factors. |
| Webber, A; McKinnon, M; Brown, V | 2009 | R & D MANAGEMENT | Empirical article | To explain the Proof of Concept (PoC) process within a University Science Park located as a means for improving the commercialisation of University technology transfer using an AC perspective. | Importance of Absorptive Capacity on PoC outcomes. | Multi-case analysis; interpretive research philosophy; semi-structured interviews. | 16 PoC projects; ... | AC influencing factors such as levels of R&D, investment, prior knowledge base, ... | AC influences the ... | Future studies should integrate ... | |
| Marcel, M | 2012 | JOURNAL OF SMALL BUSINESS MANAGEMENT | Empirical article | Explores knowledge acquisition, adaptation, and absorptive capacity in early venture development and how they are related to innovation creation. | AC as an essential variable aspects of prior knowledge and experience may refer to AC and the development of radical offerings. | IV: Knowledge acquisition III: Innovation Readiness Control Variables: ... | Survey | ... | Asymmetries in knowledge base acquisition ... | Future studies are encouraged to explore the multi-dimensional nature of knowledge and learning in explaining opportunity discovery, exploitation, and survival outcomes. |
| Merkens, M; Jessen, A; Rappe, M | 2015 | EUROPEAN JOURNAL OF INTERNATIONAL MANAGEMENT | Empirical article | How market-oriented networks contribute to the development of adaptive, absorptive, and innovative knowledge bases and dynamic capabilities in international new ventures (INVs). | The participation of M&As in market-oriented networks encourages AC, and market orientation makes significant contribution to the development of AC in INVs. | Survey; structural equation modeling | JBI firms founded after 2005 and with international activity | Variables: market orientation of the network and dynamic capabilities of the firms. | The study shows the utility of the network-market orientation dynamic construction knowledge derived from the firm's market-oriented networks, helps the firm to improve dynamic capabilities in order to act sustainably in their international markets. | Future studies that continue to analyse factors that can explain the international competitiveness of INVs. |
| Kamienow, D; Baden-Fuller, C; Zhang, J | 2017 | JOURNAL OF PRODUCT INNOVATION MANAGEMENT | Empirical article | What are the characteristics mechanisms, models, and approaches that influence the importance of producing breakthrough innovations? | Search capabilities and AC of partners can be used in early stage to forecasting fundamental research. | Longitudinal panel study | 69 UK new biotechnology firms over 15 years. | DV: number of the firm’s patents that turned out to be a breakthrough innovation IV: knowledge development mode CV: R&D, VC backing, public stock listing, number of employees, number of alliances, technology types, product categories. | External knowledge development activity is associated with greater breakthrough innovations and a faster turnover of innovations to market. | Future studies that need to consider the firms’ choice of knowledge development activities and the impact of these antecedents to the knowledge development. |
Exploring the Link Between Entrepreneurial Capabilities, Cognition, and Behaviors
Marta Gancarczyk & Anna Ujwary-Gil (Eds.)
Yim, W., & Park, Y. J. 2009. *British Journal of Management*. Empirical article. How does corporate entrepreneurship (CE) contribute to extending the firm’s knowledge-based capital and its performance? The authors propose that CE enables ACAP of SAN enterprises. CE improves firm performance as a dynamic capability by incorporating, reconfiguring, and modifying the firm’s knowledge-based resource. Smellie, J. 2013. *Strategic Entrepreneurship Journal*. Empirical article. How does the effects of innovative capability and inter-firm network attributes on valuation vary with firm age? A heterogeneous network provides access to diverse and effective information flows and, consequently provides firms with the ability to absorb external information. ACAP is positively influenced by a heterogeneous network.
Absolutnosc absorbancy (AC) ma kluczowe znaczenie dla procesu innowacji w dużych firmach. Jednak wielu innych autorów uważa startupy za kluczowe czynniki napędzające innowacje w obecnej gospodarce światowej. Dlatego niniejszy artykuł ma na celu określenie, w jaki sposób koncepcja AC została potraktowana w kontekście nowego przedsięwzięcia.

**Methodology:** Systematyczny przegląd literatury analizujący 220 artykułów opublikowanych w latach 2001–2018. **Wyniki:** Systematyczny przegląd literatury identyfikuje trzy grupy badań dotyczących AC w start-upach: wiedza, innowacje i wyniki wraz z głównymi autorami dyskusji, głównymi wkładami, odniesienia teoretyczne i wytyczne dotyczące ich przyszłego programu badawczego. **Implicazioni per teorie e prassi:** Niniejsze badanie wnosi wkład do literatury dotyczącej innowacji i przedsiębiorczości łącząc znaczenie AC i tworzenia nowych przedsięwzięć oraz zapewniając lepsze zrozumienie, w jaki sposób przedsiębiorcy mogą usprawnić swoje procesy innowacyjne. **OriginaLity and waRtnosz:** Na podstawie analizy przeglądu literatury stworzono ramy różnicujące strategie pozyskiwania wiedzy dla nowych przedsięwzięć. Ramy kategoryzują strategie według...
źródła wiedzy (tj. wewnętrznego lub zewnętrznego) oraz stopnia intencjonalności (tj. formalnej lub nieformalnej).

Słowa kluczowe: innowacje, chłonność, startupy, nowe przedsięwzięcia, przedsiębiorczość.

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Conflicts of interest

The authors declare no conflict of interest.

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