Towards a multi-level framework of the Dynamic Capabilities: bridging innovation and project management literature

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Abstract:

The development of dynamic capabilities (DCs), a critical issue in innovation, is barely approached in Project Management (PM) literature, although the literature considers DCs development as a valued mechanism to create a competitive advantage. Hence, this study critically reviews the literature on DCs, looking for cross-fertilization from the areas of Innovation and PM, using a multi-level perspective to organize the coding book and exploring the DCs microfoundations. The research merges content analysis and bibliometrics. The results identify 99 DCs clustered into three levels: PM, project portfolio management and project-based organizations. It proposes a multi-level framework, which classifies the core DCs.

Keywords: Dynamic Capabilities, Project Management, Project-based Organizations, Portfolio Management, Microfoundations.

1. Introduction

Project-based Organizations (PBOs) play an increasingly significant social and economic role, being considered a prominent player in the economy (Fang & Zhang, 2021; Gemünden et al., 2018; Pemsel et al., 2018; Zerjav, 2021). The projectification phenomenon (the process of change by the firm towards management by projects) is growing fast because it is suited to agility and innovation (Prouska & Kapsali, 2021). Such trend both encourages coordination of collective innovation strategies and influences internationalization patterns (Midler, 2019b). Mature project management capabilities are relevant not only in PM but also for entrepreneurs and innovation processes (Midler, 2019a).

However, the temporary nature of projects and the dynamism of the market pose constant challenges to PBOs. Some of these challenges involve continuously seeking revenue through new projects (Choi et al., 2018; Tikkanen et al., 2007), balancing them with existing revenue through project portfolio management (Melkonian & Picq, 2011), updating the execution team on the necessary technologies (Davies & Brady, 2016), and storing knowledge derived from the projects (Salunke, Weerawardena, & McColl-Kennedy, 2019; de Souza, Favoretto, & Carvalho, 2021).

The academic literature points to the development of DCs as a valued mechanism for companies to create competitive advantage in turbulent scenarios (Eisenhardt & Martin, 2000;; Otra-Aho et al., 2019; Teece et al., 1997), which are oftentimes the ones PBOs work in. DCs can create superior sustainable performance in projects when companies, including PBOs, are able to maintain an advantageous knowledge configuration over time. This kind of configuration can be achieved through organizational learning and coordinated adaptation of resources, as a result of changes in the external scenario (Helfat et al., 2007; Helfat & Peteraf, 2015; Manley & Chen, 2017).

Recent studies show that although DCs are more related to the company strategic level, in PBOs their development begins at the more operational level of projects, as companies acquire Project Capabilities (Adam et al., 2019; Davies & Brady, 2016; Lobo & Whyte, 2017). Thus, there should be a continuous double flow of learning from organizations to projects and from projects to organizations (Löwstedt, Räisänen, & Leiringer, 2018), offering opportunities for cross-fertilization to mutual advantage in both fields. Project Capabilities (PCs) foster the learning that PBOs need to develop DCs, when this learning is transferred to the organizational level (Hermano & Martín-Cruz, 2020).

Although DCs are a widely studied academic construct in its relations with themes such as strategy (Ambrosini & Bowman, 2009; Helfat & Peteraf, 2015; Teece et al., 2016; Teece et

al., 1997), operations management (Cepeda & Vera, 2007; Helfat & Peteraf, 2003; Zollo & Winter, 2002), and innovation (Janssen et al., 2016; Kindström et al., 2013; Verona & Ravasi, 2003), there are few studies on the development of DCs within the context of PM and more specifically in PBOs (Choi et al., 2018; Löwstedt et al., 2018; Pemsel et al., 2018).

Therefore, this article aims to investigate the theory on DCs in a multilevel perspective (project – portfolio – PBO), looking for cross-fertilization bridging PM and innovation literature. Besides, it aims at framing the constructs that guide PBOs in developing their DCs, rooted in microfoundations, and adopting a multi-level perspective. With this study we intend to answer the following research questions:

RQ # 1: What are the main DCs identified in PM literature?

RQ # 2: What are the main elements for the development of DCs in different levels (project, portfolio and PBO)?

RQ # 3: How can a multi-level framework represent the core DCs and their microfoundations?

RQ # 4: What are the unexplored trends and the remaining gaps in the field?

To answer these questions, the research design is a critical review aiming at developing a framework (Klein & Müller, 2020), relating DCs in a multilevel perspective (project – portfolio – PBO). It combines content analysis and bibliometrics supported by Bibliometrix and UCINET software. It uses a multi-level perspective to organize the coding book, exploring the microfoundations for DCs.

This paper contributes to the current literature by shedding light on the development of DCs from the PM literature perspective. We first developed a comprehensive review of the literature, identifying 99 DCs in the PM literature surveyed. Second, this review exposed the

main DCs among the 99 identified in the collection of analyzed articles and classified them according to Teece's (2007) microfoundations framework to show their distribution in sense, seize, and reconfigure. Based on this classification, we proposed a multilevel framework (project – portfolio – PBO), exploring their interactions. It presents under-explored variables across levels. Fourth, we presented a multi-level research agenda highlighting research opportunities and gaps.

2. Literature review

2.1 DCs: origins and concepts

The resource-based view (RBV) explains that valuable, rare, inimitable, and irreplaceable resources (VRIN) can be a source of competitive advantage (Barney, 1991; Drouin & Jugdev, 2014). Nevertheless, some authors have considered RBV essentially static in nature and inadequate to explain companies' competitive advantages when they are inserted in rapidly changing environments, where markets are turbulent and dynamic (Barreto, 2010; Eisenhardt & Martin, 2000; Ambrosini & Bowman, 2009).

Then, the concept of DCs appears as an extension of the RBV and is perceived in rapidly changing regimes showing how companies' resources evolve over time and how their advantage is sustained (Ambrosini & Bowman, 2009; Barreto, 2010; Helfat & Peteraf, 2003). While RBV focuses on companies' current resource base (tangible and intangible assets) and their operational capabilities (Barney, 1991; Grant, 1991), the DCs perspective mainly addresses intentional modifications to this resource base (Schilke, Hu, & Helfat, 2018;). Thus, the construction of DCs was originally designed to answer the question of how companies can achieve and maintain a competitive advantage in contexts of rapid technological change (Peteraf et al., 2013; Schilke, 2014). Three main definitions of DCs can be taken from the most cited articles in the literature. Teece et al. (1997) define them "as the firm's ability to integrate,

build, and reconfigure internal and external competencies to address rapidly changing environments". Eisenhardt & Martin (2000) focus on processes. For them DCs "are the organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve, and die." In their definition, Helfat et al. (2007) try to capture many of the critical features of DCs as "the capacity of an organization to purposefully create, extend, or modify its resource base".

In all these definitions, DCs are related to efficient changes in companies' resource structure to meet the needs of current or potential markets to maintain a competitive advantage. By detailing the microfoundations of DCs, Teece (2007) constructed a framework where DCs were disaggregated into three classes of capabilities: (1) sensing and shaping opportunities and threats, (2) seizing opportunities, and (3) maintaining competitiveness through improvement, combination, protection and, when necessary, reconfiguration (reconfigure) of the company's tangible and intangible assets.

Sensing refers to a set of activities that comprises scanning, learning, and interpretation. They focus on understanding customer needs and demands, developing new markets and partnerships, and monitoring competitors. Helfat & Peteraf (2015) and Teece (2014) argue that entrepreneurial management is critical and relevant for a company to detect opportunities related to the market or technology in advance. However, Warner & Wäger (2019) state that detection skills should be encouraged at all levels of the organization.

