

Barriers, practices, methods and knowledge management tools in startups

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Abstract

Purpose – *The purpose of this paper is to present the main barriers, practices, methods and knowledge management tools in startups that are characterized as agile organizations with dynamic capabilities to meet the demands of a business environment of high volatility, uncertainties, complexity and ambiguity.*

Design/methodology/approach – *The conceptual basis of the research focused on the triad: agile organization, dynamic capabilities and knowledge management. Field research began by interviewing experts to identify the barriers, practices, methods and knowledge management tools in startups. Based on the theoretical review, on the desk research and on the result of interviews with experts, a quantitative research was carried out with the leading startups coworking of São Paulo city. The obtained data made it possible to develop descriptive analyses and run linear regressions and cluster analysis for exploratory research.*

Findings – *Startups with higher maturity in innovation level, solution development level, and scalability development level, present a higher degree of utilization of the practices, methods and tools dedicated to knowledge management.*

Practical implications – *It is expected that results of the research presented in detail will be able to illustrate concrete examples of practices, methods, and knowledge management tools for large established companies seeking the organizational agility of startups.*

Originality/value – *This study contributes to the identification of barriers, practices, methods and tools of management of knowledge in startups, through the conceptual triad: agile organization, dynamic capabilities and knowledge management.*

Keywords Knowledge management, Dynamic capabilities, Startups, Coworking spaces

Paper type Research paper

1. Introduction

Business environment has become increasingly more complex, volatile, uncertain and ambiguous. Large companies seek to create their innovation research centers, create partnerships with customers and other agents for innovation and create partnerships with external knowledge generation centers to raise their innovative potential (Bower and Christensen, 1995; Chesbrough, 2003). In this way, the large business groups have always been the driving forces behind economic development closely linked to innovation (Lee *et al.*, 2017). Currently, due to the high costs of innovation, due to the extended deadlines for solution development and due to the search for diversity in meeting the new demands of the market, companies have been looking for solutions in the shared and disruptive environment of startups (Oliva *et al.*, 2011; Christensen *et al.*, 2015; Yoon and Hughes, 2016; Spender *et al.*, 2017).

The agile organization combines a number of planning, organization, execution and control practices, always aiming for an action or a reaction as quickly as possible in order to meet the business environment demands, so as to achieve its strategic objectives that may, likewise, change in view of the environmental dynamism (Teece *et al.*, 1997). The agile

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organization is, above all, an organizational state of mind, that is, the formal and informal organizational culture conspires in favor of the agile management philosophy (Teece, 2007).

In view of the above, organizations wishing to be agile must develop capabilities that enable them to achieve the characteristics of an agile organization. Some of the main ones include constant and comprehensive observation of the business environment, planning and execution in continuous harmony, agility in the resources' composition and control aiming at the changes (Weber and Tarba, 2014). Thus, in this context, the concept of dynamic capabilities is useful, which refers to organizational capabilities that enable organizations to respond quickly and continuously to demands for changes in the market (Teece *et al.*, 2016).

Considering this business context, it is understood that knowledge management is an organizational practice aligned with the new concepts of agile organization and organizations with dynamic capabilities. Knowledge management is an organizational discipline that aims to acquire, transform, store, use and discard knowledge that is important in generating value for the organization (Teece, 2007; Easterby-Smith and Prieto, 2008; Oliva, 2014; Cegarra-Navarro *et al.*, 2016).

The research is justified by its importance, contribution, feasibility and originality. The research importance focuses on the presented situation-problem, where the business environment demands innovation for companies that want to remain active and competitive in the future. Our study contributes to the research of knowledge management in startups that are considered agile companies with high dynamic capacities of adaptation to the changes in the business environment. Considering knowledge management being a powerful administrative tool to operationalize these characteristics of startups, the study offers a list of barriers to the adoption of knowledge management that can help other startups better conduct their processes. The study also presents a list of practices, methods and tools adopted by startups in knowledge management that can help other startups in the process of planning, organizing, executing, and controlling their knowledge management processes. Another point of contribution to the theory lies in the fact that the most developed startups are those that have the highest level of adoption of knowledge management. In addition to contributing to the startups, our study may offer an informational set for established companies in adopting the current mindset. We developed a conceptual framework for the study, obtained current secondary data, conducted interviews with experts and the quantitative field research with the startups of the main coworking spaces of São Paulo city, whose municipal GDP represents approximately 10 per cent of Brazil's GDP (IBGE, 2017). With respect to originality, the theme itself is unique because of the novelty that the startups, the agile management model and the dynamic capacities provide for the study.

In view of the above, the objective of the research is to identify the barriers, practices, methods and tools adopted in knowledge management by startups. In addition, we intend to analyze the relationship between the maturity of startups in relation to their stage of development and the maturity of startups in relation to their level of adoption of knowledge management.

2. Theoretical review

2.1 Agile organization

Ever since the concept of organization was established, the business environment has clearly influenced its conception and its management. At the time of the classical school, the focus was on the production in search of efficiency on the upper level (Bateman and Snell, 2011). In the evolution of the administrative process in the years since 1940 the lean production has gained prominence, where the main focus of attention is meeting the

customer's specific demands, without detriment to organizational efficiency. The lean management model exalts the best balance between effectiveness and efficiency. Some authors report that the basic principles of agile organization were born in this context (Kidd, 1994).

Innovation management has been a major mainstay of the transformation of organizations (Utterback and Abernathy, 1975). The focus on meeting the market demands continues to be one of the organization's main strategies for its creation, development and survival in the ever-competitive markets (Tidd *et al.*, 2008). Current studies show the importance of structured innovation management through governance structures and knowledge management in organizations to meet the demands of local and global markets (Singh and Gaur, 2013; Mukherjee *et al.*, 2018). In this way, the agility to meet the changes arising from the business environment is a key differential that adds value to the organization.

In the 2000s, in harmony with the different evolutionary trends, innovation, collaborative vision, data-based management, digital transformation, the concept of agile organization emerged, such as organizations with the ability to continually adjust and adapt the strategic direction in order to create, maintain and generate value for their company (Doz and Kosonen, 2008) in an environment of deep uncertainties arising from business environments with dynamic changes (Teece *et al.*, 1997).

In this way, agile organization is defined as an organization that has the ability to re-implement and redirect its resources in an efficient and effective way to create, protect and capture value in higher income activities as the internal and external circumstances ensure (Teece *et al.*, 2016).

2.2 Dynamic capabilities

Companies that remain active over time are those that created a mission, vision and formalized or not formalized values at some time in the past, have managed to reinvent themselves meeting the business environment demands and generating value to their stakeholders. In this regard, companies that develop the ability to better adapt to changes or bring about the best changes in the business environment are the companies that stand out against the competition and win customers (Hamel and Prahalad, 1994; Porter and Kramer, 2011).

