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Project Management in the Development of Dynamic Capabilities

Vânia Isabel Sousa Patrício

PhD in Management

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November, 2021

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Dedico todo este trabalho e toda a minha vida à minha doce e única Ema…

Tudo por ti…

Adoro-te…

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Resumo

A gestão de projetos (GP) tornou-se fundamental para a gestão. É através dos projetos que as organizações implementam estratégias e desenvolvem capacidades e recursos. No entanto, a literatura reflete a dificuldade de se replicar conhecimento de projeto para projeto, assim como desenvolver e absorver o conhecimento adquirido nos projetos nas rotinas e na operação. Esta situação acentuou a importância da investigação em capacidades dinâmicas (CDs). O objetivo desta tese é investigar como é que a GP alavanca as CDs nas organizações. Após a revisão de literatura, foram utilizados métodos mistos como metodologia: análise qualitativa no estudo sobre a GP no desenvolvimento das CDs e análise quantitativa no estudo do impacto da GP na transformação de capacidades. Os resultados apontam para a importância da inter-relação das duas áreas no sucesso das organizações sendo a GP fornecedor de conhecimento empírico que, através das suas práticas, acumula, integra, utiliza e transforma capacidades, facilitando a aprendizagem contínua nas organizações. A investigação apresenta as boas práticas de GP que permitem às organizações desenvolver e transformar capacidades, através da acumulação, integração, utilização e reconfiguração de conhecimento adquirido nos projetos, alavancando assim CDs. Este estudo contribui para a discussão teórica e empírica de como é que a GP transforma conhecimento adquirido em projetos em rotinas, práticas e conhecimento que permitem às organizações desenvolver e transformar capacidades de forma a responder rapidamente e sistematicamente aos desafios internos e externos, fornecendo desta forma um importante contributo para as organizações e academias no desenvolvimento de CDs através da GP.

Palavras-chave: Gestão de Projetos, Capacidades Dinâmicas, Transformação de Capacidades

JEL Codes*:*M10, O22

Abstract

Project management (PM) has become fundamental to management. It is through projects that organizations implement strategies and develop capabilities and resources. However, the literature reflects the difficulty of replicating knowledge from project to project, as well as developing and absorbing the knowledge acquired in projects into routines and operations. This situation has accentuated the importance of research in dynamic capabilities (DCs). The objective of this thesis is to investigate how PM leverages DCs in organizations. After the literature review, mixed methods were used as methodology: qualitative analysis in the study on PM in the development of DCs and quantitative analysis in the study of the impact of PM on the transformation of capabilities. The results point to the importance of the interrelation of the two areas in the success of organizations being the PM provider of empirical knowledge that, through its practices, accumulates, integrates, uses and transforms capabilities, facilitating continuous learning in organizations. The research presents good PM practices that enable organizations to develop and transform capabilities, through the accumulation, integration, use and reconfiguration of knowledge acquired in projects, thus leveraging DCs. This study contributes to the theoretical and empirical discussion of how PM transforms knowledge acquired in projects into routines, practices, and knowledge that enable organizations to develop and transform capabilities in order to respond quickly and systematically to internal and external challenges, thus providing an important contribution to organizations and academia in developing DCs through PM.

Keywords: Project Management, Dynamic Capabilities, Capabilities Transformation

JEL Codes*:*M10, O22

Index

List of Figures

List of Tables

List of Abreviations

DCs	Dynamic Capabilities
PM	Project Management
VRIN	Valuable, Rare, Inimitable and Non-substitutable
RBV	Resource-Based View
VRIO	Value, Rarity, Imitability, Organization
LR	Literature review
PCs	Project Capabilities
OCs	Operational Capabilities
CM	Change Management
CI	Continuos Improvement

CHAPTER 1

Introduction

1.1. Context

Organizations need to adapt and anticipate changes in order to survive in the market (O'Reilly & Tushman, 2008). Capability can be defined as a set of routines, or a high-level routine (Winter, 2003). Routines refer to learned, standardized, repetitive behaviours (Winter, 2003). Dynamic means change (Winter, 2003).

Research on dynamic capabilities has been intensifying (Di Stefano et al., 2010). As a result, there is a variety of concepts and definitions (Di Stefano et al., 2010). DCs can be defined as a standardization of an activity that is collective, and through it the organization is able to generate and modify its operational routines in order to obtain competitive advantage (Zollo & Winter, 2002). As they are linked to the ability to change other capabilities at the organization level, they are called higher order capabilities (Winter, 2003). Capability is the result of how the organization integrates a set of critical resources (Cardeal & António, 2012).

The ability of organizations to respond systematically and in advance to these alterations is known as DCs (Teece et al., 1997). Teece et al. (1997) argue that DCs are related to the ability of organizations to integrate, develop and reconfigure competencies at the internal and external levels to be able to systematically and quickly accommodate the changes in the environment.

According to Davies and Brady (2016), more research is needed to understand how dynamic capabilities interrelate to deal with the challenges of managing the myriad conditions encountered in complex projects and continually develop capabilities.

Zollo and Winter (2002) mention that definitions in the literature (such as that of Teece et al., 1997) explain why companies need to develop DCs, but argue that it is necessary to better understand where they come from. DCs are considered a very important area in management (Davies et al., 2016, p. 27).

To carry out projects it is necessary knowledge and skills in management, technology and in the sector in which it operates, thus making the learning in organizations occur mostly through projects (Freitas & Salerno, 2018). Since it is through projects that organizations solve problems, transform and reinvent their business.

It is important to understand empirically how organizations learn through projects (Hermano & Martín-Cruz, 2016). The associated challenge arises of how organizations transform themselves permanently.

Changes in capabilities can be triggered by the collaboration of teams, which is increasingly demanded (Clegg et al., 2018). It is through this relationship between DCs and Project Management (PM) that organizations (re) configure resources, changing them, innovating them and developing capabilities to respond to the dynamics and speed required (Daniel et al., 2014; Hermano & Martín-Cruz, 2016).

1.2. Research Problem

Organizations solve problems through projects. Projects are carried out through project teams. Due to the nature of the projects, which are something with temporary effort, with a defined start and end (PMI, 2017), there is the challenge of understanding how the knowledge is accumulated, integrated and used (Eriksson, 2014; Medina & Medina, 2015), in other words, how it is integrated, absorbed and maintained in the organization (Bernroider et al., 2014), in the processes, in the people after the end of the project and its passage to operation (Biesenthal et al., 2019).

As well as it remains to be empirically explored how projects ensure that the capabilities developed in these projects are transformed, replicated from project to project and embedded in routines (Davies & Brady, 2016). Authors have argued that more research is needed on the contribution of projects to the development of DCs, in an attempt to support the dissemination of the knowledge that is acquired in projects in other future projects, in routines (Davies & Brady, 2016; Eriksson, 2014; Medina & Medina, 2015).

As well as in deepening the knowledge of how the PM facilitates the accumulation, integration, use and transformation of capabilities in organizations, in order to develop DCs (Eriksson, 2014). Investigating how PM and change management (CM) can facilitate the integration of knowledge from projects to the operation remains a topic to be explored (Biesenthal et al., 2019).

According to Bernroider et al. (2014), there is a need to deepen the knowledge of how to develop the ability to integrate and absorb knowledge from projects in the organization.

It thus becomes important to solve the research problem of how project management leverages dynamic capabilities. Thus, the research problem of this investigation is to identify how Project Management leverages Dynamic Capabilities.

1.3. Thesis structure

The structure of the thesis begins with the introduction, where there is a brief context about the importance of DCs and PM, the explanation of each article presented, the basic theoretical framework used about DCs, PM and the inter-relationship between DCs and PM, followed by the research gaps and objectives (research objectives and research questions). It ends in the research summary of the whole thesis.

After the introduction (chapter 1), being a thesis based on articles, the 3 articles conducted are presented: chapter 2 presents the paper about systematic literature review on the inter-relationship between DCs and PM; chapter 3 presents the paper with a qualitative study focused on the role of PM in the development of DCs; chapter 4 presents the paper with quantitative study focused on Key Project Management practices for capability transformation.

In chapter 2, the study focuses on a systematic literature review of the interrelationship between DCs and PM contemplated in a paper, bringing as an added value the understanding of the existing relationship in the literature review (LR) between DCs and PM, as well as the detailed identification of existing DCs and concepts in PM.

This study presents a concept map with the interconnections and concepts found in the LR, in order to obtain a global and summarised view of the internal and external interrelationships of DCs, allowing for an understanding of the concept of DCs in PM. It was analyzed 25 articles, published between 2014 and 2019 focused on the concepts of Dynamic Capabilities and Project Management.

Chapter 3 presents the qualitative study in a paper, which explains how PM ensures the accumulation, integration, utilization and reconfiguration of DCs. It also addresses how the PM develops DCs through the identification and implementation of opportunities generated in the PM (sensing and seizing).

It also identifies how PM can develop DCs through its interrelationship with change management and continuous improvement in order to facilitate the processes of utilization, reconfiguration and sezing in DCs in organizations. The article aims to identify and understand what good PM practices, techniques and tools should be implemented to develop DCs, in order to enable the accumulation, integration, use and reconfiguration of capabilities, through these DCs processes of Eriksson (2014) as a theoretical basis, as well as to understand through the sensing and seizing processes (Teece, 2007), how PM methodologies, such as waterfall and agile, can develop and reconfigure DCs (Biesenthal et al., 2019).

It also examines how knowledge is accumulated from project to project, given the nature of resource turnover in PM. Twenty-two semi-structured interviews were conducted with 22 participants from 9 companies from different industries. This qualitative study contributes to a theoretical and empirical knowledge of how PM transforms knowledge that is acquired in projects into routines and practices that allow organizations to develop or reformulate capabilities. It allows organizations and academia to know the good practices that PM should develop and implement in order to leverage DCs in organizations, allowing them to accumulate, integrate, use and transform capabilities, as well as to facilitate sensing and seizing processes.

Chapter 4 presents the quantitative study in a paper that aims to empirically identify factors and practices that significantly facilitate the possibility of PM practices to transform capabilities, using measurement scales with PLS-SEM.

This paper aims to empirically investigate the possibility that PM practices promote the transformation of capabilities. 141 surveys of professionals with experience in projects were analyzed. This study identifies and consolidates through a quantitative analysis, the practices and factors that facilitate the accumulation, integration, use and that lead to the reconfiguration of knowledge acquired in projects. This study thus contributes to the academia and organizations, as well as to the development of DCs through the PM, to the extent that it identifies the main PM practices that facilitate the possibility of the project management to transform capabilities, leveraging DCs.

Finally, the conclusions of each paper that are interrelated, the theoretical contributions, managerial implications, limitations and future lines of research are presented.

In addition to the three papers (one of them is in forthcoming and two are published), a international conference paper was also held and published, with an initial empirical essay with a brief review on the state of the art of DCs trends.

This contemplates a brief literature review of DCs, proposing to guide the following phases of the study and in the higher-level understanding of what DCs are. It focuses on a brief analysis of the state of the art of the literature on DCs in the last 10 years and its relationship with management and competitive advantage. Its contribution is related to understanding the concept and importance of DCs for organizational competitive advantage present in the existing literature, the main theoretical concepts associated and the understanding of the benefits of the development of DCs by organizations. This conference paper promotes a brief review of the existing literature on DCs in the last 10 years and understand the challenges of DCs in future research. The formal acceptance of the conference proceedings and the study where the empirical essay was presented is in attachment D.

1.4. Theoretical background

1.4.1. Dynamic Capabilities

In 1991, March launched the concepts of exploration and exploitation. Exploration is a concept related to research, innovation; exploitation with internal optimization, efficiency and the challenge of organizations being able to respond simultaneously (ambidexterity). In 1994, Teece and Pisano introduced the concept of DCs in the literature as a response to the limitations pointed out by the resource-based view (RBV) (Teece & Pisano, 1994). They appear as an extension of the resource-based view (RBV) (Easterby-Smith & Prieto, 2008), which define the concept of VRIN (valuable, rare, inimitable, nonsubstitutable) as the fundamental for sustainability and competitive advantage (Barney, 1991). With dynamic markets and environments, this concept has become limited (Eisenhardt & Martin, 2000).

DCs emphasize the continuous reconfiguration of resources (Teece et al., 1997; Eriksson, 2014) and are more process oriented (Eriksson, 2014). DCs are associated by several authors with the ability of organizations to systematically anticipate change (Teece et al., 1997). They are related to sustainable superior performance (Wilden et al., 2013). DCs are associated to renewal of capabilities and resources and responsiveness, facilitating the competitive advantage of organizations (Easterby-Smith & Prieto, 2008). Several concepts associated with DCS have emerged in the search for its understanding (table 1).

Table 1 - Concepts of Dynamic Capabilities

Authors	Dynamic capabilities settings
Teece, Pisano and Shuen (1997)	Ability to integrate, reconfigure and develop internal and external competencies so that the organization quickly and systematically adapts to the dynamic environment and obtains competitive advantage.
Eisenhardt and Martin (2000)	Dynamic capabilities are a set of specific, identifiable processes (product development, strategies and alliances). They associate DCs with the organization's best practices and processes that use resources to integrate, reconfigure, associating the concept with the ability to respond to market changes.
Teece (2007, 2014)	The author relates DCs to the concept of sensing: understanding what the market wants; seizing: related to capturing opportunities for the organization; and continuous renewal (transformation).
Easterby-Smith and Prieto (2008)	Learning capabilities act as DCs while operational capabilities are visible outputs of DCs. They relate DCs to resource renewal for new capabilities and competencies.
O'Reilly and Tushman (2008)	Relates DCs to the concept of ambidexterity: the ability of organizations to simultaneously "explore" and "exploit": exploration - creation, research, autonomy, innovation, variation; exploitation: within the organization, efficiency, increased productivity, control, certainty and reduction of variation.
Ambrosini and Bowman (2009)	DCs are associated with the development of the most appropriate resources, transformation and renewal of resources. They refer to four main processes: reconfiguration, leveraging, learning and creative integration.

Source: Authors' own elaboration, 2021

Teece launched the concepts of sensing, seizing and transformation as DCs, which arise with microfoundations, consisting of processes, organizational routines and skills (Teece, 2007, 2014). Sensing is related to the capacity of organizations to understand what the market wants, the opportunities; seizing means to capture these opportunities for the organization and to be able to respond to what this capture implies; developing the capacity to continuously renew the capabilities (transformation) (Teece, 2007). Dynamic capabilities implies change (Winter, 2003). The way organizations develop capabilities is related to the way they acquire knowledge (Pandza, 2003).

In 2014, Eriksson conducted a study on DCs, where he identified four fundamental processes of DCs based on existing empirical research on DCs: knowledge accumulation, knowledge integration, knowledge utilization, and knowledge reconfiguration. Knowledge accumulation relates to the replication of existing knowledge or its renewal, linking external sources with internal learning (Eriksson, 2014). Knowledge integration combines diverse resources, linking existing knowledge with new knowledge, which is acquired through external sources. Integration facilitates the accumulation of knowledge (Eriksson, 2014). The utilization process occurs when the organization uses the accumulated and integrated knowledge that tends to be subconscious. Utilization is related to codification of knowledge (Eriksson, 2014). The reconfiguration process involves generating new combinations of existing knowledge or boosting the knowledge that exists for new purposes and in new forms (Eriksson, 2014). Reconfiguration implies change of capabilities (Eriksson, 2014).

1.4.2. Project Management

Innovation and diversification are implemented through projects (Davies and Brady, 2016). According to the Project Management Institute (PMI), the PMBOK (Project Management Body of Knowledge), is a support that allows organizations to build methodologies, processes, tools and techniques (PMI, 2017, p. 2). PMI is considered as one of the most expanded associations internationally (Farashah et al., 2019). PMBOK is used as "best practices", and generalizations can be made from standards that are identifiable and replicable (Tereso et al., 2018).

According to PMBOK, the project has the responsibility to provide knowledge in order to build the product (PMBOK, 2021). Project teams have the function of providing insight and expertise in a particular project and contribute to the learning process of the teams (PMBOK, 2021). Project teams can consist of resources internal or external to the organization (PMBOK, 2021). Projects exist in an internal and external context, and are influenced by these (PMBOK, 2021). Although in LR we can find several studies associated to portfolio, the PMBOK defends that portfolio, programs and projects are very interconnected (PMBOK, 2021).

Project management is defined in PMBOK as the application of tools, techniques, skills and knowledge that are necessary to carry out the project and respond to its requirements (PMI, 2021, p. 4). It provides principles for strategy, problem solving and decision making, as well as behaviors of the resources involved in projects (PMBOK, 2021). The PM area interconnects with the management area (PMBOK, 2021).

Some PM principles are presented in PMBOK (2021), such as: accountability, compliance, collaborative teams, stakeholder engagement practices, focus on business benefits and objectives, interaction with systems, leadership behaviours (at individual and team level), tailoring (project development design taking into account its context), focus on the quality of processes and deliverables, and ability to interact and manage complexity (both human, systems, uncertainty and innovation), responsiveness to risks, ability to identify improvement opportunities, adaptability, adaptation to change, learning and continuous improvement (PMBOK, 2021).

According to the PMBOK (PMI, 2021, p. 4), the project creates a unique product, service or result and concerns an effort that is temporary to accomplish them, i.e., it has a beginning and an end. Despite this, there are authors who argue that the projects involve some form of repetition, in which it is established standardized project routines that allow executing projects at a lower cost and with greater efficiency (Davies & Brady, 2016). The projects cause changes in organizations (PMI, 2017, p. 6).

It is through projects that organizations implement strategies, meet the needs of stakeholders (whether internal or external), create, change, improve products, processes and services, develop capabilities and resources, meet the needs and requirements of customers (internal and external) (PMI, 2017, p. 8).

It is through projects that organizations can respond to market dynamism, thus providing the ability to have flexibility and innovate in order to respond to changes (Hermano & Martín-Cruz, 2016).

In a highly volatile and fast-paced market, the complexity of projects has increased and the techniques and methodologies used so far needed an update and change (Collyer et al., 2010). The dynamics of the context leads to the need to adapt and deliver quickly, and is related to the term agility (Conforto et al., 2016).

Since about the 1980s, we have seen changes in the business world that have led to changes in PM practices in order to meet the challenges that demanded efficiency, speed and quality (Zasa et al., 2021). The so-called traditional PM methodologies have become insufficient in face of the unpredictability of deliveries and the need for flexibility. This new scenario led companies to seek more innovative, agile and flexible methodologies, thus emerging the Agile project management method (Zasa et al., 2021). It becomes necessary in this scenario to develop the teams and the work in these new methodologies (Zasa et al., 2021).

Tailoring (adaptation of the project development and processes taking into account its context, objectives, stakeholders) becomes essential (PMI, 2021). Thus, improving knowledge of how to use good PM practices and what those good practices are becomes critical to helping organizations respond to challenges (Tereso et al., 2018).

The capacity that exists in the PM may become ineffective if internal and/or external surroundings change, which requires a permanent change in resources (Biesenthal et al., 2019). The constant changes that occur in customers and projects makes project managers have little availability to adapt PM practices (Nørbjerg et al., 2017) and ensure the use of project knowledge in day-to-day business and next projects, with impacts on the organization's adaptation (Nørbjerg et al., 2017).

There are authors who argue that one should focus on project-based required capabilities (Zhang & Leiringer, 2016). It turns out that the most innovative and complex projects reveal themselves most clearly when the company's resources are not the most adequate to respond to this uncertain and rapidly changing environment (Davies & Brady, 2016). The need to develop, integrate, and transform resources arises.

It is important for the organization to define routines for the projects and consolidate project learning in the company (Hermano & Martín-Cruz, 2016). The organizations' perception of the importance of using good practices of PM is essential for their adoption (Fernandes et al., 2014). Learning culture and project management are interconnected (Fernandes et al., 2014), as well as with DCS (Pandza, 2003).

1.4.3. Dynamic Capabilities and Project Management

The literature that connects DCS and PM presents related concepts such as project capabilities (PC) and operational capabilities (OC). Project capabilities refer to knowledge and project management activities, are inputs for the strategy, behaviors and DCs and correspond to the most

operational PM activities considered necessary for the execution and management of projects (Davis & Brady, 2016; Hermano & Martín-Cruz, 2016).

The operational capabilities lead to the reconfiguration of DCs (Davies & Brady, 2016). It is the DCs and project capabilities that allow organizations to explore new markets as well as undertaking innovative projects and responding to volatile and rapid changes and environment (Davies & Brady, 2016; Zerjav et al., 2018).

Project capabilities also allow organizations to exploit routines and processes and that allow them to respond to more stable and more predictable environments (Davies & Brady, 2016). In turn, operational capabilities are built through routines that contribute to project performance (Freitas & Salerno, 2018).

The routines that consolidate learning in projects lead to the construction of DCs (Freitas & Salerno, 2018). Operational capabilities concern processes and resources as usual (Daniel et al.,2014), and the interrelationship between DCs and operational capabilities occur in both directions (Daniel et al., 2014).

Davis and Brady (2016) argue that DCs and design capabilities reinforce each other, leading to new DCs. Davies and Brady (2016) argue that project capabilities are similar to operational capabilities. Biesenthal et al. (2019), also argues that project management capabilities support the daily operation of companies.

The concept of ambidexterity (exploration and exploitation) also appears in the DC and PM literature, associated with the concept of innovative projects and routine projects (Davies & Brady, 2016; Davies et al, 2016; Zerjav et al., 2018).

Innovative projects explore new ideas and are associated with greater complexity, totally new products and services and the concept of exploration (Davies & Brady, 2016; Davies et al, 2016; Zerjav et al., 2018), being related to the development of new capabilities (Davies & Brady, 2016), due to the requirement to respond to new situations.

Ambidexterity is supported by DCs so that organizations have the ability to respond to new opportunities, innovation and simultaneously to current routines (Davies & Brady, 2016).

On the other hand, organizations use knowledge that accumulates to exploit routine design capabilities, using existing resources (Davies & Brady, 2016). On the other hand, ambidexterity leads organizations to create and transform operational and dynamic capabilities (Davies & Brady, 2016).

Sensing, seizing and reconfiguring (Teece, 2007) also appear in the DC and PM literature in which DCs develop through sensing, seizing and reconfiguring routines, linking design capabilities with DCs (Biesenthal et al., 2019).

The concept of sensing is related to identifying opportunities outside the organization (Teece, 2007), and in terms of PM sensing it can mean identifying new opportunities for improvement in terms of PM capabilities, such as new PM methodologies against current ones, analyzing gaps and presenting opportunity for improvement (Biesenthal et al., 2019).

Seizing refers to the capture and implementation of opportunities within the firm and the entire process it involves (Teece, 2007, 2014). It may involve decisions on how to improve or change project operational capabilities, as well as the evaluation of implementing new PM methodologies (Biesenthal et al., 2019).

The organisation uses change management and continuous improvement methodologies to apply the process of reconfiguring, implying alteration of operational PM capabilities, and switching from PM methodologies to other methodologies (Biesenthal et al., 2019). Reconfiguring means, according to Teece (2007) continuous renewal.

Eriksson, in 2014, conducted a study on the processes of DCs and identified four processes of DCs considered in the literature as fundamental: accumulation, integration, utilization and reconfiguration of knowledge. These processes are interconnected, and due to the complexity of DCs, they overlap and are ambiguous, being interconnected (Eriksson, 2014).

Knowledge accumulation, according to Eriksson (2014), refers to the knowledge that is acquired through experiences, through renewal or replication of knowledge, using external cooperation or internal learning, which are transformed into routines (Freitas and Salerno, 2018).

In the implementation of projects, new capabilities are created and acquired through the experience that is acquired through external cooperation and internal learning, which allows the accumulation of knowledge through the sharing that occurs between projects (Medina & Medina, 2015).

Knowledge integration involves combining resources by coordinating existing knowledge in the organization with new knowledge that is acquired externally (Eriksson, 2014), which thus develop new knowledge or replacement of existing knowledge (Manley & Chen, 2017; Medina & Medina, 2015).

When the organization uses the accumulated and integrated knowledge subconsciously (Eriksson, 2014: 6), it is the capacity to use knowledge. It is related to the concept of absorptive capacity in which the organization uses the knowledge it has available and at its disposal, through sharing, dissemination and codification, fostering the capacity for proactive reconfiguration in the organization (Eriksson, 2014).

In the process of reconfiguration or knowledge transformation presented by Eriksson (2014), it is necessary the change of capabilities, which happens through the generation of new forms of knowledge between what already exists and what enters new, or through the transformation of the knowledge that already exists in new forms (Eriksson, 2014).

It is a concept that the literature focuses on a lot, especially in empirical studies that relate DCs to PM (Zerjav et al., 2018; Thattakath & Čiutienė, 2017; Biesenthal et al., 2019; Medina & Medina, 2015). DCs relate to the reconfiguration of routines and resources (Zahra et al., 2006), in which also the operational capabilities of projects are transformed and where the end result of the implementation of DCs happens (Biesenthal et al., 2019), allowing the operation of DCs that happens through the recombination of capabilities that is repeated through practices (Eriksson, 2014; Salvato, 2003).

It becomes relevant, due to the nature of projects, the existing turnover between project resources (Biesenthal et al., 2019), to understand how the PM develops DCs in organizations through the processes of accumulation, integration, utilization and reconfiguration (Eriksson, 2014).

1.5. Research gap and objectives

A better understanding of how DCs in PM simultaneously facilitate stability and change is essential (Davies et al., 2016). One of the major challenges for organizations is to ensure that knowledge and routines do not disappear after the project ends (Davies & Brady, 2016; Freitas & Salerno, 2018).

The accumulation of knowledge and learning should be transformed into routines and practices, in order to develop and reshape current capabilities and used in future projects (Davis & Brady, 2016). In the literature the need to conduct more research on how projects contribute to the development of DCs is highlighted (Eriksson, 2014; Medina & Medina, 2015), especially because companies increasingly work by projects.

The studies conducted in this thesis are interconnected, providing inputs for each other in order to deepen in each study the analysis of how project management can leverage the dynamic capabilities in organizations.

The analyses of the studies and the respective results are integrated with the theoretical basis of DCs: concepts of sensing, seizing and reconfiguring by Teece (2007, 2014) and the concepts of accumulation, integration, utilization and reconfiguring by Eriksson (2014). Table 2 presents the research gaps, the respective studies conducted in the thesis (literature review, qualitative study and quantitative study) that address these research gaps, the research questions and research objectives of each study and the respective research contributions.

Table 2 - Literature Review Issue, Studies, Research Questions, Research Objectives, Research Contributions

Literature Review Issue	Study	Research Questions	Research Objectives	Research Contribution
1 - The literature analyzed in the previous study states that project teams may be insufficient to promote learning beyond the project and the company (Hoang et al., 2010). Eriksson (2014) and Medina and Medina (2015) state that more research is needed on how the projects contribute to the development of DCSs in order to develop and disseminate them from project to project and for the organization. Thus, there is the need for a deep analysis of what the literature addresses about the existing relationship between DCs and PM, in order to obtain an extensive and clearer view of how these 2 areas interrelate, concepts and factors involved.	1- Systematic literature review: Inter-relationship between Dynamic Capabilities and Project Management	1 - What does the literature between 2014 and 2019 refer to about the interrelationship between PM and DCs? 2 - What DCs and other related capabilities and routines are identified in PM in the literature review between 2014 and 2019?	1. Understanding the Relationship between PM and DCs through LR 2. Identification and understanding of existing DCs in PM	1. Analysis of the interrelationship between PM and the DCs addressed in the literature review, of 25 articles, published in the period from 2014 to 2019 with the theme "DC and PM". 2. Presentation of a conceptual map, based on the LR from 2014 to 2019, with the description of the interaction between DCs and PM, incorporating the dimensions of analysis that support this interconnection. Identification of the DCs, CPs and routines identified in the LR from 2014 to 2019, with linkage to DCs and PM, indicators, inputs related to DCs, clarifying which are the DCs associated with projects and PM existing in the LR. Identification of gaps for future research on the DCs and PM found in the LR analysis and the suggestion for possible future research directions and empirical contributions.

2 - Study 1 contributed to the identification of gaps in the LR about the interaction between NCs and the PM carried out in the previous study: a) the analyzed studies focus on which DCs are identified in projects and the impact that these DCs have on PM and projects and not how PM can develop DCs; b) the analyses carried out in the studies relate mostly to specific types of projects in specific industries, to portfolio and are not applied in a more transversal way, not being addressed more empirically how PM can develop DCs during the execution of projects and after their implementation; c) change management and its relationship with DCs in PM is a topic that needs to be deepened; d) it is not detailed the importance of continuous improvement in PM in the use and reconfiguration of DCs; e) the discussion between agile and waterfall PM methodologies and their respective	2- Qualitative analysis: Project Management in the development of DCs in the era of Open Innovation	1. How does PM leverage DCs? 1.1 How does PM ensure the accumulation, integration, utilization and reconfiguration of capabilities and knowledge acquired in projects in order to build DCs? 1.2 How does PM develop DCs by identifying and implementing project management opportunities? 1.3 How does the rotation of resources between projects enable the accumulation, integration, utilization, reconfiguration of knowledge?	Understand how the PM contributes to the development of DCS O1. Analyze how organizations ensure the development and generation of new capabilities through projects O2. Identify which routines, good practices and PM techniques allow the accumulation, integration, use and transformation of capabilities and competencies. O3. Analyze how change management and continuous improvement are related to PM in order to enhance DCs O4. To analyse how the PM captures opportunities for improvement in terms of methodologies and development of new competencies in PM and how it implements them O5. Analyze how the PM ensures the use, integration, accumulation and transformation of competencies related to new PM practices and methodologies O6. Analyze whether agile and waterfall	The concept of Open Innovation is related to resources renewal, whose some PM practices are drivers to develop the capacity for Open Innovation in organizations (Pereira et al., 2021a); Pereira et al., 2021b). This qualitative study conducted with 22 respondents through semi-structured interviews, in 9 different industries contributes to a theoretical and empirical discussion about how PM transforms knowledge acquired in projects into routines and learning practices that enable organizations to develop or reshape capabilities, leveraging DCs. This study contributes to a clearer understanding of which PM best practices, techniques, and tools organizations should implement to leverage DCs, integrating the theoretical dimensions of DCs.

relationships with the creation of DCs were not found in the analyzed authors. f) It is not found in the authors identified in the previous study the analysis of the issue of turnover of resources in projects and the DCs			methodology develop DCs differently O7. Identify what factors can mitigate the impact of resource turnover between projects on the transfer, utilization of capabilities and codification of knowledge	
From study 2, the importance of a quantitative empirical analysis with the research findings from studies 1 and 2 was identified in order to continue the further analysis of the role of PM in the development of DCs.	3- Impact of Project Management to capability transformation	Which PM practices foster capacity transformation in order to develop DCs?	Understand how project management contributes to the transformation of capabilities to leverage DCs.	This quantitative study carried out through 141 surveys presents an important contribution to organizations and academies in the development of DCs through PM, in the sense that it presents the measurement scales of PM practices and factors that contribute to the transformation of capabilities, identifying and highlighting the.

Source: authors' own elaboration, 2021

1.6. Research Summary

The thesis is divided into 3 studies: three papers accepted in international journals (one of them is in forthcoming and two are published), each one corresponding to each chapter of the thesis. Figure 1 shows a summary of the thesis structure.

Table 3 – Research Summary

Research Problem		
Identify how Project Management leverages Dynamic Capabilities		
Research Context		
Identifying which PM best practices, techniques and tools leverage DCS, as well as those that foster capacity transformation		
Literature Review		
(1) Dynamic Capabilities (2) Project Management (3) Dynamic Capabilities and Project Management)		
Title of the accepted papers		
(2) Dynamic capabilities and project management: a systematic literature review	3) Project Management in the Development of Dynamic Capabilities for an Open Innovation Era	4) Impact of Project Management to capability transformation
Research Questions		
What does the literature between 2014 and 2019 refer to about the interrelationship between PM and DCs? What DCs and other related capabilities and routines are identified in PM in the literature review between 2014 and 2019?	How does the PM leverage DCs?	Which PM practices foster capacity transformation in order to develop DCs?
Research Contributions		
Analysis of the interrelationship between PM and DCs Presentation of a conceptual map of the interaction between DCs and PM Identification of gaps for future research of DCs and PM	Identifying best practices, techniques and PM tools that organizations should implement to leverage DCs	Presentation of the scales for measuring PM practices and factors that contribute to capability transformation
Papers Research Design		
Systematic literature review with 25 papers about DC and PM, adopting a inductive approach	Qualitative analysis, using MAXQDA. Conducted and analyzed 22 semi-structured interviews in 9 different industries	Quantitative analysis, using the PLS-SEM. 141 surveys were conducted and analysed
Publication Status		
Patrício, V;Lopes da Costa, R; Pereira, L.; António, N. (forthcoming). Dynamic Capabilities and Project Management: a systematic literature review. International Journal of Business Innovation and Research. https://dx.doi.org/10.1504/IJBIR.2020.10039419 ISSN: 1751-0252 [Quartil Scopus Q3; Scopus CiteScore Tracker 2021: 1.8]	Patrício, V.; Lopes da Costa, R.; Pereira, L.; António, N. Project Management in the Development of Dynamic Capabilities for an Open Innovation Era. J. Open Innov. Technol. Mark. Complex. 2021, 7, 164. https://doi.org/10.3390/joitmc7030164 ISSN: 2199-8531 [Quartil Scopus Q1; Scopus CiteScore Tracker 2021: 5.1]	Patrício, V;Lopes da Costa, R; Pereira, L.; António, N., Pereira, L, Gonçalves, R., Jerónimo, C. (2022), Impact of Project Management to capability transformation. International Journal of Agile Systems and Management. DOI: 10.1504/IJASM.2023.10047943 ISSN: 1741-9174 [Quartil Scopus Q1; Scopus CiteScore Tracker 2021: 3.3]

Source: authors' own elaboration, 2021

CHAPTER 2

First paper - Dynamic capabilities and project management: a systematic literature review

The first article “Dynamic capabilities and project management: a systematic literature review” is in forthcoming in the International Journal of Business Innovation and Research:

Patrício, V; Lopes da Costa, R; Pereira, L.; António, N. (forthcoming). Dynamic Capabilities and Project Management: a systematic literature review. International Journal of Business Innovation and Research.

ISSN: 1751-0252
Quartil scopus Q3; Scopus CiteScore Tracker 2021: 1.8

The formal acceptance of the paper “Dynamic capabilities and project management: a systematic literature review” was presented is in attachment A.

2.1 Abstract

Project management became a critical tool for today’s management success. Nevertheless, the field’s authors reflect the difficulty of sharing empirical knowledge between projects. This condition empowered the dynamic capabilities research to become an active branch of science. The research team reviews the literature in the scope through the access and assess of the 25 most cited papers, published from 2014 to 2019. The goal is to interpret and contribute to mitigating the project’s missing link while pushing dynamic capabilities science. The findings point to the importance of two branches interrelation in the organization’s longterm success. The accessed papers emphasise common factors, mostly on dynamic capabilities on coming project management tasks. project management and dynamic capabilities, although different in goals and separated as science branches, can fulfil its missing links. The first working as an empirical knowledge provider to validate the second’s theoretical models, and the later’s improving the prior’s continuous learning between projects.