Seizing relates to activities that focus on the implementation of the detected opportunities that can generate a competitive advantage. Teece (2007) highlights that companies need to create the right business models, improve technological capabilities, and protect their assets. Companies also must not be prejudiced against external technology, developing their Absorptive Capacity (AC), a DC that enables the organization to acquire and assimilate external knowledge aiming at innovation (Killen et al., 2012). The Seize group

involves planning to capture value, establish partnerships, avoid resource bottlenecks, and other microfoundations.

Reconfiguring involves mobilizing resources and competencies (internal and external) in the direction of what Teece defines as taking advantage of opportunities. It can mean diversifying, regionalizing, or even dividing the company into business units (Teece, 2007). In fast-changing markets, PBOs should reconfigure existing capabilities and develop new ones. It can also mean changing internal process routines (Petit & Hobbs, 2010). On the other hand, reconfiguration, may not only mean the expansion of resources but also their reduction, for example, with the decision to close a business unit (Helfat et al., 2007). Reconfiguring also comprises Knowledge Management through learning, transferring, integrating, and protecting knowledge and intangible assets (Teece, 2007).

DCs are strategic and distinct from ordinary capabilities (Teece, 2012; Winter, 2003). Some authors classify DCs as first-order or higher-order capabilities and affirm that they act on the ordinary capabilities of organizations (Daniel et al., 2014; Fainshmidt et al., 2016; Winter, 2003). Killen & Hunt (2010) and Sicotte et al. (2014) in their study on PPM concluded that DCs are path-dependent, evolving from the company's maturity and shaped by accumulated experience. For Killen et al. (2008) investments in learning activities (tacit experience accumulation, explicit knowledge articulation and explicit knowledge codification) can support the development of DCs.

Despite this connection of the DC concept with the field of strategic management, research based on DCs is not limited to this domain. DCs are also studied in the fields of operations management, marketing, human resources management, innovation, projects, and entrepreneurship (Barreto, 2010; Cepeda & Vera, 2007; Davies & Brady, 2016; Helfat & Peteraf, 2003; Janssen et al., 2016; Kindström et al., 2013; Teece, 2014; Verona & Ravasi,

2003; Zollo & Winter, 2002). The present study focuses on DCs in the PM and PBO domain, as mentioned before.

2.2 Project-Based Organizations, Project Portfolio Management, and Project Capabilities

PBOs are defined as companies that establish themselves around projects, providing unique services and products to meet the customized needs of their customers (Blindenbach-Driessen & Van Den Ende, 2010; Fang & Zhang, 2021; Zerjav, 2021). The revenue of this type of company depends on the execution of projects, so that management of these projects and, more broadly, competence in projects, are at the center of their competitive posture (Söderlund, 2005). PBOs typically carry out a variety of project types, including projects delivered to customer specifications and those aimed at developing new technologies, systems, or products in a wide spectrum of industries: construction, telecommunications, shipbuilding, mining, information systems, industrial automation, oil and gas, and energy systems (Gann & Salter, 2000; Sydow et al., 2004).

It is challenging for PBOs to create repeatable performance over time in project execution (Söderlund, 2005) because, among other factors, the temporary nature of projects is a barrier to learning and transferring the knowledge acquired (Duffield & Whitty, 2016; de Souza et al., 2021; McClory et al., 2017). Therefore, Pemsel, Söderlund, & Wiewiora (2018) pointed out that to capture and execute projects well, PBOs must continually adapt to improvements in different parts of their organizations and constantly strive to learn from similar recurring projects. Similarly, Löwstedt, Räisänen, & Leiringer (2018) understand that there must be a double continuous learning flow: from the organization to projects and from projects to the organization.

In addition, for Salunke, Weerawardena, & McColl-Kennedy (2019), PBOs can purposefully create knowledge both in project execution and from interaction with customers, continually adapting its capabilities to deal with changing market conditions, which means developing DCs. Although the learning scenario imposed on PBOs presents difficulties (McClory et al., 2017), the development of DCs becomes important to reach a better performance in the face of competition, since higher order capabilities acquired can improve the detection and seizing of new opportunities (Killen & Hunt, 2013; Spanuth et al., 2020).

For Hermano & Martín-Cruz (2020), it is essential that PBOs develop PCs and that these capabilities are then transferred to the organization level, allowing it to develop DCs. PCs are distinct PBO competencies necessary for their sustainable performance in efficiently conducting different projects (Melkonian & Picq, 2011). PCs refer to the activities and structures required to manage the project efficiently throughout its life, from front-end engagement with customers, through project bidding and delivery (Davies & Brady, 2016; Hermano & Martín-Cruz, 2020; Melkonian & Picq, 2011).

To have a broader view of the projects and even identify their interdependences, the PBOs should be able to manage their portfolio of projects, the PPM. For Killen & Hunt (2013), PPM capability is a high-level capability in which managers engage with a variety of processes, methods, and tools for the continuous allocation and reallocation of resources in a portfolio of projects, to maximize their contribution to the overall success of the company. Thus, an organization that has competence in PPM will be able to effectively manage both concurrent projects and existing projects while developing new ones. PPM bridges the gap between PM and the company's strategy to achieve its goals and it is considered a DC (Stewart Clegg et al., 2018; Daniel et al., 2014; Killen et al., 2012; Petro et al., 2020).

3. Research Methods

Aligned with the research questions, the research design was a critical review (Klein and Mueller, 2020), combining bibliometrics and content analysis (Carvalho et al., 2013).

3.1 Sampling process

As we look for cross-fertilization process with neighboring disciplines (Davies et al. 2018), particularly innovation literature, we conduct the sampling process not only in PM Journals but also in two databases, Web of Science (Wos) and Scopus. The search strings in both databases in all fields were as follows:

("Dynamic capa*" and "Temporary organi*") OR ("Dynamic capa*" and "Temporary firm") OR ("Dynamic capa*" and "Project-based firm*") OR ("Dynamic capa*" and "Project-based organi*") OR ("Dynamic capa*" and "project management*") OR ("Dynamic capa*" and "project portfolio*") OR ("Dynamic capa*" and "project compan*") OR ("Dynamic capa*" and "project oriented organi*")

For the analyses we applied a document type filter, choosing only articles, reviews, and early access in the English language. In the WoS database, 99 articles were found. In the Scopus database, 78 articles were found, and comparing the articles found in the two databases, 39 articles were identified as repeated, thus totalizing 138 articles for analysis. Of these, seven could not be downloaded, which resulted in a total of 131 articles.

Following Zupic & Čater (2015) we then applied two selection criteria to the remaining 131 articles intending to exclude those articles not exactly tied to the research focus: 1) we verified whether the selected article articulated DCs as a relevant construct in the study; 2) the research context was PBO or PM. We reviewed the abstract or introduction of the articles to make sure these terms were clearly and directly related. As a result of this analysis, 54 articles were removed from the collection. Thus, 77 articles were separated for deeper content analysis,

aiming to understand which were the DCs related to PM found in them. Finally, other 15 articles which did not define relationships between DCs and PM in their study results were removed. The total sample was, therefore, 62 articles.

3.2 Data analysis

We applied a two-step data analysis, exploring bibliometrics and content analysis. In the first step, the bibliometric explored top journals and articles, aiming to create an overview of the body of knowledge. Besides, we developed thematic mapping and factorial analysis, applying Bibliometrix software (Aria & Cuccurullo, 2017).