In a highly uncertain business environment, where change is constant, companies need to develop differentiated capabilities to correctly interpret change, to promptly plan and develop suitable strategies, to allocate the strategic resources needed to meet the perceived opportunity and to control the process constantly, generally accelerating the administrative cycle, to plan, to organize, to execute and to control (Grewal and Tansuhaj, 2001; Teece, 2007). In a broader context, companies operating in various markets, both domestic and international, are exposed to various changes promoted by economic, political, legal, technological and social forces. Many of these business environment forces may have convergent or divergent intensity and direction, and agile organizations must develop their dynamic capabilities to identify changes, structure their processes, and meet the peculiar demands of different international business environments (Gaur *et al.*, 2014; Mukherjee *et al.*, 2013; Contractor *et al.*, 2016). In this sense, the current moment shows that startups are more prepared to capture changes in the business environment and convert that understanding into products and services that meet market needs through innovations and lean structures that deliver exponential results (Spender *et al.*, 2017; Teberga *et al.*, 2018).

Thus, the dynamic capability concept proposed by Teece *et al.* (1997) is useful as it refers to a company's ability to integrate, build and reconfigure internal and external expertise to quickly address the changes in the business environment.

In order to operationalize the concept of dynamic capability, Teece (2007) proposes a theoretical model based on three pillars:

1. ability to detect opportunities;
2. ability to learn how to develop structure, processes, projects and incentives to take advantage of opportunities detected; and
3. ability of ongoing management of alignment and realignment of its tangible and intangible assets in pursuit of value generation.

2.3 Knowledge management

Knowledge has always been an important asset for people and therefore for organizations (Nonaka and Takeuchi, 1995; Davenport and Prusak, 2000). Considering that knowledge is a cognitive process of people, organizational knowledge depends essentially on the effective participation of key individuals in the process of knowledge management within an organization, which directly affects the level of organizational innovation (Nuruzzaman *et al.*, 2018). Obviously, mankind knowledge has increased in quantity and quality since the days of the oracles of Delphi up to the present day. Thus, it becomes increasingly necessary to adopt structured practices to assess, acquire, store, use and discard knowledge (Stewart, 1999; Sveiby, 1999; Anderson *et al.*, 2015). In this way, we must consider the identification of the level of maturity in knowledge management as an important indicator of the competitiveness potential of the organization (Oliva, 2014). Among the transformations experienced by society, it can be said that the advent of information technology has transformed the knowledge management and raised its quality to levels previously unimaginable (Khan and Vorley, 2017).

Considering a procedural view of knowledge management, Probst *et al.* (2000), suggest that knowledge management is divided into eight core processes: knowledge targets definition, knowledge identification, knowledge acquisition, knowledge development, knowledge distribution, knowledge utilization, knowledge retention and knowledge assessment.

Good knowledge management in organizations depends on good practices that go through the essential processes (Garvin, 1993; Davenport and Prusak, 2000; Doh, 2003). The adoption of structured procedures and computational techniques, the superior strategic orientation for adoption of knowledge management and the development of a culture-driven knowledge are some of the main good practices that foster the better knowledge management in organizations (Alwis and Hartmann, 2008; Powell and Swart, 2010; Oliva, 2014).

From the best practices of knowledge management, digital methods and tools have emerged that enhance efficiency and effectiveness in the assessment, acquisition, storage, use and disposal of knowledge (Oliva, 2014; Prado *et al.*, 2017). Computers, systems, internet, artificial intelligence, data mining, big data, internet of things, cloud computing and learning machine are some of the computational tools that have been revolutionizing the companies' business management and specifically knowledge management (Dennis *et al.*, 2001; Khan and Vorley, 2017; Zhang *et al.*, 2017; Hopkins and Hawking, 2018; Dubey *et al.*, 2018).

In the same way that the best practices, methods and tools foster the success of knowledge management in organizations, barriers may also arise that prevent knowledge management from finding out its fullness (Szulanski, 1996; Brandt and Hartmann, 1999; Seo, 2003; Riege, 2005). Some studies promote the research of facilitators and knowledge management barriers by the detailed analysis for each of the main stages of the process: acquisition, creation, sharing and transfer (Pinho *et al.*, 2012; Oliva, 2014). According to Oliva (2014), a

consistent classification of barriers to knowledge management may be as follows: environmental barriers, organizational barriers and human barriers.

2.4 Agile organization, dynamic capabilities and knowledge management

The agile organization is the organization that acts and reacts quickly in changing its strategies, its structure, its processes, its products, its services and its controls to meet the dynamic changes of the business environment. Being so, the concept of dynamic capability relates to the purpose of turning the organizations into agile ones (Teece *et al.*, 2016). The dynamic capabilities that stand out to do so are:

- the ability to identify the opportunities of the business environment;
- the ability to adapt the organization to meet the new demands; and
- the ability to continuously create and develop tangible and intangible assets (Teece *et al.*, 1997; Teece, 2007).

In this context, startups are agile organizations with dynamic capabilities that take risks of different natures because of their higher risk appetite and risk tolerance arising from their design, structure, strategies and innovation-driven goals that can achieve success or failure (Oliva *et al.*, 2011; Teberga *et al.*, 2018).

The knowledge management is one of the management practices that support the dynamic capabilities of agile organizations. The practice of defining, acquiring, disseminating, storing, applying, and assessing knowledge in organizations prepares people and potentializes internal changes. According to Senge (1990), organizations that learn are the readiest organizations to adapt themselves to the business environment requirements. Knowledge and ongoing monitoring of the business environment empower the organization to identify opportunities. The ability to transform explicit and tacit knowledge and their cyclical transformations enhances the organization to change its structure and administrative processes. Likewise, managed knowledge empowers the organization to promote internal innovation and the open innovation that is created transforms and develops tangible and intangible assets aligned with the dynamic demand of the business environment (Senge and Sterman, 1992; Natalicchio *et al.*, 2017).

3. Methodology

3.1 Methodological aspects

Considering that the research objective is to identify the barriers, practices, methods and tools adopted in knowledge management by startups, we decided to conduct our research in the following phases: bibliographic research, desk research, research with experts, research with startups.

The bibliographic research focused on the triad agile organization, dynamic capabilities and knowledge management. Regarding the agile organization, we sought to identify the characteristics of agile organizations and their relationship with knowledge management. Similarly, we related the concept of dynamic capacities to knowledge management. Finally, with regard to knowledge management, we sought to find, in the literature, the barriers and practices of knowledge management in agile organizations.

Desk research was based on relevant publications from the startups' environment. We focus on texts coming from the main organizations that encourage the creation and development of startups: coworking spaces, accelerators, journals, associations and government institutions.

The objective was to carry out the research together with experts to identify the main barriers, practices, methods and tools of knowledge management so that the research

instrument with startups could be formatted. Interviews were conducted with four startup experts: startup founder, consultant and expert on exponential technologies, professor of courses aimed at startups and director of an accelerator.