Keywords: dynamic capabilities; project management; systematic literature review.

2.2 Introduction

We have witnessed a great evolution in terms of research on dynamic capabilities (DCs) and lacks field validation. Although production is high, from 2014 to 2019, the Google Scholar Index alone accounts for more than 184,000 publications[1], which increasingly challenges the research to gather and revise. "The fast-growing number of publications on dynamic capabilities and the considerable theoretical and methodological variety within this body of literature make it difficult, if not impossible, to keep track of how this research field evolves" (Vogel & Güttel, 2013, p.427). We verify that the concept is still empirically unclarified "Despite their centrality in the field, dynamic capabilities remain an amorphous concept for many researchers and managers, which is rarely empirically grounded" (Davies et al., 2016, p.26). Eriksson (2014) assessed 142 articles on DCs and concluded that only four linked to project management (PM). Again, following PM's confirmed advances, Eriksson (2014) and Medina and Medina (2015) point it is necessary to evolve the theoretical models of DCs about how projects contribute to the development of DCs.

PM requires knowledge, management skills, and technology: a scope that empowers organization learning and assertiveness (Freitas & Salerno, 2018).

Through the DC's and PM's practical expertise, organizations tend to improve flexibility to face internal and external adversities easing unexpected problem-solving. Through resources and management skills updating, it is possible to react dynamically and proportionality to unpredicted issues (Daniel et al., 2014; Hermano & Martín-Cruz, 2016). When combined with the PM's organization knowledge with DC's theoretical models, it is possible to build a bridge between projects (Freitas & Salerno, 2018).

The project and the project team end when the service or product of the project is delivered to the respective client and they become the ownership of the product or service that has been produced (Zerjav et al., 2018). And projects intend to operate on limited time (PMI, 2017). The question arises on how DC's models can bind and condition the coming PM.

Gardiner (2014) refers to gathering and sharing systematic knowledge between projects, crucial to qualify next PM's procedures and workers. Hence, if projects are time-framed tasks with specific teams, DC's must act as datalink between those, enhancing performance and ensuring success (Zhang et al., 2017).

[1] Google Scholar webpage accessed in 17 September 2020, https://scholar.google.com/scholar?q=dynamic+capabilities&hl=pt-PT&as_sdt=0%2C5&as_ylo=2014&as_yhi=2019

As project managers and teams work on several projects this provides them with greater experience, with key DCs (Clegg et al., 2018). Currently, organizations must solve the issue of information overload, reconciling it with the concern to manage, transfer, and integrate knowledge (Pereira & Goncalves, 2017). And it is increasingly important to develop the capacity to create, share, and transfer knowledge (Lopes da Costa et al., 2019). This study analyses how the interrelationship between DC's and PM are processed.

The study also focuses on understanding what DCs and other related capabilities and routines are identified in PM and in projects. And that may also be important for future studies on DCs or PM. Davies et al. (2016) and Gomes and Romão (2018) refers that the concept of DCs and what constitutes them is not unanimous. The identification of DCs referred to in the literature review can help us understand what DCs are in projects.

In order to respond to this need, this article is based on five objectives. The first objective is to present a brief literature review on DCs and PM. The second objective is to identify DCs concepts and their interrelationship with PM. The third objective is to understand that DCs have been identified in PM in the literature review. The fourth objective concerns the identification of possible directions for future studies in this area, identified through the gaps found. The fifth objective is to present a conceptual model – a state of the art diagram – that describes the interrelationship of DCs with PM, as well as the factors, surrounding environment, and impacts.

This model will be able to support further discussions in the future and will facilitate an overall view of these interrelations. This study aims to be an added value for academia, as well as for business, and society of how organizations can develop and incorporate learning and knowledge through DCs and PM and how they can consolidate knowledge from project to project and for the organization. In this literature review 25 articles were analysed, published between 2014 and 2019, within the theme of DCs and PM. Section 3 of this paper consists of the literature review, Section 4 describes the methodology used, and Section 5 presents the results. Section 6 contains the discussion of results and the main findings. Section 7 describes the main conclusions of this literature review. Section 8 presents future lines of research. Section 9 explains limitations of this study.

2.3 Theoretical background

2.3.1. Dynamic capabilities

The concept of DCs has been applied to several research areas. Teece (2007) and Eisenhardt and Martin (2000) define DCs as high-level activities related to management and strategic decisions that identify opportunities and perceive what the market wants. O'Reilly and Tushman (2008) refer to competencies as operational capabilities supporting more technical activities and processes that allow the business to run.

There are authors who relate competence to knowledge and capabilities with performance that is demonstrable and measurable (Medina & Medina, 2015). There are also the concepts of resources and capabilities, where "resources and capabilities are distinct but related concepts; that is, the execution of capabilities usually requires certain resources, and in turn, the effective use of specific resources depends on certain capabilities. Hence to be effective, a DC is likely to be required to change both resources and related capabilities" (Daniel et al., 2014, p.96).

The definition of DCs is associated in the literature with concepts such as capacities and organizational processes (Eisenhardt & Martin, 2000; Cardeal & Antonio, 2012; Sivusuo et al., 2018), to the improvement of the existing or the development of the new, and to skills or opportunities (Di Stefano et al., 2010). They are also associated with the concept of reconfiguration of resources and routines (Zahra et al., 2006) and the transformation of those resources and routines into competitive advantage in rapidly changing environments (e.g., Teece et al., 1997; Easterby-Smith & Prieto, 2008; Ambrosini & Bowman, 2009; Cardeal & Antonio, 2012; Davies and Brady, 2016).

DCs aim to provide organizations with the capacity to adapt to change and the market (Eriksson, 2014), to enable competitive advantage (Di Stefano et al., 2010; Cardeal & Antonio, 2012) and the capacity to respond in anticipation to change (Teece et al., 1997). DCs represent a constant integration, adaptation, reconfiguration, renewal, and re-creation of resources and capacities in response to constant changes, at the same time be able to respond to internal processes or routines (Teece et al., 1997; Cardeal & Antonio, 2012; Sicotte et al., 2014; Eriksson, 2014; Gardiner, 2014; Sivusuo et al., 2018).

They are associated with the difficulty of imitating and replicating these capacities (Teece et al., 1997; Cardeal & Antonio, 2012). Eisenhardt and Martin (2000) mention the uniqueness of the configuration of resources and capacities created by DCs.

There are authors who argue that DCs consist of generic learning processes (Eriksson, 2014; Sicotte et al., 2014), such as accumulation of experience, articulation, and codification of knowledge (Zollo & Winter, 2002).

Winter (2003) distinguishes 'zero level' or ordinary capabilities as those that enable the company to perform its daily routine in the short term and DCs as those that increase, modify, or create ordinary capabilities. DCs are seen as orchestration and OCs as facilities, processes, and routines (Patrício et al., 2019). There are other authors who point out that DCs are related to the ability to change resources, routines, and competencies (Gardiner, 2014).

There is a consensus in the literature that DCs contrast with operational capabilities (Winter, 2003). In literature there is also the association of the concept of DCs with ambidexterity (e.g., O'Reilly & Tushman, 2008; Easterby-Smith & Prieto, 2008; Di Stefano et al., 2010) suggested by March (1991) who proposed the concept of 'exploration' and 'exploitation'.

'Exploration' is related to areas and activities of investigation, research, variation, risk, experimentation, flexibility, discovery, and innovation (March, 1991; O'Reilly & Tushman, 2008). 'Exploitation' is related to the internal part of the organization and to concepts such as optimisation, production, efficiency, selection, implementation, execution, and reduction of variation (March, 1991; O'Reilly & Tushman, 2008; Easterby-Smith & Prieto, 2008). The combination of 'exploration' and 'exploitation' is associated in the literature with increased performance and innovation and continuous learning and knowledge management (O'Reilly &Tushman, 2008; Easterby-Smith & Prieto, 2008; Davies et al., 2016).

DCs are also associated with the concept of sensing and seizing advanced by Teece (2007). Sensing is related to understanding what the market and clients want, understanding the future, developing, combining and mobilising resources to address opportunities and capture value (Teece, 2007, 2014). The concept of 'exploration,' associating DCs with capabilities for organizations to reconfigure existing assets and capabilities (O'Reilly & Tushman, 2008). Seizing means capturing the opportunity for the organization and the whole process it involves (Teece, 2007, 2014).

Problem solving skills emerge as one of the fundamental characteristics of DCs associated with integration, knowledge transformation, and creativity (Eriksson, 2014; Medina & Medina, 2015; Davies et al., 2016; Manley and Chen, 2017; Thattakath & Čiutienė, 2017), allowing for a better understanding of problems and identification of better solutions (Pereira and Santos, 2018). Through DCs, organizations are able to facilitate the integration of knowledge, learn and reconfigure internal and external resources, allowing them to adapt (Patrício et al., 2019).

2.3.2. Project management

It is through projects that organizations implement the strategies to innovate and diversify (Davies & Brady, 2016). The Project Management Institute (PMI, 2017) published the Project Management Body of Knowledge (PMBOK) and considers it as a support the construction of PM practice trough techniques, methodologies and procedures presented (PMI, 2017, p.2). Based on the PMBOK, projects have a well-defined beginning and end with unique results (PMI, 2017, p.13). Portfolio appears in PMBOK as the set of programs and projects of the organization managed to meet strategic objectives (PMI, 2017, p.13). Portfolio include process prioritisation and resource allocation (Daniel et al., 2014, p.96).

Projects are unique, but involve some repetition (Davies & Brady, 2016). PM bodies of knowledge are used as best practices, assuming that there are standards that can be identified and from which generalisations can be made (Tereso et al., 2018). These best practices are capable of being established and replicable, even if it is not possible to apply and replicate them in all situations (Tereso et al., 2018). The capacities and resources needed to carry out management and project activities are part of organizations that deliver products and services to external clients as well as organizations that develop them internally (Davies & Brady, 2016).

The adoption of good PM practices is facilitated by a clear perception of the benefits of its application, openness to change and decision-making practices (Fernandes et al., 2014). A process of quality assurance, external assistance, accountability, training, and feedback on the impacts and benefits of PM improvements can facilitate their routine and incorporation new knowledge (Fernandes et al., 2014).

2.4 Methodology

Saunders et al. (2009) suggest that the purpose of the literature review will depend on the approach we intend for our research. In this case, the inductive method was used, in which what existed was explored and from there conclusions were developed (Saunders et al., 2009). Although there were defined research objectives and questions, it did not start with pre-defined theories or concepts (Saunders et al., 2009). The aim of the literature review was not to obtain a summary of all existing information on the research topic, but rather to collect what would be most relevant on that topic for the respective research (Saunders et al., 2009). The objective was to conduct an exploratory study (Saunders et al., 2009), and the protocol used was the one recommended by Tranfield et al. (2003) and validated by the other authors (Table 4).

Table 4 – Literature review protocol

Protocol	*Section*
I – Planning	
0 – Identification of the need for literature review	2.2
1 – Preparation of a proposal for literature review	2.4.1
2 – Protocol development	2.4
II – Conducting	
3 – Identification of the research	2.4.2
4 – Studies selection	2.4.3
5 - Quality assessment of the study	2.4.4
6 – Data extraction and monitoring progress	2.4.5
7 – Data synthesis	2.4.6
III – Reporting e dissemination	
8 – Reporting and recommendations	2.5
9 – Getting evidence in practice	2.6

Source: Adapted from Tranfield et al. (2003)

2.4.1. Review questions

This research aims to collect information about how the interrelationship between these two areas and the factors involved are processed. It includes a systematisation of the dynamic capacities that were identified in the literature review.

The review questions in this study are:

Q1 What does the literature between 2014 and 2019 say about the interrelationship between PM and DCs?

Q2 What DCs and other related capacities and routines are identified in PM in the literature review between 2014 and 2019?

2.4.2. Identification of the research

After formulating the research questions in terms of the literature review, as Saunders et al. (2009) suggest, we verified whether research had been published in this area and what studies were underway. Following the protocol described by Tranfield et al. (2003), the systematic literature review started with the identification of key words and research terms, created from the topic of research, literature and discussion within the review team. To answer the research questions, we conducted a manual research of articles based on the selected keywords: dynamic capabilities AND project management, ‘dynamic capabilities’ AND ‘project management’, ‘dynamic capabilities and project management’. At the time of the search, several other articles were found that relate DCs exclusively to other areas of study, but were excluded from the selection, since the scope of the search focuses only on DCs and PM.

As suggested by Tranfield et al. (2003), newspapers published and listed in the databases (in the selected area) but also conference proceedings were included in the search. Books, theses, workshops, articles in non-English language, and duplicates were excluded. The output of this information was the list of articles with core contributions on which the literature review will be based (Tranfield et al., 2003). In addition to the key words, it is important to identify the databases (Tranfield et al., 2003) used for the research and publication period (Saunders et al., 2009): b-on, ResearchGate, ScienceDirect, and Scopus, and selected publications for the 2014–2019 time-period.

2.4.3. Study selection

Following the search by the keywords mentioned, in the time period and in the identified databases we obtained a total of 733 articles. We then refined the articles (Tranfield et al., 2003), reading the titles, abstracts, and keywords, selecting only those that addressed DCs and PM (articles that applied and related DCs to areas other than PM were excluded) obtaining a total of 56 articles. Applying the exclusion process and removing the articles that did not fit the scope of interest, 677 articles were excluded. By reading the entire text of the articles, we eliminated those not relevant to the research topic and obtained 25 articles. In order to obtain a better quality, a second and third opinion was requested from the second and third authors (Tranfield et al., 2003) about the inclusion and exclusion process and the relevance of the selected articles, and the 25 articles were maintained. With the analysis of the content and characteristics of the studies, based on the quality assessment process, we obtained a total of 25 articles for the literature review (Figure 1).

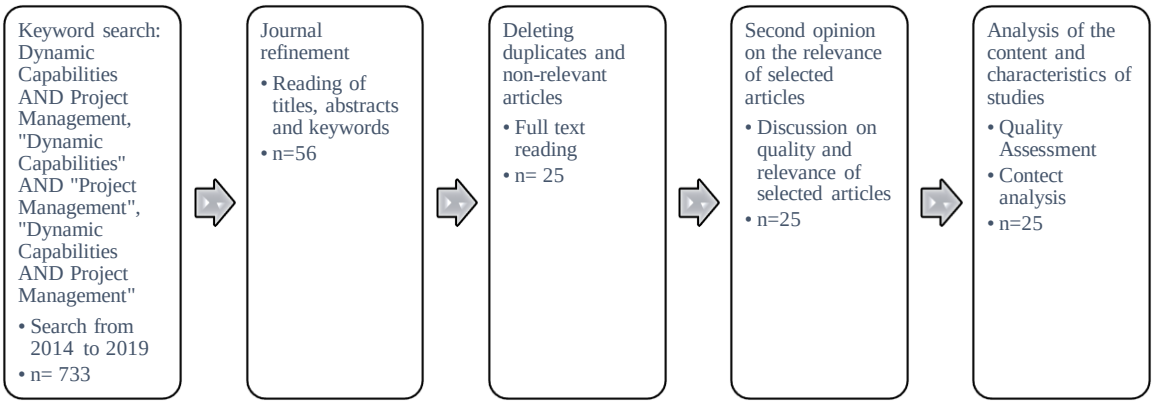

Figure 1 - Article selection process. *Source:* Author's elaboration (2020)

2.4.4. Quality assessment of the study

The quality assessment process followed was that of Saunders et al. (2009), using the checklist presented by these authors and based on the relevance and value of the research, also complementing the quality assessment suggested by Tranfield et al. (2003).

2.4.5. Data extraction and progress monitoring

The selected articles were analysed individually and entirely, and the necessary details were extracted to answer the research questions and their contribution about the relationship between PM and DCs. In this sense, in the data extraction, the selected articles were analysed in terms of author, year of publication, title, source, and number of selected articles per journal (and the journals rankings were consulted in SJR[2]). The articles were also analysed in terms of type of study (qualitative, quantitative, conceptual, and mixed methods), country of study, and research sector (public and private sectors, R&D sectors, engineering sector, construction and infrastructure, telecommunications, oil and gas, real state, education, beverages and food, e-commerce, …). These data linked the study with PM concepts (study domain/research areas applied to PM and project types – portfolio management, innovation portfolio management, IT portfolio management, IT PM, infrastructure PM, engineering, construction, …), number of b-on citations, Research Gate, Scopus, and total citations.

2.4.6. Data synthesis

Subsequently, the main theoretical topics/concepts addressed or applied by the authors were identified, organised in chronological order. Lastly, we charted the DCs and other related capacities and routines existing in the literature review and in the selected articles and identified in the projects and PM studies carried out. The most frequent words[3],3 bigrams and trigrams[4] of the selected studies were also analysed.

2.5 Results

Presenting the results obtained, the selected period was between 2014 and 2019 with 25 selected articles.

[2] https://www.scimagojr.com/

[3] https://www.worDCslouds.com/

[4] https://www.reuneker.nl/files/ngram/

2.5.1. Research results

The analysis of the number of articles per year (Figure 2) shows that in 2015 the number of articles is the lowest (n = 1), with 2017 and 2018 being the years with the highest number of articles (n = 6). In 2019 the number of articles is lower than in the last three years (n = 3).

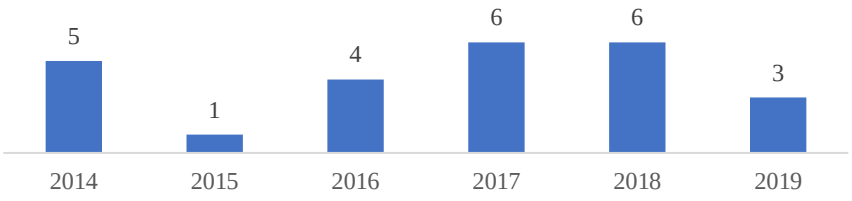

Figure 2- Number of articles per year. *Source:* Author's elaboration (2020)

The articles selected for this study were published in 21 different sources. The journals with the most articles selected were the International Journal of Project Management (four articles) and the Project Management Journal (two articles). The remaining articles were distributed among the other sources, with one article published in each of them, this being the possible sample for the scope of this study. Figure 3 presents the TOP 10 of the journals with the most selected articles.

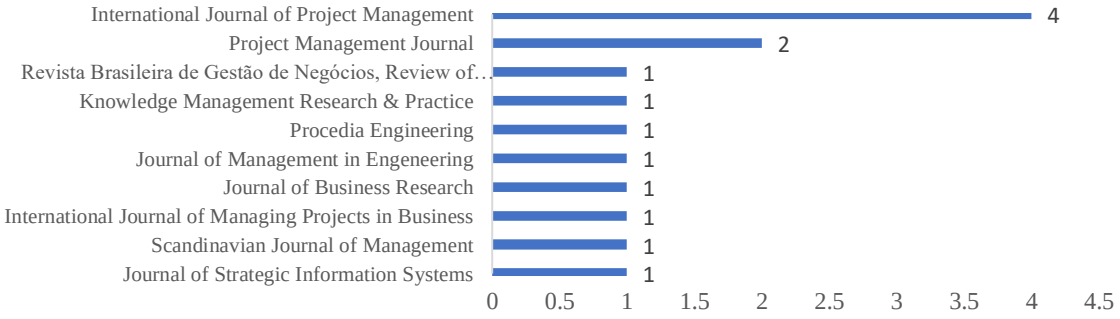

Figure 3 - Top 10 of journals and number of articles. *Source:* Author's elaboration (2020)

Based on the selected articles, the most frequent words were identified, obtaining the TOP 30 of the most frequent words in the studies. The results showed some non-appropriate words, such as parts of the publication titles that were removed from the list of irrelevant words and through a set of iterations, the result was that obtained in Figure 4. This analysis was performed through the selected articles and inserted in Wordclouds to obtain the most frequent words and through the N-gram generator to obtain the bi-grams and tri-grams. The results were later worked manually in excel (Figures 5 and 6).

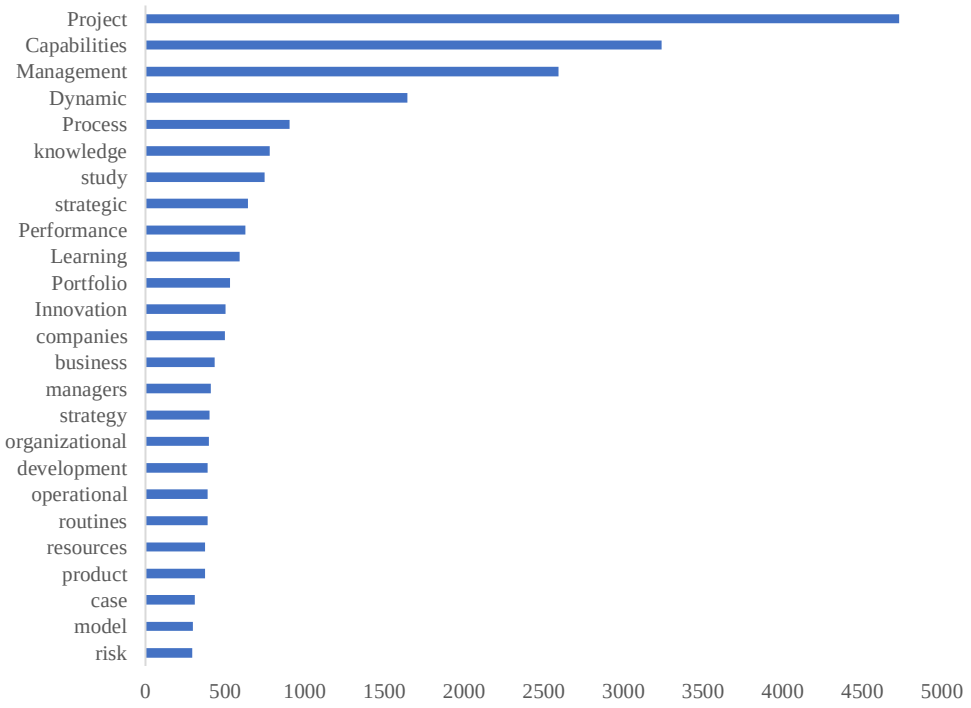

Figure 4 - Top 30 of the most frequent words in selected studies. *Source:* Author's elaboration, 2020

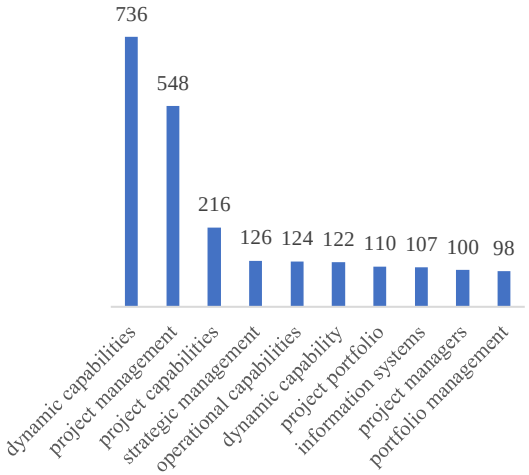

Figure 5 - Top 10 of the most frequent bi-grams. *Source:* Author's elaboration, 2020

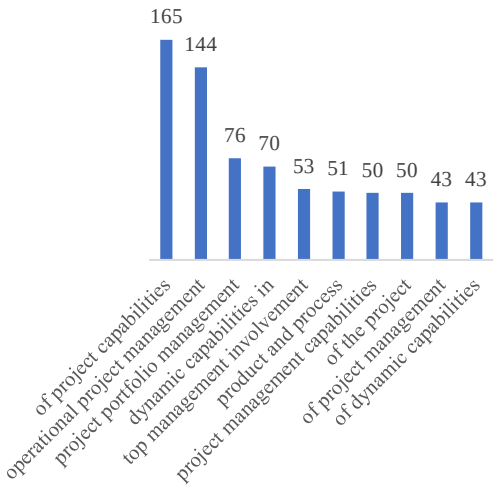

Figure 6 - Top 10 of the most frequent tri-grams. *Source:* Author's elaboration, 2020

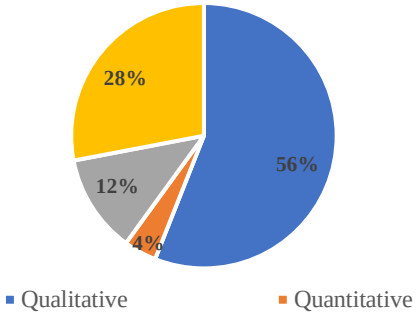

Figure 7 - Methodological overview of studies. *Source:* Author's elaboration, 2020

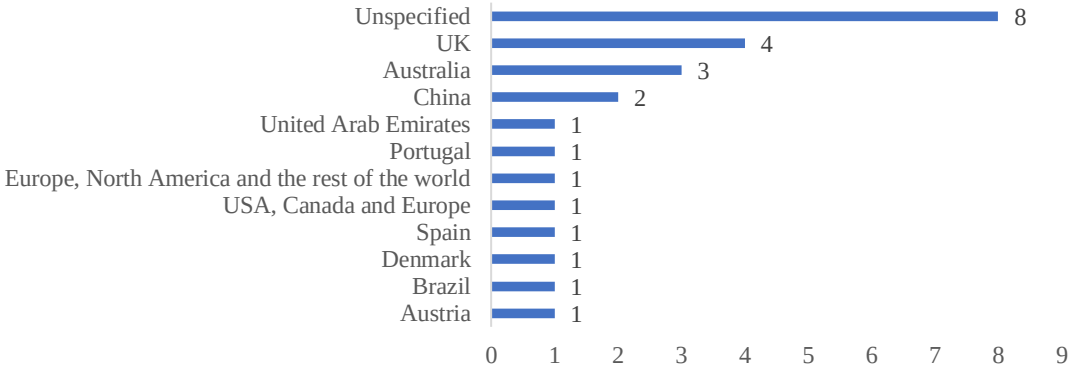

Figure 8 - Country of study. *Source:* Author's elaboration, 2020

Analysing the content of the selected articles, in Figure 7 we verify that the qualitative method was the most used in this area of research (56%), and in 86% the analysis by case study was used. The quantitative method constitutes the smallest part (4%), and the mixed method was used in about 12%. Conceptual studies were found in 28% of cases.

Another analysis concerns the country where the study was carried out (Figure 8). In this sense, the countries are quite varied, with the UK being the most predominant (4), followed by Australia (3) and then China (2), and there are articles in which the country of study was not specified by the author, which add up to 8 articles (of these eight articles, seven correspond to conceptual articles).

Table 5 - Top 10 most cited articles

Author(s)	Publication date	Title	Journal/Source	Number of citations
Eriksson	2014	Processes, antecedents and outcomes of dynamic capabilities	*Scandinavian Journal of Management*	300
Davies and Brady	2016	Explicating the dynamics of project capabilities	*International Journal of Project Management*	221
Davies et al.	2016	Dynamic Capabilities in Complex Projects: The Case of London Heathrow Terminal 5	*Project Management Journal*	135
Daniel et al.	2014	A dynamic capabilities perspective of IS project portfolio management	*Journal of Strategic Information Systems*	100
Sicotte et al.	2014	Innovation Portfolio Management as a Subset of Dynamic Capabilities: Measurement and Impact on Innovative Performance	*Project Management Journal*	77
Bernroider et al.	2014	From dynamic capabilities to ERP enabled business improvements: The mediating effect of the implementation project	*International Journal of Project Management*	72
Hermano and Martín-Cruz	2016	The role of top management involvement in firms performing projects: A dynamic capabilities approach	*Journal of Business Research*	66
Clegg et al.	2018	Practices, projects and portfolios: Current research trends and new directions	*International Journal of Project Management*	41
Manley and Chen	2017	Collaborative Learning to Improve the Governance and Performance of Infrastructure Projects in the Construction Sector	*Journal of Management in Engineering*	35
Medina and Medina	2015	The competence loop: Competence management in knowledge-intensive, project-intensive organizations	*International Journal of Managing Projects in Business*	28

Source: Author's elaboration, 2020

Table 6- Characterization of the studies analysed

Author(s)	Journal/Source	Type of Research	Country of study	Research Sector	Domain of the study applied to Project Management areas
Gardiner (2014)	Procedia - Social and Behavioral Sciences	Qualitative	United Arab Emirates	Public and Private Aviation Sector, Telecommunications, Real State, Oil and Gas	Project, programme and portfolio management
Sicotte et al. (2014)	Project Management Journal	Quantitative and Qualitative	EUA, Canada and Europe	R&D	Innovation Portfolio Management
Bernroider et al. (2014)	International Journal of Project Management	Quantitative	Austria	Unspecified	IT Project Management
Daniel et al. (2014)	Journal of Strategic Information Systems	Qualitative Case Study	UK	Diverse	IS Portfolio Management
Eriksson (2014)	Scandinavian Journal of Management	Conceptual	Unspecified	Unspecified	Unspecified
Medina and Medina, A. (2015)	International Journal of Managing Projects in Business	Conceptual	Unspecified	Unspecified	Unspecified
Hermano and Martín-Cruz (2016)	Journal of Business Research	Qualitative	Europe, North America and others	Unspecified	Portfolio Management Project Management
Davies and Brady (2016)	International Journal of Project Management	Conceptual	Unspecified	Unspecified	Portfolio Management Project Management
Davies et al. (2016)	Project Management Journal	Qualitative Case Study	UK	Engineering, Construction and Infrastructure	Project Management - Engineering, Construction and Infrastructure Project
Zhang and Leiringer (2016)	Proceedings of the 32nd Annual ARCOM Conference, 5-7 September 2016, Manchester, UK	Conceptual	Unspecified	Infrastructure Projects in the Public Sector	Project Management – Infrastructure Project
Thattakath and Čiutienė (2017)	Project Management Development – Practice and Perspectives Sixth International Scientific Conference on Project Management in the Baltic Countries	Conceptual	Unspecified	Unspecified	Project portfolio risk management
Manley and Chen (2017)	Journal of Management in Engineering	Quantitative and Qualitative	Australia	Construction	Project Management – Infrastructure Project
Zhang et al. (2017)	International Annual Conference of the American Society for Engineering Management, ASEM, 2017	Quantitative and Qualitative	China	Metallurgy, engineering, procurement and construction	Project Management – Engineering and Construction
Redwood et al. (2017)	Procedia Engineering	Qualitative Case Study	Australia	Construction	Project Management - ICT and digital technology systems in construction and supply chain
Andersson and Chapman (2017)	International Journal of Project Organisation and Management	Conceptual	Unspecified	Unspecified	Project Management for Product Innovation

Nørbjerg et al. (2017)	Proceedings of the 50th Hawaii International Conference on System Sciences, 2017	Qualitative Case Study	Denmark	IS/TI	Project Management – Software Projects
Freitas and Salerno(2018)	Revista Brasileira de Gestão de Negócios, Review of Business Management	Qualitative Case Study	Brazil	Engineering	Project Management – Engineering Projects
Clegg et al. (2018)	International Journal of Project Management	Conceptual	Unspecified	Unspecified	Portfolio Management
Zerjav et al. (2018)	International Journal of Project Management	Qualitative Case Study	UK	Engineering, Construction and Infrastructure	Project Management – Infrastructure Project
Sivusuo et al. (2018)	Management	Qualitative Case Study	Unspecified	Unspecified	Unspecified
García et al. (2018)	Journal of Modern Project Management	Qualitative Case Study	Spain	Procurement	Project Management - Procurement Projects in the Public Sector
Gomes and Romão(2018)	International Journal of Information Systems in the Service Sector	Qualitative Case Study	Portugal	IS/TI	Benefts Management project Management - IS/IT Projects
Biesenthal et al. (2019)	Long Range Planning	Qualitative Case Study	Australia	Diverse (information and telecommunications systems, government, education)	Project Management - Diverse
Hullova et al. (2019)	Research Policy	Qualitative Case Study	UK	Food and drink industry	Project Management - management of new product and process development projects
Yan et al. (2019)	Knowledge Management Research & Practice	Qualitative Case Study	China	E-commerce	Portfolio Management Project Management - IT Projects

Source: Author's elaboration, 2020

Regarding the analysis of the citations (Table 5), the sum of the citations per article was done in b-on, ResearchGate, and Scopus. Table 5 presents the list of the TOP 10 most cited articles. The most cited article was Eriksson's article 'Processes, antecedents and outcomes of dynamic capabilities' (300 citations), published in 2014 in the Scandinavian Journal of Management. The author analysed 142 articles focused on DCs, analysed their antecedents and outcomes, in which he noted that only four articles discussed PM and argued that more research was needed on how projects contribute to the development of DCs.

Eriksson (2014) identified four processes of DCs: accumulation, integration, utilization and reconfiguration of knowledge.

The second most quoted article was by Davies and Brady, published in 2016, entitled 'Explaining the dynamics of project capabilities', with 221 citations, published in the International Journal of Project Management.

These authors distinguish project capabilities (PCs), DCs and operational capabilities (OCs) and their relationship to the concept of ambidexterity (exploration and exploitation). They suggest the capabilities of projects related to routines and innovation are developed to deal with levels of exploration and exploitation. In addition to the authors mentioned, Davies et al. (2016) identify how certain types of DCs are needed to deliver large, complex, and high-risk projects involving several parties, through a three-phase process (learning, mobilisation, and codification) to support the strategic management of certain projects.

Daniel et al. (2014) identifies information systems project portfolio management as a DC in the sense that organizations use it to reconfigure information systems resources to cope with economic and market changes, mainly turbulent and uncertain caused by recessive conditions. They identify which DCs contribute to IS PPM and how they develop. Sicotte et al. (2014) address DCs related to innovation and company performance. Bernroider et al. (2014) link the benefits of IT/IS developments with business transformation, associated with ERP projects and explore the role of projects as a central mechanism. Hermano and Martín-Cruz (2016) show how top management influences projects, portfolio, and organizational performance, and how they are mediated by building DCs and operational capabilities.

Clegg et al. (2018) speak of the importance of exploiting DCs for PM and strategy. Manley and Chen (2018) address the topic of collaborative learning capability (CLC) and abortive capacity. Medina and Medina (2015) explain how projects generate competence and how the organization can use learning strategies to support exploration/exploitation competences in project intensive organizations using a competence model: accumulation, assimilation, transformation, use of knowledge in organizations, and projects.

Regarding the research sector of the selected articles, it was found that the engineering, construction, and infrastructure sector was the sector most addressed by the authors, with about 28% of the articles (Davies et al., 2016; Zhang & Leiringer, 2016; Manley & Chen, 2016; Zhang et al., 2017; Redwood et al., 2017; Freitas & Salerno, 2018; Zerjav et al., 2018). There are 36% of articles that do not specify a sector (Bernroider et al., 2014; Eriksson, 2014; Medina & Medina, 2014; Hermano & Martín-Cruz, 2016; Davies & Brady, 2016; Thattakath & Čiutienė, 2017; Andersson & Chapman, 2017; Clegg et al., 2018; Sivusuo et al., 2018).

Analysing these articles that do not specify sector, 67% of them are conceptual articles.