The second step aims to provide an in-depth understanding of the key constructs through content analysis. We developed a coding book applying the abductive approach, going back and forth between data and theory (Linneberg and Korsgaard, 2019). Finally, we explored the relationship of the codes, applying cross-tabulation and network analysis through UCINET6 software (Borgatti et al., 2002)

4. Results

4.1 Sample demographics

The sample is composed of relevant academic journals. In total, 53 articles of the sample are from journals with an impact factor greater than 3.000 from the areas of production, management, information, business, innovation, project management, and marketing, as can be seen in the references. This variety of studied areas brought insightful concepts to this study. But, since the search string positioned the study at the intersection between DC, PBO, PM and PPM, the core sources in the sample are journals devoted to the PM field: International Journal of Project Management-IJPM (17 articles), International Journal of Managing Project in Business-IJMPB (9 articles), and Project Management Journal-PMJ (7 articles).

Looking further at the sample, Table 1 presents the top 15 authors, considering the most global cited and the most local cited documents. It is interesting to note that on this table the most found research subjects are PCs (Biedenbach & Müller, 2012; Davies & Brady, 2016; Martinsuo et al., 2014; Winch & Leiringer, 2016) and PPM (Killen et al., 2012; Petit, 2012; Voss & Kock, 2013). These productions have consistently influenced, for example, the field of PPM (Kock et al., 2016; Kock & Georg Gemünden, 2016) and PCs (Hermano & Martín-Cruz, 2020). We can observe that authors such as Killen, Petit, Davies, Biedenbach, Voss, Martinsuo, and Winch are present in both analyses, being the intersection between global and local citation. The global indicates that the document has been cited for research out of the collection and the local means the documents are very relevant for the research being conducted since the sample has cited them.

Table 1- Documents with Most Local and Global Citations

MOST CITED DOCUMENTS	LOCAL CITATION	GLOBAL CITATION
Petit, 2012, IJPM	9	100
Killen, 2012, IJPM	13	89
Davies, 2016, IJPM	10	88
Petit, 2010, PMJ	11	66
Winch, 2016, IJPM	6	66
Zhang, 2013, J Constr Eng Manage	0	66
Biedenbach, 2012, IJPM	7	65
Sderlund, 2009, IJPM	0	62
Killen, 2010, IJMPB	0	59
Davies, 2016, PMJ	8	55
Voss, 2013, IJPM	4	55
Salunke, 2019, Ind Mark Manage	0	55
Martinsuo, 2014, IJPM	2	51
Daniel, 2014, J Strateg Inf Syst	0	48
Killen, 2008, IJMPB	0	45

Graphically we can observe these citations through the network of co-citations presented in Figure 1. We can identify two clusters here: the dark grey cluster composed by references

related to DCs and PCs and the light grey cluster related mostly to PPM. Also important is the analysis of the most cited references of the sample. It can tell us the foundation of the studies, relating the constructs of this research. Not surprisingly, the seminal articles about DCs would appear as the most influential references, like Teece et al. (1997), Eisenhardt & Martin (2000), Teece (2007), Zollo & Winter (2002), and all of these are about DCs.

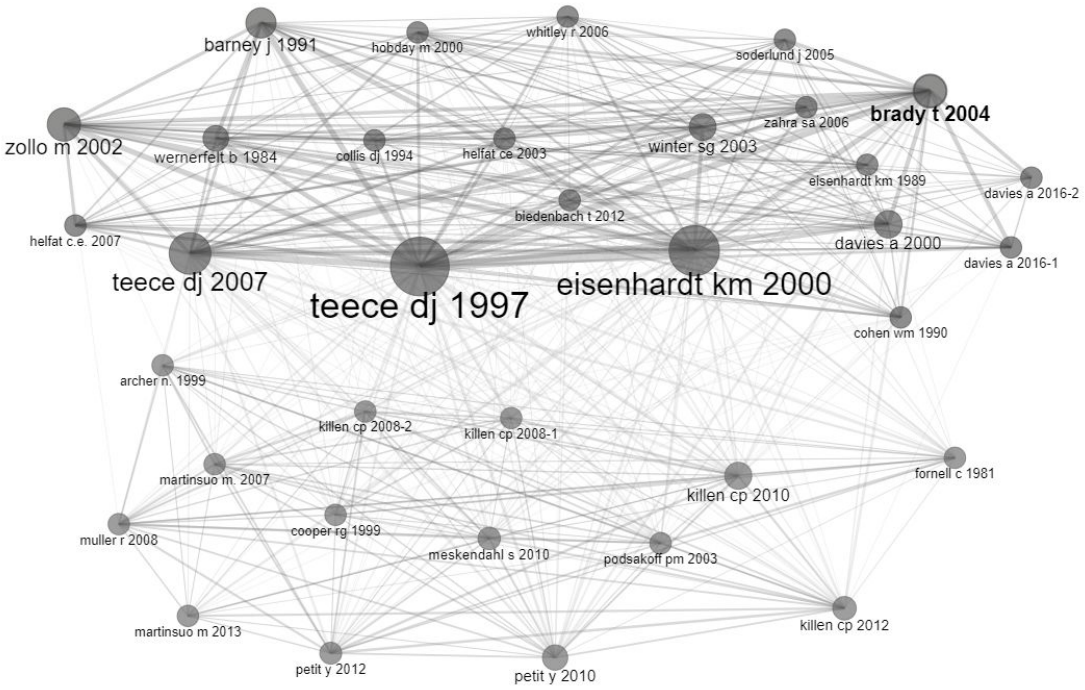

Figure 1 – Co-citation network

4.2 Trend topics and thematic evolution

Next, we explored the thematic map that classifies themes in four quadrants, according to Figure 2. We focus on the upper right quadrant that represents motor or driving themes. Motor themes are relevant, well-developed themes for structuring a research field, which present strong centrality and high density (López-Robles et al., 2020). The density in the graphic measures the internal connection force, while the centrality measures the strength of the connection of a cluster to other clusters (Kipper et al., 2020). A theme that permeates considerably the sample and is considered a motor theme is the articulation of knowledge

through Knowledge Transfer, Tacit Knowledge, Absorptive Capacity, and Learning Mechanisms. They are themes highlighted in this study and will be discussed later (Killen et al., 2008; Medina & Medina, 2017; Pemsel et al., 2018; Salunke et al., 2019; Yan et al., 2019). All these constructs are linked to the broader concept of Knowledge Management (KM). In fact, KM is a valuable construct for the development of DCs in projects (Cepeda & Vera, 2007). DCs are tied to integration, development, and management of knowledge. Additionally, Partner Selection Capability, Project Capabilities and Open Innovation appear here as motor themes and, therefore, are important constructs in the sample.