3.2 Population and sample

Having in hands the questionnaire developed based on the literature as well as the experts' responses, a field research was carried out with the startup companies in the main coworking spaces of São Paulo. It was sought to interview the founders, co-founders, CEOs, CTOs, directors or major startup managers. The founders, co-founders, CEOs, CTOs, directors or major startup managers were interviewed. The interviewer was present throughout the time of the questionnaire application, it was fully presential. This practice allows more effective data collection, as the interviewer can resolve the doubts more easily and his/her presence reduces the number of incomplete questionnaires and prevents the respondent from guessing on past events not familiar to him/her, thereby raising the quality of information collected. Table I shows the coworking spaces chosen, the number of resident startups (NSR), the number of startups interviewed (NSE), the rounded value of the percentage NSR/total of startups of all coworking spaces, percentage NSE / NSR. Habitat is a coworking space sponsored by Banco Bradesco, Brazil's second largest private bank. CIETEC is a coworking space sponsored by USP, the largest public university in Brazil. The Cubo is a coworking space sponsored by Banco Itaú, Brazil's largest private bank. The population of 287 startups is verified in the five large coworking spaces of São Paulo City. The original sample was 103 startups, representing a total of 35.8 per cent of the population. The actual sample was 102 startups, considering only the valid and fully completed questionnaires, representing 35.5 per cent of the population. A number greater than that required for a simple random sample with a 95 per cent confidence level, with a sampling error of 0.50 and a standard deviation estimate of 3, whose size is 94 companies. It is also verified the percentage balance of the sample (NSE/NSR), that is, the proportions of the number of startups interviewed by the number of startups residents for each coworking are very close.

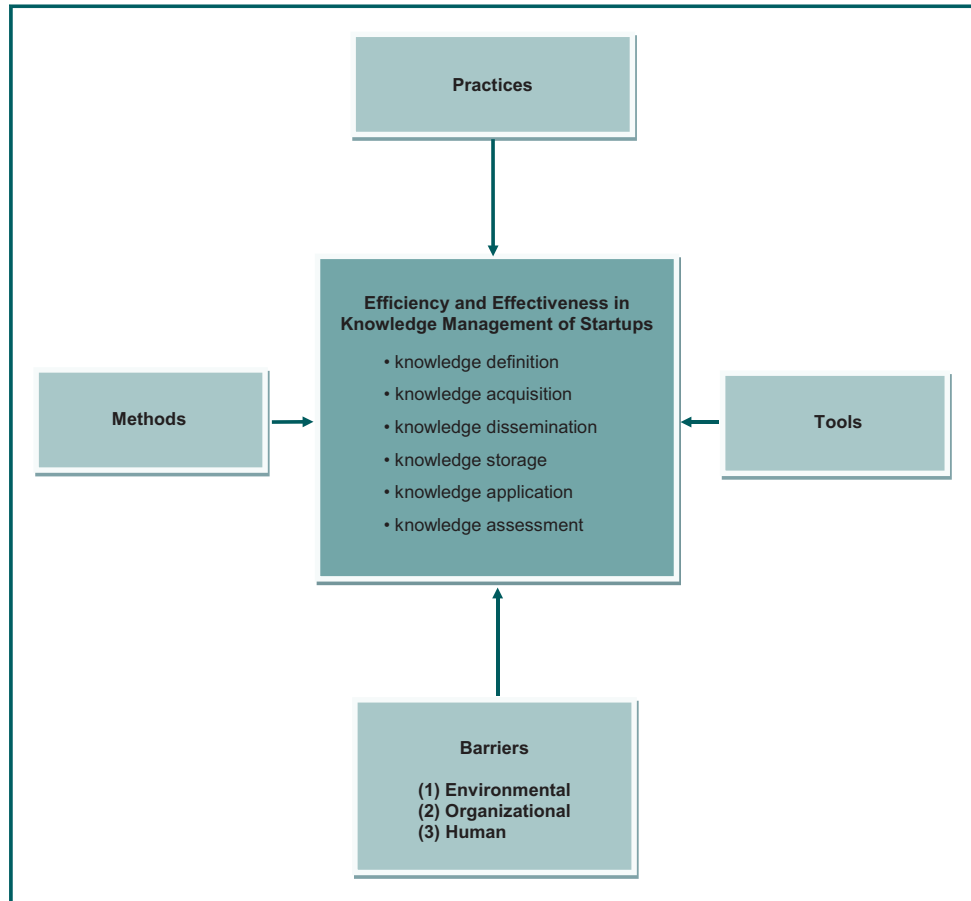
3.3 Conceptual model

The conceptual model presented in Figure 1 was drawn up based on bibliographic research, desk research and research with experts. The model represents the process of knowledge management with its stages: knowledge definition, knowledge acquisition, knowledge dissemination, knowledge storage, knowledge application and knowledge assessment, considering the barriers, the practices, the methods and the tools that affect the efficiency and effectiveness of knowledge management in startups. It should be noted that the analysis of barriers, practices, methods and tools is for each of the six stages of the knowledge management process. In particular for the barriers one must evaluate the three types of barriers, environmental, organizational and human for each of the six stages of the knowledge management process.

Table I Population and sample

Coworking space	NSR	NSR/TSTC (%)	NSE	NSE/NSR (%)
Habitat (BRADESCO)	90	32	31	34.4
CIETEC (USP)	75	27	27	36.0
CUBO (ITAÚ)	66	23	24	36.4
We Work (BERRINI)	32	12	12	37.5
OXIGÊNIO (PORTO SEGURO)	24	9	8	33.3
Total (TSTC)	287	103 – 35.8	102	35.5

Figure 1 Model of analysis of barriers, practices, methods and tools in knowledge management of startups



3.4 Data analysis

Preliminary analyses were conducted, followed by various multivariate analyses for exploratory purposes.

Data analysis is divided into four stages. Initially, the main barriers for each stage of the knowledge management process are presented, considering the three types of barriers: environmental, organizational and human. In addition, a double entry table shows the average importance assigned by the interviewees to each type of barrier for each stage of the knowledge management process in the startups. In the sequence, the main practices for each stage of the knowledge management process are presented. In addition, using the linear regression we obtained the main practices that justify the interviewee's perception regarding the intensity of the good practices of knowledge management in startups. The third stage presents, similarly to best practices, the main methods and tools for each stage of the knowledge management process. In addition, using the linear regression we obtained the main methods and tools that justify the interviewee's perception regarding the intensity of the use of methods and tools in the management of knowledge in the startups. Finally, using the technique of conglomerates can we identify two groups of startups, a group that presents a higher degree of development maturity, considering the variables innovation, solution and scalability and another with a considerable degree of inferior development maturity. It can be verified that the group with a higher degree of

maturity of development also presented a higher degree of use of the practices, methods and tools dedicated to knowledge management.

4. Results

In the first stage, the analysis was conducted of the data obtained through the research with the startups, based on the information obtained by the desk research, research with experts, with startups and supported by the conceptual basis proposed in the bibliographic research. In the subsequent stages of analysis below, we present the barriers to organizational knowledge management, the main practices adopted in the organizational knowledge management, the main methods and tools applied in the organizational knowledge management and, in addition, an analysis of the relationship between startup maturity and the knowledge management maturity.