About 12% are articles that applied their study to the IT/IS sector (Nørbjerg et al., 2017; Gomes & Romão, 2018; Biesenthal et al., 2019).

Other sectors addressed in the articles were other industrial sectors such as Procurement (García et al., 2018), e-commerce (Yan et al., 2019), beverage and food industry (Hullova et al., 2019), public and private aviation, telecommunications, real state, oil and gas (Gardiner, 2014), and R&D sectors (Sicotte et al., 2014), corresponding to 4% of the study sectors applied by the authors (Table 6).

When the study domains applied or related to PM areas were analysed, we verify that 24% of the studies were related to portfolio management (corresponding to four articles in terms of portfolio management, one to innovation portfolio management, and one to IT portfolio management). Furthermore, 24% corresponded to PM applied to Engineering, Construction and Infrastructure projects, 20% to IT PM, 8% to product innovation PM, and 4% to procurement PM, portfolio risk management, and PM applied to various types of projects. About 12% did not specify the area in which the study was applied in terms of PM (which corresponds to three articles, of which two are conceptual).

2.5.2. Analysis dimensions

With the analysis of the main theoretical concepts addressed by the authors, with an exhaustive and independent reading of the articles, and taking into account the most relevant articles and topics covered (Table 7). The characterisation of the main theoretical topics was based on convenience and parallel were the most common concepts among the analysed authors. Based on this, four main areas were identified:

1 DCs, project capabilities and operational capabilities

2 ambidexterity (exploration and exploitation)

3 sensing, seizing and reconfiguring

4 accumulation, integration, utilization and reconfiguration of knowledge.

Table 7 - Characterization of the main theoretical topics

Publication Date	Concept / main theoretical topics	Author (s)
2014	Dynamic capabilities and operational capabilities	Gardiner (2014)
	Learning capabilities	Gardiner (2014)
	Exploration and exploitation	Gardiner (2014)
	Absorptive capability	Bernroider et al. (2014)
	Sensing, seizing and transformation	Sicotte et al. (2014)
	Innovative dynamic capabilities	Sicotte et al. (2014)
	Second (or higher) order dynamic capabilities First order dynamic capabilities Ordinary capabilities (business as usual process and resources)	Daniel et al. (2014)
	Knowledge accumulation Knowledge integration Knowledge utilization Knowledge reconfiguration	Eriksson (2014)

2015	Competence utilization Competence accumulation Competence assimilation Competence transformation	Medina and Medina (2015)
	Exploratory learning Exploitative learning	Medina and Medina (2015)
	Absorptive Learning	Medina and Medina (2015)
	Second-order capability First-order capability	Medina and Medina (2015)
2016	Project capabilities	Davies and Brady (2016)
	Dynamic capabilities and project capabilities	Davies and Brady (2016) Zhang and Leiringer (2016) Hermano and Martín-Cruz (2016)
	Ambidexterity	Davies and Brady (2016) Davies et al. (2016)
2017	Sensing, learning, Renewal and replication, integration, seizing/ utilization, coordination, reconfiguration	Thattakath and Čiutienė (2017)
	Collaborative learning capability	Manley and Chen (2017)
	Absorptive capability	Manley and Chen (2017)
	Exploratory learning Exploitative learning	Manley and Chen (2017)
	Integrated project delivery	Zhang et al. (2017)
	Team capabilities	Zhang et al. (2017)
	Sensing and responding	Nørbjerg et al (2017)
	Project Capabilities, project resources, project contingencies	Andersson and Chapman (2017)
2018	Project capabilities	Zerjav et al. (2018)
	Dynamic capabilities and operational capabilities	Zerjav et al. (2018)
	Ambidexterity	Zerjav et al. (2018)
	Experience accumulation, knowledge articulation, knowledge codification	Freitas and Salerno (2018)
	Leadership	Clegg et al. (2018)
	Norm and value	Sivusuo et al. (2018)
	Learning and Knowledge Management, acquisition, transformation, exploitation	García et al. (2018)
	Benefits Management	Gomes and Romão (2018)
2019	Sensing, seizing e reconfiguring	Biesenthal et al. (2019)
	Ostensive e performative Aspects	Biesenthal et al. (2019)
	New product and process development	Hullova et al. (2019)
	Knowledge-based decision support	Yan et al. (2019)

Source: Author's elaboration, 2020

DCs, project capabilities and operational capabilities

We verify a complementarity between the analysed authors on the concepts of DCs, project capabilities, and operational capabilities. DCs are associated with knowledge, collection, and transfer of experience from project to project and to the organization as a whole (Davies & Brady, 2016). Daniel et al. (2014) define DCs as the processes or routines that integrate and transform resources related ordinary capabilities to respond market change (Daniel et al., 2014, p.97).

Several authors associate operational capabilities at the project and project performance level with DCs at the portfolio, management activities and strategy level (Sicotte et al., 2014; Daniel et al., 2014; Hermano & Martín-Cruz, 2016; Davies & Brady, 2016; Gardiner, 2014; Zerjav et al., 2018; Davies et al., 2016; Andersson & Chapman, 2017; Gomes & Romão, 2018; Yan et al., 2019). The role of portfolio management is to ensure that resources are allocated where they are most effective (capacity management) (Gardiner, 2014). Portfolio projects require a set of operational capabilities and PM capabilities are considered a critical success factor in portfolio and PM (Biesenthal et al., 2019).

It is also unanimous to relate DCs to strategic resources that are used by management to modify, reconfigure, and create operational capabilities and routines in volatile environments and to exploit new opportunities (Davies & Brady, 2016; Zerjav et al., 2018). The project's capabilities are at the operational level to execute the projects and they constitute inputs for strategic priorities, behaviours, and future implementation of DCs (Davies & Brady, 2016; Hermano & Martín-Cruz, 2016). Operational capabilities also lead to the restructuring of DCs (Davies and Brady, 2016).

DCs and project capabilities are used to explore innovations, allow companies to enter new markets, undertake unique and innovative projects, respond to rapid and unpredictable change (Davies & Brady, 2016; Zerjav et al., 2018). And project capabilities also allow companies to exploit routines and carry out processes when conditions are stable and predictable (Davies & Brady, 2016). In line with this, Hermano and Martín-Cruz (2016) state that the construction of the project's operational capabilities developed during the project implementation leads the organization to build assets and procedures. In this regard, they argue that routines should be established that contribute to project performance (building the project's operational capabilities). And other routines that consolidate project learning and contribute to portfolio performance (building the portfolio's DCs).

Organizational routines lead to the construction of DCs (Freitas & Salerno, 2018). DCs can also be considered elements that can be identified as processes (Sivusuo et al., 2018). Operational capabilities are comprised of routines that encompass systems, rules of action, and behaviours (Biesenthal et al., 2019). Authors identify DCs as higher-order capabilities that influence operational capabilities (Eriksson, 2014; Medina & Medina, 2015). Ordinary capabilities are business as usual processes and resources (Daniel et al., 2014).

Daniel et al. (2014), argue that the interrelationship and changes between DCs and ordinary capabilities occur in both directions.

Davies and Brady (2016) argue that the relationship between DCs and project capabilities is bilateral, thus giving rise to new project, behavioural, and DCs. Only in this way can we analyse all the ways in which changes can occur in project (Clegg et al., 2018). One of the great challenges for organizations is to ensure that project routines do not disappear after the project has ended and according to Davies and Brady (2016) and Freitas and Salerno (2018), this issue is solved by incorporating project routines into standardised processes.

This is because the accumulation of knowledge and learning when transformed into organizational routines and practices enables them to respond to unexpected problems and opportunities. So, it develops or reformulates existing capacities and processes are made available for future projects (Davies & Brady, 2016). This transforms these processes into repetitive, project-to-project learning solutions, creating standardised project routines (Davies & Brady, 2016). In this sense, it enables an increasing number of projects to be executed at lower cost and with greater efficiency (Davies & Brady, 2016).

These learning practices and methodologies are provided by the Project Management Office (PMO), which changes, adapts, and institutionalises PM practices and learning, which will facilitate the creation and change of new DCs (Gardiner, 2014). It is consensual that the learning process is a central element in the creation and renewal of DCs (Gardiner, 2014; Bernroider et al., 2014; Eriksson, 2014; Sicotte et al., 2014; Medina & Medina, 2015; Davies & Brady, 2016; Davies et al., 2016; Hermano & Martín-Cruz, 2016; Thattakath & Čiutienė, 2017; Manley & Chen, 2017; Freitas &Salerno, 2018; Gomes & Romão, 2018; Biesenthal et al., 2019).

Davies and Brady (2016) argue that project capabilities are similar to operational capabilities, as Biesenthal et al. (2019), who also stress that PM capabilities help companies in their daily operation. Organizations depend on DCs and project capabilities to be able to respond to the conditions, whether stable or unpredictable, that are encountered during the project life cycle (Zerjav et al., 2018). DCs and operational capabilities are interlinked, and the project's delivery can be understood as the point of interception between these capabilities that enables the transformation of project results (Zerjav et al., 2018).

The challenge is how dynamic and project capabilities are implemented to balance the need to execute stable routines and unpredictable events at the same time, together with exploration and exploitation (Zerjav et al., 2018; Davies et al., 2016).

Ambidexterity (exploration and exploitation)

It is consensual among the authors to distinguish innovative projects from routine projects, linking them to the concept of ambidexterity (exploration for innovative projects and exploitation for routine projects) (Davies & Brady, 2016; Davies et al., 2016; Zerjav et al., 2018). And these authors describe how project capabilities work with DCs and ambidexterity (Davies & Brady, 2016; Davies et al., 2016; Zerjav et al., 2018). Authors have identified two types of projects.

The first type is a routine project, associated with greater stability and predictability and the concept of exploitation. It exploits the existing base, uses mature technology and products, and responds to the current needs of clients (Davies & Brady, 2016; Davies et al., 2016; Zerjav et al., 2018). The second type of projects is innovative projects that explore innovative and alternative solutions and ideas. These projects are more complex and create entirely new technology and markets, change existing capacities, structures, and knowledge (Davies & Brady, 2016; Davies et al., 2016; Zerjav et al., 2018). They are associated with unpredictable uncertainty, agile methodologies, and the concept of exploration (Davies & Brady, 2016; Davies et al., 2016; Zerjav et al., 2018).

Davies and Brady (2016) argue that DCs ensure that project capabilities relate to the surrounding environment, but that new capacities generally create and develop more in innovative projects. This is because they require more specific knowledge to respond to new situations and that they will restructure current routines and practices, with new capacities developing more in innovative projects according to Davies and Brady (2016). DCs, being at the strategic and management level, decide how to create and use resources to support ambidexterity (Davies & Brady, 2016).

It is unanimous in some authors that project capabilities are essential to the competitive advantage of industries producing new and complex products and systems (Davies & Brady, 2016; Davies et al., 2016; Sicotte et al., 2014; Zerjav et al., 2018). In these types of projects, DCs are essential to Davies et al.'s (2016) so-called disciplined flexibility to ensure that project objectives are met even under conditions of change and uncertainty (Davies et al., 2016). Ambidexterity supports itself on DCs to exploit current routines and in parallel explore new opportunities (Davies & Brady, 2016). It identifies Portfolio Management techniques as a DC in that through them companies combine resources and capabilities, manage between routines and innovation, carry out exploration and exploitation, and prioritize between innovative and routine projects (Davies & Brady, 2016).

DCs relate to product innovation capabilities (Sicotte et al., 2014) and management's ability to coordinate, use and transform internal and external competencies (Eisenhardt & Martin, 2000; Teece et al., 1997; Davies & Brady, 2016; Davies et al., 2016; Zerjav et al., 2018). Simultaneously, managers decide how and when to launch innovative projects to respond to change and gain competitive advantage through projects that create new technologies, new products, and services (Davies & Brady, 2016). This dynamic can lead to the creation and transformation of project, operational, and DCs (Davies & Brady, 2016). DCs enable the balance and response between stable and rapidly changing environmental conditions, routine and innovation, and flexibility (Davies & Brady, 2016; Davies et al., 2016; Zerjav et al., 2018).

Sensing, seizing, and reconfiguring

There seems to be a consensus that DCs alter operational resources through routines of sensing, seizing, and reconfiguring (Biesenthal et al., 2019). Linking DCs to OCs, Biesenthal et al. (2019) identified that DCs work through the implementation of routines of sensing, seizing, and reconfiguring and that it is based on these concepts that they intertwine with the operational capabilities of PM. The concepts of sensing, seizing and reconfiguring of Teece (2007) emerge as themes addressed by the various authors studied and these relate them to DCs and PM (Sicotte et al., 2014; Thattakath & Čiutienė, 2017; Nørbjerg et al., 2017; Biesenthal et al., 2019).

The concept of sensing is associated with the identification of new opportunities (Teece, 2007) that can lead to the development of new knowledge that in turn leads to new opportunities (Thattakath and Čiutienė, 2017) that are often undertaken by project managers (Nørbjerg et al., 2017). The capacities of organizations enable them to deal with the market (Teece, 2007) and transform new knowledge, new practices and ideas into new products, new systems and new processes (Sicotte et al., 2014). The relationship between the sensing concept and operational and PM capabilities is explained with greater emphasis by Biesenthal et al. (2019) in which, through the identification of new capabilities, DCs and PCs develop.

Sensing involves the identification of opportunities needed to improve PM capabilities by identifying gaps or improvements (Biesenthal et al., 2019). Thus, through sensing the organization can identify that the currently used PM methodologies (which are part of the operational capabilities of projects) are less effective than new methodologies that may have emerged. In view of this, the company analyses the gap between the current methodology and the new one, which represents an opportunity to improve the operational capacities of PM (Biesenthal et al., 2019).

Through seizing, the utilization of the new PM methodology is evaluated. And a change management plan is developed on how to implement the new methodology in current PM capacities (Biesenthal et al., 2019). Seizing specifies the opportunities for improvement that the company should decide for (which may include decisions on how to improve or change the operational capabilities of PM) (Biesenthal et al., 2019).

When a need is identified to improve operational capabilities in PM, this should serve as input and opportunity to improve the PM (Biesenthal et al., 2019). For example: if a new PM methodology emerges and the team does not have this knowledge, it should be assessed whether and how the company should adopt this new methodology in the operational resources of PM (Biesenthal et al., 2019).

The company can use the alterations management, change management, and continuous improvement frameworks to apply in the process of reconfiguring the operational capabilities of PM (Biesenthal et al., 2019). This reconfiguring process is the result of the implementation of DCs which involves changing the operational capabilities of PM resources according to Biesenthal et al. (2019). The PM resource routines are modified by replacing, for example, one PM methodology for another (Biesenthal et al., 2019). Projects are usually started even before the current ones are finished, which makes, according to Biesenthal et al. (2019), the transfer and codification of knowledge become more difficult.

Accumulation, integration, utilization, and reconfiguration of knowledge

One of the great challenges of DCs associated to PM is to understand how they integrate, accumulate, use, and reconfigure the knowledge generated and acquired in the organizations. This challenge is linked to the project definition itself. Strategic management plays an important role in the adaptation, integration, and reconfiguration of internal and external organizational competencies (Hermano & Martín-Cruz, 2016; Gomes & Romão, 2018).

Eriksson (2014) identified four key processes of DCs, which are also referenced by Medina and Medina (2015) and Hullova et al. (2019): accumulation, integration, utilization and reconfiguration of knowledge. Related to these are also the concepts of learning capabilities (Gardiner, 2014; Manley & Chen, 2017; García et al., 2018), absorptive learning (Bernroider et al., 2014; Medina & Medina, 2015; Manley & Chen, 2017), as well as the relationship with the concepts of exploratory learning and exploitative learning (Medina & Medina, 2015).

The accumulation of knowledge referred to by Eriksson (2014), which already comes from Zollo and Winter (2002), concerns the knowledge acquired through the experience developed by the renewal or replication of existing knowledge. The accumulation of knowledge and learning when transformed into routines and practices enables companies to develop or reformulate existing capacities (Freitas & Salerno, 2018). Through projects and during the execution of the project, new skills are created and acquired through experience, articulation, utilization, and codification of knowledge (absorptive learning), accumulating it through sharing between projects (Medina & Medina, 2015; Freitas & Salerno, 2018).

Eriksson's (2014) knowledge integration links the knowledge that already exists in the organization with new knowledge, using a combination of resources. The concepts of absorptive capability and exploratory learning are related to the concept of knowledge integration of Manley and Chen (2017) and Medina and Medina (2015). External knowledge integration and exploratory learning are related concepts and encompass knowledge that does not exist in the organization (Manley & Chen, 2017; Medina & Medina, 2015). And that will develop new knowledge or replace existing knowledge and generate new value (Manley & Chen, 2017; Medina & Medina, 2015).

Exploitative learning is related to expanding knowledge that already exists to increase current value (Manley & Chen, 2017; Medina & Medina, 2015). This concept of absorptive capability is referred to by several authors as a dynamic capacity that allows organizations to explore, reconfigure, and transform internal and external knowledge (Manley & Chen, 2017) that relates it to the concept of knowledge utilization (Eriksson, 2014; Bernroider et al., 2014; Manley & Chen, 2017; Medina & Medina, 2015). Knowledge utilization means the organization uses knowledge accumulated and integrated through its sharing, codification, and reconfiguration (Eriksson, 2014).

The more complex and new projects are, the greater the need for project teams to collaborate with external teams that complement knowledge that does not exist internally (Hullova et al., 2019).

Thus, this increases the delivery capacity of projects, but the project team needs to incorporate the knowledge of other partners – absorptive capability – to increase, renew, and transform its knowledge and incorporate it into its operations (Hullova et al., 2019). This process is aligned with the concept of utilization and reconfiguration. In the reconfiguration or transformation of knowledge presented in Eriksson's (2014) model, the organization can generate new combinations of knowledge between what is new and what already exists or transform existing knowledge into new forms or new objectives (Eriksson, 2014).

To reconfigure knowledge, it is necessary to change capacities (Eriksson, 2014; Biesenthal et al., 2019). This concept of reconfiguration presented by Eriksson (2014) is a concept that the analysed authors put much emphasis on and use in their research and in their association with DCs and PM (Zerjav et al., 2018; Thattakath & Čiutienė, 2017; Biesenthal et al., 2019). Medina and Medina (2015) also link to the concept of transformative learning that combines exploitative and exploratory learning and new knowledge with existing knowledge, transforming it. Different contexts require different capacity combinations to ensure good PM and delivery (Medina & Medina, 2015; Zhang & Leiringer, 2016; Biesenthal et al., 2019).

2.6 Discussion and findings

Studies on DCs have grown rapidly and have been linked to several areas. There are studies associated with more generic DCs, others with DCs in more specific terms, which makes it very difficult to analyse all areas of DCs in the literature. Looking specifically at DCs and their relationship with PM, we find that more studies are still needed on the link between these two areas. This study contributes to a better understanding of the relationship between these two research topics.

The vast majority of studies identify and analyse DCs in specific types of projects and their importance for the success of these types of projects, in specific areas such as IT projects, innovation, and specific industries (such as engineering, construction and infrastructure, e-commerce, IS/IT, beverages and food, procurement, etc.). They therefore focus on the analysis of which and how DCs are present in these specific projects and impact them. The analysis of these studies confirms what Eriksson (2014) said about there being a tendency to use qualitative methods in investigations of DCs processes.

The first contribution of this study is the specific analysis of the interrelationship between PM and the DCs addressed in the literature review, in the period from 2014 to 2019. This analysis allowed answering the first research question 2: What does the literature between 2014 and 2019 say about the interrelationship between PM and DCs? The conceptual map related to this review is the second important contribution of the study (Figure 9).

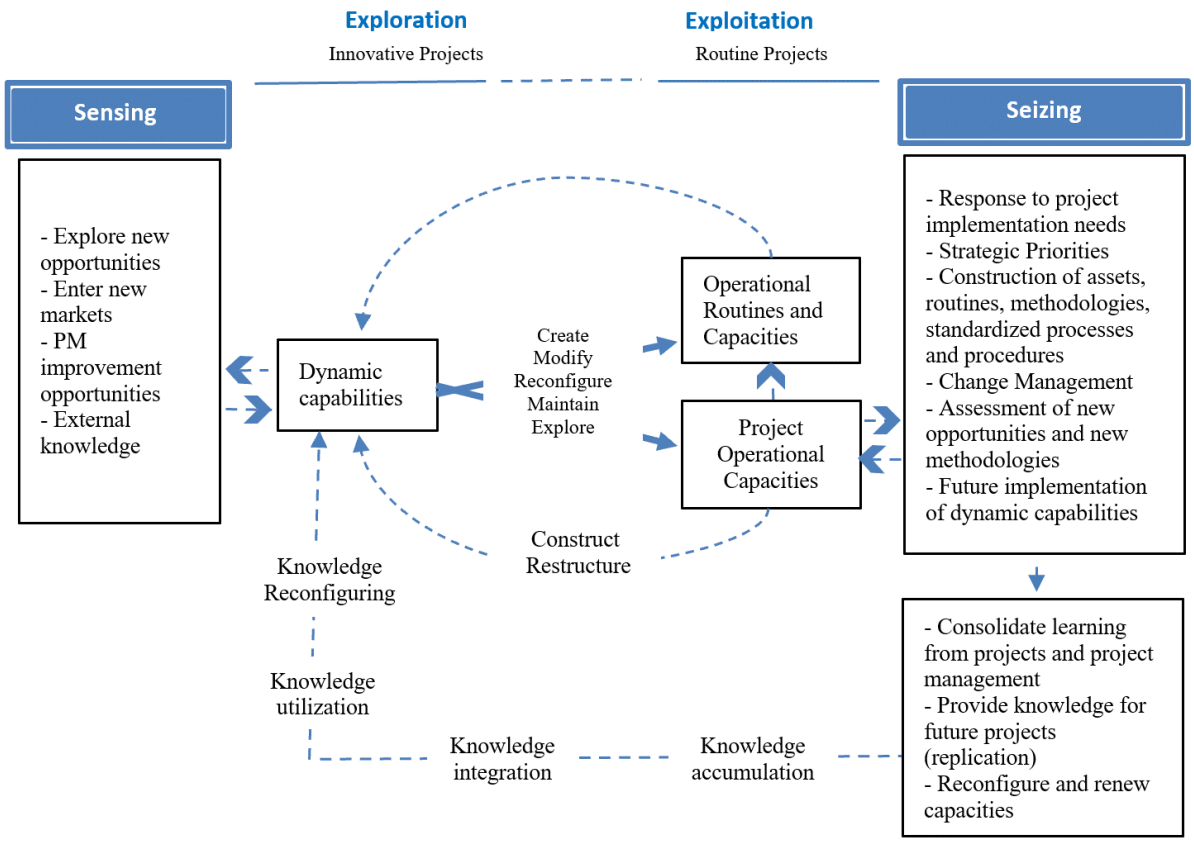

Figure 9 - Conceptual model of the relationship between DCs and PM. *Source:* Author's elaboration (2020), based on data from Gardiner (2014), Bernroider et al. (2014), Eriksson (2014), Sicotte et al. (2014), Medina and Medina (2015), Davies and Brady (2016), Davies et al. (2016), Hermano and Martín-Cruz (2016), Manley and Chen, 2017 (2017), Freitas and Salerno (2018) and Biesenthal et al. (2019)

Answering the research questions in this study, and analysing question 1, it is presented a conceptual map based on what the reviewed literature refers to about the relationship between DCs, PCs, and OCs, linked to the concepts of exploration and exploitation, sensing, seizing, and reconfiguring. And how accumulation, integration, utilization, and reconfiguration is processed from the knowledge acquired in projects. The result of the description of the dimensions of analysis (explained in section 2.5.2) is the conceptual model presented in Figure 9. This model describes the interaction between DCs and PM, incorporating all the dimensions of analysis that support this interconnection.

Table 8 - DCs, project capabilities, routines, indicators and inputs identified and analysed in thearea of PM /projects and DCs

ID	Dynamic Capabilities, project capabilities, routines, indicators and inputs	Author (s)
1	Portfolio management capabilities and techniques	Hermano and Martín-Cruz (2016), Davies and Brady (2016), Gardiner (2014), Daniel et al. (2014) and Biesenthal et al. (2019)
2	Top management involvement	Hermano and Martín-Cruz (2016) and Sivusuo et al. (2018)
3	Capacity management techniques	Hermano and Martín-Cruz (2016)
4	Work routines, processes and procedures in project management	Gardiner (2014), Davies and Brady (2016), Hermano and Martín-Cruz (2016) and Biesenthal et al. (2019)
5	Staffing	Freitas and Salerno (2018)
6	Use of new software, number of software programs developed and/or used in projects	Freitas and Salerno (2018) and Zhang et al. (2017)
7	Hiring experts	Freitas and Salerno (2018)
8	Creation of new departments	Freitas and Salerno (2018)
9	Industry expertise	Freitas and Salerno (2018)
10	Creation of discussion groups	Freitas and Salerno (2018)
11	Project reports	Freitas and Salerno (2018), Bernroider et al. (2014) and Biesenthal et al. (2019)
12	Regular training programs	Freitas and Salerno (2018) and Sivusuo et al. (2018)
13	Creation of administrative and operational routines and processes	Freitas and Salerno (2018) and Gomes and Romão (2018)
14	Alliances and partnerships	Freitas and Salerno (2018)
15	Increase and improvement of infrastructure	Freitas and Salerno (2018)
16	Expertise	Freitas and Salerno (2018)
17	Capacity to build innovative projects	Davies and Brady (2016)
18	Development of project capabilities throughout the company on products or services developed in the projects	Davies and Brady (2016)
19	Project meetings (and adaptions)	Freitas and Salerno (2018)
20	Business Cases methodology	Gomes and Romão (2018)
21	Cost reduction practices	Gardiner (2014)
22	Training in Project Management at organizational level	Gardiner (2014), Davies and Brady (2016) and Sivusuo et al. (2018)
23	Leveraging the value chain and technical leadership	Gardiner (2014), Sivusuo et al. (2018) and Sicotte et al. (2014)
24	Innovation capacities and methodologies development	Gardiner (2014), Zhang et al. (2017), Sivusuo et al. (2018) and Davies et al. (2016)
25	IT governance model	Bernroider et al. (2014)
26	Decision-making methods	Bernroider et al. (2014), Hermano and Martín-Cruz (2016) and Zhang et al. (2017)
27	Acquisition of external information	Bernroider et al. (2014) and Eriksson (2014)
28	Innovation portfolio management techniques	Sicotte et al. (2014)
29	Intrapreneurship	Sicotte et al. (2014)
30	Proactive Adaptability	Sicotte et al. (2014)
31	Strategic Renewal	Sicotte et al. (2014)
32	Business objectives drive projects	Daniel et al. (2014)
33	Multiple and dynamic prioritization criteria	Daniel et al. (2014) and Hermano and Martín-Cruz (2016)
34	Dynamic balancing of risk and reward	Daniel et al. (2014)
35	Cancel or reconfigure in-flight projects	Daniel et al. (2014)
36	Adaptations to new product development	Daniel et al. (2014)
37	Retail Outlet Development	Daniel et al. (2014)
38	New product development	Daniel et al. (2014)
39	Problem Solving	Thattakath and Čiutienė,2(017), Manley and Chen, 2017; Eriksson (2014), Davies and Brady (2016) and Davies et al. (2016)
40	Collaboration	Eriksson (2014), Davies et al. (2016), Zhang et al. (2017) and Manley and Chen (2017)
41	Integrated project teams	Davies et al. (2016)
42	Risk sharing	Davies et al. (2016) and Zhang et al. (2017)
43	Disciplined flexibility	Eriksson (2014), Davies et al. (2016), Freitas and Salerno (2018), Carderón et al. (2018) and Biesenthal et al. (2019)

44	Commercial and supplier management capabilities	Zhang and Leiringer (2016)
45	Brainstorming	Thattakath and Čiutienė (2017)
46	Resources recombination	Gomes and Romão (2018)
47	Lessons learned meetings and reporting	Biesenthal et al. (2019) and Freitas and Salerno (2018)
48	Networking	Biesenthal et al. (2019)
49	Project management quality assurance	Biesenthal et al. (2019)
50	Mentoring/coaching	Biesenthal et al. (2019)
51	Change management framework	Zhang et al. (2017) and Biesenthal et al. (2019)
52	Capacity to identify the level of complementarity and implement mechanisms between product innovation and related process	Hullova et al. (2019)
53	Capacity to disseminate individual knowledge and proactive attitude organizational	Hullova et al. (2019)
54	Capability of Trust	Zhang et al. (2017)
55	Competitive benchmarking	Eriksson (2014)
56	Informal communication	Biesenthal et al. (2019)

Source: Author's elaboration (2020) based on data from authors listed in the table

Table 9 - Relationship between RQ, RO and findings

Research Questions (RQ)	Research Objectives (RO)	Findings
Q1 - What does the literature between 2014 and 2019 say about the interrelation between project management and dynamic capabilities?	Understanding the relationship between PM and DC through the literature review	Dynamic capabilities modify, reconfigure and create project capabilities and operational routines, leading to the restructuring of dynamic capabilities. This interrelationship also occurs through processes of exploration and exploitation, sensing, seizing and reconfiguring. Accumulation, integration, utilization, and reconfiguration of knowledge acquired in projects in organizations occurs through the interrelationship between all the above concepts (Figure 9).
Q2 - What dynamic capabilities and other related capacities and routines are identified in project management in the literature review between 2014 and 2019?	Identification and understanding of existing DCs in PM	Identified specific capabilities of specific project types: dynamic capabilities, operational capabilities for project management, routines, or characteristics found by the authors and that have increased the dynamic capabilities in the studies performed, indicators of the evolution of capacities through projects, capacities that fit the concept of dynamic capabilities and that are related to projects and inputs for the construction or reconfiguration of dynamic capabilities within projects. No DCs were identified that were studied and applied transversally and that should be part of good PM practices (Table 8).

Source: Author's elaboration (2020)

Analysing the answer to question 2: What capacities and routines related to DCs are identified in PM in the literature review between 2014 and 2019? It is found that PM contributes to sustained organizational performance through the influence of DCs, knowledge management, and learning processes (Gardiner, 2014) and PCs. By conducting a thorough analysis, a several capabilities in PM and in the projects were found of the articles studied. These articles refer to specific capabilities of specific project types: DCs, operational capabilities of PM and routines. Indicators of the evolution of capabilities through projects were also found.

Thus, the third contribution of this study relates to a compilation of DCs, PCs and routines identified by the authors in connection with DCs and PM. Thus, clarifying which DCs we may be talking about when associated with projects and PM (Table 8). This analysis allowed us to answer the second research question. The fourth contribution of this research is related to the possible identification of gaps for future research on DCs and PM found in the literature review.

Suggestions are presented for possible future directions of investigation. Through the literature review the emphasis in the studies is on which DCs are found in projects and on the impact that these DCs have on PM and projects. The analyses made in the studies apply to specific types of projects and do not apply in a more transversal way. Table 9 presents a summary of research questions (RQ), research objectives (RO), and main findings.

2.7 Conclusions

In gathering information about the interrelationship between DCs and PM, through literature review, it was found that there is an interconnection between concepts such as DCs, project capabilities, routines and operational capabilities. DCs modify, reconfigure, and create project capabilities and operational routines, and these lead to the restructuring of DCs.

Project capabilities refer to the knowledge and PM activities at the operational level to execute and manage individual projects. There is a reciprocal relationship with DCs. Also related to these concepts is the concept of ambidexterity (where literature associates exploration for innovative projects and exploitation for routine projects) to demonstrate the role of DCs in these types of projects.

Following this analysis, there is a consensus in the literature that DCs change operational resources through routines of sensing, seizing, and reconfiguring. In this study, we defined a conceptual map with all these interconnections and concepts in order to obtain a global and summarised view of the internal and external interrelationships of DCs, PCs and OCs, using the main concepts found in the literature review.

Many of the studies identified specific DCs of analysed project, as well as more generic DCs in the more theoretical articles.This study becomes relevant as it allows for a deeper understanding of what the literature says about the relationship between PM and DCs, perceiving it through a conceptual map.

Due to all this complexity of inter-relationships and concepts, and how DCs, PCs and OCs were distributed across the various articles, it became relevant to conduct a comprehensive identification of what DCs, project capabilities, routines, indicators, and inputs might exist in the PM and projects. In this sense, this literature review also provides a list of DCs, trying to mitigate the complexity of concepts and improve the understanding and perception of what DCs can be in PM and projects.

2.8 Future lines of research

Several authors refer to some PM tools and techniques applied to specific project types that are identified as DCs or as operational capabilities that build or restructure DCs. The answer to how PM leverages DCs in organizations remains unclear and detailed in practice. It is also left unclarified and undetailed how PM ensures that the knowledge acquired in projects is accumulated, integrated, utilized, and transformed in organizations through PM. It is possible to do this using, for example, the capabilities identified by the authors studied and identifying that other DCs would be important to contemplate.

Change management and its relationship with DCs in PM is a little addressed theme, being only referred to by Biesenthal et al. (2019). This author addresses this issue at a more macro and theoretical level that touches on change management and its relationship with seizing and reconfiguration. The theme of quality assurance of PM at capacity reconfiguration level is also approached only at a high level. The importance of continuous improvement as part of PM methodology in the utilization and reconfiguration of DCs is also not detailed.

The discussion between agile and waterfall PM methodologies and their respective relationships with DCs creation was also not found in the analysed authors. Biesenthal et al. (2019) talks about the relationship between sensing and seizing and the new PM methodologies, but only at a theoretical and high level. Another critical issue to DCs' knowledge lies in human resources' first interchange between projects, particularly without achieving the prior's close. According to Biesenthal et al. (2019), this makes it difficult to disseminate and codify knowledge between projects.

Nowadays, companies tend to hire PMs services to field suppliers. Often, those pass it (or parts) to other players, which, e.g., adds difficulty to responsibility allocation when there are problems. People may want to participate in projects to be recommended for other projects, because companies work by projects. This project context could reduce people's loyalty to organizations and this situation may make it more difficult to accumulation, dissemination and integration of knowledge and the construction of DCs. It would be interesting to analyse and validate in future research this topic in DC's and PM.

DCs increase competitive advantage if the routines, skills, and factors involved are difficult to imitate (Patrício et al., 2019) and Biesenthal et al. (2019) state that the DCs at the project level are specific to the context in which this project is positioned. In line with this, Gardiner (2014) argues that the project, program, and portfolio management capabilities (PPPM) are related to the environment in which they are inserted, which makes them difficult to imitate. On the other hand, this also means that there is no single way to implement DCs (Biesenthal et al., 2019), which is in line with what good PM practice also indicates in terms of the need to adapt the project (PMI, 2017).

That is, there is a proposal for relevant future research in order to deepen the practical knowledge on how PM can leverage DCs in organizations. This applied not only to PM and its resources, but also to the organization, incorporating DCs in good practices during the execution of projects and consequently in the implementation of its products/services and integrating them in the organization.