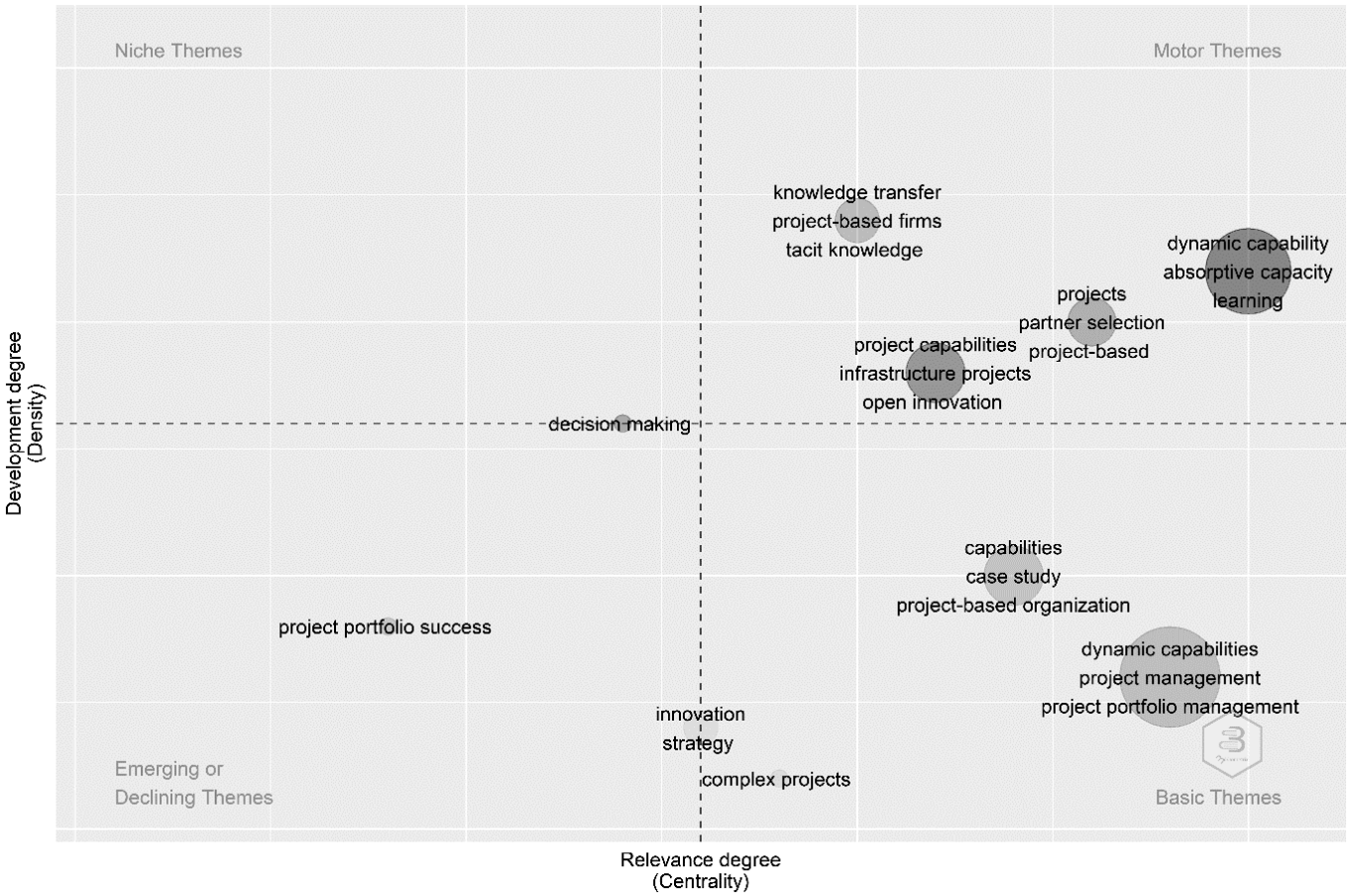

Figure 2 - Thematic Map: Author's Keywords

Finally, we explored multiple correspondence analysis, configured in two dimensions. The output was a map formed by two clusters of constructs (Figure 3). The clusters represent the proximity between the constructs in the sample and this can be useful to analyze their

relationships and, if necessary, possible classifications. Analyzing the central points of each cluster, we can associate the dark grey cluster with the field of strategic management and the light grey cluster with the field of project management. It is interesting to note that in the dark grey cluster we find dynamic capabilities closer to project portfolio management and strategy. It was expected to see all these constructs in the same cluster, as discussed in the literature review, since PPM should be found close to the strategic management theme (Davies & Brady, 2016; Jerbrant, 2013; Killen et al., 2012). At the same time, this cluster comprises Organizational Knowledge, Knowledge Transfer, and Absorptive Capacity, which means that learning internally or externally is an essential action related to DCs.

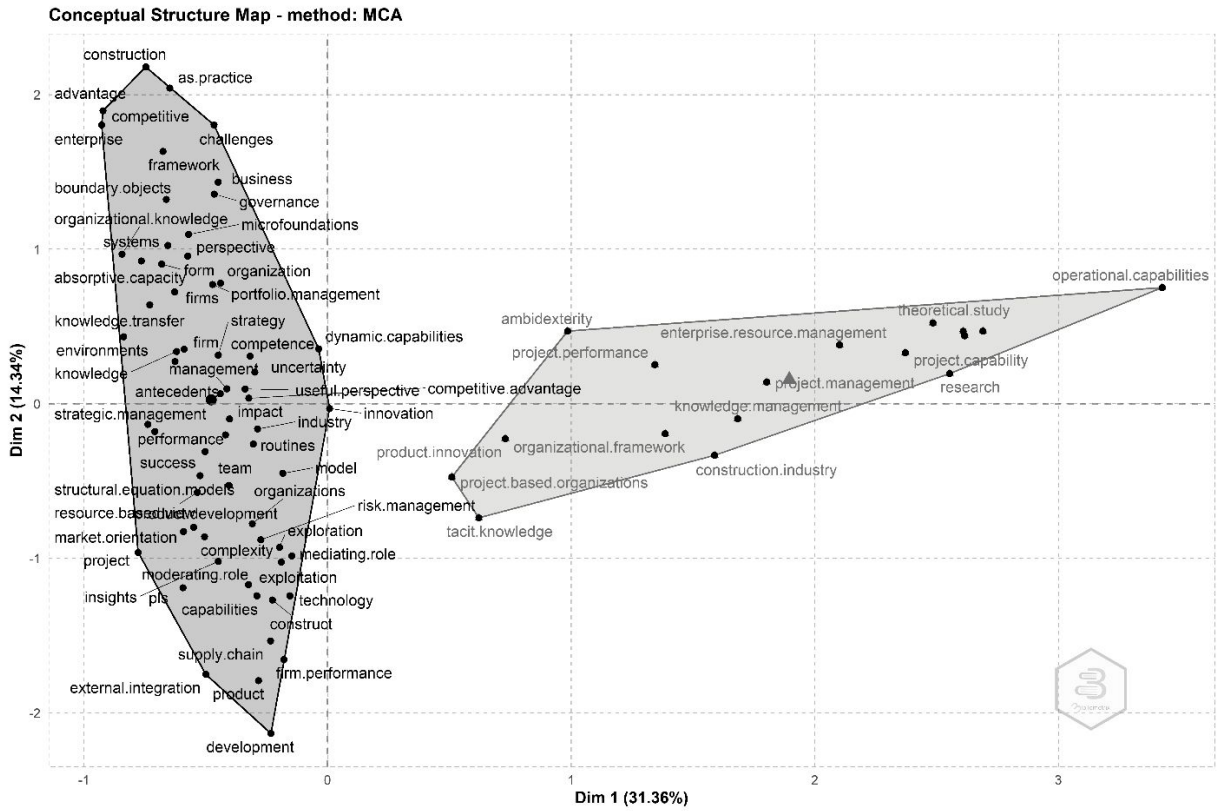

Figure 3 – Factorial analysis: multiple correspondence analysis

The light grey cluster shows Project Management almost in its center and it embraces PC, which is plotted near the operational capabilities. PC is the unit for the development of DCs in PBOs. This cluster involves KM and Tacit Knowledge, necessary constructs to leverage the learning from PC to other levels of the organization (Davies et al., 2016; Söderlund & Tell,

2009). Ambidexterity is found in this cluster. It refers to the ability the organization has to develop PC in complex or vanguard projects while managing well-known projects (Davies et al., 2016; Kock & Gemünden, 2019; Petro et al., 2020; Zerjav et al., 2018).