4.1 Main barriers to knowledge management in startups

Based on the information obtained through the interviews with the startups, we identified the main barriers in knowledge management. In this interview, we asked about the importance of barriers stemming from the organization, from the people and from the business environment for each stage of the knowledge management process: defining, acquiring, disseminating, storing, applying and assessing the knowledge in their startups.

Based on the 102 valid questionnaires, we obtained the mean responses for each startup, for each barrier, for each of the three types of barriers and for each stage of the knowledge management process. In Table II, the five main barriers found are presented, starting from the most important barriers in startups' knowledge management.

Looking at Table II, it is observed that the barrier *acquisition* stands out in the early stages, and that the barrier *assessment* stands out in the final phase of the knowledge management process. This leads one to believe that the lack of resources can affect the whole process. This finding is consistent with the general reality of startups, which are new ventures that require investments (Oliva *et al.*, 2011; Spender *et al.*, 2017; Papa *et al.*, 2018). It is also worth mentioning the issue 9 – “Pressure for results in a short period of time hinders the knowledge dissemination in someone’s startup”, where startups that stand out for their agility in the solutions proposed for society and other traditional companies suffer the same demanding for results from other business environment agents, such as their investors and customers (Teberga *et al.*, 2018). Finally, the barrier *staff* stands out in the storage and knowledge assessment. It is worth mentioning two intrinsic characteristics of the new enterprises, resistance to formality and focus on the immediate, both detractors of the best

Table II the Top five barriers to knowledge management in startups

Question	Barrier	Barrier type	Process	Mean
Q16	Lack of resources (staff, time, systems) for the startup to assess the knowledge use Focus on operational work makes it difficult to assess the knowledge use	Organization	Assessment	6.56
Q4	Lack of resources of the startup for the knowledge acquisition (organization)	Organization	Acquisition	5.69
Q9	Pressure for results in a short period of time hinders the knowledge dissemination in someone’s startup	Business environment	Dissemination	5.49
Q11	Resistance to documentation hinders the knowledge storage in someone’s startup	Staff	Storage	5.38
Q17	Commitment only with the current time – here and now – prevents the assessment of the knowledge use in someone’s startup	Staff	Assessment	5.18

knowledge management (Senge, 1990; Senge and Sterman, 1992; Seo, 2003; Weber and Tarba, 2014).

Table III is prepared taking into account all assessed barriers, calculating the average of the scores assigned by the interviewed managers, considering the average by type of barrier: environmental, organizational and staff, and the averages for each stage of the knowledge management process: defining, acquiring, disseminating, storing, applying and assessing knowledge.

In general, it appears that the overall assessment of the barriers to knowledge management startups, 4.14, is low. It is argued that the new ventures of this nature have the strength and power of innovation. The belief of overcoming is one of the top attributes of startups (Oliva et al., 2011; Teberga et al., 2018). The figures show that no barrier, classified by type or stage of the knowledge management process, has averaged higher than 5, considering a scale from 0 to 10. Only five barriers have achieved a value higher than 5, which are focused on organizational and human barriers. It is worth mentioning that environmental barriers obtained the lowest importance value, 3.36, which is fully consistent with entrepreneurship studies on the entrepreneurs' perception. On the other hand, it is noteworthy that those considered the most important barriers are concentrated on the stage of knowledge management assessment, which is consistent with the nature of the new companies.

4.2 Main practices adopted in knowledge management of startups

Based on the information obtained in the interviews with the startups we identified the main practices in knowledge management. This interview asked about the importance of practices for each stage of the knowledge management process: defining, acquiring, disseminating, storing, applying and assessing the knowledge in someone's startup.

Based on the 102 valid questionnaires, we obtained the mean score on the responses for:

- each startup;
- each practice; and
- each stage of the knowledge management process.

Table IV presents the five main practices found, as from the practices of major importance in the startups' knowledge management.

Looking at Table IV, it is observed that of the 25 practices listed for startups assessment, 11 practices obtained an assessment of their importance for knowledge management superior to 7, considering a scale from 0 to 10. It is found that in all the stages, at least one practice of knowledge management, received a rating higher than 7.0, which indicates the adoption of best practices by startups throughout the knowledge management process. We highlighted, with emphasis, the practices: "Internal meetings: team meetings, brainstorming sessions, backlog with teams" with a mean score of 9.16, and "Internal meetings – team

Table III Barriers to knowledge management in startups				
Knowledge management process	Barriers			Average
	Organizational	Staff	Environmental	
Definition	4.40	3.47	3.53	3.80
Acquisition	5.69	3.76	2.89	4.11
Dissemination	4.82	3.87	5.49	4.73
Storage	3.09	5.38	1.89	3.45
Application	3.24	4.84	3.13	3.74
Assessment	6.56	5.18	3.24	4.99
Average	4.63	4.41	3.36	4.14

Table IV The 11 main practices adopted in knowledge management at startups

Question	Practice	Process	Average
Q3	Internal meetings: team meetings, brainstorming sessions, backlog with teams	Definition	9.16
Q13	Internal meetings: team meetings, in-house seminars, weekly talk	Dissemination	8.56
Q5	Assessments of market or experts: prototyping and pitches	Acquisition	8.16
Q4	Validation with clients "listen to consumers"	Definition	8.11
Q1	Consultation with mentors	Definition	7.87
Q25	Creation of KPIS	Assessment	7.73
Q24	Assessment of market or expert: pitches, listen to consumers, concept test	Assessment	7.69
Q8	Market research, benchmarking, partnership with startups	Acquisition	7.53
Q17	Report, history of Prototyping and testing	Storage	7.51
Q7	Social interactions: participation in fairs and events, coworking, serendipities, consultation with mentors, paired programming	Acquisition	7.22
Q22	Report, history of Prototyping and Testing	Application	7.01

meetings, in-house seminars, weekly talk" with a mean importance score of 8.56, which show that the practice of transferring through tacit knowledge is still widely used. Regarding the knowledge application stage, it appears that there was no greater emphasis on the practices, the most widely adopted practice is "Report, History of Prototyping and Testing" with a mean importance score of 7.01.

Another interesting way to read the best practices is through identifying the best practices for each stage of knowledge management as shown in [Table V](#).

In the questionnaire applied to startups, one of the synthesized questions seeks to identify what the intensity of best practices in the startup knowledge management is, on a scale from 0 to 10. Based on the answers of this question, a linear regression was performed, considering this variable as dependent variable (Y) and the assessments of the 25 practices as independent variables (PRA_{ij}), where *i* is the indicator of the process stage and *j* is the indicator of the process stage practice. The results of the multivariate analysis are shown in [Table VI](#).