This is applied to PM methodology in such a way that it can be used in terms of good practice and not to specific projects in industries or areas. 'Good practices' require that there are standards that can be identified and generalised, from which the best practices can be defined, implemented, used, and replicated, even if this is not possible in all situations (Tereso et al., 2018). In addition, most articles used qualitative analysis referring to specific project cases, which makes it even more relevant to verify in practice these capacities in PM in a more transversal and replicable way in terms of good practices, through the validation of the conceptual model presented.

2.9 Limitations

Addressing the limitations of this study, the selection and analysis of the articles collected was done manually. In addition to the fact that there are not a large number of articles in the selected period that specifically address the topic of DCs and PM, the analysis carried out, although

including the full and careful reading of the articles, may present flaws in the identification and categorisation of capabilities, whether they are dynamic, project, or operational capabilities. In addition, most articles use qualitative methods referring to case studies of specific projects, which limits the level of scope of application of these DCs and results to other types of projects, so they may need further validation in terms more transversal to the project level.

CHAPTER 3

Second paper - Project Management in the Development of Dynamic Capabilities for an Open Innovation Era

The second article was accepted and published in the journal of Open Innovation: Technology, Market, and Complexity:

Patrício, V.; Lopes da Costa, R.; Pereira, L.; António, N. (2021). Project Management in the Development of Dynamic Capabilities for an Open Innovation Era. Journal of Open Innovation: Technology, Market, and Complexity. 2021, 7, 164. https://doi.org/10.3390/joitmc7030164

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The formal acceptance of the paper “Project Management in the Development of Dynamic Capabilities for an Open Innovation Era” was presented is in attachment B.

3.1 Abstract

The aim of the research is to explain how Project Management (PM) ensures the accumulation, integration, utilization, and reconfiguration of capabilities and knowledge acquired in projects in order to build dynamic capabilities (DCs). The study also gives us insight into how PM can develop DCs through the identification and implementation of project management opportunities. The result of 22 semi-structured interviews with 22 participants from nine companies of different industries are detailed and framed within theoretical dimensions of DCs: knowledge accumulation, integration, utilizations, and reconfiguration, sensing and seizing. As a result, we present best practices, techniques, and PM tools that allow leveraging DCs in organizations. This qualitative study contributes to a theoretical and empirical discussion about how PM transforms knowledge acquired in projects into routines and learning practices that allow organizations to develop or reshape capabilities.

Keywords: dynamic capabilities; project management; sensing; seizing; qualitative analysis

3.2 Introduction

Through DCs, organizations reconfigure existing capabilities and develop and renew others (Jantunen et al., 2018). DCs link resources with performance and influence operational capabilities (Eriksson, 2014). They are also linked to the ability to respond to changes in the environment (Eriksson, 2014). According to Eriksson (2014), DCs consist of four core knowledge processes: accumulation, integration, utilization, and reconfiguration, which are also qualified as DCs. The same author argues that future research of these processes in more detail is needed, as well as the connection of DCs with PM (Eriksson, 2014). Studies show the evolution of capacities in organizations (Eisenhardt, 1989a).

This study is part of an investigation with the following phases: (1) systematic literature review about the interrelationship between PM and DCs; (2) how PM leverages DCs in organizations.

In phase 1 of the systematic literature review, 25 articles, published between 2014 and 2019, with research focused on the topic of DCs and PM, were analyzed. From the search, using DC and PM keywords, 733 articles were obtained; after refinement, an exclusion process, and detailed reading, 25 articles remained (Patrício et al., 2021a).

The study used the literature to analyzed the interrelationship between the two areas of study. It was found that there was a limited number of articles published in the literature with the relationship between DCs and PM.

This detailed analysis led us to conclude that one of the themes addressed by the literature is the relationship between the DCs and operational capabilities in projects (Davies & Brady, 2016; Biesenthal et al., 2019). The literature also identifies DCs found in specific projects (Bernroider et al., 2014; Yan et al., 2019; Andersson & Chapman, 2017) in specific industries, which contributed to the success of the projects or DCs that were present in certain projects (Biesenthal et al., 2019; Daniel et al., 2014; Davies et al., 2016; Freitas & Salerno, 2018; Manley & Chen, 2017).

One of the contributions of this literature review was the identification of the DCs identified in previous studies, facilitating a clear understanding of which DCs we are talking about when it comes to projects. Another contribution was the clarification of which theoretical bases were being used in these studies. We found the connection of DCs in projects to themes such as exploration and exploitation (Davies & Brady, 2016; Gardiner, 2014; Zerjav et al., 2018; Davies et al., 2016), as well as seizing and sensing (Biesenthal et al., 2019; Sicotte et al., 2014; Thattakath & Čiutienė, 2017).

After an in-depth literature review on DCs (Patrício et al., 2021a; Patrício et al., 2019) and on the relationship of DCs with PM (Patrício et al., 2021a), we found that DCs need to be revisited (Davies et al., 2016), especially their relationship with project management in a more empirical analysis about the role of project management in the development of DCs (Eriksson, 2014; Medina & Medina, 2015).

The literature addresses existing DCs from the perspective of their contribution to a project's success and not how PM contributes to the development of DCs. In other words, the literature does not provide a theoretical and practical basis for answering what the PM should implement and use in order to leverage DCs.

It was also found that Eriksson's (2014) DC processes remain to be applied and detailed in practice in terms of PM. The question of how PM ensures the accumulation, integration, utilization, and reconfiguration of capabilities and knowledge acquired in projects in order to build DCs is not analyzed in the literature, especially the application of this theoretical basis in the framework of DCs in PM.

The second phase of the study in this paper innovates and contributes to deepening this analysis empirically.

The interconnection between change management and continuous improvement with project management was a topic addressed in a more high-level way (Biesenthal et al., 2019), but this also needs to be further explored due to its importance and impact on the reconfiguration and utilization of new capabilities in projects and routines. Projects are implemented, but the challenge of using the knowledge acquired in routines, processes, and by people, and ensuring the transformation of capacities, is still a current challenge.

It was verified in this LR that the relation of the sensing and seizing concepts with DCs and PM still needs to be explored; namely, how PM develops DCs through projects (opportunities for change, new GP methodologies, new products/services) and how they integrate and disseminate methodologies such as agile and waterfall in order to reconfigure capabilities (Biesenthal et al., 2019).

The demand for speed in decision-making processes (Eisenhardt, 1989a, 1989b), the challenges facing organizations in their internal and external responses, and the challenge of greater collaboration and communication between teams has led organizations to transform and develop new capacities and implement new methodologies, mainly agile (Cesarotti et al., 2019). The question arises of how project management, through seizing and sensing, captures new methodologies and implements them in organizations, thus integrating and reconfiguring project management capabilities, since organizations sometimes experience some difficulty in implementing these new methodologies.

Resource turnover in project management hinders the dissemination of knowledge between projects (Biesenthal et al., 2019), creating a gap on how it is ensured that skills acquired between projects are replicated; this topic is still unanswered in the literature.

What is innovative about this study is the analysis of how PM can leverage DCs, through best practices, techniques, and tools that PM in organizations should develop and implement in order to build DCs through the accumulation, integration, use, and transformation of knowledge through projects. This is the new perspective and original contribution of this second phase of the study about the existing literature.

Results are also achieved by linking change management and continuous improvement with PM, as well as resource turnover in order to leverage DCs and pass on knowledge.

Another contribution relates to the analysis and articulation of these good practices and techniques with theoretical concepts such as accumulation, integration, utilization, and reconfiguring by Eriksson (2014) and sensing and seizing by Teece (2007) from the perspective of the contribution of PM to DCs.

This paper intends to answer the overarching question: “How does project management leverage dynamic capabilities?” presenting a fundamental work to understand what it is that project management should contemplate and perform to ensure the development of DCs through projects, so that the knowledge acquired in projects is accumulated, integrated, utilized, and transformed in project management, in its routines, and in the organization. It aims to understand how this is done through the processes presented by Eriksson (Eriksson, 2014) and the concepts of sensing and seizing (Biesenthal et al., 2019; Teece, 2007) applied to PM methodologies. In addition, it aims to understand what is needed for new PM methodologies, such as agile and waterfall, to be disseminated and used, and thus, reconfiguring capabilities.

Considering that qualitative methods are considered suitable for obtaining data that can capture DC and given that change is central to DC (Eriksson, 2014), the research was conducted through a qualitative study, answering the following specific research questions: (1) How does PM ensure the accumulation, integration, utilization, and reconfiguration of capabilities and knowledge acquired in the projects in order to build DCs? (2) How does PM develop DCs through the identification and implementation of project management opportunities? (3) How does the resource turnover between projects enable the accumulation, integration, utilization, and reconfiguration of knowledge?

The paper is structured in the following way: as a previous work of in-depth literature review was carried out on DCs and how they interrelate with PM, a theoretical framework on PM and its relation with DCs is presented, on the aspects to be analyzed and theoretical processes to be used. Then, the research methodology and data analysis used are explained. The discussion and findings of each research question are detailed and presented in this section. Finally, the main conclusions and limitations of this study are presented.

3.3 Theoretical Framework

3.3.1 Project Management

There are several definitions of what a project is (Tereso et al., 2018). The Project Management Institute (PMI) is considered one of the most widespread professional associations internationally (Farashah et al., 2019). The PMBOK (Project Management Body of Knowledge), is a PMI framework supporting Project Management (PM) methodology (Farashah et al., 2019). According to the PMBOK, projects are defined by being temporary and creating products, services, or outcomes that are considered unique (PMI 2017, p. 4). Projects lead to changes in organizations (PMI 2017, p. 6). Through projects, companies implement and

adapt business or technology strategies; satisfy stake- holder needs; create, improve, or maintain products, processes, or services; and meet in- ternal and external customer, regulatory, legal, or social requirements (PMI 2017, p. 8).

The concept of project management related to a waterfall approach and in a more static environment is linked to the perspective of predictability, through more detailed plans, processes, and checklists with a higher control in order to reduce changes and gain economies of scale with the size of the project (Collyer et al., 2010).

Speed and technical demands have increased the number of interactions and complexity of projects (Cesarotti et al., 2019). The techniques used so far have become insufficient and obsolete (Collyer et al., 2010; Cesarotti et al., 2019). The literature about PM indicates that its techniques will be complemented by approaches related to other methodologies, such as Agile, Lean, and Six Sigma, with the aim of reducing waste and allowing organizations and their teams to work in a more collaborative, communicative, and transparent way (Cesarotti et al., 2019). The environment has become more dynamic and there is a greater focus on adapting objectives and fast interactive releases, relinquishing some of the control (Cesarotti et al., 2019). These concepts are related to the term "agility," which, according to the study by Conforto et al. (2016), implies the ability to change the project plan and continuously and actively involve the customer in the development process, depending on the use of agile methodologies, supposedly skeptical to the industry. Practicing better knowledge about how to use good PM practices in organizations, as well as the best fit of these with the industry in question and the characteristics of those practicing project management, becomes essential to tackle the crisis we are witnessing (Tereso et al., 2018). Promoting training to project managers, managing their skills, developing a learning culture, benchmarking for project management, and continuous improvement allow improving project management in organizations (Fernandes et al., 2014).

3.3.2 Dynamic Capabilities and Project Management

The concept of dynamic capabilities (DC) is associated with high-level management activities (Teece, 2007; Eisenhardt & Martin, 2000).

The competitiveness of organizations depends on their ability to constantly adapt to changes and uncertainties (Gomes & Romão, 2018).

Associated with this statement is the concept of DC, which aims to enable organizations to respond and adapt to the market (Eriksson, 2014), which represents the ability of organizations to learn (Manley & Chen, 2017); Ambrosini & Bowman, 2009), integrate, renew, reconfigure, and create new resources and capabilities, both to respond to external demands and to internal operational processes and routines (Teece et al., 1997; Eisenhardt & Martin, 2000; Zahra et al., 2006; Ambrosini et al., 2009; Cardeal & Antonio, 2012; Di Stefano et al., 2014; Eriksson, 2014; Gardiner, 2014; Sicotte et al., 2014; Davies & Brady 2016; Sivusuo et al., 2018; Zerjav et al., 2018).

The concept of DC is related to the management's ability to identify and capture opportunities (Teece, 2007). By leveraging DCs, organizations increase their capacity for competitive advantage and responsiveness to challenges, because they develop the ability to renew resources, giving them new capabilities and competencies (Patrício et al., 2019).

In the literature, we can find the interconnection between DCs and PM, namely on how DCs can be applied to various PM and project domains (Davies et al., 2016). However, this research mainly focuses on which DCs are identified in certain projects and in certain specific industries and how they impact these projects, rather than how PM develops DCs (Eriksson, 2014; Davies & Brady, 2016; Gardiner, 2014; Hermano & Martín-Cruz, 2016; Biesenthal et al., 2019; Bernroider et al., 2014; Davies et al., 2016; Freitas & Salerno, 2018; Manley & Chen, 2017; Sicotte et al., 2014; Medina & Medina, 2015). For example, Davies et al. (2016) identified, through a case study, which DCs are required to deliver large, complex, and high-risk projects involving multiple stakeholders and how these were developed and implemented in the project.

Other research works looked at the relationship between DC concepts and operational capabilities (Davies & Brady, 2016; Gardiner, 2014; Hermano & Martín-Cruz, 2016; Zerjav et al., 2018; Biesenthal et al., 2019; Daniel et al., 2014; Sicotte et al., 2014). Davies and Brady (2016) addressed the concept of project capabilities, demonstrating how it supports routine and innovative projects, identifying links between project capabilities, operational level, and DC as the strategic level of the organization.

Another research line addresses the development of operational capabilities at project level and DC at portfolio level that appear as a means for TOP Management to influence organizational performance Hermano and Martín-Cruz (2016), along with other authors who addressed the issue of the relationship between DC and identify portfolio management as a DC (Daniel et al., 2014) , or how project management contributes to sustained organizational performance through the in- fluence of dynamic capabilities (Gardiner, 2014; Yan et al., 2019).

Analysing these authors and their research, we can identify an unexplored line of research that has to do precisely with the question of how project management leverages DC. That is, how it accumulates, acquires, integrates, develops, and transforms the capabilities and knowledge acquired in projects in organizations. The consolidation of knowledge from project to project and in the organization is still a topic to be explored (Gardiner, 2014; Medina & Medina, 2015). Eriksson (2014) referred to the importance of developing empirical research to further explore how project management contributes to the development of DC in organizations. Our study builds on the work of Eriksson (2014), whose study found that DCs include four knowledge processes, and on the concepts of sensing and seizing developed by Teece (2007).

Accumulation, Integration, Utilization, and Reconfiguration of Knowledge

Eriksson (2014) identified, through his research, four fundamental processes of DC: (i) knowledge accumulation; (ii) knowledge integration; (iii) knowledge utilization; (iv) knowledge reconfiguration.

Knowledge accumulation is related to the ability of organizations to develop or renew capabilities through experience by the replication of knowledge or its renewal through external cooperation and internal learning (Eriksson, 2014), as is the case with the execution of projects (Medina & Medina, 2015), which are transformed into routines (Freitas & Salerno, 2018).

Knowledge integration happens when there is interconnection between new acquired knowledge, which is attained from external sources, with already existing knowledge through the combination of resources (Eriksson, 2014).

Knowledge utilization is the organization's ability to use acquired and integrated knowledge (Eriksson, 2014).

With knowledge reconfiguration, the organization combines new forms of knowledge through existing capabilities or transforms it into new knowledge (Eriksson, 2014). Reconfiguration requires the changing of capabilities (Eriksson 2014; Biesenthal et al., 2019).

As Eriksson pointed out (Eriksson, 2014, p. 5), due to the complexity, these processes are necessarily ambiguous and overlapping.

Sensing and Seizing

In this paper, we also use Teece's (2007) concepts of sensing and seizing. Sensing has to do with the market, identifying customer needs and market opportunities, developing of new

knowledge, and reconfiguring capabilities (Teece, 2007). Seizing is related to capturing these opportunities for the organization and implementing them (Teece, 2007, 2014). Through implementation of sensing, the functions of DCs are seized and reconfigured and the operational PM resources and capabilities are changed (Biesenthal et al., 2019). Through sensing, improvements that need to be made to PM methodologies are identified by analyzing current and new ones (Biesenthal et al., 2019). Seizing allows implementing the new PM methodology and using it, changing operational PM capabilities (Biesenthal et al., 2019).

These concepts related to DCs are interconnected with PM and appear as drivers of Open Innovation in organizations with regard to responsiveness to emerging opportunities and, consequently, to open innovation dynamics.

3.4 Research Methodology

As knowledge changes, resources and capabilities also change and develop, and theprocess of acquisition, accumulation, and utilization of the capabilities of a company cannot be dissociated with that of the acquisition of its knowledge (Pandza et al., 2003, p. 1028). This study adopted the following processes of DCs suggested by Eriksson (Eriksson, 2014): the ability of the organization to accumulate, integrate, utilize, and reconfigure knowledge applied to project management, i.e., how the project management develops these DCs.

In this paper we also used Teece's (2007) concepts of sensing to explain the link from DCs to PM in terms of identifying opportunities through projects and seizing to verify how the organization captures the identified opportunity. These concepts were applied to PM methodologies as suggested by Biesenthal et al. (2019): sensing to analyze current and new methodologies and seizing to implement new methodologies, joining new capabilities with current ones. The methodologies used were agile and waterfall. We identified the existing issues, gaps, and doubts in the literature review; the research questions and research objectives are shown in Table 10.

Table 10 - Literature Review Issue, Author Reference (Date), Research Question, Research Objective

		Research Question (RQ)	Research Objective (RO)
Literature Review Issue	**Author reference (date)**	**RQ1. How does PM leverage DCs?**	**Goal: Understand how project management contributes to the development of DCs**
Several studies address that DCs are built and identified in specific projects, and analyzed in specific areas. Several authors also mention some project management tools and techniques applied to specific types of projects and which are identified as DCs or as operational capabilities that build or restructure DCs, but the answer to how project management can leverage DCs remains unclear.	Daniel et al. (2014), Davies et al Davies (2016), Freitas and Salerno (2018)	RQ1.1. How does the PM ensure the accumulation, integration, utilization and reconfiguration of capabilities and knowledge acquired in projects in order to build DCs?	O1. Analyze how the organizations guarantee the development and generation of new capacities through projects O2. Identify which PM routines, good practices, and techniques enable the accumulation, integration, utilization, and transformation of capabilities and competences
Conceptual models related to DC processes have been developed, but need to be applied empirically in order to deepen how project management contributes to the development of DCs in organizations.	Eriksson (2014), Medina and Medina (2015)		
Change management frameworks emerge as a representation of a routine and reconfiguring and can support the reconfiguring process of project COs. Through the seizing process, the organization assesses whether or not to use a new PM methodology and develops a change management plan of how to integrate this methodology with the current one. However, it does not detail empirically how change management should be integrated and related to project management in order to ensure that this process occurs in a way that develops the COs, especially in detail and in practice, in terms of its relationship with utilization and reconfiguring.	Biesenthal et al. (2019)		O3. Analyze how change management and continuous improvement are related to project management in order to enhance DCs.
Organizations implement changes in project operational resources through formal processes, such as continuous improvement initiatives. It would be interesting to understand how these continuous improvement initiatives should interlink with project management in order to develop DCs, mainly in the use and reconfiguration of DCs and in the relationship with OCs (operational capabilities).	Biesenthal et al. (2019)		
The discussion about new and current project management methodologies (such as agile and waterfall) and their respective relations with the creation of dynamic capabilities were not addressed in a detailed and practical way. The relationship between sensing and seizing and the new	Biesenthal et al. (2019)	RQ1.2. How does PM develop DCs through the identification and implementation of project management opportunities?	O4. Analyze how PM captures opportunities for improvement in terms of methodologies and development of new competencies in PM and how it implements them

and current high-level project management methodologies is addressed.			O5. Analyze how the PM ensures the use, integration, accumulation and transformation of competencies related to new PM practices and methodologies O6. Analyze whether agile and waterfall methodology develop DCs differently
The nature of projects leads project teams to move in and out of projects, even when they are not closed. This hinders the dissemination and codification of knowledge between projects. This constant exchange between resources may imply a lack of loyalty in the companies, because the concern is allocation from project to project, reducing the accumulation and integration of knowledge coming from the projects and consequently the construction of DCs. It would be interesting to empirically analyze this issue and understand how to mitigate it.	Biesenthal et al. (2019)	RQ1.3 How does the resource turnover between projects allow for the accumulation, integration, utilization, and reconfiguration of knowledge?	O7. Identify what factors can mitigate the impact of resource turnover between projects on knowledge transfer, capacity utilization and codification

Source: authors' own elaboration, 2021

DCs are related to how organizations respond to their environment (Teece, 2007), the concept of which still requires clarification (Davies et al., 2016). To explore how PM can leverage DCs, we used qualitative research (Yin, 2018) in order to clarify our understanding of the problem (Saunders et al., 2009), allowing us to acquire information that would not have been obtained through other techniques (Charmaz, 2006), which is not solely concerned with theory generation (Bryman, 2016). The narrative review allows for flexibility, which makes it more suitable for inductive and qualitative research (Bryman, 2016). According to Yin (2018), using an inductive approach allows us to work with qualitative data and use a set of methods that allow us to obtain different points of analysis about the phenomenon we are analyzing.

Considering the context of the fields of DCs and PM, the inductive and interpretive approach is suitable to analyze through experts from different companies and different industries, which have different perspectives, leading to inferences that can be generalized (Saunders et al., 2009; Bryman, 2016). The interpretivist philosophy is considered appropriate for management research (Saunders et al., 2009).

In order to support the relationship between the concepts for a better understanding of the phenomenon under study, Grounded Theory was used, which is an inductive methodology (Strauss & Corbin, 1994, 2008).

The sample was oriented towards theory building (Charmaz, 2006); this means that we identified interviewees and companies that could generate necessary categories (Glaser & Strauss, 1967).

Due to the complexity of the study and the fact that the current literature focuses more on specific industries (Daniel et al., 2014; Davies et al., 2016; Freitas & Salerno, 2018), this study was applied to several companies from different industries and organizational areas related to projects and competency development. We focused on companies on a national context, namely Portugal. The sample is diverse, including companies with various characteristics to enhance the development of concepts (Strauss & Corbin, 2008). We carried out 22 semi-structured interviews with participants from 9 companies of different industries (Figure 10), who were professionals with years of experience and responsible for areas of project management, areas with projects, and areas of skills development and members of executive committees capable of generating the categories and concepts necessary for this study. The interviewing process ended when the identification of new categories and data was exhausted (theoretical saturation) (Charmaz, 2006).

The interviews took between 50 min and 90 min (Table 11). The interviews were conducted in a video conference format, due to the state of the COVID-19 pandemic we currently face and the respective confinement, which made it impossible to conduct the interviews in person. They were all conducted via Microsoft Teams.

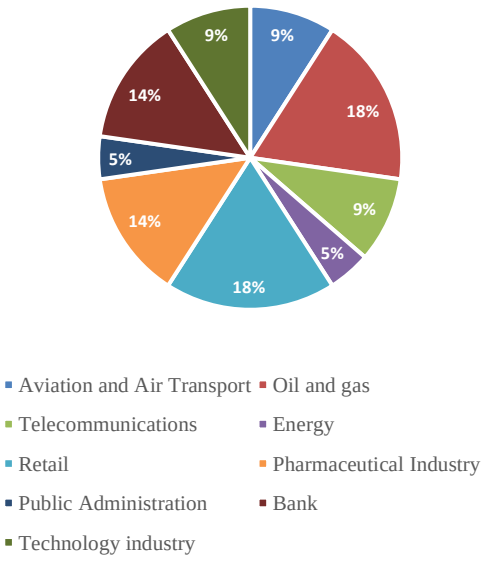

Figure 10 - Sample description: industry distribution. *Source*: authors' own elaboration, 2021

The anonymity of the interviewees and their organizations was taken into account. The interviews were recorded and transcribed in full. All interviews were conducted in Portuguese. Direct quotes were translated from Portuguese into English for presentation in this paper. With auto-recording, the interviews allowed for greater focus on what was being said (Saunders et al., 2009). No names were included, and data storage is password-protected. All participants were asked to authorize the audio-visual recording of the interviews, and 100% of them accepted.

This type of interview allowed us to seek explanations and explore the phenomenon (Saunders et al., 2009), gave flexibility, which is important to clarify and deepen the understanding (Bryman, 2016), and generated the categories (Glaser & Strauss, 1967). Given the exploratory nature of this study, questionnaires would not be an option. Semi-structured interviews allowed us to get the interviewees' points of view, and what they consider as relevant, thus enriching the study with detailed answers (Bryman, 2016). As Bryman (2016) mentioned, this type of interview allows the interviewee to continue to reflect on the topic, even after the interview. Two interviewees in the post- interview period referred to further interesting and related themes, which were included in their respective interviews. Where responses were longer, the interviewer summarized the response to the interviewee, and rectifications were made where necessary.

Table 11 - Sample characteristics. Interviews conducted between September and October 2020

Interviewees ID	Industry	No. of Employees	Interviewee Roles	Time (hours)
1	Aviation and Air Transport	10,000	Portfolio and Capacity Manager	50 minutes
2	Aviation and Air Transport	10,000	PMO Manager	1 h
3	Oil and gas	6,700	IT and Digital Project Manager	1 h
4	Oil and gas	6,700	Learning Manager	1 h
5	Oil and gas	6,700	Manager Engineering and Project Management Office	50 minutes
6	Telecommunications	2,400	Head of IT Transformation Management and Projects	1h20
7	Energy	11,660	Project Manager	1 h
8	Retail	4,500	IT Service Delivery Lead	1 h
9	Retail	4,500	Quality Assurance	1 h
10	Retail	4,500	Program Manager and PM Chapter	1 h
11	Bank	6,500	IT Manager	1h30
12	Pharmaceutical Industry	300	Supply Chain Director and PMO Director	1h30
13	Public Administration	300	PMO Director e Digital Transformation	1 h
14	Pharmaceutical Industry	500	European Head of Project Management and Executive Member	1 h
15	Bank	850	Agile Coach	1 h
16	Pharmaceutical Industry	270	Quality Director	1 h
17	Technology industry	385.000	PMO Leader and PMO Training Coordinator	1 h
18	Technology industry	96.000	Program Manager	1 h

19	Retail	8.500	PMO Manager	1 h
20	Telecommunications	2.400	Head of Enterprise Architecture and Projects	1h15
21	Bank	400	CIO and Executive Member	1 h
22	Oil and gas	6.700	Global Chief Information and Digital Officer	1 h
	Online interviews – total hours			23h25

Source: authors' own elaboration, 2021

The checklist suggested by Bryman (2016) was used to ensure that the issues from the semi-structured interviews would be considered (Bryman 2016, p. 262). In order to ensure that the research instrument worked well (Bryman, 2016), two pre-tests were conducted with two interviewees, which were not included in the results. Questions that were unclear or too long were rewritten and simplified (in questions 4 and 8 brief explanations were added to make them clearer and question 5 was simplified). The question "How many people are involved in projects in the organization?" was removed as it was considered to be a difficult question to answer, especially for respondents from very large companies. All rectifications identified in the pre-tests were made.

Only two interviewees requested the interview script in advance, and no other information was conveyed to the interviewees. After full transcription of the interviews, none were made available to interviewees for correction.

The interview script was developed so that the questions were clear, easily interpreted, composing a total of 13 open questions, organized into two sections: section 1 is a framework of how many employees the company has and the division where the interviewee is inserted. Section 2 consists of the remaining questions of the interview script, which were integrated with the research objectives and framed within the theoretical dimension used to support the research, i.e. accumulation, integration, utilization and reconfiguration of knowledge (Eriksson, 2014) and the concepts of sensing and seizing (Biesenthal et al., 2019; Teece, 2007).

The analysis was complemented with some internal documents that the interviewees provided to detail and exemplify some points, and with information from the companies' websites and social media.

3.5 Data Analysis

Data were analyzed using qualitative data analysis, where categories were coded and grouped into themes that allowed us to arrive at the model (Saunders et al., 2009). The interviews were analyzed using the qualitative data analysis software MAXQDA® 2020.

Using the practices of Grounded theory, these helped greater control and insight into the work (Charmaz, 2006). By using Grounded Theory, data collection and analysis was done simultaneously, codes and categories were constructed from the data collected, comparisons were made at each stage of analysis, theory was constructed as the data were collected and analyzed, and notes were written for the categories in terms of what each meant, the relationships, and related gaps (Charmaz, 2006; Strauss & Corbin, 1994, 2008). Categories and subcategories were identified, taking into account their relationship and the general category was identified, around which the remaining categories were developed (Strauss & Corbin, 2008) (Table 12). Table 12 represents the connection between the research questions, the main category, the generic categories, the sub- categories, and the theoretical dimensions framed and used.

Content analysis is objective, systematic, and transparent, where rules are applied consistently so that there is no bias (Bryman, 2016). The checklist presented by Bryman (Bryman, 2016, p. 566) and Saunders et al. (Saunders et al., 2009, p. 488) was used to ensure the quality of the process. With the full transcription of the interviews, the interview corpus was created (see Appendix E, Table 23). The categories were defined a posteriori based on the data collected in the inter- views (Saunders et al., 2009; Strauss & Corbin, 1994; Glaser & Strauss, 1967). Seven categories and twelve subcategories were identified.

Table 12 - Coding of the interview corpus, categorization, and theoretical dimensions

Research Questions	**General Category**	**Subcategories**	**Annotations/ Description Subcategories**	**Theoretical Dimensions**
1. How does PM leverage DCs?	1. The role of project management in the development of DCs			
	Generic Categories			
1.1 How does the PM ensure the accumulation, integration, utilization, and reconfiguration of capabilities and knowledge acquired in projects in order to build DCs?	1.1 Development and generation of new capacities through projects	1.1.1 Transforming project knowledge into routines	1.1.1 Transformation of knowledge and learning in projects into daily routines and practices	1.1.1 Accumulation
		1.2.1 Actions to address the lack of project knowledge	1.2.1 Actions to address lack of project knowledge	1.1.2 Integration
	1.2 Project management routines, best practices and techniques	1.2.2 PM best practices that bring about capacity change	1.2.2 Project management routines, best practices, techniques, competencies, processes that bring about capacity development, dissemination and change	1.2.1 Accumulation and reconfiguration
		1.2.3 Facilitating and blocking factors for capacity development	1.2.3 Factors in project management and in projects that most facilitate and those that most hinder the development,	1.2.2 Accumulation, integration, utilization

			replication and application of new competencies from project to project and to the organization	
	1.3 Relation of Change Management and Continuous Improvement with project management	1.3.1 Capacity building through GM in projects	1.3.1 Capacity development through change management in projects	1.3.1 Utilization, reconfiguration, seizing
		1.3.2 Capacity development through CI in projects	1.3.2 Capacity building through continuous improvement in projects	1.3.2 Utilization, reconfiguration, seizing
1.2 How does PM develop DCs by identifying and implementing project management opportunities?	2.1 Capturing and implementing improvement opportunities	2.1.1 Identifying and implementing opportunities through projects	2.1.1 Identifying and implementing opportunities through projects	2.1.1 Sensing
	2.2 Use, integration, accumulation and transformation of capacities according to new practices and methodologies	2.2.2 Use and integration of new PM methodologies	2.2.2 Use and integration of new project management methodologies and capacity development	2.2.1 Seizing
	2.3 Agile and Waterfall methodologies and capacity development	2.3.1 Capacity development differentiation between methodologies	2.3.1 Capacity development differentiation between Waterfall and Agile methodology	2.3.1 Reconfiguration
		2.3.2 Identification of capabilities developed in Agile and Waterfall	2.3.2 Identification of capabilities developed in Agile and Waterfall	2.3.2 Reconfiguration
		2.3.3 Reconfiguration of capabilities through Agile and Waterfall	2.3.3 Capacity development and reconfiguration through Agile and Waterfall methodologies	2.3.3 Reconfiguration
1.3 How does resource turnover between projects allow for the accumulation, integration, utilization, and reconfiguration of knowledge?	3.1 Resource turnover	3.1.1 Knowledge replication between projects	3.1.1 Knowledge replication between projects taking into account resource turnover	3.1.1 Accumulation

Source: authors' own elaboration, 2021

In line with Saunders et al. (Saunders et al., 2009, p. 490), we combined the types of processes for qualitative analysis to support the analysis: summarizing and categorizing. In summarizing, we compressed the sentences into a few words, and in categorizing, we developed the categories which allowed us to establish relationships (Saunders et al., 2009). The analytical categories and their relationships allow for a conceptual approach to the study (Charmaz, 2006). The data were interpreted, resulting in a set of concepts that were then coded, compared, organized, merged, and renamed, giving rise to the matrix of codes and the categories and sub-categories that allowed to understand and explain the phenomenon under study (Charmaz, 2006; Strauss & Corbin, 1994).

The criteria used to reinforce the quality of the research were those proposed by Lincoln and Guba (1985) (and also referenced by Charmaz, 2006), considered equivalent to terms used in quantitative analysis (internal and external validity and objectivity) (Charmaz, 2006), credibility, transferability, dependability, and confirmability (Lincoln & Guba, 1985).

To ensure credibility, the researcher had an intense involvement in the topic under study, minimizing distortions (Lincoln & Guba, 1985). A cooperation with the interviewees was established in order to detect distortions. A full transcription of the interviews was made using MAXQDA® 2020, where all information was included. An analysis of all the information obtained by the different authors of the study was made.

To ensure that the sample is representative of the population where generalization will be applied (transferability), the nature of the individuals and organizations that were part of the study were diverse (Carcary, 2009).

To obtain dependability (Lincoln & Guba, 1985), all data, sentences and complete records of the entire process, full transcripts of the interviews, and use of MAXQDA® 2020 to develop the database were kept, which allowed for the transparency of the data collected, including notes, relationships with literature review, and content evaluation. The remaining authors of the study acted as auditors (Charmaz, 2006). All research steps are detailed, allowing for authenticity and accuracy (Lincoln & Guba, 1985). Confirmability was one of the auditors' objectives (Lincoln & Guba, 1985). For this, the same techniques were used for credibility and dependability.

The content analysis was performed by checking the top 15 words most frequently used during the interviews (Figure 11). Bigrams (Figure 12) and trigrams (Figure 13) were identified. Inappropriate words were excluded.