4.3 Coded Categories: study context

Evidently, due to the search filter used, all selected articles had as object of study or result at least one DC related to a PM, PPM or PBO environment. Thus, to understand the context and application of the DC studied, they were identified, classified, and grouped.

After reading the articles, when we started their grouping and classification, we realized that one DC could be classified differently depending on the study context in which it was included. Therefore, we considered crucial to identify the study context each article was aligned to, as an inductive content analysis (McKibben et al., 2020; Skjott Linneberg & Korsgaard, 2019) Hence, after further analyses of the sample, we found three clear study contexts: PM, PPM, and PBO. This grouping helped us understand better how to regroup the identified DCs under Teece´s (2007) microfoundations. The goal of all this classification is to compile a framework resulting from the analyses. Table 2 presents the summary of this grouping, including the studied context mentioned. Its details can be seen in Appendix A.

Although all studies relate DCs directly or indirectly to PM, 30.6 % (19) of the articles show how the development of Project Capabilities can influence the performance of companies or projects. Project Portfolio Management account for 29.0% (18) of the sample having PPM Capability as the main related DC. The other 40.3 % of the selection of articles (25) are studies in which DCs are directly related to the improvement of PBOs and these types of organization constitute the core of the study.

Table 2 – Context definition of the sample studies

Study Context	Approach	%	Articles IDs (appendix A)
Project Management (PM)	DCs are studied as a means to improve PM performance. Project Capabilities are the main DC in this group, embracing PM. PM is the main construct of the article.	30.6%	13,14,23,24,25,26,27,33,34,36,37,38,43,44,47,51,55,56,58
Project Portfolio Management (PPM)	PPM is a DC that bridges PM to the strategy. PPM can be linked to innovation or to allocation of resources and capabilities. Articles can approach service or product innovation projects.	29.0%	1,2,3,5,6,8,9,15,19,30,31,32,35,42,45,46,48,59
Project Based Organizations (PBOs)	DCs studied are related to the performance of PBOs. PBOs are central for the article considerations.	40.3%	4,7,10,11,12,16,17,18,20,28,29,39,40,41,49,50,52,53,54,57,60,61,62

4.4 Coded Categories: DCs found inside the articles

The DCs were identified through the argumentation the authors of the sample used in their articles, that is, since they described a Capability as a DC, this was respected and placed in Appendix A, in "Dynamic Capabilities" column. A total of 99 DCs were identified in the 62 articles. A summary of the main DCs found in the sample articles, their study context and microfoundations classification is presented in Figure 4.

Some articles identify DCs as Capabilities developed in the execution of projects, which seem to be more linked to contingent situations, not developed through strategic planning (Davies et al., 2016; Hermano & Martín-Cruz, 2020; Zerjav et al., 2018). They are Project Capabilities. The development of PCs is the basis for the company to generate learning and knowledge that can support it in the creation of DCs. PCs are included in articles of PM and PBO contexts. Although some articles have classified PCs as DCs (Braun & Sydow, 2019; Davies & Brady, 2016), they are lower level (Hermano & Martín-Cruz, 2020) or lower order DCs (Daniel et al., 2014).These DCs will not make the necessary transformation for the company to gain a competitive advantage if they do not evolve to a higher-level or first order

and, as in a continuous cycle, the company does not develop other lower-level DCs (Melkonian & Picq, 2011).

The skills created by PCs, when they are transformed into higher-level DCs and perceived by senior management, can improve the company's performance and consequently its image in the market, creating a competitive advantage, even if temporary. Observing figure 4 we can notice that Project Capability, KM Capability, and PPM Capability have strong connections with PBO studies. On the other hand, we can also see that there is an important number of studies regarding PPM Capability, Absorptive Capacity, and Innovative Capability in the field of Project Portfolio and Project Management. These DCs studied can be a source of improvement if applied to PBOs too.

	Study Context			%		Microfoundations		
Main Dynamic Capabilities	Project Portfolio Management	Project Management	PBO	Total	%	Sensing	Seize	Reconfigure
PPM Capability	13	4	6	23	23,2%	22	22	22
KM Capability	1	2	5	8	8,1%	0	0	8
Absorptive Capacity	3	3	2	8	8,1%	0	8	0
Innovative Capability	4	1	1	6	6,1%	4	2	0
Learning Capability	1	1	3	5	5,1%	0	0	5
Project Capability	0	4	5	9	9,1%	4	4	8
Ambidexterity	0	0	3	3	3,0%	3	1	1
Adaptive Capacity	2	0	0	2	2,0%	0	0	2
Sensing	16	12	13	41	26,6%	41		
Seize	17	16	16	49	31,8%		49	
Reconfigure	17	16	31	64	41,6%			64

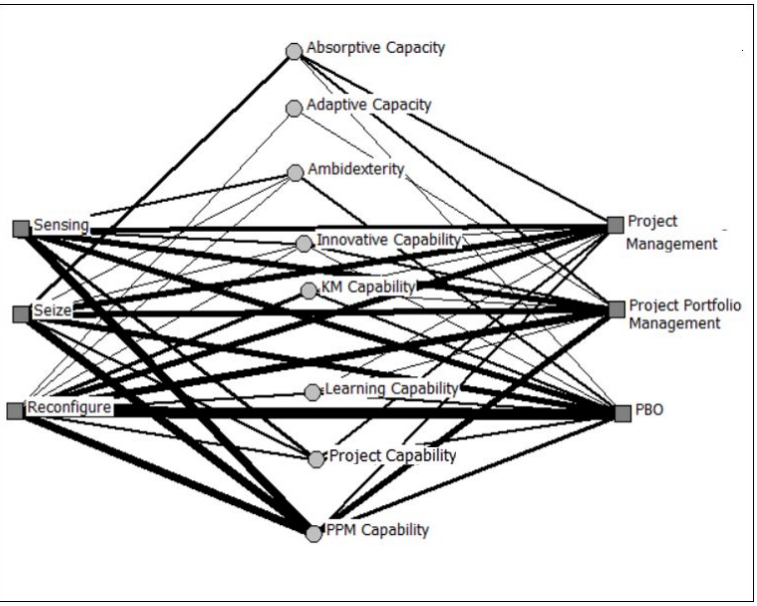

Figure 4 - Main DCs found and their classification

Note: Based on content analysis data using the UCINET6 software. Line thickness represents the intensity of relations. See Appendix A for the complete list.