Here is the equation:

$$Y = 1.830 + 0.216 \text{ PRA1.3} + 0.108 \text{ PRA3.3} + 0.125 \text{ PRA3.5} - 0.194 \text{ PRA4.1} + 0.214 \text{ PRA4.3} + 0.113 \text{ PRA6.3}$$

PRA1.3: "Internal Meetings: team meetings, brainstorming sessions, backlog with teams";

Table V The main practices adopted for each step of knowledge management in startups

Process	Question	Practice	Average
Definition	Q3	Internal Meetings: team meetings, brainstorming sessions, backlog with the teams	9.16
Definition	Q4	Validation with Clients "listen to consumers"	8.11
Definition	Q1	Consultation with Mentors	7.87
Acquisition	Q5	Market or Experts Assessments: prototyping and pitches	8.16
Acquisition	Q8	Market research, benchmarking, partnership with startups	7.53
Acquisition	Q7	Social Interactions: participation in fairs and events, coworking, serendipities, consulting the mentors, paired programming	7.22
Dissemination	Q13	Internal Meetings: team meetings, in-house seminars, weekly talk	8.56
Storage	Q17	Report, History of Prototyping and Testing	7.51
Application	Q22	Report, History of Prototyping and Testing	7.01
Assessment	Q25	Creating KPIS	7.73
Assessment	Q24	Market or Experts Assessments: pitches, listen to consumers, concept test	7.69

Table VI Multivariate linear regression statistics

Statistics	Values
Number of observations	102
Default error	1.111
Level of significance	0.05
Dependent variable	Y
Independent variables	PRA1.1, PRA1.2, ..., PRA6.2, PRA6.3
Coefficients:	
Intersection	1.830
PRA1.3; PRA3.3; PRA3.5; PRA4.1; PRA4.3; PRA6.3	0.216; 0.108; 0.125; -0.194; 0.214; 0,113
R (%)	77.8
R ² (%)	60.6

PRA3.3: "Internal Hackton";

PRA3.5: "Internal Meetings: team meetings, in-house seminars, weekly talk";

PRA4.1: "Notations in Post-Its";

PRA4.3: "POP – Standardized Operating Procedures";

PRA6.3: "KPIS Creation";

It is understood that linear regression provides the best adjustment coefficients of a linear combination of the independent variables, considering the startup perception with respect to intensity of use of the best knowledge management practices. It is noteworthy that the PRA1.3 variable related to the practice of internal meetings such as team meetings, brainstorming sessions and backlog with the teams was the variable that got the highest contribution ratio to express the intensity of the use of good knowledge management practices. Another point to be highlighted is the PRA4.1 variable related to the use of annotations in post-its that obtained the negative coefficient, indicating that the practice is a characteristic of startups with lower intensity of knowledge management practices. In general, the practices that make up the equation are the practices that best explain the intensity of use of the best practices of knowledge management that support the dynamic capabilities of agile organizations such as startups, as some studies attest ([Campanelli and Parreiras, 2015](#); [Schilke et al., 2018](#)).

4.3 Main methods and tools adopted in the startups knowledge management

Based on information obtained in interviews with the startups, it was identified the main methods and tools for knowledge management. In this interview, it was asked about the importance of methods and tools for each step of the knowledge management process: defining, acquiring, disseminating, storing, applying and assessing the knowledge in their startup.

Based on the 102 valid questionnaires, we obtained the mean responses for:

- each startup;
- each method and tool; and
- each stage of the knowledge management process.

[Table VII](#) shows the five main methods and tools found starting with the most important methods and tools for knowledge management in startups.

Looking at [Table VII](#), it is observed that of the 33 listed methods and tools for startups assessment, 10 methods and tools had an assessment of their importance to knowledge management superior to 7, considering a scale from 0 to 10. It is found that

Table VII The top ten methods and tools adopted in knowledge management in startups

Question	Practice	Process	Average
Q20	Tools for Project Management and Storage: trello, asana, g-drive, dropbox, evernote, jira, slite.com, microsoft office	Storage	8.91
Q12	Search Sites and Content Sites: Google, Gartner, blogs from the area, social media, tech-crouch, slack groups	Acquisition	8.80
Q14	Tools for Project Management and Storage: slack, asana, dropbox, trello, clickup	Dissemination	8.80
Q29	Experimentation and Prototyping	Assessment	7.60
Q4	Development Methods: design thinking, Lean Kanbam, 5W2H, Job to be done, reverse engineering, 5 "whys"	Definition	7.53
Q27	Prototyping	Application	7.38
Q8	Social Interactions: events, coworking	Acquisition	7.33
Q25	Project Management and Storage Tools: template, asana, clickup	Application	7.31
Q10	New Development Methods: design thinking, customer development, metrics, scrum	Acquisition	7.20
Q33	Guidance for Data and Internal Results: metrics, kpis, data driven	Assessment	7.11

in all stages, at least one method or knowledge management tool had an assessment higher than 7.0, which indicates the adoption of the best methods and tools by the startups throughout the knowledge management process. The following methods and tools stand out:

- "Tools for Project Management and Storage: trello, asana, g-drive, dropbox, evernote, jira, slite.com, microsoft office" with an average assessment of importance 8.91.
- "Search Sites and Content Sites: Google, Gartner, blogs of the area, social media, tech-crouch, slack groups" with an average assessment of importance of 8.80.
- "Tools for Project Management and Storage: slack, asana, dropbox, trello, clickup" with average assessment of importance of 8.80, and that they show that the methods and tools focus the use of current digital tools for projects management, communication and content generation.

With regard to the knowledge application, again, as in knowledge management practices, it is observed that there was no higher emphasis on methods and tools, the most commonly used method and tool is the "Prototyping" with an average assessment of importance of 7.38, consistent with the best practice "Report, History of Prototyping and Testing".

Another interesting way to read the best practices is by identifying the best methods and tools for each stage of knowledge management as shown in [Table VIII](#).

In the questionnaire applied to startups, one of the synthesized questions seeks to identify the intensity of the methods and tools' use in the knowledge management in the startup, scale from 0 to 10; then, based on the answers, a linear regression was carried out, considering this variable as dependent variable (Y) and the assessments of the 33 methods and tools as independent variables (MF_{ij}), where i is the indicator of the process stage and j is the indicator of the method and tool of the process stage. The results of the multivariate analysis are presented in [Table IX](#).

Here is the equation:

$$Y = 2.177 + 0.191 MF1.3 + 0.088 MF2.5 + 0.188 MF2.6 + 0.157 MF3.5 + 0.104 MF6.3$$

MF1.3: "Smart Goals Setting";

MF2.5: "Online Education Platforms: coursera, veduca";

Table VIII The main methods and tools adopted for each step of knowledge management in the startups

Process	Question	Practice	Average
Definition	Q4	Development Methods: design thinking, Lean Kanbam, 5W2H, Job to be done, reverse engineering, 5 "whys"	7.53
Acquisition	Q8	Social Interactions: events, coworking	7.33
Acquisition	Q10	New Development Methods: design thinking, customer development, metrics, scrum	7.20
Acquisition	Q12	Search Sites and Content Sites: Google, Gartner, blogs from the area, social media, tech-crounch, slack groups	8.80
Dissemination	Q14	Tools for Project Management and Storage: slack, asana, dropbox, trello, clickup	8.80
Storage	Q20	Tools for Project Management and Storage: trello, asana, g-drive, dropbox, evernote, jira, slite.com, microsoft office	8.91
Application	Q25	Tools for Project Management and Storage: template, asana, clickup	7.31
Application	Q27	Prototyping	7.38
Assessment	Q29	Experimentation and Prototyping	7.60
Assessment	Q33	Guidance for Data and Internal Results: metrics, kpis, data driven	7.11