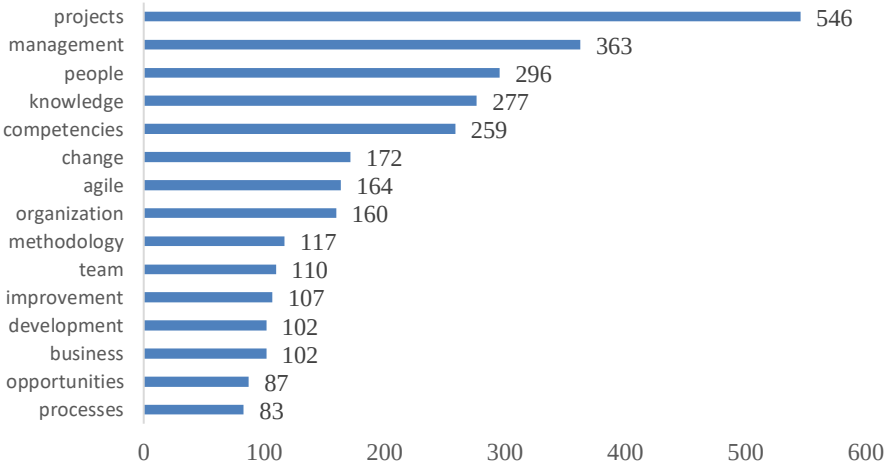

Figure 11 - Top 15 of the most frequently used words. *Source:* authors' own elaboration, 2021

Figure 12 - Top 15 of the most frequent bigrams. *Source:* authors' own elaboration, 2021

Figure 13 - Top 15 of the most frequent trigrams. *Source:* authors' own elaboration, 2021

There is a connection between the top 15 most frequently used words and the bi- grams and trigrams. Words and word combinations such as "projects", "management", "project management", "people", "acquired knowledge", "use of knowledge" or "competencies" appeared very frequently. Words and word combinations such as "change" or "change management" are often referenced in top words, bi-grams, and trigrams, which reflects the relevance given to this theme. Similarly, "methodologies" and "agile" are words that were frequently referenced by the interviewees.

3.6 Discussion and Findings

In this section, we will present and discuss the research findings.

The results aim to explain how PM leverages DCs, identifying exhaustively through best practices, PM techniques, and tools that allow accumulation, integration, utilization, and reconfiguration of knowledge through projects, as well as sensing and seizing through PM methodologies (Figure 14).

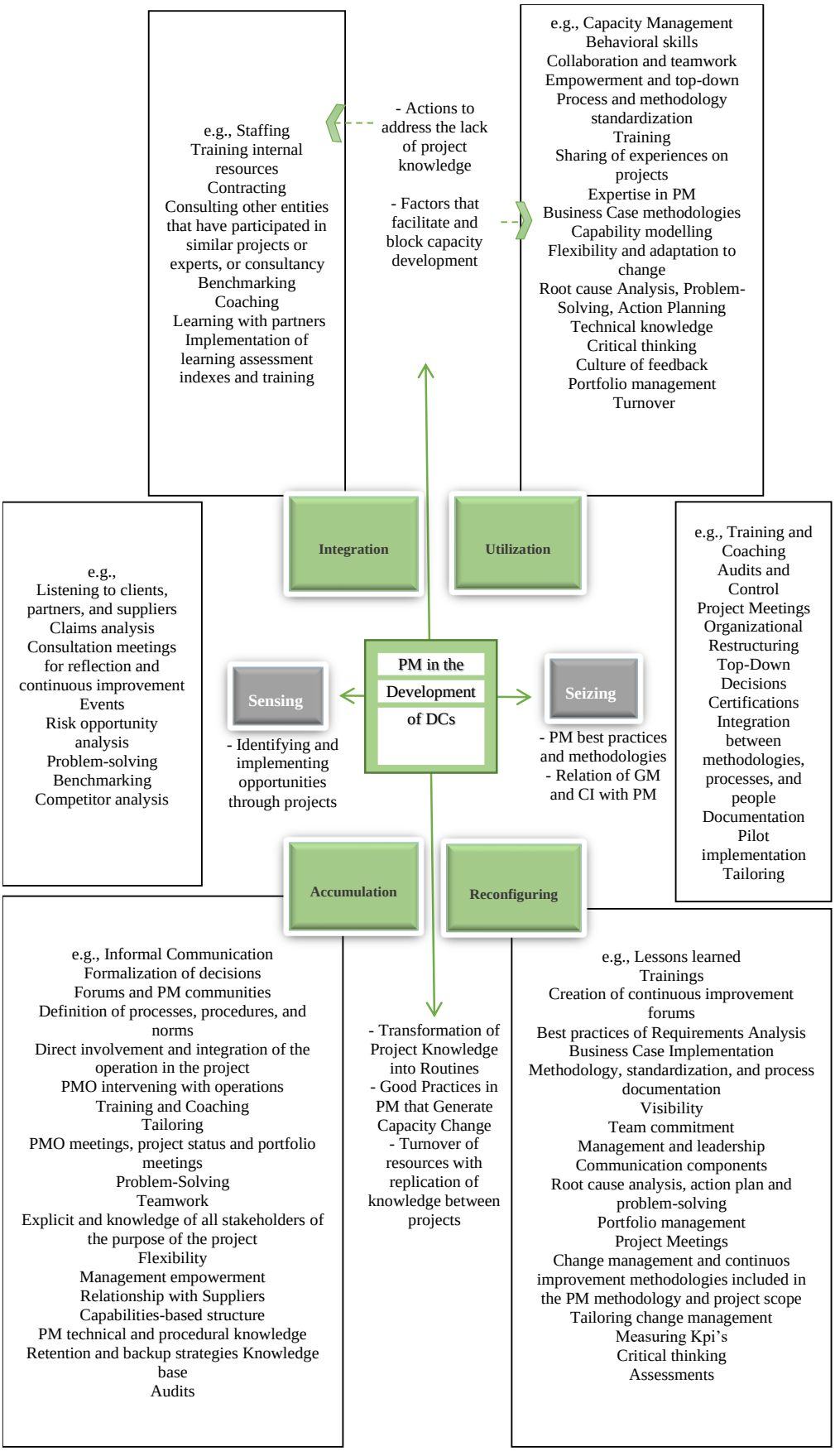

Figure 14 - PM as a facilitator of DCs. *Source*: authors' own elaboration, 2021

Following the Grounded Theory method, the results of the study were compared with the existing literature (Strauss & Corbin, 1994, 2008), which allowed increasing the quality of the theory presented (Eisenhardt, 1989a, 1989b) (Tables 13–15), in order to identify studies in line with the results obtained through new literature review.

Table 13 - Building DCs through the accumulation, integration, utilization, and reconfiguration of capabilities and knowledge acquired in the projects

Generic Categories	Subcategories	Theoretical Dimensions – DCs	PM best practices, techniques, and tools that leverage DC	Comparison with the literature - Autor Reference
1.1 Development and generation of new capacities through projects	1.1.1 Transforming project knowledge into routines	1.1.1 Accumulation	Informal Communication	Biesenthal et al. (2019)
			Analysis of recurrent problems with periodic review of methodologies	
			Formalization of decisions taken	
			Automated reporting documents	
			Forums and project management communities, with thematic discussion and dissemination	Biesenthal et al. (2019), Freitas and Salerno (2018)
			Definition of processes, procedures and norms; norms and rules for closing projects	Davies and Brady (2016), Gardiner (2014), Hermano and Martín-Cruz (2016), Biesenthal et al. (2019), Freitas and Salerno (2018), Gomes and Romão (2018)
			Creation of forums for project initiatives and ideas	Freitas and Salerno (2018)
			Direct involvement and integration of the operation in the project	
			PMO intervening with operations	
			Training and Coaching	Davies and Brady (2016), Gardiner (2014), Biesenthal et al. (2019), Freitas and Salerno (2018), Sivusuo et al. (2018)
			Tailoring	
			Partnerships with the business	Freitas and Salerno (2018)
			PMO newsletters	
			PMO meetings, project status and portfolio meetings	Biesenthal et al. (2019), Freitas and Salerno (2018)
			Flexibility	Eriksson (2014), Biesenthal et al. (2019), Davies et al. (2016), Freitas and Salerno (2018), García et al. (2018)
			Problem-Solving	Eriksson (2014), Davies and Brady (2016), Davies et al. (2016) Manley and Chen (2017), Thattakath and Čiutienė (2017), Pereira et al. (2021a)
			Teamwork	
			Explicit and knowledge of all stakeholders of the purpose of the project	
			Management empowerment	Hermano and Martín-Cruz (2016), Sivusuo et al. (2018)
			Management and relationship with Suppliers	
			Capabilities-based structure	
			Technical and procedural knowledge of the organization by project management	

			Formal record of the scope of projects immediately included in the operation	
			Role of leadership in the development and transformation of knowledge	Gardiner (2014), Hermano and Martín-Cruz (2016), Sivusuo et al. (2018)
	1.1.2 Actions to address the lack of project knowledge	1.1.2 Integration	Staffing	Freitas and Salerno (2018)
			Training internal resources	Freitas and Salerno (2018), Sivusuo et al. (2018)
			Contracting Consulting other entities that have participated in similar projects or experts, or consultancy	Zhang and Leiringer (2016), Freitas and Salerno (2018)
			Benchmarking Coaching	
			Learning with partners Implementation of learning assessment indexes and training	Eriksson (2014), Biesenthal et al. (2019), Manley and Chen (2017), Medina and Medina (2015)
1.2 Project management routines, best practices, and techniques	1.2.1 PM best practices that bring about capacity change	1.2.1 Accumulation and reconfiguration	Lessons learned	Biesenthal et al. (2019), Freitas and Salerno (2018)
			Creation of knowledge base	Yan et al. (2019), Medina and Medina (2015)
			Trainings	Davies and Brady (2016), Gardiner (2014), Biesenthal et al. (2019), Freitas and Salerno (2018), Sivusuo et al. (2018)
			Project Management Forums	Biesenthal et al. (2019), Freitas and Salerno (2018)
			Customer and business involvement in projects and project management methodology Best practices of Requirements Analysis	
			Business Case Implementation	Gomes and Romão (2018)
			Methodology, standardization, and process documentation	Davies and Brady (2016), Gardiner (2014), Hermano and Martín-Cruz (2016), Biesenthal et al. (2019), Freitas and Salerno (2018), Gomes and Romão (2018)
			Visibility Team commitment Short goals	
			Management and leadership	Gardiner (2014), Sicotte et al. (2014), Sivusuo et al. (2018)
			Communication components	
			Root cause analysis, action plan and problem-solving	Eriksson, (2014), Davies and Brady (2016), Davies et al. (2016), Manley and Chen (2017), Thattakath and Čiutienė (2017), Pereira et al. (2021a)
			Portfolio management	Davies and Brady (2016), Gardiner (2014), Hermano and Martín-Cruz (2016), Biesenthal et al. (2019), Daniel et al. (2014)
			Project Meetings	Biesenthal et al. (2019), Freitas and Salerno (2018)
	1.2.2 Factors that facilitate and	1.2.2 Accumulation,	Capacity Management – Workload and execution capacity	Hermano and Martín-Cruz (2016)

	block capacity development	integration, utilization	Behavioral, managerial, and organizational skills	Gardiner (2014), Sicotte et al. (2014), Sivusuo et al. (2018)
			Collaboration and teamwork	Eriksson (2014), Davies et al. (2016), Manley and Chen (2017), Zhang et al. (2017)
			Empowerment and top-down decisions	Hermano and Martín-Cruz (2016), Fernandes et al. (2014), Sivusuo et al. (2018)
			Process and methodology standardization	Davies and Brady (2016), Gardiner (2014), Hermano and Martín-Cruz (2016), Biesenthal et al. (2019), Freitas and Salerno (2018), Gomes and Romão (2018)
			Training	Davies and Brady (2016), Gardiner (2014), Biesenthal et al. (2019), Freitas and Salerno (2018), Sivusuo et al. (2018)
			Sharing of experiences on projects	
			Project meetings	Biesenthal et al. (2019), Freitas and Salerno (2018)
			Expertise in Project Management	Sivusuo et al. (2018)
			Application of Business Case methodologies	Gomes and Romão (2018)
			Capability modelling	
			Flexibility and adaptation to change	Eriksson (2014), Biesenthal et al. (2019), Davies et al. (2016), Freitas and Salerno (2018), García et al. (2018)
			Root cause Analysis, Problem-Solving, Action Planning	Eriksson (2014), Davies and Brady (2016), Davies et al. (2016), Manley and Chen (2017), Thattakath and Čiutienė (2017), Pereira et al. (2021a)
			Technical knowledge	Freitas and Salerno (2018)
			Critical thinking	
			Culture of feedback and reflection	
			Portfolio management	
			Turnover	
1.3 Relation of Change Management and Continuous Improvement with project management	1.3.1 Capacity development through CM in projects	1.3.1 Utilization, Reconfiguration, seizing	Change management methodology included in the Project Management methodology and project scope	Biesenthal et al. (2019), Zhang et al. (2017)
			Tailoring change management	
			Leadership through Influence	
			Change Champions	Biesenthal et al. (2019), Zhang et al. (2017)
			Communication plan	
			Measuring KPIs	
	1.3.2 Capacity development through CI in projects	1.3.2 Utilization and Reconfiguration, seizing	Continuous improvement methodology included in the Project Management methodology and in the scope of the project	
			Methodology for implementing and monitoring KPIs included in the scope of the project	
			Creation of continuous improvement forums	
			Supplier participation in the projects and continuous improvement forums	
			Critical thinking	
			Assessments	

Source: authors' own elaboration, 2021

Table 14 - Developing DCs by identifying and implementing project management opportunities

Generic Categories	Subcategories	Theoretical Dimensions – DCs	PM best practices, techniques, and tools that leverage DC	Comparison with the literature - Autor Reference (Date)
2.1 Capturing and implementing improvement opportunities	2.1.1 Identifying and implementing opportunities through projects	2.1.1 Sensing	Listening to clients, partners and suppliers	Freitas and Salerno (2018)
			Claims analysis	
			Consultation meetings for reflection and continuous improvement	
			Events	
			Risk opportunity analysis	
			Problem-solving	Eriksson (2014), Davies and Brady (2016), Davies et al. (2016), Manley and Chen (2017), Thattakath and Čiutienė (2017), Pereira et al. (2021a)
			Benchmarking	Eriksson (2014), Manley and Chen (2017), Medina and Medina (2015)
			Competitor analysis	Eriksson (2014), Manley and Chen (2017), Medina and Medina (2015)
2.2 Utilization, integration, accumulation and transformation of capacities according to new practices and methodologies 2.2.2 Utilization and integration of new PM methodologies		2.2.2 Seizing	Training and Coaching	Davies and Brady (2016), Gardiner (2014), Biesenthal et al. (2019), Freitas and Salerno (2018), Sivusuo et al. (2018)
			Audits and Control	
			Project Meetings	Biesenthal et al. (2019), Freitas and Salerno (2018)
			Organizational Restructuring	
			Top-Down Decisions	Hermano and Martín-Cruz (2016), Fernandes et al. (2014), Sivusuo et al. (2018)
			Certifications	
			Integration between methodologies, processes, and people	Davies and Brady (2016), Gardiner (2014), Hermano and Martín-Cruz (2016), Biesenthal et al. (2019), Freitas and Salerno (2018), Gomes and Romão (2018)
			Documentation	Davies and Brady (2016), Gardiner (2014), Hermano and Martín-Cruz (2016), Biesenthal et al. (2019), Freitas and Salerno (2018), Gomes and Romão (2018)
			Pilot implementation	
			Tailoring	
2.3 Agile and Waterfall methodologies and capacity development	2.3.1 Capacity development differentiation between Agile and Waterfall methodologies	2.3.1 Reconfiguration		
	2.3.2 Identification of capabilities developed in Agile and Waterfall	2.3.2 Reconfiguration		
			Process negotiation	Zhang and Leiringer (2016)
			Monitoring	
			Commitment	
			Adaptability	Sicotte et al. (2014)
			Responsibility	
			Team spirit	
			Knowledge sharing	
			Critical spirit	
			Agility	
			Communication	
			Waterfall:	

			Business understanding Planning Overview Predictability	
	2.3.3 Reconfiguration of capabilities through agile and Waterfall	2.3.3 Reconfiguration		

Source: authors' own elaboration, 2021

Table 15 - Replication of knowledge between projects, taking into account the resource turnover

Generic Categories	Subcategories	Theoretical Dimensions – DCs	PM best practices, techniques, and tools that leverage DC	Comparison with the literature - Autor Reference (Date)
3.1 Resource turnover	3.1.1 Knowledge replication between projects	3.1.1 Accumulation	Retention and backup strategies (of internal employees and staffing)	
			Knowledge base	Yan et al. (2019), Medina and Medina (2015)
			Audits	
			Meetings for sharing and passing on knowledge	
			Documentation	Davies and Brady (2016), Gardiner (2014), Hermano and Martín-Cruz (2016), Biesenthal et al. (2019, Freitas and Salerno (2018), Gomes and Romão (2018)
			Informal communication	Biesenthal et al. (2019)

Source: authors' own elaboration, 2021

Each research question will be discussed in detail in the following sections.

3.6.1 RQ1: How Does Project Management Ensure the Accumulation, Integration, Utilization, and Reconfiguration of the Skills and Knowledge Acquired in Projects, in Order to Build DCs?

To answer RQ1, we verified with the interviewees how (i) the development and generation of new capabilities through projects occurs, i.e., how knowledge and capabilities are accumulated and reconfigured through projects; (ii) the mapping of routines, best practices, and techniques

of project management was carried out, in order to identify how the use and integration of skills and knowledge acquired in projects is processed; and (iii) the relationship of change management and continuous improvement with the project management was identified, in order to understand how to use and reconfigure the knowledge and skills acquired in projects (Table 13).

Development and Generation of New Capacities through Projects

We considered (i) how the knowledge and learning acquired in projects is transformed into daily routines and practices, thus leveraging the accumulation of knowledge and (ii) which routines, best practices, techniques, tools, competencies, and project management processes cause development, dissemination, and change of capabilities in the organization, thus developing the accumulation and reconfiguration of capabilities absorbed in projects.

Transformation of Project Knowledge into Routines

Analyzing the results of the transformation of project knowledge into routines, we can observe that the informal communication, which exists between project teams, works very well in terms of sharing experiences, enabling learning and replication of good practices. As interviewee 16 stated: "[...] there are moments when everyone is together, they learn from each other; through informal communication that works well, they gain experience and help each other with ideas." This idea is in line with Biesenthal et al. (2019), who argued that knowledge about the best way to deliver projects is transferred through informal channels—*ad hoc* conversations between project managers that do not follow written rules, regular meetings, or project reports (the authors highlighted this aspect by linking it more to a sensing routine in identifying new opportunities).

Several authors mentioned that informal conversations between project managers have results in project success, other than just lessons learned and formal project meetings, changing methodologies when necessary in a specific project, as well as the flexibility to solve issues that arise, as long as it is not inconsistent with organizational models and processes (Eriksson, 2014; Biesenthal et al., 2019; Davies et al., 2016; Freitas & Salerno, 2018; Manley & Chen, 2017; García et al., 2018).

In line with these authors, one of the interviewees identified flexibility as a key element: "People's flexibility is very important in knowledge development and transformation" (Interviewee 15).

Although informal communication was identified as important in knowledge accumulation, project management office (PMO) meetings, project status meetings, and portfolio meetings also emerge as important in trans- forming project knowledge into routines, mainly associated with meetings with more agile methodologies. As one of the interviewees explained, “doing retrospective meetings and understanding what we can improve not only in project management, but also in the IT area, in the business areas, relationship and communication within the areas, ends up being the main point of knowledge dissemination” (Interviewee 3). Project and portfolio meetings are mentioned in the literature review as important for identifying strategies, resistance, and communication, and for seeking to understand the projects (Manley & Chen, 2017; having been pointed out as codification of knowledge into routines (Freitas & Salerno, 2018).

Eriksson (2014) mentioned that problem solving is essential in DC, but it is not enough. The interviewees showed that it is necessary to analyze recurring problems with a peri- odic review of the methodologies, in order to facilitate the transformation of knowledge into routines, accumulating it. “When a problem gets repeated, which did not happen in this specific project but in several projects, we will discuss and analyze how we are going to improve and deal with it from now on. This serves as input to the methodology, that is, changes are included in the methodology by means of what was discussed to solve the identified and recurring problem” (Interviewee 2). This topic goes beyond the themes found in the literature review. In line with some authors reviewed previously (Davies & Brady, 2016; Davies et al., 2016; Manley & Chen, 2017; Thattakath & Čiutienė, 2017; Medina & Medina, 2015; Sivusuo et al., 2018), problem-solving emerges as very important in PM, associated with the development of DCs. Problem-solving models provide a better understanding of problems and their solutions (Pereira et al., 2021a). In the LR, we also found the relation between problem-solving in projects as a tool to explore Open Innovation in organizations (Pereira et al., 2021a).

The formalization of the decisions taken identified in the study emerges as an additional theme to the literature review: “If it is not written down and accessible, it does not work. People have to be involved [...] people have to see the value and management has to empower them” (Interviewee 17). Reinforcing Hermano and Martín-Cruz (2016) on the importance of senior management involvement, one of the interviewees identified the im- portance of the active role of leadership in knowledge development and transformation: “[...] alignment of the objectives that are very different. Each director of the business unit should bring these indicators to life” (Interviewee 15).

The definition of processes, procedures, and standards identified by the interviewees reinforces what was referred to in previous literature as knowledge codification (Freitas & Salerno, 2018) and routines (Teece, 2012). In it, the accumulation of knowledge and learning, when transformed into routines and practices, allows companies to develop or reformulate existing capabilities (Freitas & Salerno, 2018). However, according to Teece (2007), this is not enough for the organization's competitiveness.

The definition of methodologies and their standardization was identified in the study as being important for the accumulation and transformation of knowledge from projects into routines. Methodology tailoring was also identified. In the LR, work routines, processes, and procedures in project management have been found to be related (Davies & Brady, 2016; Gardiner, 2014; Hermano & Martín-Cruz, 2016; Biesenthal et al., 2019).

The study brings the extension to the LR on the Project Management Maturity Model, which has gained relevance: "The definition of processes and methodologies is very important [...]. A set of initiatives that ensures the components, one of them being the maturity model, has been created (the assessment of knowledge of the areas that have it and the level of maturity on it, as well as actions for us to improve)" (Interviewee 17).

In order to ensure that the knowledge in the methodology is clear and understandable to all to be used correctly, one of the interviewees explained the importance of all individuals involved understanding its value: "A person does the handbook at the task level, but it is then seen together with those who do not know, in order to ensure that the knowledge is explicit and that nothing is missing [...]. We are investing in cost management. There is no process, no tool, and no education. We are building it [...] and putting the knowledge on paper is fundamental in the processes, procedures, and standards, but then what I notice is that many times, they do not even remember that there is a database that explains how to do it. People do not apply or they do not follow a PM process, or they do not use the tool in that way and they are always making up their own ways because they do not understand the value of the processes themselves, nor of the standardization" (Interviewee 12).

Although in the study the project closure standards and rules were identified as an important procedure in PM for the development and generation of new capabilities through projects, one of the interviewees drew attention to "when there are problems, they are addressed post mortem and they retrieve a set of actions that they apply.

The problem is that the format of lessons learned is static" (Interviewee 9). This idea is in line with what Gardiner (2014) and Biesenthal et al. (2019) argued—that it remains difficult to address problems in practice and to pass knowledge of the lessons learned from project to project. One of the interviewees drew attention to the importance that "lessons learned cannot be static, they must be turned into living documents" (Interviewee 9).

Freitas and Salerno (2018) referenced the creation of a group discussion as encoding knowledge into routine, but this study goes further. It identifies in detail project management forums and communities, thematic discussions and dissemination, creation of project initiatives and idea forums, as well as PMO Newsletters that were considered important in transforming PM knowledge into routines by the interviewees.

As one of the interviewees noted: "The various levels of explicit knowledge are very important: the tool, the standard, the education, talking about topics, having a record that they can refer back to, a recording [...]; increasingly more people are asking [for these tools], because increas- ingly more things are happening, and there is a need for theory to really turn into practice. Thus, we invested a lot in the 10, 20, 70 methodology: 10% we learn through theory, 20% through observation, 70% by doing, which has to start right in education and be reinforced in our work. And we have also implemented a community of good practices; every 15 days, all the project managers of the world meet and discuss a theme (for one hour), which may be a process, a tool, a difficult experience, and with that, we become aware for the first time of that procedure or tool, although it was sent in writing" (Interviewee 12).

PMO, project, and portfolio meetings have been identified, reinforcing the findings from the LR (Davies & Brady, 2016; Gardiner, 2014; Hermano & Martín-Cruz, 2016; Biesenthal et al., 2019; Daniel et al., 2014; Freitas & Salerno, 2018), as well as project reports (Biesenthal et al., 2019; Bernroider et al., 2014; Freitas & Salerno, 2018). The note given by one interviewee goes further and reinforces the importance of reports being automated in order to increase their quality, and respect periodicity and use for transforming the knowledge of projects into routines.

The direct involvement and the integration of the operation into the project, a PMO intervening in the operations, partnerships with the business, the formal recording of the scope of projects immediately included in the operation, and the explanation and knowledge of all stakeholders of the purpose of the project were mentioned by interviewees as being fundamental.

As reinforced by some of our interviewees: “if it stays within the scope of the project and it stays directly in the operation, with recognition and visibility, it helps in [the building of] knowledge” (Interviewee 14). “Partnerships with the business [are needed], so that the projects belong to the business and not to the SI. Thus, business people are [involved] in the projects, and thus, knowledge is transferred to the operation, because they are already in the project and are business people” (Interviewee 19), “[...] integrate people in the projects who then make the transition” (Interviewee 11).

Training and coaching of project managers (PMs) and team members reinforced what the LR refers to concerning the importance of these processes in formalizing knowledge and increasing DCs (Davies & Brady, 2016; Gardiner, 2014; Biesenthal et al., 2019; Freitas & Salerno, 2018; Sivusuo et al., 2018). Additionally, one of the interviewees identified the importance of technical and procedural knowledge of the organization by project management (Interviewee 5).

Although alliances and partnerships have already been identified in the LR as an important example for building dynamic capabilities through the accumulation of experience and codification of knowledge absorbed through projects (Freitas & Salerno, 2018; Zollo & Winter, 2002), the management of the relationship with suppliers is referred to in the study and associated with team- work: “Suppliers have to be very transparent and serious in the execution of activities. There has to be a degree of mutual trust [...]. There is a good rapport and when there is no partnership and interrelationship with unexpected situations, help is more difficult [...] [a] rapport between company and supplier is fundamental for reciprocal assistance and good relationship and greater responsiveness to problems and development of mutual knowledge. [...] The most important capabilities are behavioral ones, and technical knowledge and experience in similar projects are fundamental. The complexity is such that teams have to be knowledgeable about the surroundings. [...] Quality here is key and the expertise of the supplier and the relationship we have with them. The contracting regime is what we discuss the most. The margin for failure is very small; these are installations that deal with flammable, hazardous materials and the risk is serious for the installation and for people” (Interviewee 5). Reliability capacity had previously been identified by Zhang et al. (2017)

The study reveals that the capabilities-based framework is important for knowledge accumulation through projects, and one of the interviewees (Interviewee 20) argued: “It is better to change capabilities than processes.

There is an interesting and safe benchmark. Before we think about time and the change that each project brings to something, one should know what that something is. [...] Decompose profit and loss as a whole into a cluster of business capabilities."

Actions to Respond to the Lack of Project Knowledge

When there is no knowledge and capabilities within the organization to meet a challenge, the organization acquires it outside and integrates this knowledge with what already exists, combining capabilities Eriksson's concept of integration (Eriksson, 2014). In the study, the interviewees identified actions to respond to the lack of knowledge in projects, both at the technical and management levels. Staffing and training of internal resources were mentioned by several interviewees (14 interviewees identified staffing and 12 training), followed by coaching and hiring (five interviewees). Training and coaching are needed "in order to also ensure standardization and homogeneity," as stated by Interviewee 6. Internal skills development, training, and staffing had emerged in the LR also as learning routines implemented by projects related to knowledge articulation (Freitas & Salerno, 2018), in line with periodic training programs (Freitas & Salerno, 2018; Sivusuo et al., 2018). One of the interviewees stated: "Staffing, because there is no time to go and train. With more stability one [can give better] training; nowadays, in IT, the speed does not allow for training to respond" (Interviewee 21). New hires had already been identified in previous studies by Zollo and Winter (2002) as an indicator of new knowledge, and also by Zhang and Leiringer (2016) and Freitas and Salerno (2018), as a form of experience and learning routines implemented by projects. Capacity management and its intersection with roadmap of resource needs emerged as a theme related to staffing: "Capacity management models are important" (Interviewee 21).

Benchmarking, consulting/visiting other entities that have participated in similar projects or experts, or consulting and learning from partners were also identified as actions to take when it is necessary to seek knowledge and capabilities outside the organization. This is in line with Freitas and Salerno (2018), who had identified partnerships and alliances as contributing to the creation of DCs, with the note that it works if the company has a policy to be able to take advantage of these alliances.

In accordance with the data collected, this study provides a more comprehensive view and points to the theme of implementing learning assessment indexes and trainings as an action to respond to the lack of knowledge.

As interviewee 18 explained: “[...] training is mandatory and all the training they have to do goes into the evaluation of the employees. It is within the evaluation indicators themselves [that] contributes to improvement and learning. [...] the individual perspective of evaluation is associated with the index, if it contributed to learning or not. It is an evaluation index for which you either work or you fail. These is training that allow us to see who did or did not do [their task], if they fulfilled [their task] or not, or if they still need to be done. And this criterion serves as input for the performance and career evaluation model.”

PM Routines, Best Practices, and Techniques That Enable the Accumulation, Integration, Utilization, and Transformation of Skills and Competencies

In order to identify what can leverage or hinder the development of DCs through projects, we referenced good practices that cause visible change of capabilities. To this end, a mapping was made of routines, best practices, techniques, competencies, and project management processes that cause the development, dissemination, and change of capabilities, leveraging DCs through their accumulation and transformation. Furthermore, a mapping was made of the factors in project management and in projects that most facilitate and those that most hinder the development, replication, and application of new competencies from project to project and for the organization, allowing us to understand how the accumulation, integration, and utilization of capabilities acquired in projects is achieved. In order to respond to one of the gaps identified in the LR, we also asked the interviewees how project management interrelates with change management and how it generates and transforms capabilities and ensures the use of knowledge acquired in projects.

Good Practices in PM That Generate Capacity Change

Despite what the literature mentions about the difficulty of applying lessons learned (Gardiner, 2014; Biesenthal et al., 2019) interviewees stated that “lessons learned are in people’s heads. Formally, they are not used, but when passed informally from project to project, lessons learned are passed from project manager to project manager. When transformed into workshops, podcasts, visual management, people already see them and use them. In other words, by changing the format, making them alive and not static, the dissemination and use rate increases. The same happens with the knowledge base” (Interviewee 2).

The training is identified as a good practice that causes a change in capacities. There are also project management forums "[...] for thematic discussions" (Interviewee 2), knowledge sharing sessions, "which are sessions [held] once a month where there is a speaker who talks about themes" (Interviewee 9), "talks between areas, which are sharing projects, initiatives [...] so that knowledge is disseminated" (Interviewee 6), "visits between the various geographies, with sharing of documents" (Interviewee 14).

Methodology, standardization, and process documentation were mentioned by several interviewees, associated with agile methodologies: "This methodology changed everything, agile is changing and reconfiguring skills, processes, day to day [...]" (Interviewee 10). "Agile made things more accepted by all and smoother, this is because there was business involvement, time management involvement in project management, in control, from high level the standardization became a routine, it was assimilated with standardization" (Interviewee 16). The involvement of the customer and the business in the projects and in the project management methodology is associated with the need to have the purpose of the project clear and the teams involved from the beginning: "Having people within the project that [are involved] right away in the operation of the project of the product/service [and] know the project management methodology, [that] put in the project the transmission of knowledge, but not at the end. [...] The most important thing is that people who are in operation and maintenance start to have notions of project management" (Interviewee 11). "The project manager tells them when they need the dates, and then production plans the products as if they were their products from the operation. This has, wonderfully, made things easier and smoother. They have been incorporated not as a project activity but as a day-to-day activity right into the project" (Interviewee 16).

In the study, the importance of setting short-term goals also emerges, associated with methodologies such as Kanban that lead to skills development and changes in routines according to interviewees. Associated with this theme, the requirements methodology is identified as a result in this study. As two of the interviewees referred: "If you have a greater structuring of the tasks, of the requirements, the teams are more interested and developed" (Interviewee 17). "The methodology of testing and of requirements has brought a lot of improvement. It used to be in a meeting that they made and raised the requirements and people did not remember everything. People write, commit, and have time to think and prepare. Dates [are starting to be adhered to], and hence, greater confidence and performance ensues" (Interviewee 21).

Gomes and Romão (2018) analyzed how the management of benefits can help organizations obtain the dynamic capabilities needed to face market challenges. In line with this, the implementation of business cases as good PM practices that transform capabilities also arose, identified by the interviewees.

As detailed by Interviewee 19: "They only do projects that really bring value to the company […]. And it is a huge mindset change, because they were not worried about the costs involved. They prioritize their value. And that changed skills and capabilities. They learned how to do a business case, evaluate the project quantitatively, and make it more factual. [This makes the process] much more rational and less based on needs [of which] you do not know [the] worth."

Portfolio management and project meetings are also repeated here as good practices, in which emphasis is given to their importance for collaboration, prioritization, and focus on what is important in the weekly identification of risks, in tracking the activities of the previous period, in retrospective meetings in order to solve problems. The focus should be on the team, and on team learning, not on the individual, "continuous improvement [needs to be] included in the projects and then in the operation, always looking for a solution applied not only to projects, but to all projects and products" (Interviewee 16). The commitment of the team and with the importance of the visibility of the delivery as good practices is also related and was also identified by the interviewees. In the LR, the importance of collaboration in DCs had been identified (Eriksson, 2014; Davies et al., 2016; Manley & Chen, 2017; Zollo & Winter, 2002).

Techniques such as problem-solving, root cause analysis, and action-planning are associated and identified as important for the accumulation and transformation of capabilities. As one of the interviewees detailed: "Many times there is [a presentation] at the end of the line, when what is needed is to act on the cause, on the context, to create the conditions, discipline, routine, to coach opportunity - they want to learn, but it takes so long to learn by themselves that they cannot. It is necessary to create this context, to think about what type of behavior we want to influence in order to impact results. Sometimes, we want to act at the level of behavior, sometimes at the level of numbers. And acting at the level of behavior is different from acting at the level of competencies" (Interviewee 12).

Good practices related to communication are associated with multidisciplinarity, but also with agile methodologies, and "the transversality of knowledge and the capacity of people to leave their box" (Interviewee 4).

Good practices—such as newsletters, team building, volunteer events, presentations on the market, exchange of experiences in projects in specific events that inform the whole company of what a given area did in terms of projects—were identified by the interviewees as facilitators of communication and even behaviors, leveraging the accumulation and reconfiguration of capabilities (Interviewees 1, 3, 4, 7, 9, 17).

The role of management and leadership appeared in this study to be associated with one-to-one meetings with the entire project team, coaching by those responsible, encouraging participation, and transversal initiatives and improvements: "It is necessary to create context, routines, quality time depending on the person's profile so that they can express desired behaviors and improve performance. Develop people, educate them. Poorly defined KPIs are often drivers of bad behavior. You have to think in terms of context, behaviors, results, to define results, but be aware of this path and work on it. In general, people want quick results. But that is not real, you do not inject knowledge and competence. You have to build competencies to have sustained behaviors that are of value and will influence outcomes. KPIs are influenced by behaviors that were developed prior" (Interviewee 12).

Top-down decisions to use PM best practices and methodologies decisions associated with business, customer segmentation and knowledge, and analytical and technical capacity were also identified by the interviewees.