In the field of Project Management, PPM Capability is considered a higher-order capability, which constitutes a necessary input for the development of DCs at the strategic level (Killen & Hunt, 2013; Kock et al., 2016; Melkonian & Picq, 2011). At this level, this DC can

make the company reach a new and more competitive position. It is not without reason that PPM Capability is a DC with 23.2% of the total DCs of the sample. At the same time, the company needs to ensure that DCs developed from PCs are registered and communicated to all levels of the organization and KM Capability can support the company in this objective (Chen & Fong, 2013). The importance of knowledge in the development of DCs is highlighted when the percentages of KM Capability and Learning Capability (LC) are added, resulting in 13.2% of the DCs in the studied selection. Ambidexterity figures in three articles or 3.0% of the sample. In some articles of the sample (Davies et al., 2016; Zerjav et al., 2018) ambidexterity in projects seems to be translated into flexibility, even improvisation in project execution or in the ability to execute routine projects and complex projects simultaneously. Other articles consider Ambidexterity as a DC related to the exploration of new or vanguard projects (Daniel et al., 2014; Hermano & Martín-Cruz, 2020; Kock & Gemünden, 2019).

4.5 Coded Categories: DCs classified as Sense, Seize and Reconfigure

After this identification, the DCs were classified and grouped following the concepts of Sensing, Seize and Reconfigure of the framework proposed by Teece (2007), through deductive content analyses (McKibben et al., 2020; Skjott Linneberg & Korsgaard, 2019). This last classification intended to evaluate the current configuration of DCs studies under the criteria used by Teece (2007) to group DCs microfoundations. The result of this grouping is also detailed in Figure 4. To make this classification, in addition to identifying the respective DC, it was necessary to understand the context in which it was studied, since this context may reveal a different group for the same DC. For example, PPM as a DC in the PPM context was classified as Sensing, Seize, and Reconfigure simultaneously, because it involves prioritizing projects to meet changing customer needs and the necessary preparation for that (Petit & Hobbs, 2010). At the same time, PPM from the PM perspective can be classified as Reconfigure, as the PPM concept for the latter case is predominantly linked to asset alignment and realignment (Teece,

2007). Moreover, the DC itself in some cases can belong to two different groups, as is the case of Ambidexterity, which involves exploration and exploitation actions, classified as Sensing and Reconfigure.

As seen in Figure 4, although Sensing is present in 26.6% of the DCs found in the sample, this proportion is mostly related to the PPM in the selection and prioritization of projects portfolio, according to market necessities and new opportunities. In the sample we can also see three articles correlated to the process of identifying target marketing segments and customer needs for innovation mentioned as microfoundations by Teece (2007). They are the DCs: Client-Focused Learning Capability, Marketing Orientation Capability, and Marketing Capabilities (Kurniawan et al., 2021; Nik Hashim et al., 2020; Salunke et al., 2019). Sensing is the group with the lowest number of DCs found.

In their article, Choi, Cho, Han, et al. (2018) analyze the strategies of two studied PBOs. They classify the diversification strategy as Sensing, but not its implementation. Diversification is an option to explore the market, technological innovation, and regionalization. This can determine the company's expansion and can create a competitive advantage. However, when implemented, this capability is characterized as Reconfigure in Teece's (2007) framework, as it mobilizes company resources and can bring top management closer to the client and its market.

Analyzing the results of the classifications in Figure 4, we notice that most of the identified DCs are in the Reconfigure group (41.6%). A factor that helps explain this important percentage is that the articulation of KM and LC belongs to this group and figures in most studies, as mentioned before. Furthermore, we consider that the DCs that address the alteration and recombination of company resources are also included in Reconfigure (Teece, 2007).

The Seize group in figure 4 corresponds to 31.8% of the DCs found. The main DC in this group is Absorptive Capacity with 8.1%. Developing AC, companies can acquire external

knowledge, learn this knowledge in sequence, and then use it in future projects (Biedenbach & Müller, 2012; Hullova et al., 2019). AC is a planned action for companies to capture value and it is in the group of microfoundations that Teece (2007) calls "Selecting enterprise boundaries". Other DCs associated with the Seize group were: External Information Acquisition, Alliancing Capability, Networking Capability, and Partner Selection Capability (appendix A). All these DCs seem to translate a relationship with partners who support the company in its quest to capture value through assets it does not own. Teece (2007) argues that companies need to avoid the prejudice of technologies that come from abroad and improve their ability to acquire external resources.

When reading all the sample articles, we realized that even those in which the identified DCs were not directly related to Knowledge or Learning, these two constructs seemed to be present somehow as a basis for the development of the DCs in the study. Due to this perception, we decided to verify the incidence of the words Knowledge and Learning in all 62 articles. According to Zupic & Čater (2015), when words co-occur frequently in documents, concepts behind these words are closely related. Thus, an RPA (Robot Process Automation) application called KeywordSearch, conceived from the UiPath Orchestrator software was used to automatically scan all sample articles. This application was configured to search the keywords (7344 in total) of the main DCs found in the articles. They were Knowledge (28.9%), Learning (17.8%), Portfolio (17.7%), Innovative (26.6%), Absorptive (3.7%), Ambidexterity (3.6%), Adaptive (1.6%). The relevance of Knowledge and Learning in the general context of the identified DCs is then widely recognized. Moreover, according to Killen et al. (2008), the practice of learning activities involving tacit experience accumulation, explicit knowledge articulation, and explicit knowledge codification can support the development of DCs.

5. Discussion and framing

The analyses performed in this study could answer RQ # 1: What are the main DCs identified in PM literature? We identified and analyzed a total of 99 DCs in the collection. A total number of 42 different DCs were verified. From figure 4 we have noticed that most of the identified DCs are in the Reconfigure group of microfoundations (41.6%) mainly related to KM Capability, alteration, and recombination of company resources (Teece, 2007). On the other hand, the classification revealed that the Sensing group counts with a lower percentage of DCs (26.6%), mainly related to PPM Capability. Studies in this field should expand their focus to include more DCs that help PBOs detect opportunities and threats, as the DCs already studied in this sample: Innovative Capability, Market Orientation Capability, Client-Focus Learning Capability, Ambidexterity, and others.

Based on this literature review, it was possible to answer RQ # 2: What are the main elements for developing DCs in different levels (project, portfolio and PBO)? The study presented knowledge as a valuable construct for this objective (Cepeda & Vera, 2007; Killen et al., 2008). PBOs can purposefully create knowledge both in project execution and from interaction with customers, adapting it to changing market conditions (Salunke, Weerawardena, & McColl-Kennedy, 2019). The study also emphasized that the development of DCs in PBOs begins at the more operational level of projects, as companies acquire Project Capabilities (Adam et al., 2019; Davies & Brady, 2016; Lobo & Whyte, 2017; Melkonian & Picq, 2011). Project Capabilities foster the learning PBOs need to develop DCs, and this learning must be transferred to the organizational level (Hermano & Martín-Cruz, 2020). In this sense, PPM can help PBOs to effectively manage concurrent projects while developing new ones. Even though PPM is a DC most present in the innovation articles, PBOs will benefit from developing this DC. PPM would facilitate the learning from projects, and it bridges the gap between PM and

the company's strategy (Killen et al., 2012). Therefore, PBOs must face the challenge of learning from projects, creating the necessary mechanisms for that.

The proposed framework of Figure 5 answers RQ # 3: How can a multi-level framework represent the core DCs and microfoundations? The three groups of microfoundations by Teece (2007), sensing, seize, and reconfigure appear in all three levels of the framework, and in each one of the levels they should be continuously active. At the same time, there should be a double flow of sensing, seize, and reconfigure between the levels. It means that the DCs at all these levels are correlated to actions of detecting opportunities in the market, preparing the company to take advantage of them, and reconfiguring its assets to make them work. DCs will help PBOs expand their capacity to deal with new technologies and solutions. The framework lists the core DCs into three levels, PM as a lower level, PPM as a middle level, and at the third level, PBO and its strategy. The framework also shows a constant flow of knowledge among the three levels of DC creation. This knowledge flow will be responsible for the development of DCs that can make PBOs develop a competitive advantage that can be sustainable (Biedenbach & Müller, 2012; Chen & Fong, 2013; Hermano & Martín-Cruz, 2020). Ambidexterity, as already mentioned, has a greater focus on exploring new business potentials. Client necessities can be a source of Learning Capability. The PPM level is devoted to managing the portfolio that can bring more return for the PBO by choosing the correct project in which to invest, be it novel or even those already developed by the PBO (Kock, Heising, & Gemuenden, 2016).