Table IX Statistics of the multivariate linear regression

Statistics	Values
Number of observations	102
Default error	1.184
Level of significance	0.05
Dependent variable	Y
Independent variables	MF1.1, MF1.2, ..., MF6.4, MF6.5
Coefficients	
Intersection	2.177
MF1.3; MF2.5; MF2.6; MF3.5; MF6.3	0.191; 0.088; 0.188; 0.157; 0,104
R (%)	77.1
R ² (%)	59.5

MF2.6: "Search Sites and Content Sites: Google, Gartner, blogs of the area, social media, tech-crounch, slack groups";

MF3.5: "Scrum";

MF6.3: "Landing Pages";

It is understood that the linear regression presents the best adjustment coefficients of a linear combination of the independent variables, when considering the startup perception with respect to the intensity of use of the knowledge management methods and tools. It is worth noting that the MF1.3 variable on the definition of goals that had the highest contribution ratio to express the intensity of the use of the knowledge management methods and tools. The methods and tools, like the educational platforms, content sites, scrum methodology and landing pages are some of the most commonly digital tools used by startups, as experts and specialized literature have recorded (Yoon and Hughes, 2016; Prado *et al.*, 2017; Zhang *et al.*, 2017). In general, the methods and tools that make up the equation are the ones that best explain the intensity of use of knowledge management methods and tools in startups.

4.4 Analysis of the relationship between startups development maturity and knowledge management maturity

Considering the 25 knowledge management practices assessed by startups, a cluster analysis was conducted seeking to identify homogeneous groups internally and with some external heterogeneity. The hierarchical clusters method was used to identify the ideal

number of groups and the initial centroids, and then, based on the identified data. The non-hierarchical *K*-means clusters method was employed. In the hierarchical cluster analysis, the Euclidean quadratic distance was used as measure of similarity and as a grouping *between-groups linkage* method (Hair *et al.*, 2009). Based on the numerical analysis of the column *Agglomeration Schedule* coefficients and on the *Dendrogram* visual analysis it was found that the ideal number of *clusters* is of three groups. Considering that 3 is the ideal number of *clusters*, we used the non-hierarchical *K*-means cluster analysis to identify those members of each clusters. In the processing, we used, as a measure of similarity, the option “Euclidean distance” and as a method of grouping the option “*nearest centroid sorting*” that seeks to minimize the internal variance of the elements of each *cluster* and maximize the variance between *clusters* (Pestana and Gageiro, 2000). In the first process, a grouping was obtained, however, with the ANOVA analysis, it was found that the variables PRA2.3 and PRA4.1 presented level of significance higher than 0.05. Thus, the groupings analysis without these two variables was redone, that is, considering the 23 variables of identification of knowledge management practices. In this process, with the 23 variables valid for ANOVA analysis, we obtained the following startup segmentation configuration: the first C1 cluster with 1 startup, the second C2 cluster with 66 startups and the third and last C3 cluster with 35 startups. Cluster C1 was regarded naturally as an outlier.

In the synthesized questions, we also sought to identify the startup development maturity in relation to the innovation development degree, in relation to the solution development degree and in relation to the scalability development degree of the startup, on a scale of 0 to 10. With regard to the startups practices, methods and tools for knowledge management, as used in the regression analysis, in the synthesized questions we had a variable that identifies what the intensity of use of practices in knowledge management at startup is and a variable that identifies what the intensity of the use of methods and tools in the knowledge management of the startup is, both in the scale of 0 to 10. Furthermore, we calculated the mean of the 23 variables on knowledge management practices as well as the mean of the 33 variables on knowledge management methods and tools. Based on these seven variables synthesis, a comparative analysis was conducted, shown in Table X.

The analysis of Table X shows that cluster C2 presents higher means when compared to cluster C3 in relation to the maturity metrics of the startups’ development (INO, SOL, ESC and MISE) and in relation to maturity metrics in knowledge management (MPRA, PRA, MMF and MF). Being so, we also see that the cluster C2 has a higher maturity in the startups’ development, as the perception of development in innovation, solution and scalability of the startup proposal is higher than the perception of cluster C3. Similarly, we see that cluster C2 has a higher maturity in the startups’ knowledge management, as the perception of the intensity of the practices and the use of the methods and tools of the startups’ knowledge management is higher than the perception of cluster C3. Thus, more mature startups are

Table X Conglomerate analysis statistics

Group	No. of startups	MPRA	PRA	MMF	MF	INO	SOL	ESC	MISE
C2	66	6.8	7.2	6.5	7.2	8.4	8.3	7.0	7.9
C3	35	4.4	5.8	4.2	5.7	8.0	7.4	6.3	7.2
Difference	31	2.4	1.4	2.3	1.5	0.4	0.9	0.7	0.7
Total	101								

Notes: MPRA – mean of the 23 variables on GC practices – Knowledge Management; PRA – identification of the importance of GC practices adopted by startups; MMF – mean of the 35 variables on GC methods and tools; MF – identification of the importance of GC methods and tools adopted by startups; INO – identification of the maturity degree in the startups innovation; SOL – identification of the maturity degree in solution of the startups; ESC – identification of the maturity degree in scalability of startups; MISE – mean of INO, SOL and ESC variables

found to have a higher degree of use of practices, methods and tools dedicated to knowledge management.

5. Final considerations

The business environment has been driven by innovation in products, services, processes, strategies and business model. In this innovation environment, government, research institutions, universities, investors and companies assume different roles and different interests, but when they agree with each other, they leverage the social change. In particular, the companies, focus of this study, are organizations that seek opportunities to generate value for themselves and for society in general and consequently, they are key agents of this change. In this composition of social, political and economic forces, value innovation arises in response to a demand from society. Therefore, companies need to be agile to capture opportunities, transform the organization and produce tangible and intangible assets that generate value. Therefore, dynamic capabilities prepare organizations to become agile organizations. Similarly, knowledge management is a powerful organizational tool to support change processes, since it provides the organization with a continuous flow of relevant information to achieve a better decision making throughout the administrative process. Thus, startups play an important role in disrupting consolidated patterns in the market, producing innovations that generate value for most of the society and destroying value of a smaller portion which submit themselves to modern times.

5.1 Attendance to the research objectives

The present study has aimed to present the barriers, practices, methods and tools of knowledge management used by startups to develop this transformation role. Startups that are characterized by the innovation framing, by the proposition of a transforming solution of a problem, and by the scalability that is configured in the broad offer for society, are agile organizations that generate knowledge and are dependent on knowledge to play their role of transformation. It is worth noting that, in addition to the descriptive nature of the study, it can be observed that, startups showing higher maturity in the three aspects that characterize them, also present higher maturity regarding the use of best practices, methods and tools of knowledge management.