Facilitating and Blocking Factors of Capacity Development

Capacity management (volume of work and execution capacity) emerges in the study as a factor that can facilitate or block the development of capacity in projects. As mentioned by the interviewees: "When there is a lot of work, there is no room for continuous improvement, you will not be coaching, you do not document, you do not formalize" (Interviewee 2). "When you take and try to absorb the knowledge, be critical, the time is lacking, you do not get so deep into the skills [...] people cannot be critical, question, know why, whether or not the solution will meet the needs and propose alternative solutions" (Interviewee 6).

Interviewees identified behavioral, managerial, and organizational skills, relating these to "being able to mobilize project teams, people, and resources, looking for new solutions, always being up to date, reporting what is going to happen and what are the key skills" (Interviewee 5). Leadership development had already been mentioned in the LR (Gardiner, 2014; Freitas & Salerno, 2018; Sivusuo et al., 2018).

The interviewees in this study went further and identified other components of management and leadership that facilitate or block the development of skills, such as: “people with great organizational skills, persistence, pragmatism, resistance to adversity, some technical knowledge, empathy, friendliness, knowing how to deal with people, knowing how to communicate, and leadership are very important skills that facilitate the application and development of project skills.

People with little organization, little leadership ability, lack of persistence, absence of processes and procedures hinder the development and application of capabilities” (Interviewee 21).

The interviewees reinforced what had been mentioned in the LR about the importance of collaboration (Eriksson, 2014; Davies et al., 2016; Manley & Chen, 2017) and teamwork (Gomes & Romão, 2018). The interviewees indicated that what facilitates most are the relationships between people but drew attention to the fact that collaboration within teams works; however, when it comes to collaboration between areas, it becomes more difficult: “It is a competence that should not depend on how the organization is arranged. [...] Project management can be very important in contributing to collaboration between teams/between areas” (Interviewee 12). “Often, cultural issues arise [...]. It is a complex factor and demotivating when it is too much. Cultures that navigate [uncertainty] in a difficult way […] make it difficult; silos do not help either. When there is greater size, it creates a silo” (Interviewee 14).

Top management involvement had been mentioned by Hermano and Martín-Cruz (2016) and Sivusuo et al. (2018), in the sense that top management involvement leads to the development of project and portfolio DCs, related to decision-making capacity (Zollo & Winter, 2002) and the definition of processes and procedures Hermano and Martín-Cruz (2016).

Pereira et al. (2021b), in a study relating knowledge management and projects in this new era of Open Innovation, found that senior managers argue that knowledge transfer in PM is a key topic. The interviewees, in addition to the importance of empowerment and sponsorship, also referred to the importance of top-down decisions to facilitate standardization and use. This theme was also raised by Fernandes et al. (2014). The operational routines and processes mentioned in the LR are related to the development of DCs (Freitas & Salerno, 2018; Gomes & Romão, 2018).

In line with that, the interviewees noted that “what makes it most difficult is the lack of processes, of consistency between the various steps of the project, because each one does it in a different way. It causes complexity, people learn fast if they do it routinely” (Interviewee 9). They emphasized the importance of standardization and processes, of people understanding the purpose of the existence of areas in the organization responsible for ensuring methodology, that the “common information and standardization also helps the turnover that exists in staffing” (Interviewee 7).

Interviewee 22 mentioned: “planning, rigor, method, training, experience, predictability, top-down in terms of compliance with processes and methodologies, sponsorship, mandatory methodology, and its correct use. If we want companies to transform, we have to define how we guarantee continuity, what we want people to learn.” One of the interviewees drew attention to the role of processes: “Standard processes are there to help us do our job, to help us be productive, to make it easier to manage the team, to manage the customer; we do not have to learn formats, we just have to manage content, but processes are not rails. When there is a checklist for a meeting, the idea is not to limit those questions, it is to understand that you can change” (Interviewee 12).

Training for project managers and the whole team in PM, expertise in project management, related to permanent reinvention and sharing of experiences on projects, as well as project meetings encouraging critical participation of stakeholders were identified by the interviewees as facilitating factors if they exist in PM.

Technical knowledge was also identified in the study. Freitas and Salerno (2018) had referred to industry specialization as DC.

Portfolio management is referred to by interviewees as facilitating the stimulation of integration and collaboration, in the sense that, when there are focused on common goals and cross-cutting initiatives, it helps prioritizing continuous improvement.

The interviewees identified the application of business case methodologies as a facilitating factor: “They prioritize it for its value. And that changed skills and capabilities” (Interviewee 19), in line with what was mentioned by Gomes and Romão (2018).

The application of techniques such as root cause analysis, action-planning, and problem-solving also appear associated with critical thinking as facilitating factors. “But there are many one-to-one coaching sessions, one to ten sessions every week on root cause analysis, action planning, and cost analysis that [are done] in a mathematical way, but without a critical eye. You have to look beyond the numbers. Critical thinking is a very important capability, linked to problem-solving, root cause analysis, and action planning, which has a process and competence component that is essential. It has to be developed in companies and in education itself. Cognitive flexibility, flexibility with discipline, with standards and processes” (Interviewee 12).

The flexibility and ability to adapt to change, associated with the willingness of teams and leadership to learn and the adaptation of the organization was also mentioned: “the organization will have to adapt to the new applications and not the applications to the organization. The applications no longer adapt to the team and processes to become the organization” (Interviewee 6). This factor identified by our stakeholders is in line with the topic of disciplined flexibility mentioned in previous studies (Eriksson 2014; Davies et al., 2016; Freitas and Salerno 2018; Garcia et al., 2018; Biesenthal et al., 2019). Critical thinking, problem solving, and a culture of feedback and reflection in projects are drivers for the open innovation culture, allowing organizations to acquire knowledge and technology in the outside environment (Pereira et al., 2021a).

“There are rules and processes, but sometimes you need adaptability and flexibility to be able to respond” (Interviewee 15).

The existence in the organization of a culture of feedback was also identified as a facilitating factor for capacity development: “[a] culture of feedback and reflection is necessary (through day-to-day, coaching, reflection meetings)” (Interviewee 12).

Capacity modeling was also mentioned, in the sense of “saying what is going to be needed and making it known to everybody. [...] People have to know what is relevant. Shared benchmarks are the most important thing; it is about understanding what technological capabilities the organization has to have and selecting them. Carrying the knowledge into the value chain. [...] Coding/modeling with shared benchmarks in the sense that they are known by everyone. How you keep the modeling alive: selecting the right one, validating whether it is being updated [too] much or not updated enough” (Interviewee 20).

Resource turnover emerged in the study as an inhibiting factor for capacity development, related to the loss of associated knowledge.

Relationship of Change Management and Continuous Improvement with Project Management

Capacity Building through Change Management in Projects

According to the interviewees, in order to develop capabilities through change management (CM) in projects, the change management methodology should be included in the organization's Project Management methodology and within the scope of the project. Change management depends on the complexity and impact of the project, "it only happens in certain types of projects with some dimensions and processes already in place; when it happens, there are change management sprints where there is internal communication, there is involvement with other areas. There are approaches, strategy, small alterations where there is change, but changes that are more circumscribed to the universe of affectation or scope of communication, point by point" (Interviewee 6). "When the projects are large there is concern with change management [...]. Small projects no, but that in reality is changing the ways of doing. Small projects change the day to day [...]" (Interviewee 11). "A good streamlined change management process makes all the difference" (Interviewee 8). Associated to these points, the tailoring of change management was referred to by the interviewees as a necessary factor for the PM to generate, utilize, and reconfigure knowledge acquired in the projects.

In order to involve the areas in change management, the change champion emerges as a change agent mentioned by the interviewees, reinforcing the ideas of Biesenthal et al. (Biesenthal et al., 2019). These authors highlighted change management associated with the implementation of changes in project management methodologies in their study, to guide the reconfiguration process. Through a seizing process it evaluates the use of a new project management methodology and develops a change management plan of how to implement the new methodology into current project management capabilities (Biesenthal et al., 2019). These authors addressed change management associated with implementing changes in project management methodologies and operational capabilities in PM but did not detail the interconnection of change management as a whole with dynamic capabilities in projects. This study addresses this topic.

The communication plan was mentioned as an important piece to reduce fear and ensure comfort for the teams. The KPIs and their monitoring and control were identified— interviewee 22 explained: "you have to have accountability, it has to be measured. Digital transformation is cultural transformation and communication. Sponsorship is fundamental, with concrete KPIs" (Interviewee 22).

Leadership through influence was considered as a factor of interconnection between PM and CM, in the sense of generating, transforming, and ensuring the use of knowledge acquired in projects. One of the interviewees stated: “Another fundamental aspect is the ability to influence and this is fundamental in change management. We help to personify the why of the change, the pain of the change.

The project manager with his ability to manage and influence is very important, and he must position himself as a service leader who puts his team and the organization first: server leadership and leadership through influence [...]. There is a very important parallel between project management that is able to develop capabilities for change management. Those aspects of context and driver behaviors and driver performance are fundamental. You have to first create conditions, processes, tools, educate people, so that afterwards we can expect different behaviors or get a different performance aligned with the purpose of the company” (Interviewee 12).

Change management was identified by interviewees as an area that still needs to be ensured and developed. Eight of the interviewees mentioned that they do not have change management or that there is no interconnection between change management and project management in the organization where they work, or that there is still great difficulty in change management (Interviewees 3, 4, 5, 9, 11, 12, 13, and 21). As one of the interviewees explained: “we have had a lot of difficulty and there is awareness of the need, but we still cannot act on taking knowledge management beyond the team [...]. Education [is needed] from an earlier age, considering that education in companies has to be complementary, but they have to teach us about the importance of preparation, risk, thinking beyond, continuous improvement, change management” (Interviewee 12).

Capacity Building through Continuous Improvement in Projects

The continuous improvement methodology (CI) included in the project management methodology and within the project scope was identified by the interviewees as a factor of interconnection between PM and CI in order to develop capabilities in projects and in the organization. According to some of the interviewees, nowadays, the continuous improvement is integrated into the operation and not in the projects, lacking interconnection, being an area that is still not so transversal in organizations (Interviewees 2, 13, 11, 20, 6, 21, and 14). As one of the interviewees stated “there are improvement actions focused on errors and not so much on innovation. It should be an area to be developed” (Interviewee 5). The LR mentions that

organizations implement changes in project management operational resources through formal programs, such as continuous improvement initiatives (Biesenthal et al., 2019).

The use of agile methodologies was identified by the interviewees as a way to link the two areas. “We use agile methodologies and agile methodologies give tools for that. And they ensure continuous improvement. The retrospective meetings themselves contribute to CI. [This is not the case if] you use traditional project management” (Interviewee 9).

Interviewee 16 explained how this interconnection worked well in his organization: “There are several cases where project managers develop continuous improvement activities that are transposed to the whole routine. Continuous improvement activities were inserted in the project scope itself and were replicated to the whole production and to the manufacturing and if it was not like that, we would not be able to manufacture with the competences and in the way we do today. By assembling a solution process for a certain problem, it was possible to solve problems in other products.” The methodology for implementing and monitoring KPIs included in the scope of the project was also considered, as were assessments to “identify what is not right and opportunity for change, new services, business opportunities” (Interviewee 8).

The creation of systematization of continuous improvement forums in order to give visibility and create synergies, the creation of routines for analyzing what went well, reflections on improvements to be implemented, and opportunities were mentioned. The participation of suppliers in these forums, bringing ideas “contribute a lot because they have a different view of things, there are many different companies with many new ideas [...] you invest in continuous change” (Interviewee 7).

The development of critical thinking in the organization and in the projects was identified as a necessary factor for the development of skills: “They have to ask when they do not know, they must have critical thinking, they must question, they must know where they are going and why they are going. Design thinking, critical thinking is fundamental” (Interviewee 22).

3.6.2 RQ2: How does PM Develop DCs by Identifying and Implementing Project Management Opportunities?

Biesenthal et al. (2019) studied the relationship between sensing and seizing and new project management methodologies and the currently existing ones in the organization, looking at the opportunities that existed in terms of methodologies in the market to improve current capabilities (sensing) and the evaluation of using the new PM methodology within the organization (seizing) by developing new DCs.

The results of this study demonstrate how opportunities are identified and implemented through projects and how they use and integrate these new PM methodologies, leading to leveraging DCs through current and new methodologies (Table 14).

Capture and Implementation of Improvement Opportunities—Identification and Implementation of Opportunities through Projects

According to the interviewees, opportunities are identified through the projects by listening to customers, as well as through partners and suppliers. Events also enable the capture of opportunities for improvement: "there is a lot of interactions outside [of the company] and [as a result, there are] accounts and reports of situations that come together with technology, methodology, and with tools that are based on and seek to explore" (Interviewee 13).

Inter-company sharing sessions, as interviewee 6 explained: "[...] go through a set of clients who have already implemented this platform, identify pains, problems, and go hand in hand with each other. The problems are identical."

Competitor analysis and benchmarking were also identified: "They will scientifically look at the market and trends and instead of receiving what the boards say they need or think they need, they will be indicating what capabilities are needed in the short, medium, and long term according to that analysis" (Interviewee 4).

These practices are drivers of open innovation in organizations, since they listen to the market, customers, and technology (Pereira et al., 2021a, 2021b). Open Innovation uses inbound and outbound knowledge to increase the speed of innovation in the organization (Valdez-Juárez & Castillo-Vergara, 2021).

The analysis of complaints is referred to by the interviewees as input for the implementation of opportunities through projects, as well as meetings for reflection, continuous improvement, and problem-solving: "[...] we are updating standards, detailing the standards, processes, customers' needs during the projects" (Interviewee 12).

The analysis of the opportunities of the risks identified in the projects was referred to in the study by the interviewees as something to be enhanced and developed: "They do not look at it as an opportunity, they look at opportunities as one less problem and not as an opportunity to explore. There is a lot of focus on delivering the product, using the methodology and not how to leverage" (Interviewee 11).

Problem solving is associated with DCs (Eriksson, 2014), indicated by the interviewees of the study as a practice that allows the identification and implementation of opportunities through projects, and also appears in the literature as a driver of open innovation dynamics (Pereira et al., 2021a).

Utilization, Integration, Accumulation, and Transformation of Capacities According to New Practices and Methodologies of PM

In order to use and integrate new methodologies and develop and reconfigure capacities, interviewees considered trainings in PM methodologies on a large scale in the organization, reinforcing what had already been mentioned in the LR (Davies and Brady, 2016; Gardiner, 2014; Sivusuo et al., 2018), as well as coaching. The LR talks about coaching/mentoring of project managers (Biesenthal et al., 2019). The interviewees identified the role of agile coaches in mentoring teams.

Certifications related to PM methodologies were suggested, as well as the implementation of pilots for the use of the new methodologies, with tailoring.

Audits and control to standardize and ensure use were highlighted as important for using and integrating new methodologies. As one of the interviewees indicated: “Lack of standardization leads to non-use, standardization leads to use” (Interviewee 9). Integration between methodologies, processes, and people, ensuring that the purpose and impact of their use/non-use is understood and is aligned with strategy, was pointed out. PM emerged as having “a key role in managing dynamics and change” (Interviewee 12).

Documentation must exist, explaining the whole methodology, routines, and manuals. In the case of the agile methodology, it must explain all the formalities. The project meetings using the respective methodology were identified in the study by the interviewees.

Organizational restructuring, in order to accommodate the new methodologies and align the whole organization with the methodology, associated with top-down decisions, was identified in the study: “Change in philosophy and paradigm changed behaviors” (Interviewee 6). This topic brings us to the topic of the role of the leadership and project team members in the understanding of open innovation, and more precisely the open business models to respond to what the market demands (Oh & Choi, 2020; Rotjanakorn et al., 2020).

Agile and Waterfall Methodologies and Capacity Development

Another outcome of the study, looking at an existing gap in the LR, was to analyze the relationship of agile and waterfall methodologies used in PM, and their relationship with DC development, through the reconfiguration of capabilities.

Capacity Development Differentiation between Agile and Waterfall Methodologies

Concerning the theme of agile and waterfall methodology developing capabilities, of the 22 respondents, 16 (73%) considered that the agile and waterfall methodologies develop capabilities differently (Figure 15).

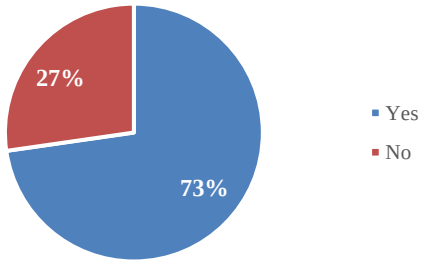

Figure 15 - Capacity development differentiation between agile and waterfall methodologies. *Source:* authors' own elaboration, 2021

Some of the interviewees mentioned that they tried to implement agile methodology, but had to abandon it "because people were not prepared to decide quickly, they did not have autonomy and confidence in themselves, everything was solved in meetings with a lot of people. We went back to waterfall. The company was not ready" (Interviewee 21). There are organizations that try to have the two methodologies coexist: "The project management component itself was separated from the software development cycle management component and an attempt was made to have the two coexist" (Interviewee 13).

Identification of Capabilities Developed in Agile and Waterfall Methodologies

According to the interviewees, the agile methodology develops more skills at the procedural negotiation level, allows monitoring through daily meetings, facilitates transparency, and focuses people on a goal with commitment and accountability. "It promotes team spirit and knowledge sharing. They do not get locked up each doing their own thing. It makes it easier for

people to ask their doubts and questions, there is more mutual help" (Interviewee 11). Furthermore, the agile methodology favors critical spirit, due to the dedication it implies, "Agile develops agility, communication, more day-to-day management" (Interviewee 10), "there is no longer communication by silos" (Interviewee 18). "Within agile the personal relationship, communication, empathy, has to be at the highest level. The team has to function as one. There is an interconnectedness between people that have to function as one piece. That allows dissemination and integration of knowledge" (Interviewee 3)

According to the interviewees, the waterfall methodology develops capabilities such as business knowledge and planning, providing an overview and predictability. "In agile we have a collection of things and we know what we deliver in each sprint, but you do not know the whole. You must have a skeleton" (Interviewee 8).

Capability Reconfiguration through Agile and Waterfall Methodologies

Forty one percent of the interviewees referred that the agile methodology allows greater development and reconfiguration of capabilities in the organization compared to the waterfall methodology (Figure 16).

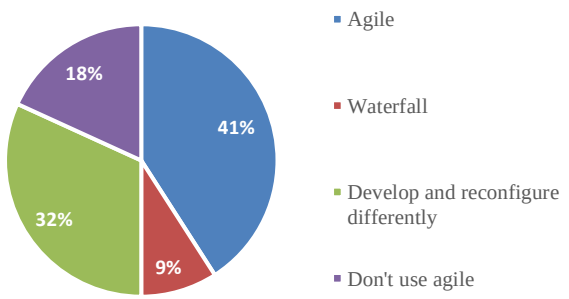

Figure 16 - Reconfiguration of capabilities through Agile and Waterfall methodologies. *Source:* authors' own elaboration, 2021

As mentioned by Interviewee 9, "Agile [...] people have to be more multifaceted"; "agile requires more continuous accountability from the actors, requires more communication, lean and centralized" (Interviewee 21). "Agile has brought more systematization and more of these themes, whether in the problem-solving components or in customer experience and journey issues" (Interviewee 6).

In total, 32% of the interviewees mentioned that agile and waterfall methodology develop and reconfigure capabilities differently: “They do not develop one more than the other, they develop different skills” (Interviewee 2); “hybrid is what you should do and what we are doing. They have invested in transversal knowledge, such as quality management, audits, PM, and this is what transforms the resources into added value at a transversal level and we give them greater capacity to be in various different projects” (Interviewee 17); “you have to identify the best methodology that should fit. It depends on the projects. There are projects that have to be waterfall. Focus on delivery. In agile you have a faster output” (Interviewee 8); “Personal skills in agile are greater. Not of the whole, but of each person. [...] The documentation is a big flaw in agile. Things are not documented, it is too light in agile and that is a problem. If I have not documented, how then are we going to check things? Agile makes [use of] a more oral and unsystematized transference and that may in terms of organization make it difficult to pass competencies from the project to the operation” (Interviewee 11).

In total, 9% of interviewees stated that the waterfall methodology develops more capabilities than the agile methodology, explaining that “in the waterfall methodology, there is a capability that ends up being very well developed: contract management. Because of the scope, a lot of supplier management [is present with the waterfall methodology, which] does not happen in agile” (Interviewee 3); “[I prefer] waterfall, because it ends up being more transformational for the organizational structure of the company and medium and long-term strategic decisions. Agile gives short-term visibility, more in tune with the processes themselves than waterfall” (Interviewee 1).

In total, 18% of the interviewees stated that they do not use agile as a methodology. According to interviewee 5, “At the industrial and engineering level, you do not apply agile methodology to large projects. [...] The design phase is too long.” Interviewee 14 stated that “with the size of the projects and predictability that investors require, agile alone could not be implemented here. The change factor is constant, but at every point, they want a big waterfall traction with change management.” Interviewee 20 mentioned that he uses the agile and lean methodologies.

3.6.3 RQ3: How Does the Turnover of Resources between Projects Allow for the Accumulation, Integration, Utilization, and Reconfiguration of Knowledge?

The results of the study confirm that resource turnover between projects is an inhibiting factor in developing DCs. Biesenthal et al. (2019) drew attention to the fact that project managers

leave projects even before they end, hindering knowledge transfer and codification. The LR indicated that the way skills and knowledge developed in each project stay in the organization and are replicated and used in other projects considering the nature of project turnover had not yet been analyzed. Table 15 shows the results of this study.

The retention and backup strategies of both internal employees and staffing were mentioned by the interviewees as necessary for knowledge to be replicated from project to project, taking into account the issue of resource turnover that is witnessed in PM. Specifically, the interviewees mentioned the importance of working conditions favorable to retention (financial, career development plan, training), the proximity of the primary structure to the most critical resources, the creation of backups of critical functions, and actions that enable knowledge transfer: "Concerning people turnover, the organization is concerned that both internal and external people feel good. The organization should bring them motivation, the work environment should be pleasant and meet the expectations of each one" (Interviewee 6). The importance of centralizing the backups in the supervisors and of them coaching, being aware of the entire operation of the area was mentioned: "On the project management side, everything remains the same, even when people leave. They [know that] the manager has well-defined backups (if the manager leaves there are already backups) and she does coaching. I never even saw it as a problem, because they have a toolkit, what I feel sorry for is the loss of personal skills" (Interviewee 16).

The creation of a knowledge base: "[...] which has trainings, papers, PM technical documents, PM glossary, thematic forums on agile. [...] this knowledge base [needs to be reviewed] in future projects—when a problem becomes habit, we adjust the methodology" (Interviewee 2). Knowledge Management areas are related to systems and tools for knowledge acquisition (Lopes da Costa et al., 2019). Audits, gate reviews, checklists, and alarm systems were mentioned by several interviewees: "One of the people in charge has a check page that is like alerts for lack of updates. [...] He has set up alarm systems to always have cards, projects, initiatives that have been waiting for feedback for more than 15 days, status updates, states of play, problems. These alarm systems are visible and available to everyone, including administration. Movement is transparency. It is a good technique to use and disseminate knowledge. The responsible person sees this information daily and asks the PM chapter for help to talk to the project managers to update" (Interviewee 10).

In addition to informal communication, meetings for sharing and passing on knowledge emerged as important: “they have been trying to disseminate among the project managers with meetings every 15 days, each one presents their project, lessons learned, what went well, what went wrong, to ensure that everyone works in the same way” (Interviewee 19): “There is a daily sharing of knowledge. The daily meeting focuses on the progress of the work compared with the previous day, retrospective is feedback and continuous improvement” (Interviewee 15).

Documentation was associated with the need to make documents simple and alive through sharing and dissemination in meetings: “The theme of documentation, non-traditional, from support documents, user stories, requirements, support materials to pass on skills. Nothing is done without coming around and ensuring that the capabilities, using change management, continuous integration processes, reconfigurations is achieved” (Interviewee 19); “We learned that it is not enough for someone to know how to [follow] the manual, someone who does not know about the subject has to […] understand whether everything was transmitted. The person did not transmit knowledge because they thought it was obvious” (Interviewee 12). Interviewee 20 explained how they keep the documents alive: “In every project we model the capabilities, it is mandatory. Internal employees give training, external employees suggest training. We try to make the coverage map and network, as a whole, work. We have to make sure we have active and appropriate actors in each domain. Success comes from modeling by diagrams, with business, technology, and systems capabilities and sub-capabilities, and their interrelationship. If you have a tool where you can ask for people’s collaboration, [where you can] publish on an internal portal saying all the projects that have touched advertising and it shows, for example, […] what the projects have in common and quickly know what dependencies exist and do a modeling. You realize, that way, what interrelationship they have and capabilities they need, and turn [them] into KPIs.”

3.7 Conclusions

In this paper we looked at how PM can leverage DCs. The objective was to under- stand how project management contributes to the development of DCs and what good PM practices, techniques, and tools should be applied to develop DCs in order to enable the accumulation, integration, utilization, and reconfiguration of capabilities, using Eriks- son’s (Eriksson, 2014) DC processes as a theoretical basis. With it we aimed at understanding through the sensing and seizing process (Teece, 2007) how PM methodologies, such as waterfall and agile, can develop and reconfigure DCs (Biesenthal et al., 2019). In this study, we also examined how change

management and continuous improvement should intertwine with PM to enable capabilities to be used and reconfigured in projects and routines. The results of the 22 interviews with several professionals from different sectors allowed us to answer three research questions: The first research question was “How does PM ensure the accumulation, integration, utilization, and reconfiguration of capabilities and knowledge acquired in projects in order to build DCs?” This was achieved by developing and generating new capabilities through projects, transforming project knowledge into routines in order to accumulate this knowledge and thus develop this DC.

A total of 24 good practices, techniques, and PM tools that enable this accumulation of knowledge were identified. Eight actions were identified to respond to the absence of knowledge in projects, in order to allow the integration of knowledge to happen when the necessary capabilities do not exist. Sixteen good PM practices were identified that bring about visible change in capabilities, allowing knowledge accumulation and reconfiguration in projects. The facilitating and blocking factors of capability development were identified as being 18, with these factors—if favorable—enabling knowledge accumulation, integration, and utilization.

The relationship of change management and continuous improvement with PM was the area of greatest difficulty and room for development according to the interviewees, in the sense that it still has much to improve in order to develop DCs, mainly the integration of CM with PM in order to ensure that the knowledge acquired in projects stays in the routines and allows the use and reconfiguration of capabilities. Six good practices, tools, and techniques were identified that allow the development of capabilities through PM in projects and another six through CM. It was verified that the agile methodology can be used as a way to leverage the continuous improvement in the PM.

The second research question “How does the PM develop DCs through the identification and implementation of project management opportunities?” was answered, and eight ways of detecting and implementing opportunities through projects, through a sensing process, were identified. For using and integrating new PM methodologies—seizing—10 good practices were identified.

We found that there is differentiation in the development of capabilities between the agile and waterfall methodologies, with 41% reporting that agile develops more capabilities than waterfall, allowing a greater reconfiguration of capabilities.

Conforto et al. (Conforto et al., 2016) mentioned that the use of agile methodologies is supposed to be agnostic to the industry, but in the study, it was found that respondents belonging to the pharma industry use the waterfall methodology more often than agile. Some interviewed companies from the energy field, including in large and complex projects, did not apply agile.

Apart from PM, the difficulty of using documentation for knowledge and capacity development still remains a challenge, as does turnover.

The third research question "How does the resources turnover between projects allow for the accumulation, integration, utilization, and reconfiguration of knowledge?" was answered by identifying six best practices in order to understand how knowledge is replicated between projects, taking into account the turnover of resources between projects, allowing the accumulation of knowledge.

This paper contributes to a better practice and knowledge about which PM best practices, techniques, and tools organizations should be used and implemented in order to leverage DCs. It provides insight into how PM develops and integrates knowledge into processes, people, and tools. It integrates these good practices with theoretical dimensions of DCs, allowing a completeness of the study in its various dimensions, having used a sample that allows insight into various areas with interviews with very senior professionals. The study brings theoretical and practical contributions about the importance of a consolidated and studied vision so that organizations may work with a PM that contributes to the development of DCs in organizations, thus allowing an accumulation, integration, utilization, and transformation of capabilities, integrating them in routines, and allowing their day-to-day continuity, enhancing opportunities related to PM. This study helped went beyond this evolutionary economy with complexity that we are witnessing; it also helped to understand that promoting DCs through these PM practices and techniques allows the accumulation, integration, utilization, and transformation of knowledge, through both sensing and seizing, which are drivers of open innovation dynamics (Rotjanakorn et al., 2020).

3.8 Limitations and Future Lines of Research

Like all studies, this research has limitations. Only a small number of interviews were conducted, taking into account the size of some of the interviewed companies, as well as the number of companies in Portugal (according to Statistics Portugal's report of companies in Portugal, in 2019, there were 1,318,330 non-financial companies), and the fact that the study was only conducted in Portugal (although there were companies with international operations

in the sample). The sample can be justified by its theoretical saturation, since the marginal utility of the data collected was reached after the number of interviews conducted. Furthermore, there was no expectation of obtaining important new information in more and new interviews (Saunders et al., 2009).

Future studies can be done in other contexts, besides Portugal. Future studies can work on quantitative analysis, taking into account the results of this study. A future line of research could be the deepening of the theme of change management in projects with DCs.

In the LR, in some articles related to the subject of this study, the term Open Innovation appears related to knowledge of the organization (Pereira et al., 2021b) and has been the focus of several investigations (Pereira et al., 2021c). The projects and the knowledge they generate are related to the development of open innovation (Pereira et al., 2021a). Pereira et al. (2021b) focused on the importance of external knowledge absorptive capacity being dependent on internal knowledge absorptive capacity. Looking at these terms, relating Open Innovation with knowledge and projects, we identify a knowledge gap in the relationship between projects and their capacity to develop Open Innovation, through sensing, seizing, accumulation, and integration. Future studies on the relationship and the role of projects in the development of Open Innovation, associated with the development of DCs, mainly concerning processes related to sensing, seizing, accumulation, and integration of knowledge, are, therefore, suggested. The relationship of Open Innovation with knowledge transformation is also referred to in the LR (Pereira et al., 2021b), being pointed out as another future research path to be detailed. The tools and techniques needed to increase the quality and speed that Open Innovation requires, such as Problem-Solving, among others (Pereira et al., 2021a), intersect with techniques and tools also used in projects (Pereira et al., 2021a). Research into which tools and techniques enable an Open Innovation dynamic through projects and DCs would be an important empirical study in these areas.

Sustainability is a current challenge, especially in the energy sector, which requires companies to innovate (Radnejad et al., 2020).

Another current challenge of this industry, for example, is the innovation of processes to increase efficiency related to this issue of sustainability and cost reduction (Radnejad et al., 2017). This scenario imposes a new requirement in the development of DCs so that organizations can respond to these current challenges, adding the complexity that these are industries that are very dependent on suppliers, with complex and high-risk projects.

The challenges in terms of sustainability, cost reduction, and efficiency with DCs and the nature of the projects that these industries have been developing has made empirical studies essential in order to help organizations respond to the various internal and external demands.

CHAPTER 4

Third paper - Impact of Project Management to capability transformation

The third article was accepted and published in the journal: International Journal of Agile Systems and Management

The formal acceptance of the paper “Impact of Project Management to capability transformation” was presented is in attachment C.

Patrício, V; Lopes da Costa, R; Pereira, L.; António, N., Pereira, L, Gonçalves, R., Jerónimo, C. (2022). Impact of Project Management to capability transformation. International Journal of Agile Systems and Management. DOI: 10.1504/IJASM.2023.10047943

ISSN: 1741-9174

Quartil Scopus Q1; Scopus CiteScore Tracker 2021: 3.3

4.1 Abstract

A central question for researchers and practitioners is whether and which project management (PM) practices foster capability transformation in order to develop dynamic capabilities (DCs). To explore this question, this study seeks to empirically examine whether PM practices promote capability transformation. To this end, 141 surveys of professionals with project experience were analyzed. This research used PLS-SEM and empirically presents factors and practices that significantly facilitate the possibility of PM practices transforming capabilities in organizations, thereby leveraging DCs, through the accumulation, integration, utilization, and reconfiguration of knowledge gained from projects. This quantitative study contributes to the literature by presenting scales for measuring PM practices and factors that contribute to capability transformation, and highlighting those, thereby providing an important contribution to organizations and academia in developing DCs through PM.

Keywords: Dynamic Capabilities; Project Management; PLS-SEM; Reconfiguration; Capability Transformation

4.2 Introduction

DCs have been growing in terms of importance (Teece, 2012). Moreover, learning in companies occurs very much by projects (Freitas & Salerno, 2018). It is unanimous in the literature that more research is needed on how PM can contribute to the evolution of DCs (Eriksson, 2014; Medina & Medina, 2015), as well as the dissemination of knowledge gained in projects (Patrício et al., 2021a) and its incorporation into routines (Davies and Brady, 2016). Reconfiguration is considered a fundamental process in DCs (Eriksson, 2014), which means continuous renewal (Teece, 2007) and that it is the process where the change of operational capabilities of PM happens (Biesenthal et al., 2019). The research objective defined for this paper is: to understand how PM contributes to the transformation of capabilities in order to leverage DCs.

Due to the nature of projects, which are carried out through teams and are something with a temporary effort, with a defined beginning and end (PMI, 2017), organizations are faced with the challenge of how they absorb and retain this knowledge and capabilities after the project ends and moves into operation, not least because resources often leave from project to project without the project ending and the lessons learned prove to be insufficient (Biesenthal et al., 2019; Bernroider et al., 2014).

There is also the need to consolidate the learning of the projects, their dissemination throughout the company and the reduction of error repetition (Hermano & Martín-Cruz, 2016). DCs are necessary for this (Hermano & Martín-Cruz, 2016).

It is unanimous in the literature that it remains to be seen what PM should ensure to facilitate the transformation of capabilities, their replication from project to project and their absorption into routines (Davies & Brady, 2016; Eriksson, 2014; Medina & Medina, 2016). This study intends to bring as added value a deeper analysis of these issues, to identify and clarify which factors and practices positively facilitate this incorporation, replication and transformation of capabilities, integrated in the DCs process.

In innovative and complex projects and in environments with rapid and uncertain change, the weakness of current project capabilities is quickly revealed to be inadequate (Davies & Brady, 2016). If the organization can implement some repetition in practices, it increases its ability to respond to the future (Davies & Brady, 2016). This study intends to demonstrate that PM practices facilitate the transformation of capabilities in a way that can facilitate this response ability in the future.

Previous studies approach DCs in PM from the perspective of studying the effects of DCs on projects, applied to specific areas (Daniel et al., 2014; Davies et al., 2014; Freitas & Salerno, 2018). In the literature DCs are identified in a more general way in more conceptual articles, and not so much in specific and practical terms of how MP can transform capabilities (Eriksson, 2014; Medina & Medina, 2015). There is also a gap regarding the question related to how PM can facilitate Change Management (CM) in order to transform capabilities (Biesenthal et al., 2019). This article is intended to clarify this topic.