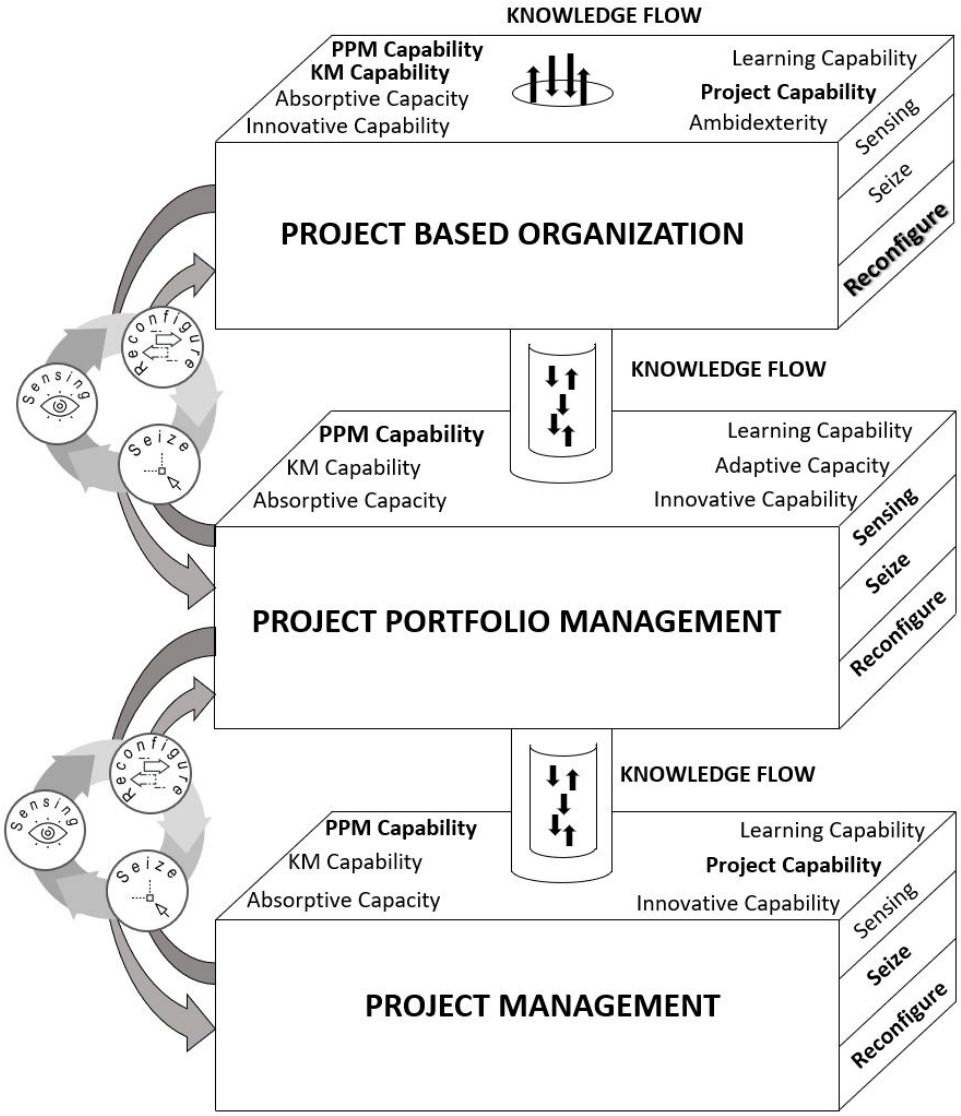

Figure 5 – Framework of Dynamic Capabilities developed for PBO

Content analysis together with the thematic map and multiple correspondence analysis made it possible to recognize the trends and remaining gaps in the studied field, answering RQ # 4: What are the unexplored trends and the remaining gaps in the field? The motor themes presented in figure 2 showed that Knowledge Transfer, Tacit Knowledge, Absorptive Capacity, Learning, Partner Selection Capability, and Open Innovation are trend constructs. As already discussed, the literature concerning DCs in the PBO/PM field has a large avenue for new research regarding Open Innovation and partnerships. Partner Selection Capability, for example, can be a crucial DC when the PBOs are facing a challenging project opportunity and, therefore, should be better explored. Moreover, the authors in the collection did not present

entrepreneurship as relevant for the development of DCs. None of the articles approached this construct in the studied field, what may be considered a gap, too. With the proposed framework, we argue that studies relating the development of DCs in the PM field must account for three levels: PM level, PPM level, and PBO level.

6. Conclusions, limitations, and future research

This paper contributes to the literature by in-depth surveyed 62 articles on DCs in PM literature. It identified 99 DCs and critically analyzed them, looking for the core DCs. Since the DCs extracted from the surveyed articles were approached differently according to the level of analysis, we had to inductively find out the perspectives adopted in the papers studied. Afterward, we classified the DCs according to Teece's (2007) microfoundations framework to show their distribution in its sense, seize, and reconfigure. As a result, we proposed a DC multilevel framework into three levels: project management, project portfolio management, and project-based organization.

Our study showed that knowledge is the greatest asset to be created, developed, and protected by PBOs. As these companies are inserted in an environment of constant technological change, they need to use knowledge as a vector for generating PCs. PBOs will not create a sustainable competitive advantage by only having PCs. PCs must be developed in the execution of projects, transformed into a company asset, and made able to permeate the PM environment to facilitate the work of project managers in their search for efficiency and competitiveness. This more efficient management of projects, if cyclical, can generate a competitive advantage. However, it will only be sustainable if there is a balance between routine projects and projects that are not yet part of the company's portfolio, whether due to technological innovation, segmentation, or diversification.

Following this line, this study sought to demonstrate that PPM is the second level of DCs to be targeted by the PBOs. PPM capability is a DC subservient to the company's strategy and must be used to drive it within the guidelines outlined by top management. The framework developed in this study can help managers to interpret DCs at their respective levels.

Our study, therefore, contributes to the theory by providing new insights into DCs development in the field of PM, revealing that this may be possible when this construction is done at three levels according to the proposed framework: PM (first level), PPM (second level), and organization or PBO (third level). The current literature presents the development of DCs through the learning flow in PM for the organization, but it does not detail an intermediate level, nor does it clarify what each of the levels is. Thus, showing that there should be a bridge connecting these levels and that the knowledge acquired in project execution must be the vehicle for this connection is the main contribution of this study.

Our findings also contribute to the practice by demonstrating that managers must be aware of the knowledge generated in the execution of PBOs projects in order to analyze how this knowledge can be stored and retained in the organization. By doing so, they facilitate the execution and management of similar projects and the analysis of the project portfolio acquisition in accordance with the company's strategy. Furthermore, project and line managers can analyze the DCs extracted from this study, so that they can similarly identify those that apply to their activity and others that can be built, using the proposed framework as a guide.