5.2 Attendance to the research methodology

Regarding the methodology, the study was based on the bibliographic research on the triad: agile organization, dynamic capability and knowledge management; desk research on coworking spaces, accelerators, journals, associations and government institutions; research with specialists aiming to identify the current reality of the startups' world; and finally, the representative quantitative survey with 102 startups of the five main coworking spaces of São Paulo city totaling approximately 287 startups.

5.3 Contributions to theory

In general, the literature on knowledge management focuses on the knowledge production that is invariably focused on average and large organizations, due to the natural realization that they are more likely to support a structured process for knowledge management. However, with the gradual participation of individual entrepreneurs or small businesses, such as the current startups, in the process of open innovation to meet the society demands for changes in a complex, volatile, uncertain and ambiguous business environment, we observed a more consistent and integrated academic production about agile organizations, dynamic capabilities, and knowledge management for entrepreneurial organizations. Specifically, this research contributes to the presentation of the main barriers, practices,

methods and tools of startups in conducting the knowledge management for efficiency and the effectiveness of their administrative processes. Moreover, it is believed that the finding that startups that have higher maturity in their development also present higher maturity in relation to the use of best practices, methods and tools of knowledge management, which confirms the common sense and theoretical clues about the theme.

5.4 Managerial implications

Regarding the managerial implications, it is understood that the research offers to the startups managers some guidelines to avoid the barriers that may prevent the adoption of superior knowledge management. To promote knowledge management, the description of the practices, methods and tools most used by startups contributes to guide the current and new startups for adoption or development of knowledge management to determine their dynamic capabilities, allowing them to become increasingly a truly agile organization. Likewise, it is believed that these recommendations can affect the way that established companies adopt new practices, methods and tools in the processes of definition, acquisition, dissemination, storage, application and assessment of knowledge. A learning process can be set up as a successful practice for companies already established to incorporate the best practices adopted by startups in the management of their main capital, knowledge.

5.5 Limitations and future studies

This research was limited to reading the reality of the startups in São Paulo city only. Even though São Paulo is economically the largest city in Brazil, which strengthens the relevance of the study, it is necessary to emphasize the prudence in understanding the results in a particular way to a reality equivalent to large economic centers. Intellectual claim for future studies is to expand the population studied over periods of time for comparison and assessment of the barriers, practices, methods and knowledge management tools in agile organizations.

References

- Alwis, R.S. and Hartmann, E. (2008), "The use of tacit knowledge within innovative companies: knowledge management in innovative enterprises", *Journal of Knowledge Management*, Vol. 12 No. 1, pp. 133-147.
- Anderson, U., Gaur, A.S., Mudambi, R. and Persson, M. (2015), "Inter-unit knowledge transfer in multinational enterprises", *Global Strategy Journal*, Vol. 5 No. 3, pp. 241-255.
- Bateman, T.S. and Snell, S.A. (2011), *Management: Leading & Collaborating in a Competitive World*, McGraw-Hill/Irwin, Boston.
- Bower, J.L. and Christensen, C.M. (1995), *Disruptive Technologies: Catching the Wave*, Harvard Business Review, January-February Issue.
- Brandt, D. and Hartmann, E. (1999), "Editorial: research topics and strategies in socio-technical systems", *Human Factors and Ergonomics in Manufacturing*, Vol. 9 No. 3, pp. 241-243.
- Campanelli, A.S. and Parreiras, F.S. (2015), "Agile methods tailoring – A systematic literature review", *Journal of Systems and Software*, Vol. 110, pp. 85-100.
- Contractor, F., Yong, Y. and Gaur, A.S. (2016), "Firm-specific intangible assets and subsidiary profitability: the moderating role of distance, ownership strategy and subsidiary experience", *Journal of World Business*, Vol. 51 No. 6, pp. 950-964.
- Cegarra-Navarro, J.G., Soto-Acosta, P. and Wensley, A.K. (2016), "Structured knowledge processes and firm performance: the role of organizational agility", *Journal of Business Research*, Vol. 69 No. 5, pp. 1544-1549.

- Chesbrough, H. (2003), *Open Innovation: The New Imperative for Creating and Profiting from Technology*, Harvard Business Press, Boston.
- Christensen, C.M., Raynor, M.E. and McDonald, R. (2015), "What is disruptive innovation?", *Harvard Business Review*, Vol. 93 No. 12, pp. 44-53.
- Davenport, T.H. and Prusak, L. (2000), *Working Knowledge: How Organizations Manage What They Know*, Harvard Business School Press, Boston, MA.
- Dennis, C., Marsland, D. and Cockett, T. (2001), "Data mining for shopping centres – customer knowledge-management framework", *Journal of Knowledge Management*, Vol. 5 No. 4, pp. 368-374.
- Doh, J.P. (2003), "Can leadership be taught? Perspectives from management educators", *Academy of Management Learning & Education*, Vol. 2 No. 1, pp. 54-67.
- Doz, Y. and Kosonen, M. (2008), "The dynamics of strategic agility: Nokia's rollercoaster experience", *California Management Review*, Vol. 50 No. 3, pp. 95-118.
- Dubey, R., Gunasekaran, A. and Childe, S.J. (2018), "Big data analytics capability in supply chain agility: the moderating effect of organizational flexibility", *Management Decision*, available at: <https://doi.org/10.1108/MD-01-2018-0119>
- Easterby-Smith, M. and Prieto, I.M. (2008), "Dynamic capabilities and knowledge management: an integrative role for learning?", *British Journal of Management*, Vol. 19 No. 3, pp. 235-249.
- Garvin, D.A. (1993), "Building a learning organization", *Harvard Business Review*, Vol. 71 No. 4, p. 80.
- Gaur, A.S., Kumar, V. and Singh, D.A. (2014), "Resources, institutions and internationalization process of emerging economy firms", *Journal of World Business*, Vol. 49 No. 1, pp. 12-20.
- Grewal, R. and Tansuhaj, P. (2001), "Building organizational capabilities for managing economic crisis: the role of market orientation and strategic flexibility", *Journal of Marketing*, Vol. 65 No. 2, pp. 67-80.
- Hair, J.F.J., Black, W.C., Babin, B.J. and Anderson, R.E. (2009), *Multivariate Data Analysis*, Prentice Hall, Upper Saddle River, NJ.
- Hamel, G. and Prahalad, C.K. (1994), *Competing for the Future*, Harvard Business Review, July-August Issue.
- Hopkins, J. and Hawking, P. (2018), "Big data analytics and IoT in logistics: a case study", *International Journal of Logistics Management*, available at: <https://doi.org/10.1108/IJLM-05-2017-0109>
- IBGE (Instituto Brasileiro de Geografia e Estatística) (2017), *Produto Interno Bruto Dos Municípios: 2010-2015*, IBGE, Rio de Janeiro.
- Khan, Z. and Vorley, T. (2017), "Big data text analytics: an enabler of knowledge management", *Journal of Knowledge Management*, Vol. 21 No. 1, pp. 18-34.
- Kidd, P.T. (1994), *Agile Manufacturing: Forging New Frontiers*, Addison-Wesley, Wokingham.
- Lee, C., Y., Lee, J., H. and Gaur, A.S. (2017), "Are large business groups conducive to industry innovation? The moderating role of technological appropriability", *Asia Pacific Journal of Management*, Vol. 34 No. 2, pp. 313-337.
- Mukherjee, D., Gaur, A.S. and Dutta, A. (2013), "Creating value through offshore outsourcing: a resource management framework", *Journal of International Management*, Vol. 19 No. 4, pp. 377-389.
- Mukherjee, D., Lahiri, S., Ash, S.R. and Gaur, A.S. (2018), "Search motives, local embeddedness and knowledge outcomes in offshoring", *Journal of Business Research*, available at: <https://doi.org/10.1016/j.jbusres.2017.10.035>.
- Natalicchio, A., Ardito, L., Savino, T. and Albino, V. (2017), "Managing knowledge assets for open innovation: a systematic literature review", *Journal of Knowledge Management*, Vol. 21 No. 6, pp. 1362-1383.
- Nonaka, I. and Takeuchi, H. (1995), *The Knowledge-creating Company: How Japanese Companies Create the Dynamics of Innovation*, Oxford University Press, New York, NY.
- Nuruzzaman, N., Gaur, A.S. and Sambharya, R. (2018), "A micro-foundations approach to studying innovation in multinational subsidiaries", *Global Strategy Journal*, pp. 1-25.
- Oliva, F.L. (2014), "Knowledge management barriers, Practices and Maturity Model", *Journal of Knowledge Management*, Vol. 18 No. 6, pp. 1053-1074.