The literature mentions the importance of incorporating information and knowledge gained from projects and DCs, but no deep and clear analysis is identified of which PM practices contribute to the transformation of capabilities (Davies & Brady, 2016; Bernroider et al., 2014).

This study innovates and deepens the analysis of these issues, in that it presents scales for measuring PM practices and factors that facilitate capability reconfiguration, using a quantitative approach with Structural Equations Modeling (SEM). It was used partial least squares (PLS) and wich is a variance-based structural equation modelling technique, using a SmartPLS 3 software (PLS-SEM), (Ringle et al., 2015).

Constant changes mean that project managers have little time to adapt PM practices and ensure the utilization of project knowledge (Norbjerg et al., 2017). There is a need to improve knowledge of which best practices help organizations respond to the challenges (Fernandes et al., 2014; Tereso et al., 2018).

Of the appropriate PM practices, the study contributes quantitatively to the perception of which ones contribute most to the transformation of capabilities through several variables studied, presenting the top principles of capturing and transforming knowledge and capabilities in PM.

Finally, this study delves into this topic and demonstrates how one can incorporate theoretical underpinnings related to DCs, which are often vague and difficult to interpret practically in the literature, into a set of PM practices and factors by which it is easier to assess the benefits of incorporating them.

The rest of the paper is structured as follows: Section 3 describes the theoretical framework; section 4 presents the research model and hypotheses. Section 5 describes the methodology, i.e., data collection and sampling, constructs and measures, and measurement model. Section 6 presents the results, and Section 7 discusses them and the main implications of this study. Section 8 presents the conclusions and section 9 the limitations of this study, as well as future research opportunities.

4.3 Theoretical Framework

This chapter will detail the theoretical framework that supports the study.

4.3.1 Dynamic Capabilities

DCs include changing routines and analytical methodologies (Teece, 2012). Routines are repeated actions, including those related to organizational transformation (Teece, 2012).

DCs relate to capabilities and processes (Eisenhardt & Martin, 2000; Cardinal & Antonio, 2012; Sivusuo et al., 2018), to the development of new competencies (Di Stefano et al., 2010), and to the reconfiguration of resources and routines (Easterby-Smith & Prieto, 2008; Cardinal & Antonio, 2012; Teece et al., 1997; Ambrosini & Bowman, 2009; Davies & Brady, 2016).

The concepts of sensing and seizing are associated with DCs. Through sensing, the organization identifies needs and opportunities outside the organization (Teece, 2007). Through seizing the organization implements these opportunities inside the organization (Teece, 2007). It is thus related to CM, and through it, to processes of reconfiguring capabilities (Biesenthal et al., 2019).

According to Eriksson (2014), DCs occur through four processes: 1) accumulation of knowledge; 2) knowledge integration; 3) knowledge utilization; 4) knowledge reconfiguration/transformation. These DCs processes were used as the theoretical basis for this study (table 16).

Table 16 - Processes of DCs (Eriksson, 2014)

Processes of DCs (Eriksson, 2014)	Concepts
Knowledge accumulation	Happens when organizations develop capabilities by replicating knowledge or renewing internal knowledge through knowledge that comes externally which is transformed into routines (Eriksson, 2014).
Knowledge integration	When external knowledge is linked with internal knowledge and resources and knowledge are combined (Eriksson, 2014).
Knowledge utilization	When the organization is able to use the acquired and integrated knowledge (Eriksson, 2014).
Knowledge reconfiguration	When the organization is able to transform knowledge by combining new forms using existing knowledge or transforming this existing knowledge into a new one (Eriksson, 2014). In reconfiguration or transformation either the organization generates new combinations of existing knowledge or leverages existing knowledge into a new form or a new purpose (Eriksson, 2014). To reconfigure requires changing capabilities (Eriksson, 2014).

Source: Author's own elaboration (2021), based on data from Eriksson (2014)

DCs appear in the literature directly related to the reconfiguration of routines and resources (Patrício et al., 2021a, Zahra et al., 2006). DCs work through recombination that is repeated across existing practices (Eriksson, 2014; Salvato, 2003). The reconfiguration/transformation of capabilities apparently benefit from practices that facilitate proactivity in organizations (Eriksson, 2014).

Reconfiguration is the process by which operational project management capabilities are changed (Biesenthal et al., 2019).

4.3.2 Project Management

The demand for increased quality, efficiency and speed of response has changed PM practices (Zasa et al., 2021). Traditional PM methodologies have become insufficient to respond to the required flexibility (Zasa et al., 2021). Organizations are required to be more innovative, agile and flexible in terms of practices and methodologies, increasing the importance of agile project management methodologies (Zasa et al., 2021).

Important adaptations are necessary for organizations to be able to implement new methodologies, such as agile (Ashmore et al., 2018). These adaptations include preparing organizations and teams to work with these methodologies (Zasa et al., 2021).

Amulen et al. (2016) have identified key parameters that are essential, for example, for the implementation of software capability maturity models, which lead to capability transformation. This current scenario, where more and more organizations have to implement agile systems, requires organizations to develop the ability to be able to adapt (Amulen et al., 2016). The development projects of organisational change gain importance (Amulen et al., 2016). Process change requires a learning curve (Amulen et al., 2016).

In several studies, resistance to change and lack of flexibility emerge as a blocker of agility and also of the implementation of new methodologies, such as agile (Hasan et al., 2007). This reality increases the need to develop the interrelationship between PM and DCs so that organizations can respond to all these internal and external challenges in an agile, fast and continuous manner.

4.3.3 The relationship between Project Management and Dynamic Capabilities

How to create DCs in projects is not consensual (Freitas & Salerno, 2018). One cannot dissociate skill change from knowledge acquisition (Pandza et al., 2003).
Organizations try to share accumulated knowledge among individuals, providing agility (Tooranloo & Saghafi, 2018).

Thus, it is important to note that knowledge management is related to agile responsiveness (Tooranloo & Saghafi, 2018), such as DCs allow you to have a dynamic and quick response capability to internal and external changes (Gardiner, 2014). Project teams provide knowledge for the project, thus contributing to the teams' learning (PMBOK, 2021).

Tooranloo and Saghafi (2018), have shown that knowledge management has a positive relationship with flexibility, with competencies and with agility. Flexibility is directly related to DCs and project success (Eriksson, 2014; Davies et al., 2016; Freitas & Salerno, 2018; Garcia et al., 2018; Biesenthal et al., 2019; Manley & Chen, 2017), as well as the very definition of DCs is also related to the use and transformation of internal and external competencies (Eisenhardt & Martin, 2000; Teece et al., 1997; Davies & Brady, 2016; Davies et al., 2016; Zerjav et al., 2018).

Analyzing the main concepts of DCs and PM in table 17, we verify that there is unanimity and relationship between the concepts regarding the ability to provoke changes, develop and transform capabilities in resources, as well as being fundamental for the implementation of strategies, increase flexibility and responsiveness to the market.

PM requires a permanent transformation of resources, which is one of the fundamental concepts of DCs (transformation) (Biesenthal et al., 2019). Replication, reconfiguration, and recreation are fundamental elements of DCs (Teece et al., 1997; Cardinal & Antonio, 2012; Eriksson, 2014; Gardiner, 2014; Sicotte et al., 2014; Sivusuo et al., 2018). This concept of reconfiguration/transformation is heavily emphasized in the literature review about PM and DCs (Patrício et al., 2021a; Zerjav et al., 2018; Thattakath & Čiutienė, 2017; Biesenthal et al., 2019). Thus, there is a strong interrelationship between the concepts of PM, DCs and capability transformation. We can see these relationships through table 17.

Table 17 - DCs and PM concepts

DCs Concepts	PM Concepts
Ability to integrate, develop and reconfigure internal and external competencies for the organization to adapt quickly and systematically in order to gain competitive advantage (Teece, Pisano and Shuen, 1997).	Projects bring about changes in organizations (PMI, 2017, p. 6).
Relates DCs to sensing: understanding what the market wants; seizing: ability to capture opportunities for the organization; and continuous renewal (transformation) (Teece, 2007; 2014).	It is through projects that organizations implement strategies, develop capabilities and resources (internal and external) (PMI, 2017, p. 8).
Set of specific, identifiable processes. DCs are associated with the organization's best practices and processes that use resources to integrate, reconfigure, linking to responsiveness to market changes (Eisenhardt and Martin, 2000).	It is through projects that organizations develop the ability to be flexible and to innovate in order to respond to the changes and dynamics of the market (Hermano & Martín-Cruz, 2016).
DCs are associated with the development of appropriate resources, their transformation and renewal. DCs are defined through four main processes: reconfiguration, leveraging, learning and integration (Ambrosini & Bowman, 2009).	PM is related to the capacity for permanent change in resources (Biesenthal et al., 2019).

Source: Author's own elaboration (2021)

4.4 Research Model and Hypotheses

This chapter will detail the independent variables and the dependent variable that served as the basis for the conceptual model and the hypotheses to be tested.

Thus, following the gap identified on how PM can leverage DCs and on the reconfiguring process, considered key in DCs (Eriksson et al., 2014), the study focuses on a model to understand which PM practices could favor the transformation/reconfiguration of capabilities in order to develop DCs. Accordingly, the following research question (RQ) was defined: Which PM practices are conducive to transforming capabilities in order to develop DCs? Figure 1 shows the conceptual model and hypotheses to be tested to answer the research question.

In this sense, it was defined as the dependent variable of this study: what is the possibility that PM practices promote the transformation of capabilities.

About the independent variables, Davies and Brady (2016), Hermano and Martín-Cruz (2016) and Freitas and Salerno (2018), argue that knowledge and learning from projects should be consolidated into routines, since these routines, in turn, lead to the construction of DCs. Therefore, an independent variable was defined that would allow us to perceive practices that favor the transformation of projects' knowledge into routines: Practices that favor the transformation of projects' knowledge into routines.

One of the great challenges of project management in building DCs is to ensure that the routines and learning acquired in projects do not disappear after project implementation (Davies & Brady, 2016; Freitas & Salerno, 2018). When the knowledge acquired in projects is transformed into routines and practices, it is possible to develop and reformulate capabilities and make this knowledge available to be used in future projects, turning these practices into a repetitive process used from project to project (Davis & Brady, 2016; Patrício et al., 2021a; Patrício et al., 2021b). In this sense, an independent variable to be considered in this study was defined: Factors in PM that facilitate the development and replication of new capabilities from project to project.

The more complex and innovative the projects are, the greater the need to externally seek knowledge that does not exist in the organization, being fundamental to develop and know the practices that allow the development of capabilities to absorb this knowledge (absorptive capability), in order to integrate external knowledge with internal knowledge (Hullova et al., 2019; Eriksson, 2014; Medina & Medina, 2015). This becomes critical for the PM to be able to utilize and integrate externally acquired knowledge into the organization's processes and routines. Thus, another independent variable used in the model was: Practices that facilitate responses to lack of knowledge in projects.

The integration of CM with PM is a topic that needs further investigation (Patrício et al., 2021a; Patrício et al., 2021b). As mentioned, one of the major challenges is to transform project knowledge into routines and standards in the organization (Davies & Brady, 2016; Freitas & Salerno, 2018), which is also related to CM. Besides the reconfiguring process, CM is also associated with the seizing process (Teece, 2007), through which the organization has the ability to evaluate the use and implementation of new PM methodologies, as well as the respective change management plans (Biesenthal et al., 2019).

It is important to understand the interrelation of PM with CM in the development, transformation and use of knowledge acquired in projects in the operation (Patrício et al., 2021b). Therefore, the independent variable defined was: Practices that favor the interrelation of change management with PM.

About the hypotheses to test, according to Davis and Brady (2016), learning is achieved when capabilities are developed in projects that allow for the development of routines and accumulated experience that improves processes from project to project and in the organization. There are factors in PM that can facilitate the development of capabilities and the replication and application of new skills from project to project and to the organization (Patrício et al., 2021b), thus contributing to the accumulation, integration, and utilization of knowledge acquired in projects and in PM. The organization benefits when knowledge is accumulated and integrated through knowledge sharing (utilization) (Eriksson, 2014). This is related to absorptive capacity (Eriksson, 2014). Knowledge needs to be codified so that it is shared and replicated, utilization consolidates and reconfigures capabilities (Eriksson, 2014).

We present the conceptual model and hypotheses to be tested in figure 17. The first hypothesis formulated is as follows:

H1. Factors in PM that facilitate the development and replication of new capabilities from project to project have a positive relationship with whether PM practices promote capability transformation.

According to Freitas and Salerno (2018), when knowledge accumulation and learning is transformed into routines and practices, it allows firms to develop or reshape existing capabilities (accumulation, reconfiguration). Routines at the organization level are key to building DCs, they allow codification and accumulation of knowledge absorbed through projects (Freitas & Salerno, 2018). Projects can alter existing capabilities because they involve current routines, repetition, but also new roles and new ideas (Davies & Brady, 2016), combining existing knowledge with new knowledge (integration). Accordingly, the second hypothesis is formulated as follows:

H2. Practices that favor the transformation of project knowledge into routines have a positive relationship with the possibility that PM practices promote the transformation of capabilities.

Change management appears related to routine and utilization, as well as transformation, which can support reconfiguration. In turn, it is related to the seizing process, in which it allows implementing new methodologies, and transforming capabilities (Biesenthal et al., 2019). DC reconfiguration includes usually stable and standardized rules and systems of how to implement capability improvements, as is the case with change management methodologies (Biesenthal et al., 2019). The challenge is to ensure that project routines do not disappear after the project ends and that they become embedded in the routines and processes of the organization (Davies & Brady, 2016). A set of practices were listed through the LR that favor the interrelation of project management with change management, generating in this way, transformation of competencies, ensuring the use of knowledge acquired in projects (Patrício et al., 2021b). In this sense, the third hypothesis is formulated as follows:

H3. Practices that favor the interrelation of change management with PM have a positive relationship with the possibility that PM practices promote the transformation of capabilities.

Knowledge accumulation is related to the fact that organizations develop or renew capabilities by experience through knowledge replication or renew capabilities through external cooperation and internal learning (Eriksson, 2014). This identifies practices that facilitate responses when there is no knowledge, capacity, or availability to execute projects (Patrício et al., 2021b), facilitating the accumulation and reconfiguration of knowledge acquired in projects. The greater the complexity and innovation of projects, the greater the need for collaboration with the outside to complement knowledge that does not exist internally (Hullova et al., 2019). For this to happen, it is necessary to integrate this knowledge (absorptive capability) and use it to transform/renew knowledge and incorporate it into their routines (Hullova et al., 2019). In this sense, the fourth hypothesis is defined as follows:

H4. Practices that facilitate responses to lack of knowledge in projects have a positive relationship with the possibility that PM practices promote the transformation of capabilities.

Routines are changed and improved with the absorption and accumulation of knowledge, consequently producing knowledge (Zollo & Winter, 2002). In order to ensure the absorption and accumulation of knowledge, it is necessary that the routines of the executed projects are part of standardized processes, incorporate the knowledge acquired from the projects into routines, and are used and made available for future projects (Davies & Brady, 2016). A set of practices that favor the transformation of knowledge from projects into routines has been identified in the literature (Patrício et al., 2021b). Accordingly, the fifth hypothesis is proposed as follows:

H5. Practices that favor the transformation of project knowledge into routines have a positive relationship with factors in PM that facilitate the development and replication of new capabilities from project to project.

Integration supports routine activities, and it is necessary for a company to work on information and knowledge sharing (Thattakath & Čiutienė, 2017). In order to integrate knowledge (integration process) during project execution, project management needs to have integration mechanisms to incorporate and transform the knowledge that is acquired internally and externally into routines (Patrício et al., 2021b). A set of practices that facilitate responses to absence of knowledge in projects was identified in the LR.

This ability to implement an integration process is related to the integration process of the DC theory, which explains that organizations need to have practices that transform into routines the ability to constantly gather knowledge developed internally through projects and combine it with knowledge that comes from external sources (Hullova et al., 2019). Thus, the sixth hypothesis is proposed as follows:

H6. Practices that favor the transformation of project knowledge into routines are positively related to practices that facilitate responses to lack of project knowledge.

Knowledge accumulation relates to the acquisition of knowledge through experience, namely through replication or renewal of existing knowledge (Eriksson, 2014). Davis and Brady (2016) found that organizations that can reuse knowledge from project to project were able to establish standard project routines, allowing them to adapt and reconfigure quickly. These authors argue that projects should help organizations in their future direction. In this sense, the seventh hypothesis is defined as follows:

H7. Factors in PM that facilitate the development and replication of new capabilities from project to project mediate the relationship between practices that favor the transformation of project knowledge into routines and the possibility that PM practices promote the transformation of capabilities.

Knowledge integration happens when resources are combined by linking new acquired knowledge that came in externally with knowledge that already exists in the company (Eriksson, 2014), which in turn is related to absorptive capacity, i.e., use of external knowledge and its application (Manley & Chen, 2017). It is also related to the concepts of exploratory learning, i.e., the integration of external knowledge that does not exist in the firm into routines to create new knowledge or replace existing knowledge (Manley & Chen, 2017; Medina & Medina, 2015). Medina and Medina (2015) also talk about transformative learning that combines exploitative and exploratory learning, that is, combining new knowledge with existing knowledge, thus changing capabilities (Medina & Medina, 2015). In accordance, the eighth hypothesis is proposed as follows:

H8. Practices that facilitate responses to lack of knowledge in projects mediate the relationship between practices that favor the transformation of project knowledge into routines and the possibility that PM practices promote the transformation of capabilities.

This proposed research model illustrates the hypotheses to be tested. It assumes that factors in PM that facilitate the development and replication of new capabilities from project to project, as well as practices that favor the transformation of knowledge from projects into routines and those that facilitate responses to absence of knowledge in projects, push the possibility that PM practices promote the transformation of capabilities. As well as practices that favor the interrelation of change management with PM promote the possibility that PM practices push the transformation of capabilities. Therefore, the model assumes that the relationship between practices that favor the transformation of project knowledge into routines and the possibility that PM practices promote capability transformation is mediated by the factors in PM that facilitate the development and replication of new capabilities from project to project. The model also assumes that the practices that favor the transformation of project knowledge into routines and the possibility that PM practices promote capability transformation are mediated by the practices that facilitate responses to absence of knowledge in projects.

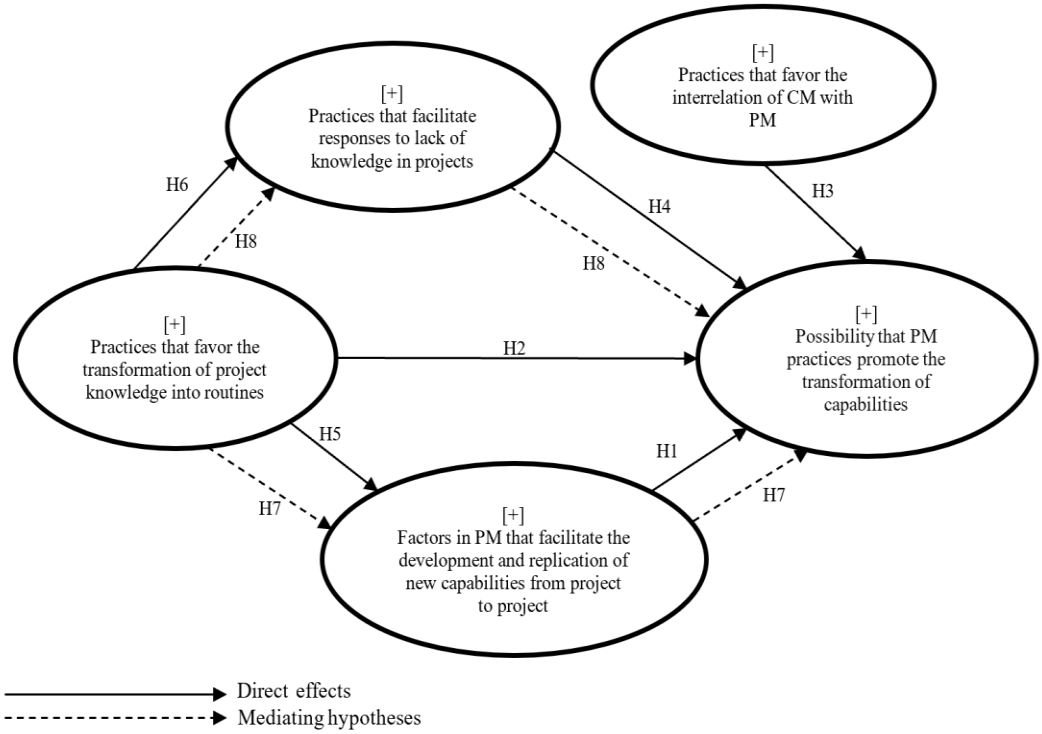

Figure 17 - Conceptual model and hypotheses to be tested. *Source:* Author's own elaboration (2021)

4.5 Methodology

4.5.1 Data collection and sample

A questionnaire was developed based on recommended good practice (Churchill, 1979). The selected items were clear and concise, with scale parameters used for the independent variables and for the dependent variable, with the scale following the recommendations of Podsakoff et al. (2003).

Indicators related to the constructs under study were identified through an in-depth literature review with inputs from phase 1 (Patricio et al., 2021a) and phase 2 of the study (Patricio et al., 2021b). To develop the questionnaire, indicators listed in these previous studies were compiled in phase 1 of the study (literature review of DCs and PM) and phase 2 (qualitative analysis of how PM can leverage DCs).

The study items and scale were improved with consultation with academic experts and project professionals representing industries. Peers of the first author of this paper and five representatives from five industries were consulted and a pre-test was conducted with 10 respondents. This process led to the refinement and reduction of indicators to work with. The questionnaire was preliminarily tested with 20 professionals in the context of projects belonging to organizations. This phase confirmed the adequacy and validity of the questionnaire.

The sample consisted exclusively of respondents with three or more years of experience in a project context, and there was this control variable at the beginning of the questionnaire to ensure that only respondents who met this criterion answered the questionnaire. The questionnaire was constructed in Portuguese in order to increase the number of responses and then translated in the paper. Data collection took place between June 28 and July 5, 2021. The questionnaire was distributed through the researcher's professional contacts, using convenience sampling. About 500 emails were sent to potential respondents who were invited to answer the survey via email.

A total of 148 responses were received, seven of which were eliminated because they did not meet the project context experience required in the existing control variable in the survey. A total of 141 complete responses were used for further analysis, with a response rate of 28.2%, which is consistent with comparable studies using the key informant methodology (Capron & Mitchell, 2009).

To control bias, confidentiality in responses was ensured as well and the use of the information that the data collected for research purposes only was communicated (Chan et al., 2010). Access to the results of the survey was also offered.

The sample size comfortably meets the recommended rule of thumb, i.e. ten times the number of indicators of the construct with the highest number of indicators (Hair et al., 2012). 98 respondents had more than 5 years of experience in project contexts (70%) and 43 between three and five years of experience in project contexts (30%) (figure 18).

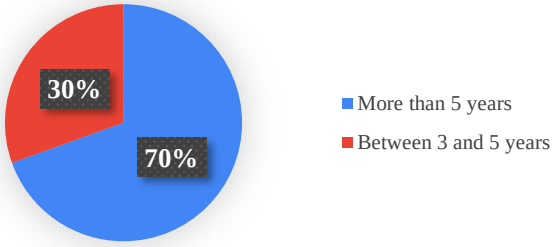

Figure 18 -. Distribution of respondents by professional experience in projects. *Source:* Authors' own elaboration (2021)

In terms of the distribution of respondents by activity sector (figure 19), 30 (21%) belong to services, 20 to retail (14%), 20 to engineering and construction (14%), 19 to aviation (13%), 17 to technology (12%), 10 to banking and insurance (7%), 8 to public administration (6%), 7 to energy (5%), 4 to telecommunications (3%) and logistics (3%), and 2 to the pharmaceutical industry (1%).

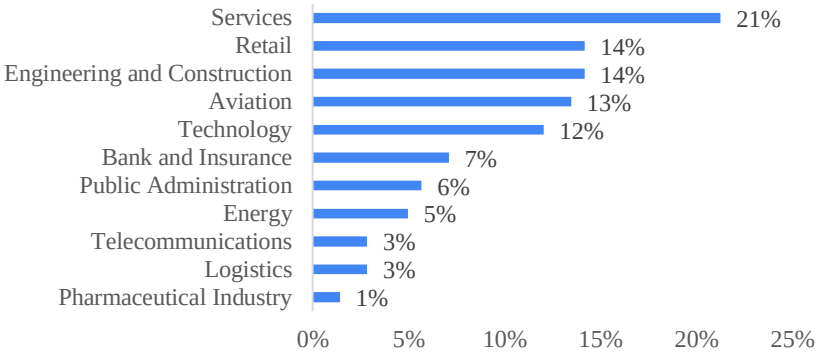

Figure 19 - Distribution of respondents by activity sector. *Source:* Authors' own elaboration (2021)

The survey was conducted by project managers/program managers, product owners, managers, directors, ceo's, technicians, HR/training officers/talent development officers, project manager officer's (PMO's), portfolio managers, and scrum master's/ agile coach's.

Regarding the size of the companies to which the respondents belong, eight work in micro-companies (up to 10 employees), 19 belong to small companies (up to 50 employees), 38 work in medium-sized companies (up to 250 employees), 76 work in a large company with more than 250 employees, and 67 belong to companies with more than 500 employees.

Regarding the respondents' academic qualifications, six (4%) finished high school, 68 (48%) have a bachelor's degree, 63 (45%) have a master's degree, and four (3%) have a doctorate.

4.5.2 Variables and measurement

Appendix F and figure 20 show in detail the information that integrated the conceptual model to answer the formulated research question. Existing scales were used to measure the variables in this study (see appendix F). The variables in this study and their indicators stem from previous studies: the categories and qualitative analysis done in the previous study (Patrício et al., 2021b) and the detailed LR done prior (Patrício et al., 2021a). The dependent and independent variables of the study were thus operationalized through various PM practices that came from the previous study conducted (Patrício et al., 2021b), the in-depth literature review (Patrício et al., 2021a), and previous studies done by other authors.

To measure the construct of whether PM practices promote capability transformation we used 12 items adopted from the previous study conducted (Patrício et al., 2021b), the in-depth literature review (Patrício et al., 2021a), and previous studies done by other authors. We asked respondents to indicate their agreement regarding: How likely PM practices are to promote capability transformation in their organization, on a Likert scale (1- strongly disagree; 2- disagree; 3- neither agree nor disagree; 4- agree; 5- strongly agree).

The factors in PM that facilitate the development and replication of new project-to-project capabilities were measured using nine items adopted from the previous study conducted (Patrício et al. 2021b), the in-depth literature review (Patrício et al., 2021a), and previous studies done by other authors. We asked respondents to rate their agreement in terms of the contribution of each of the factors in project management listed in the development and replication of new capabilities from project to project on a Likert scale (1- strongly disagree; 2- disagree; 3- neither agree nor disagree; 4- agree; 5- strongly agree).

To measure the construct of practices that favor the transformation of project knowledge into routines, eight items adopted from the previous study conducted (Patrício et al., 2021b), from the in-depth literature review (Patrício et al., 2021a), and from previous studies done by other authors were used. We asked respondents to rate their agreement in terms of the contribution of each of the indicated practices in transforming project knowledge into routines on a Likert scale (1- strongly disagree; 2- disagree; 3- neither agree nor disagree; 4- agree; 5- strongly agree).

The practices that facilitate responses for absence of knowledge in projects were measured using four items that were adopted from the previous study conducted (Patrício et al., 2021b), the in-depth literature review (Patrício et al., 2021a), and previous studies done by other authors. We asked respondents to rate their agreement in terms of the contribution of each of the practices indicated in the response to lack of knowledge in projects on a Likert scale (1- strongly disagree; 2- disagree; 3- neither agree nor disagree; 4- agree; 5- strongly agree).

To measure the construct concerning the practices that favor the interrelationship of change management with PM, five items were adopted from the previous study conducted (Patrício et al., 2021b), from the in-depth literature review (Patrício et al., 2021a), and from previous studies done by other authors.

Respondents were asked about the indicated practices that favor the interrelationship of project management with change management, to rate their agreement as to what each one contributes to the transformation and use of the knowledge gained in projects, on a Likert scale (1- strongly disagree; 2- disagree; 3- neither agree nor disagree; 4- agree; 5- strongly agree).

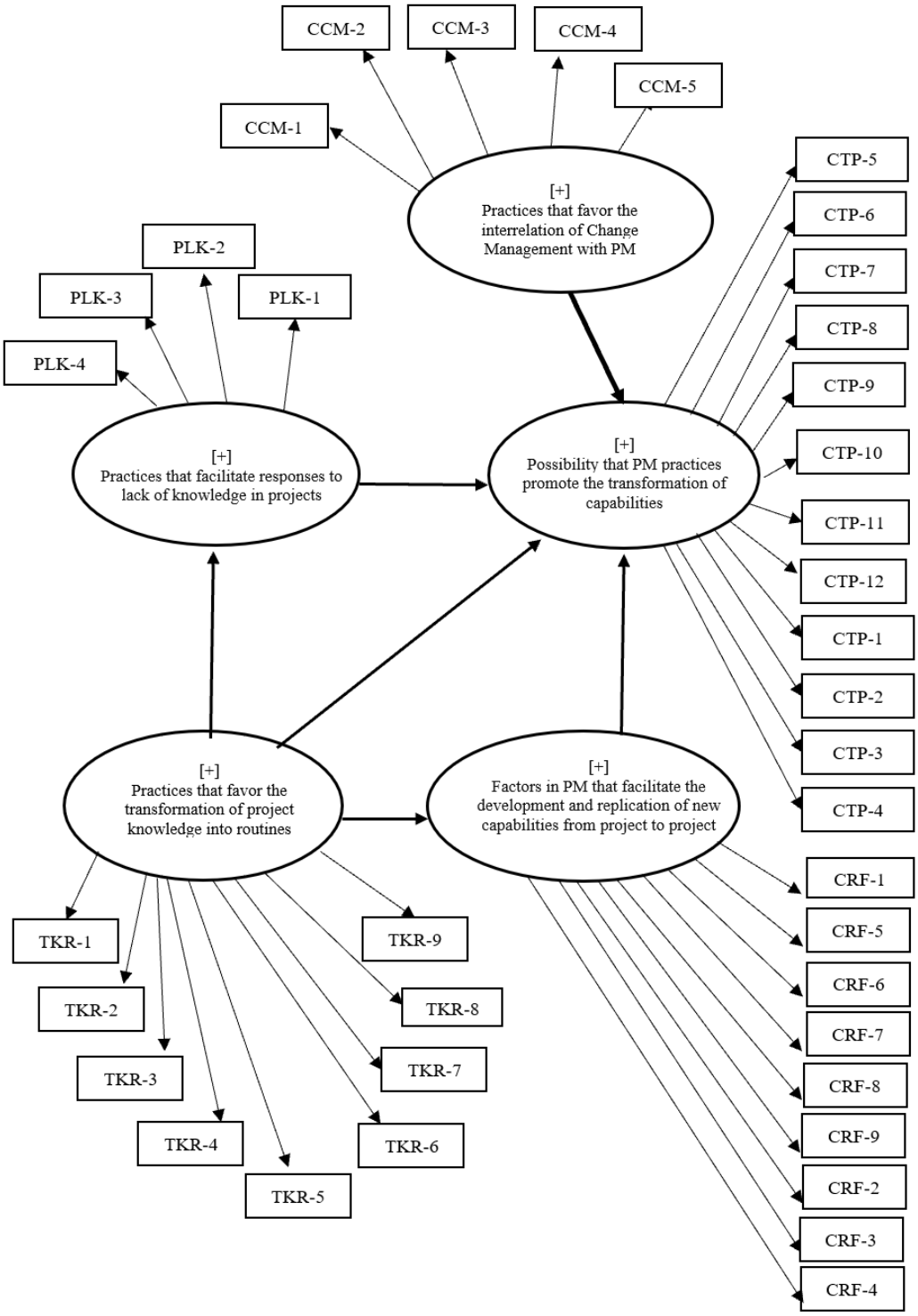

Figure 20 - Conceptual model to be tested in the PLS. *Source:* Authors' own elaboration (2021)

4.5.3 Statistical analysis

To test the conceptual model, quantitative methodology was used, namely Structural Equations Modeling (SEM). SEM is considered to be a robust statistical tool, even in management studies

(Hair et al., 2012). In addition Partial Least Squares (PLS), which is a variance-based structural equation modeling technique, was used. Thus, PLS-SEM with SmartPLS 3 (Ringle et al., 2015) was selected for testing the proposed research model.

Two steps were followed for the analysis and interpretation of the results: 1) evaluation of the reliability and validity of the measurement model; and 2) evaluation of the structural model. Four criteria were followed for the evaluation of the quality of the measurement model: reliability, convergent validity, internal consistency reliability, and discriminant validity (Hair et al., 2017). The indicator loadings are above 0.6 (the indicators are between 0.635 and 0.809), and were all significant when $p < 0.001$, which satisfies the reliability indicator (Hair et al., 2017) (see Figure 21). Internal consistency reliability was confirmed because Cronbach's alpha (α) and composite reliability (CR) values exceeded the minimum value of 0.7 (Hair et al., 2017) (table 18).

Convergent validity was confirmed for three reasons: 1) as verified earlier, all indicator loadings were positive and significant in their respective constructs; 2) all constructs had CR values higher than 0.70; and 3) the average variance extracted (AVE) of all constructs exceeded the minimum value of 0.50 (Bagozzi & Yi, 1988).

The discriminant validity was confirmed using two approaches. First, the Fornell and Larcker criterion (1981) was used, which requires that the square root of a construct's AVE (shown diagonally with bold values in table 18) be greater than its correlation with any construct (Fornell &Larcker, 1981). We can see from table 18 that the measurement model satisfies the Fornell-Larcker criterion. Then, the HTMT (Heterotrait-Monotrait ratio) criterion was used (Hair et al., 2017; Henseler et al., 2015). In Table 18 we can confirm that all HTMT ratios are below the threshold value of 0.90 (Hair et al., 2019), which satisfies the HTMT criterion and confirms discriminant validity.

Table 18 - Composite reliability, average variance extracted, correlations, and discriminant validity checks

Latent Variables	**α**	**CR**	**AVE**	**1**	**2**	**3**	**4**	**5**
(1) PM Practices transformation project knowledge into routines (TKR)	0.881	0.904	0.513	**0.716**	0.836	0.819	0.836	0.704
(2) PM Factors development and replication of new capabilities from project to project (CRF)	0.879	0.903	0.509	0.743	**0.713**	0.854	0.721	0.747
(3) Possib PM practices transformation capabilities (CTP)	0.918	0.930	0.527	0.746	0.781	**0.726**	0.809	0.741
(4) Practices that facilitate responses to lack of knowledge in projects (PLK)	0.748	0.840	0.569	0.686	0.594	0.678	**0.754**	0.691
(5) Practices that favor the interrelation of CM with PM (CCM)	0.765	0.841	0.515	0.580	0.622	0.627	0.538	**0.718**

Note: α -Cronbach Alpha; CR -Composite reliability; AVE -Average variance extracted. Bolded numbers are the square roots of AVE. Below the diagonal elements are the correlations between the constructs. Above the diagonal elements are the HTMT ratios. *Source*: Authors' own elaboration (2021)

The structural model was evaluated by the sign, magnitude, and significance of the structural path coefficients; the R^2 values for each endogenous variable as a measure of the model's predictive accuracy; and Stone-Geisser's Q^2 values as a measure of the model's predictive relevance (Hair et al., 2017). Collinearity was also checked before evaluating the structural model (Hair et al., 2017).