As a limitation, we can mention that since this study is a literature review and the number of articles in the sample is relatively small, the generalization of the results found may be compromised. The search string configured by itself may have narrowed the number of articles in the sample, constituting a limiting factor. Besides, the companies studied whether in

the case studies or surveys of the sample, were mostly construction companies, which for this study may also have brought analyses restrictions.

For future studies, we suggest discussing the gap found in the correlation between PBOs, DCs, and Entrepreneurship. Analyzing the Sensing grouping, the absence of the entrepreneurial orientation (EO) construct was noticed. The articles did not present, for example, EO as relevant for the development of DC, although both Helfat & Peteraf (2015) and Teece (2014) have argued that entrepreneurship is essential to detect opportunities since the entrepreneur interprets the existing information differently. Another interesting initiative would be the path-dependent analysis of DCs in PBOs. This study could relate low complexity and high complexity projects in PBO, classified as small or large businesses. In the articles of the sample, there is no study highlighting the importance of transferring the knowledge generated in the projects to the PBOs marketing and sales areas and how this can be transformed into DCs through portfolio selection and project trade-offs still at the front-end stage.

Appendix A: Dynamic Capabilities found in the study sample

ID	Article	DC
1	Kashan & Mohannak (2014)	KM(REC)
2	Kock *et al*. (2016)	PPM(SEN,SEI,REC)
3	Daniel *et al*. (2014)	IS PPM(SEN,SEI,REC)
4	Arena *et al*. (2014)	PPM Risk Management(SEN,SEI,REC)
5	Biedenbach & Müller (2012)	Absorptive Capacity(SEI) Adaptive Capability(REC) Innovative Capability(SEN)
6	Killen *et al*. (2012)	Absorptive Capacity(SEI) PPM(SEN,SEI,REC)
7	Lobo & Whyte (2017)	Digital Align Capability(SEI) Reconciling digital Capability(REC)
8	Kock & Georg Gemünden (2016)	Innovation PPM(SEN,SEI,REC)
9	Spieth & Lerch (2014)	Innovation PPM(SEN,SEI,REC)
10	Melkonian & Picq (2011)	PC(SEN,SEI,REC)
11	Manley & Chen (2017)	Absorptive Capacity(SEI) Learning Capability(REC)
12	Pemsel *et al*. (2018)	KM Knowledge governance capability(REC)
13	Nik Hashim *et al*. (2020)	Market Orientation Capability(SEN) Technological capabilities(SEN) Team organization capabilities(REC)
14	Hullova *et al*. (2019)	KM Knowledge Integration Component(REC) Capability to identify the complementarity(SEI) Capability to leverage the outputs and learnings(REC)
15	Kodama (2017)	Innovative Capability(SEI)
16	Löwstedt *et al*. (2018)	PPM(SEN,SEI,REC)
17	Davies *et al*. (2016)	PM Ambidexterity(SEN,SEI,REC)
18	Choi Cho Han *et al*. (2018)	Decentralization(SEI) Diversification(SEN)
19	Killen &Hunt (2010)	PPM Capability(SEN,SEI,REC)
20	Mainga (2017)	Learning Capacity(REC) Knowledge Transfer(REC) KM(REC)
21	Sohani & Singh (2016)	Tacit Knowledge Development(REC)

ID	Article	DC
35	Killen & Hunt (2008)	PPM(SEN,SEI,REC) Learning Capability(REC)
36	Medina & Medina (2017)	Absorptive Capacity Learning Capability PPM
37	Al-Hanshi *et al*. (2020)	Project Control and Monitoring(SEI)
38	Kurniawan *et al*. (2021)	Networking Capability(SEI) Balanced APM capability(REC) Market Orientation Capability(SEN)
39	Jerbrant (2013)	PPM(SEN,SEI,REC)
40	Petro *et al*. (2020)	PPM(SEN,SEI,REC) Alliancing Capability(SEI) Ambidexterity(SEN)
41	Winch & Leiringer (2016)	Owner Project Capabilities(REC)
42	Clegg *et al*. (2018)	PPM(SEN,SEI,REC)
43	Zerjav *et al*. (2018)	Reconfiguring project capabilities(REC) Adapting project capabilities(SEI) Maintaining project capabilities(REC)
44	Kock & Gemünden (2019)	PPM(SEN,SEI)
45	Petit (2012)	PPM(SEN,SEI,REC)
46	Petit & Hobbs (2010)	PPM(SEN,SEI,REC)
47	Vicente-Oliva *et al*. (2015)	Absorptive Capacity(SEI)
48	Killen & Hunt (2013)	PPM(SEN,SEI,REC)
49	Braun & Sydow (2019)	Partner Selection Capability(SEI)
50	Zhang *et al*. (2013)	Anticipation Capability(REC) Reaction Capability(REC)
51	Drouin & Jugdev (2014)	Innovative Capability(SEN)
52	Spanuth *et al*. (2020)	Innovative(SEI) Capability Strategic Flexibility(SEN,SEI,REC)
53	Salunke *et al*. (2019)	Episodic Learning Capability(REC) KM Knowledge Integration Capability(REC) Client-Focused Learning Capability(SEN)
54	Adam & Lindahl (2020)	PM Capability for Resource Allocation(REC)

22	Davies & Brady (2016)	PC creation(REC)
23	Guertler & Sick (2021)	PM to enhance sensing capabilities(SEN)
24	Ichsan & Sadeli (2020)	PPM capabilities(SEN,SEI,REC)
25	Bernroider *et al*. (2014)	External information acquisition (SEN,SEI) Decision Making and Evaluation(SEI) IT Governance(REC)
26	Melo *et al*. (2020)	PM Capability for Open Innovation(REC)
27	Urhahn & Spieth (2014)	PM Governance(SEI)
28	Rungi (2015)	PPM capabilities(SEN,SEI,REC) PC(REC)
29	Wang & Wang (2019)	Integration Capability(REC) Learning Capability(REC)
30	Martinsuo *et al*. (2014)	PPM(SEN,SEI,REC)
31	Voss & Kock (2013)	PPM(SEN,SEI,REC)
32	Sicotte *et al*. (2014)	Innovative Capability(SEN)
33	de Souza *et al*. (2021)	Absorptive Capacity(SEI) KM(REC)
34	Yan *et al*. (2019)	PC(SEI)
55	Rungi (2014)	PPM Capabilities(SEN,SEI,REC) PM Capabilities(SEN,SEI,REC) Strategic Alignment(SEN)
56	Hossein & Aurum (2012)	defect-removal capability and funcionality-enhancement capability(REC)
57	Lutz & Ellegaard (2015)	Routines to Mobilize Resources(REC)
58	Soderland & Tell (2008)	PC(REC)
59	Biedenbach (2011)	Adaptive Capability(REC) Absorptive Capacity(SEI) Innovative Capability(SEN)
60	Hermano & Martín-Cruz (2020)	Absorptive Capacity(SEI) Ambidexterity(SEN) PC(SEN,SEI,REC) KM Capability(REC)
61	Hermano & Martín-Cruz (2016)	PPM(REC)
62	Chen & Fong (2013)	KM Capability(REC)

MF (SEN) Sensing, (SEI) Seize, (REC) Reconfigure; (KM) Knowledge Management, (AC) Absorptive Capacity, (IC) Innovative Capability, (LC) Learning Capability, (AB) Ambidexterity, (AD) Adaptive Capacity, Project Capability (PC)

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