- Oliva, F.L., Sobral, M.C., Santos, S.A., Almeida, M.I.R. and GRISI, C.C.H. (2011), "Measuring the probability of innovation in technology based companies", *Journal of Manufacturing Technology Management*, Vol. 22 No. 3, pp. 365-383.
- Papa, A., Dezi, L., Gregori, G.L., Mueller, J. and Miglietta, (2018), "Improving innovation performance through knowledge acquisition: the moderating role of employee retention and human resource management practices", *Journal of Knowledge Management*, Vol. 27 No. 3, available at: <https://doi.org/10.1108/JKM-09-2017-0391>
- Pinho, I., ; Rego, A. and Cunha, M.P. (2012), "Improving knowledge management processes: a hybrid positive approach", *Journal of Knowledge Management*, Vol. 16 No. 2, pp. 215-242.
- Pestana, M.H. and Gageiro, J.N. (2000), *Análise de Dados Para Ciências Sociais: A Complementaridade Do SPSS*, Edições Sílabo, São Paulo.
- Porter, M.E. and Kramer, M.R. (2011), "Creating shared value", *Harvard Business Review*, Nos 1/2, pp. 62-77.
- Powell, J.H. and Swart, J. (2010), "Mapping the values in B2B relationships: a systemic, knowledge-based perspective", *Industrial Marketing Management*, Vol. 39 No. 3, pp. 437-449.
- Prado, A.G., Chiareto, J., Oliva, F.L. and Grisi, C.C.H. (2017), "Ethical implications in the way some marketing activities are using big data", *Journal of Systemics, Cybernetics and Informatics, Winter Garden*, Vol. 15 No. 7, pp. 72-76.
- Probst, G., Raub, S. and Romhardt, K. (2000), *Managing Knowledge: Building Blocks for Success*, Wiley.
- Riege, A. (2005), "Three-dozen knowledge-sharing barriers managers must consider", *Journal of Knowledge Management*, Vol. 9 No. 3, pp. 18-35.
- Schilke, O., Hu, S. and Helfat, C.E. (2018), "Quo vadis, dynamic capabilities? A content-analytic review of the current state of knowledge and recommendations for future research", *Academy of Management Annals*, Vol. 12 No. 1, pp. 390-439.
- Senge, P. (1990), *The Fifth Discipline: Mastering the Five Practices of the Learning Organization*, Doubleday, New York, NY.
- Senge, P.M. and Sterman, J.D. (1992), "Systems thinking and organizational learning: acting locally and thinking globally in the organization of the future", *European Journal of Operational Research*, Vol. 59 No. 1, pp. 137-150.
- Seo, M.G. (2003), "Overcoming emotional barriers, political obstacles, and control imperatives in the action-science approach to individual and organizational learning", *Academy of Management Learning & Education*, Vol. 2 No. 1, pp. 7-21.
- Singh, D. and Gaur, A.S. (2013), "Governance structure, innovation and internationalization: evidence from India", *Journal of International Management*, Vol. 19 No. 3, pp. 300-309.
- Spender, J.C., Corvello, V., Grimaldi, M. and Rippa, P. (2017), "Startups and open innovation: a review of the literature", *European Journal of Innovation Management*, Vol. 20 No. 1, pp. 4-30.
- Stewart, T.A. (1999), *Intellectual Capital: The New Wealth of Organizations*, Currency/Doubleday, New York, NY.
- Sveiby, K.E. (1999), *The New Organizational Wealth: Managing & Measuring Knowledge-Based Assets*, Berrett-Koehler Publishers, San Francisco.
- Szulanski, G. (1996), "Exploring internal stickiness: impediments to the transfer of best practice within the firm", *Strategic Management Journal*, Vol. 17 No. S2, pp. 27-43.
- Teberga, P.M.F., Oliva, F.L. and Kotabe, M. (2018), "Risk analysis in introduction of new technologies by start-ups in the brazilian market", *Management Decision*, Vol. 56 No. 1, pp. 64-86.
- Teece, D., Peteraf, M. and Leih, S. (2016), "Dynamic capabilities and organizational agility: risk, uncertainty, and strategy in the innovation economy", *California Management Review*, Vol. 58 No. 4, pp. 13-35.
- Teece, D.J. (2007), "Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance", *Strategic Management Journal*, Vol. 28 No. 13, pp. 1319-1350.
- Teece, D.J., Pisano, G. and Shuen, A. (1997), "Dynamic capabilities and strategic management", *Strategic Management Journal*, Vol. 18 No. 7, pp. 509-533.

Tidd, J., Bessant, J. and Pavitt, K. (2008), *Managing Innovation: Integrating Technological, Market and Organizational Change*, Wiley, Chichester.

Utterback, J.M. and Abernathy, W.J. (1975), "A dynamic model of process, and product innovation", *Omega*, Vol. 3 No. 6, pp. 639-656.

Weber, Y. and Tarba, S. (2014), "Strategic agility: a state of the art", *California Management Review*, Vol. 56 No. 3, pp. 5-12.

Yoon, E. and Hughes, S. (2016), *Big Companies Should Collaborate with Startups*, Harvard Business Review, Boston.

Zhang, T., Wang, W.Y.C. and Pauleen, D.J. (2017), "Big data investments in knowledge and non-knowledge intensive firms: what the market tells us", *Journal of Knowledge Management*, Vol. 21 No. 3, pp. 623-639.

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