The VIF (variance inflation factor) values ranged from 1.419 to 3.387, all being below the critical value of 5 (Hair et al., 2017). These values indicated no collinearity. The coefficient of determination R^2 for the three endogenous variables of PM factors development and replication of new capabilities from project to project, Possibility PM practices transformation capabilities and Practices that facilitate responses to lack of knowledge in projects were 55%, 71% and 47% respectively, which exceeds the recommended minimum threshold of 10% (Falk & Miller, 1992).

The Q^2 values for all endogenous variables were 0.265, 0.364, 0.258 respectively, which are all above zero, indicating the predictive relevance of the model (Hair et al., 2017). We performed structural model evaluation to analyze the hypothesis proposition using bootstrapping with 5,000 subsamples (Hair et al., 2017).

4.6 Results

The results in Table 19 show that the practices that favor the transformation of project knowledge into routines have a significantly positive effect on the factors in project management that facilitate the development and replication of new capabilities from project to project (ß = 0.743, $p < 0.001$), as well as on the possibility of PM practices to promote the transformation of capabilities (ß = 0.219, $p < 0.01$).

These results confirm hypotheses H5 and H2, respectively. It is also possible to verify that the practices that favor the transformation of project knowledge into routines have a significantly positive relationship with the practices that facilitate responses for absence of project knowledge (ß = 0.686, $p < 0.001$), thus supporting hypothesis H6. It can be further stated that factors in PM that facilitate the development and replication of new capabilities from project to project have a significantly positive relationship with whether PM practices promote capability transformation (ß = 0.411, $p < 0.001$), which supports hypothesis H1.

Practices that facilitate responses to lack of knowledge in projects have a significantly positive relationship with the possibility that PM practices promote capability transformation (ß = 0.215, p <0.01), which supports hypothesis H4. Finally, practices that favor the interrelationship of change management and PM are found to have a significantly positive effect on the possibility that PM practices promote capability transformation (ß = 0.128, p <0.05), which supports hypothesis H3.

Table 19 - Structural model assessment

Path	Path coefficient	Standard errors	T Statistics	P Values
PM Practices transformation project knowledge into routines -> PM factors development and replication of new capabilities from project to project	0.743	0.040	18.580	0.000
PM Practices transformation project knowledge into routines -> Possib PM practices transformation capabilities	0.219	0.074	2.977	0.003
PM Practices transformation project knowledge into routines -> Practices that facilitate responses to lack of knowledge in projects	0.686	0.047	14.622	0.000
PM factors development and replication of new capabilities from project to project -> Possib PM practices transformation capabilities	0.411	0.060	6.800	0.000
Practices that facilitate responses to lack of knowledge in projects -> Possib PM practices transformation capabilities	0.215	0.066	3.245	0.001
Practices that favor the interrelation of CM with PM -> Possib PM practices transformation capabilities	0.128	0.059	2.181	0.030

Source: Authors' own elaboration (2021)

The recommendations of Hair et al. (2017, p. 232) were followed to test the mediation hypotheses (H7 and H8). Accordingly, to test the significance of indirect effects through the mediator, the bootstrapping approach was followed (Preacher & Hayes, 2008). Table 20 presents the results of the specific indirect relationships between constructs.

Table 20 - Bootstrap results for indirect effects

Indirect effect	Path coefficient	Standard errors	T Statistics	P Values
PM Practices transformation project knowledge into routines -> PM factors development and replication of new capabilities from project to project -> Possib PM practices transformation capabilities	0.305	0.052	5.819	0.000
PM Practices transformation project knowledge into routines -> Practices that facilitate responses to lack of knowledge in projects -> Possib PM practices transformation capabilities	0.148	0.047	3.153	0.002

Source: Authors' own elaboration (2021)

The indirect effects of practices favoring the transformation of knowledge from projects into routines on the possibility that PM practices promote the transformation of capabilities through the mediator factors in PM that facilitate the development and replication of new capabilities from project to project are significant (ß = 0.305, p <0.001), thus supporting hypothesis H7. The indirect effects of practices favoring the transformation of project knowledge into routines on the possibility that PM practices promote the transformation of capabilities through the mediator practices favoring the transformation of project knowledge into routines are significant (ß = 0.148, p <0.01), thus providing support for hypothesis H8. The conceptual model tested with information from the obtained values can be seen in figure 21.

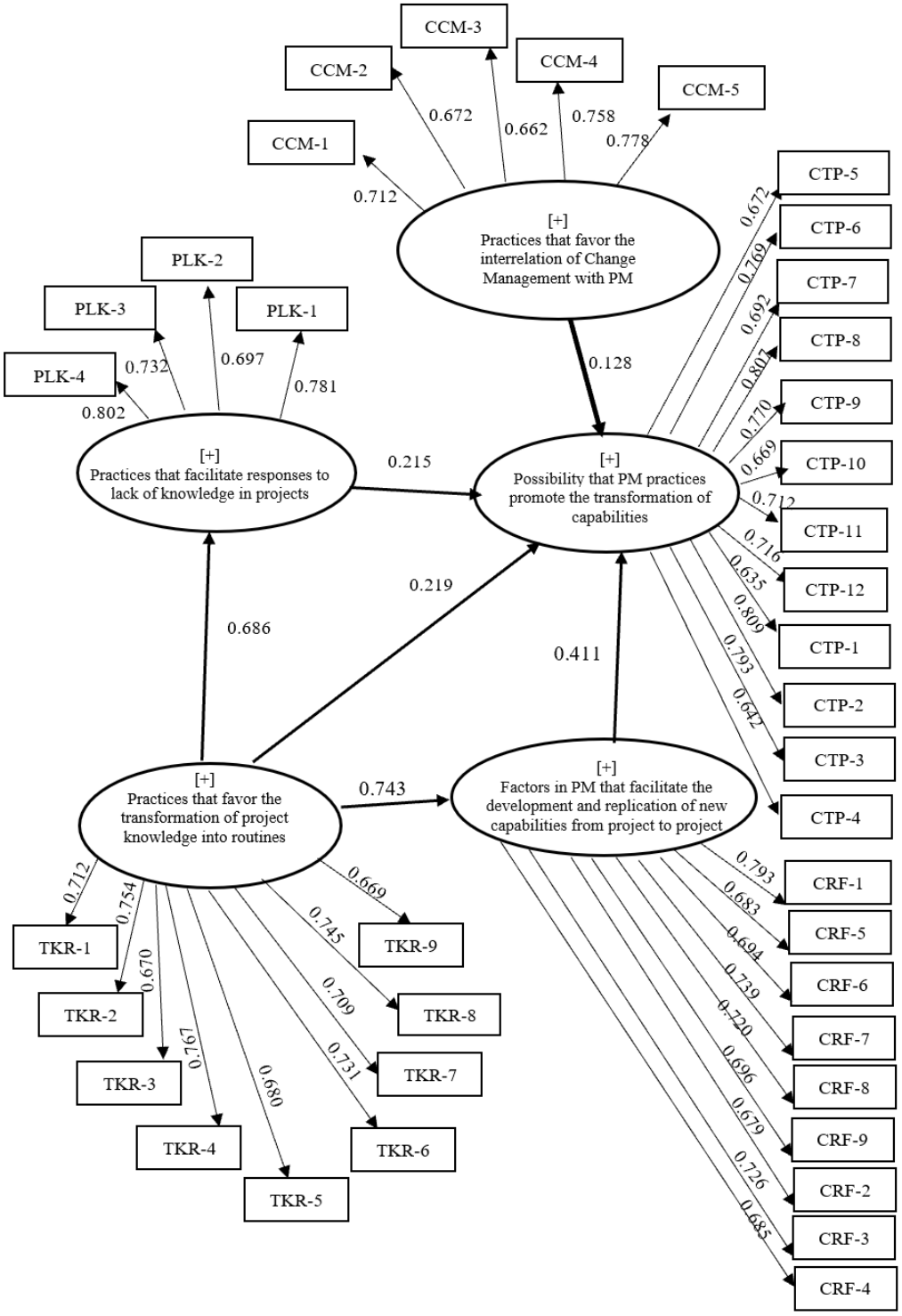

Figure 21 - Conceptual model tested with SmartPLS 3 with associated values (Results). *Source*: Authors' own elaboration (2021)

In this figure 21 we can see the loadings (as noted above), which indicate what each item is contributing to each variable (Hair et al., 2017). The results show that factors that facilitate the development and replication of new capabilities from project to project have the most predominant role in enabling PM practices to promote the transformation of capabilities.

4.7 Discussion and Implications

In order to answer the RQ: "Which PM practices favor the transformation of capabilities in order to develop DCs?" it was possible to conclude, through the analysis of the tested conceptual model (PLS-SEM analysis), that practices that favor the transformation of project knowledge into routines, practices that facilitate responses to absence of project knowledge, factors in PM that facilitate the development and replication of new capabilities from project to project, and practices that favor the interrelation of change management with PM significantly facilitate the possibility that PM practices promote the transformation of capabilities. This paper confirms and extends the findings of previous studies (Patrício et al., 2021b).

The PLS-SEM analysis shows that the practices and factors that positively influence PM practices that favor capability transformation are: 1) factors in PM that facilitate the development and replication of new capabilities from project to project; 2) practices that favor the transformation of project knowledge into routines; 3) practices that facilitate responses to lack of knowledge in projects; 4) practices that favor the interrelation of change management with PM.

Through the results of the PLS-SEM analysis described in figure 21 it is possible to identify which items contribute most to each variable. Looking at the indicators that operationalized the possibility that PM practices promote capability transformation, the results show that this is supported essentially by: 1) good requirements analysis practices—this result is in line with the result of the previous study (Patrício et al., 2021); 2) root cause analysis, action plan and problem solving—this result alignes with the previous study conducted (Patrício et al., 2021b) and with authors studied (Thattakath & Čiutienė, 2017; Manley & Chen, 2017; Eriksson, 2014; Davies & Brady, 2016; Davies et al. , 2016; Pereira & Santos, 2018; Pereira et al., 2021); and 3) Business Case methodology implementation—these results are in agreement with the study done previously and authors reviewed (Patrício et al., 2021b; Gomes & Romão, 2018).

Regarding the practices that favor the transformation of project knowledge into routines, the results are in line with the previous study and with the literature analyzed: 1) cognitive flexibility—this result corroborates the previous study (Patrício et al., 2021b) and is an extension to the previous literature; 2) Problem Solving—this result confirms the previous study conducted (Patrício et al., 2021b) and the authors studied (Thattakath & Čiutienė, 2017; Manley & Chen, 2017; Eriksson, 2014; Davies & Brady, 2016; Davies et al., 2016; Pereira & Santos, 2018; Pereira et al., 2021a); and 3) proactive adaptability—the result is in line with the literature review analyzed (Sicotte et al., 2014; Teece et al., 1997).

As for the practices that facilitate responses to lack of knowledge in projects, the results are also aligned with the previous study carried out and with the literature analyzed: 1) implementation of learning assessment indexes and trainings—the results are aligned with the previous study carried out (Patrício et al., 2021b) and is an extension to the previous literature; 2) coaching—this result confirms the previous study conducted (Patrício et al., 2021b) and the authors studied (Freitas & Salerno, 2018; Sivusuo et al., 2018); and 3) learning with partners—the result is in line with the literature review analyzed (Freitas & Salerno, 2018).

Analyzing the results of the factors in PM that facilitate the development and replication of new capabilities from project to project, these show they are aligned with the previous study carried out and with the literature analyzed and are mainly supported by: 1) Capacity Management (workload and execution capacity)—these results are in line with the study done previously (Patrício et al., 2021b) and with authors analyzed (Hermano & Martín-Cruz, 2016); 2) application of Business Cases methodologies—these results are in line with the study done previously (Patrício et al., 2021b) and with authors analyzed (Patrício et al., 2021b; Gomes & Romão, 2018); and 3) empowerment, top management involvement—this result confirms the previous study done (Patrício et al., 2021b) and authors studied (Hermano & Martín-Cruz, 2016; Sivusuo et al., 2018; Fernandes et al., 2014).

Finally, regarding the practices that favor the interrelation of change management with project management, the analysis of the PLS-SEM shows that the results are aligned with the previous study carried out and with the literature analyzed: 1) change management processes and frameworks—the result is in line with the literature review analyzed (Zhang et al., 2017; Biesenthal et al., 2019); 2) enterprise-wide capacity building on products or services developed in the projects—the result is in line with studies by authors reviewed (Davis & Brady, 2016); and 3) leadership through influence—this result corroborates the previous study conducted (Patrício et al., 2021b) and is an extension of the previous literature.

In table 21, we can see the 3 main factors, practices and indicators of capturing and transforming knowledge and capabilities in PM.

Table 21 - Top principles of capturing and transforming knowledge and capabilities in PM

Variables	Top principles of capturing and transforming knowledge and capabilities in PM
Indicators that operationalized the possibility that PM practices promote capability transformation	Good requirements analysis practices
	Root cause analysis, action plan and problem solving
	Business Case methodology implementation
Practices that favor the transformation of project knowledge into routines	Cognitive flexibility
	Problem Solving
	Proactive adaptability
Practices that facilitate responses to lack of knowledge in projects	Implementation of learning assessment indexes and trainings
	Coaching
	Learning with partners
factors in PM that facilitate the development and replication of new capabilities from project to project	Capacity Management (workload and execution capacity)
	Application of Business Cases methodologies
	Empowerment, top management involvement
Practices that favor the interrelation of change management with project management	change management processes and frameworks
	Enterprise-wide capacity building on products or services developed in the projects
	Leadership through influence

Source: Authors' own elaboration (2021)

About the contributions of this study in theory and practice, the findings about the relationship between project management practices and DCs can develop the interest of organizations and academia about DCs and the role of PM in developing DCs. Moreover, the results show organizations which PM practices they should implement in order to transform capabilities with measuring scales.

This study is innovative in this sense. With the results, organizations can identify which practices can favor the transformation of project knowledge into routines and day-to-day life, and which PM practices most favor and promote transformation and renewal of capabilities. It demonstrates practices that facilitate responses to absence of knowledge in projects and that contribute positively to PM transforming capabilities.

It also presents the factors that facilitate the development and replication of new capabilities from project to project and the transformation of capabilities.

The study also brings insights to the topic of the interrelationship of change management with PM, and indicates which practices favor this interconnection, as well as those that facilitate PM practices that promote capability transformation.

It shows organizations how to overcome the challenge of passing knowledge from project to project, how to embed this knowledge in the organization's routines, and how to respond to the absence of knowledge in order to incorporate new external knowledge into the organization.

The article also demonstrates that PM practices favor change management in the passage from projects to operation, so as to be able to reconfigure/transform capabilities to meet internal and external challenges. Another innovative contribution of this study is that its results identify the practices and factors that facilitate PM to accumulate, integrate, utilize and transform the knowledge gained from projects.

4.8 Conclusions

The main objective of this paper was to investigate which PM practices favor the possibility of transforming capabilities in order to develop DCs. This study focused on a research gap related to DCs and PM, namely how PM can leverage DCs (Davies et al., 2016; Medina & Medina, 2015; Eriksson, 2014).

The article operationalizes the multidimensional construct of DCs in PM. Following the work done previously on how PM leverages DCs (Patrício et al., 2021b), and based on prior studies conducted by other authors, as well as on the in-depth literature review also conducted (Patrício et al., 2021a), this study focused on the transformation/reconfiguring process of DCs and investigated whether and which PM practices contribute to the possibility of PM practices' transforming capabilities in organizations.

This research used PLS-SEM and focused in particular on investigating the practices that favor the transformation of project knowledge into routines, the practices that facilitate responses to lack of project knowledge, the factors in PM that facilitate the development and replication of new capabilities from project to project, and the practices that favor the interrelation of change management with PM facilitate or not the possibility of PM practices to promote the transformation of capabilities.

Through this study it was possible to verify which practices operationalized each of the variables, indicating in a detailed and clear way which PM practices are included.

It has been empirically demonstrated that practices that favor the transformation of project knowledge into routines positively favor the possibility that PM practices promote capability transformation. In this way PM enables organizations to accumulate, integrate, and reconfigure knowledge through its practices.

It was also shown that practices that facilitate responses to lack of knowledge in projects positively favor the possibility of PM practices to promote the transformation of capabilities, and in this way PM allows organizations to use, accumulate, and reconfigure knowledge acquired through their practices.

We also found that factors in PM that facilitate the development and replication of new capabilities from project to project positively favor the possibility of PM practices to promote the transformation of capabilities, and in this way PM allows organizations to accumulate knowledge through their practices.

Practices that favor the interrelationship of change management with PM significantly facilitate the possibility that PM practices promote capability transformation, thus enabling organizations to utilize and reconfigure knowledge through PM practices, as well as perform a seizing process. The study also showed that the factors in PM that facilitate the development and replication of new capabilities from project to project mediate the relationship between practices that favor the transformation of project knowledge into routines and the possibility that PM practices promote the transformation of capabilities, thus facilitating the accumulation of knowledge through its practices.

4.9 Limitations and future lines of research

This study contains some limitations. First, the sample size is limited to 141 responses. Therefore, future studies should expand in terms of sample size and international depth, using, for example, international databases related to project management professionals.

Second, the study focused on certain constructs, so future studies should use quantitative analyses relating other PM topics that were also referenced in phase two of this study, such as agile methodologies and their impact on the development of DCs in projects, or the impact of project resource turnover on project-to-project knowledge replication.

Third, in-depth knowledge about how PM should facilitate change management in the operation in practice should remain a topic to be detailed empirically. An important future line of research, whose insights from these studies contain background information, would be the proposal of a knowledge area of DCs in PM.

Finally, the principles of capturing and transforming knowledge in PM could be used by organizations for new applications such as its relationship to increasing organizational agility. A future line of research using these results would be to empirically analyze their relationship with organizational agility.

CHAPTER 5

Conclusions

The thesis focuses on exploring how project management can leverage dynamic capabilities in organizations.

In terms of conclusions of the research, regarding the relationship between the areas of DCs and PM, it can be stated that it is the ability for organizations, through the PM best practices identified in this research to accumulate, integrate, utilize and transform capabilities (Eriksson, 2014), as well as develop sensing and seizing processes and ensure continuous reconfiguration of capabilities (Teece, 2007, 2014), through these PM best practices. DCs are thus developed through the transfer of knowledge from project to project, to routines, and to the organization as a whole (Davies & Brady, 2016; Biensenthal et al., 2019), influencing project capabilities and operational capabilities (Davies & Brady, 2016; Eriksson, 2014), simultaneously responding to internal and external challenges (Teece, 2007, 2014), unexpected problems, and unanticipated opportunities (Davies & Brady, 2016).

The findings, conclusions and gaps defined and found in each paper contributed as input for the following papers.

The main conclusions of the studies carried out are presented below.

5.1. First Paper - Dynamic capabilities and project management: a systematic literature review

The analysis conducted shows that the literature interconnects DCs, CPs and OCs (Davies & Brady, 2016, Daniel et al., 2014; Hermano & Martín-Cruz, 2016; Zerjav et al., 2018). This interconnection takes place as DCs alter, reconfigure and develop OCs and PCs. In turn, OCs and CPs lead to the restructuring and development of DCs.

The literature also relates to these concepts the concept of ambidexterity, which associates exploration with innovative projects and exploitation with more routine projects, in order to demonstrate the DCs in these projects (Davis & Brady, 2016; Davies et al., 2016; Zerjav et al., 2018). Following this analysis, there is also a consensus that DCs alter operational resources through seizing, sensing and reconfiguring routines (Sicotte et al., 2014; Thattakath & Čiutienė, 2017; Nørbjerg et al, 2017; Biesenthal et al., 2019).

From the analyzed articles it was found that the studies focus on the existing DCs in projects and their relationship with project success, as well as the application of these studies to specific types of projects in specific industries (Daniel et al., 2014; Davies et al., 2016; Freitas & Salerno, 2018), and the identification of more generic DCs in the more conceptual articles (Eriksson, 2014; Medina & Medina, 2015).

In the analysis regarding the understanding that DCs and other capabilities and routines are identified in this LR, one finds specific capabilities of specific types of projects: DCs, CBs, PCs, routines or characteristics that DCs found in these same projects and that implied their success.

There are also indicators of the evolution of capabilities through projects, inputs for the construction of DCs within certain projects. It was not identified in the analyzed studies, good practices of PM that develop DCs, especially with regard to the accumulation, integration, use and reconfiguration of knowledge to leverage DCs.

Due to the fact that there is great complexity and difficulty in the perception of the interrelationship and concepts related to DCS, OC and CP, this study reflects in a conceptual model based on the LR the vision of these interrelationships of DCS and CP. With this analysis, it was found that there are few studies that analyse these two areas simultaneously, and it is important to further deepen the empirical analysis.

It was also found that it remains unclear how the PM accumulates, integrates, uses and reconfigures DCs, as well as facilitates the sensing and seizing process.

The human resources of the projects move from project to project, even without these projects being closed (Biesenthal et al., 2019), which causes a difficulty in the transfer of knowledge from project to project and in learning. In the analysis carried out, it appears that this theme is not addressed by the articles studied and, therefore, a topic to be explored in terms of the relationship of the turnover of project resources and the construction of DCs.

To answer RQ 1) What does the literature between 2014 and 2019 refer to about the interrelationship between PM and DCs? The literature points to the interrelationship between dynamic capabilities, project capabilities and operational capabilities. DCs modify, reconfigure, exploit, maintain and create project capabilities and operational routines, and these in turn lead to the restructuring of DCs.

This interrelationship also occurs through processes of exploration (linked to innovative projects) and exploitation (linked to routine projects), sensing (through the exploration of new opportunities, entry into new markets, identification of opportunities for PM improvement, through the integration of external knowledge), seizing (through the response to the needs for project execution, defining strategic priorities, building standardised assets, routines, methodologies, processes and procedures, through change management, through assessment of new opportunities and new methodologies and through future implementation of DCs, consolidation of project and PM learning, replication for future projects) and reconfiguration and renewal of capabilities.

Accumulation, integration, utilization and reconfiguration of the knowledge acquired in projects in organizations occurs through the interrelation between all the mentioned concepts.

RQ2 - What dynamic capabilities and other related capabilities and routines are identified in project management in the literature review between 2014 and 2019? PM is found to contribute to the sustainability of organizational performance through DCs, knowledge management, learning processes (Gardiner, 2014) and CPs.

It was identified specific capabilities of specific types of projects: DCs found in specific projects, operational capabilities of project management, routines or characteristics found by the authors in the studies carried out, indicators of the evolution of capabilities through projects, capabilities that fit the concept of DCS and that are related to projects and inputs for the construction or reconfiguration of DCs in projects.

It was not identified the good practices of PM that facilitate the development of DCs. It was also found that most of the analyzed studies used the qualitative analysis, which becomes important to deepen the theme, using the quantitative approach.

Change management and continuous improvement and its relationship with DCs in PM is a little addressed topic, being only referenced by Biesenthal et al. (2019) at a more macro and theoretical level talks about change management and its relationship with seizing and reconfiguration.

The discussion of the relationship between PM methodologies such as agile and waterfall and the development of DCs were also not found in the analysed studies.

It is found through this study that the emphasis given in LR focuses mainly on which DCs are identified in projects and the impact that these DCs have on projects.

The following papers aim at a deeper investigation of these gaps found in this LR work.

5.2. Second paper - Project Management in the Development of Dynamic Capabilities for an Open Innovation Era

Through the analysis of the results and gaps found in the previous paper, this article seeks to understand how the PM contributes to the development of DCs through the identification of good practices, techniques and PM tools that should be applied in order to facilitate the accumulation, integration, use and reconfiguration of capabilities (Eriksson, 2014) as a theoretical basis, as well as to understand through the sensing and seizing process (Teece, 2007), how PM methodologies, such as waterfall and agile, can develop and reconfigure DCs (Biesenthal et al., 2019).

The paper also addresses that how change management and continuous improvement should intertwine with PM to enable capabilities to be used and reconfigured in projects and routines. The study also examines how the turnover of resources between projects facilitates the accumulation, integration, utilization, reconfiguration of knowledge.

The concept of Open Innovation is related to resources renewal, i.e., with DCs, whose some PM practices are drivers to develop the capacity for Open Innovation in organizations (Pereira et al., 2021a, 2021b).

The results of 22 interviews conducted with several professionals related to projects, from different industries allowed answering the research questions of the study. Regarding the RQ 1) How does the PM ensures the accumulation, integration, use and reconfiguration of capabilities and knowledge acquired in projects in order to build DCs? It was understood that it is necessary to transform the knowledge of projects into routines, thus accumulating knowledge in order to develop DCs.

Knowledge accumulation through PM: 24 good PM practices, techniques and tools that facilitate knowledge accumulation were identified.

Integration of knowledge through PM: 8 actions were identified to respond to the absence of knowledge in projects, thus facilitating the integration of knowledge when the necessary capabilities do not exist in the organization and in the projects.

Use of knowledge through PM: 18 facilitating and blocking factors of capacity development were identified. It was verified that, these factors, if favourable, enable knowledge accumulation, integration and use.

Reconfiguration of knowledge through the PM: 16 good practices of PM were identified that cause visible change of capabilities, allowing the accumulation and reconfiguration of knowledge in projects. There were identified 6 good practices, tools, techniques that facilitate capacity building through CM in projects and another 6 through CI.

The relationship of change management and continuous improvement with the PM are the areas of greatest need for development according to the interviewees, in order to contribute to the development of DCs.

Mainly the integration of the CM with the PM so as to ensure that the knowledge acquired in projects remain in the routines after the end of the project, thus enabling the use and reconfiguration capabilities in the organization. The agile methodology was identified by the interviewees as a lever for continuous improvement in PM.

In the second RQ "How does PM develop DCs through the identification and implementation of project management opportunities?" 8 techniques and good practices were identified that facilitate the identification and implementation of opportunities through projects, by a sensing process.

To use and integrate new PM methodologies, i.e. a seizing process, 10 good practices were identified that facilitate it. It was found that 41% of respondents mentioned that the agile methodology develops more capabilities than the waterfall methodology, allowing a greater reconfiguration of capabilities. In addition to CM, the difficulty of using the documentation produced in the projects for knowledge and capacity development still remains a challenge, as does turnover.

The third research question "How does the rotation of resources between projects allow the accumulation, integration, use, reconfiguration of knowledge?" was answered by identifying 6 best practices, which allow us to understand how to facilitate the replication of knowledge between projects, taking into account the rotation of resources between them, allowing the accumulation of knowledge in the organization.

A quantitative analysis that would further explore these results of this qualitative study was recommended.

5.3. Third paper - Impact of Project Management to capability transformation

Following the findings of the previous two papers of LR and qualitative analysis, the importance of conducting a quantitative analysis with the research findings from these two previous studies was identified, in seeking to further research into the role of PM in the development of DCs.

The reconfiguration process is considered a fundamental process in DCs (Eriksson, 2014), which means continuous renewal (Teece, 2007) and is the process where the change of operational PM capabilities happens (Biesenthal et al., 2019).

In this sense, this study seeks to answer a central question for researchers and practitioners: What are the PM practices that favour the transformation of capabilities in order to develop DCs?

Following the study done previously on how PM leverages DCs and based on previous studies conducted by authors analyzed in the systematic literature review, this research focused on the transformation/reconfiguring process of DCs.

This paper seeks to empirically investigate the possibility that PM practices promote the transformation of capabilities.

141 surveys of professionals with experience in projects were analyzed. This research used the PLS-SEM and empirically presents factors and practices that significantly facilitate the possibility of PM practices to transform capabilities in organizations, thus leveraging DCs, allowing the accumulation, integration, use and reconfiguration of knowledge acquired in projects.

It investigated in particular whether practices that favor the transformation of knowledge from projects into routines, whether practices that facilitate responses to absence of knowledge in projects, whether factors in PM that facilitate the development and replication of new capabilities from project to project and whether practices that favor the interrelation of change management with PM facilitate or not the possibility that PM practices promote the transformation of capabilities.

The study identifies the practices that operationalize each of the variables studied, allowing access in a detailed manner to which PM practices contribute to the transformation of capabilities in order to develop DCs.

The study has shown, thus, practices that favor the transformation of knowledge of projects into routines positively favor the possibility of the PM practices promote the transformation of capabilities, allowing the PM to accumulate, integrate and reconfigure knowledge through its practices. It was also shown that practices that facilitate responses to absence of knowledge in projects positively favor the possibility that the PM practices promote the transformation of capabilities.

Thus, the PM practices facilitate the organizations in the use, accumulation and reconfiguration of knowledge acquired in projects. It was also found that the factors in the PM that facilitate the development and the replication of new capabilities from project to project positively favor the possibility of the PM practices promote the transformation of capabilities, allowing organizations to accumulate knowledge through their practices.

The practices that favor the interrelation of change management with PM significantly facilitate the possibility of PM practices to promote the transformation of capabilities, facilitating organizations to use and reconfigure knowledge through PM practices, as well as to carry out the seizing process.

The study showed that the factors in PM that facilitate the development and replication of new capabilities from project to project mediate the relationship between the practices that favor the transformation of knowledge from projects into routines and the possibility that the PM practices promote the transformation of capabilities, facilitating the accumulation of knowledge.

It was found that the practices that facilitate responses for absence of knowledge in projects mediate the relationship between practices that favor the transformation of the projects' knowledge into routines and the possibility of the PM practices to promote the transformation of capabilities, promoting the integration and use of knowledge in organizations through the PM practices.

This study has demonstrated the importance of PM practices being implemented and utilized in ways that promote capability reconfiguration/transformation by leveraging DCs.

5.4. Theoretical and managerial contributions

The empirical essay conducted and used in the conference communication entitled "Dynamic Capabilities Trends: a brief review of the state of the art", contributed to the understanding of the state of the art of DCs in the last 10 years for guidance in future research, having had a theoretical contribution.

The LR paper "Dynamic capabilities and project management: a systematic literature review", contributes to a greater knowledge of the relationship between DCs and PM, at theoretical and management level.

This paper has as contributions:

1. Analysis of what the literature refers to about the interrelationship between PM and DCS, referring to 25 articles analyzed, published in the period from 2014 to 2019 with the theme DCS and PM.

2. Presentation of a conceptual map, based on the LR from 2014 to 2019, with the description and clarification of the interaction between DCs and PM, incorporating the various dimensions of analysis that support this interconnection, according to the literature and that can be adapted, applied and tested at corporate level.

3. Identification of the DCs, PCs and routines addressed in the LR from 2014 to 2019, related to DCs and PM, indicators, inputs, clarifying which are the DCs associated with projects and PM, as well as the relationship existing between them.

4. Identification of gaps for future research on how PM can leverage DCs and the suggestion for possible future lines of investigation.

The third study reflected in the paper "Project Management in the Development of Dynamic Capabilities for an Open Innovation Era" is a qualitative study that contributes in a theoretical and empirical way about how the PM transforms knowledge acquired in projects into routines and practices that allow organizations to develop or reformulate capabilities, thus facilitating the development of DCs.

This research contributes to greater knowledge about which PM best practices, techniques and tools organizations should implement in order to leverage DCs. It provides practical insight into how PM develops and integrates knowledge gained from projects into the processes, people and tools embedded in theoretical dimensions of DCs, knowledge accumulation, integration, use and reconfiguration (Eriksson, 2014), and also sensing and seizing (Teece, 2007; Biesenthal et al., 2019) applied to PM methodologies.

The study provides completeness across these various dimensions, and a sample was used to provide insight into various areas with interviews with very senior project-related practitioners from various industries.

The study provides theoretical and practical contributions on the importance of having a consolidated and empirically studied vision so that organizations can invest in a PM that contributes to the development of the DCs in organizations, thus allowing to accumulate, integrate, use and transform capabilities, integrating them into daily routines, people and processes, enhancing their continuity and simultaneously opportunities related to PM, both externally and internally, through sensing and seizing, which are levers for a dynamic of open innovation.

The fourth study, continues the previous studies and deepens them through a quantitative analysis, using the PLS-SEM for the effect, in order to fill the gap identified in the LR to know how the PM can target DCs.

The paper entitled " Impact of Project Management to capability transformation", focuses on the process of transformation/reconfiguring of DCs and presents the measurement scales of PM practices and factors that contribute to capability transformation, providing an important empirical and practical contribution to organizations and academia in the development of DCs through PM.

The results show organizations and academies the PM variables and practices that can significantly foster capability transformation and renewal in order to develop DCs. Another innovative contribution of this study is that the results of the study present measurement scales on practices and factors that facilitate the possibility of the PM to accumulate, integrate, use and transform the knowledge acquired in the projects.

In summary, theoretical and practical contributions to the literature and to the advancement of knowledge based on this research are presented in the table 22:

Table 22 - Contributions to the state of the art and to business management

Author	Topic/ Literature Issue	Contribution to the state of the art and to business management
Eriksson (2014)	It is necessary to know how PM facilitates the accumulation, integration, utilization and transformation of capabilities in organizations, in order to develop and transform DCs	Development and generation of new capabilities through a set of PM best practices, techniques and tools (24 PM best practices that enable accumulation, 8 that facilitate integration, 16 that reconfigure knowledge, 18 PM factors that enable knowledge accumulation, integration and use)
Davies & Brady (2016) Gardiner (2014)	Remains to be empirically explored how the projects ensure that the capabilities developed are incorporated into the routines and the organization as a whole	9 practices that favor the transformation of project knowledge into organizational routines
Biesenthal et al. (2019)	It is difficult to pass and consolidate knowledge from project to project	9 factors in GP that facilitate the development and replication of new capabilities from project to project
	Investigating how PM and change management can facilitate the integration of knowledge from projects to operations remains a topic to be explored	5 practices that favor the interrelation of change management and project management
Teece (2007, 2014)	Continuous transformation of capabilities	Capability transformation is done substantively through PM factors and practices (at least 12 PM practices that promote capability transformation were identified)

Source: authors' own elaboration, 2021

5.5. Research Limitations

All three studies presented have limitations.

The limitations of the study on LR are related to the selection and analysis of the collected articles, which was performed manually. Due to the duration of the thesis research and although there was a concern to update the current literature from article to article, there is the limitation of this study concerning the analysis of LR, which referred to the period from 2014 to 2019.

There is not a large number of articles in the selected period that specifically and simultaneously address the topic of DCs and PM, which limits our analysis. The analysis performed, despite including the detailed and full reading of the articles, may present flaws in the identification and categorization of the identified capabilities, whether DCs, PCs or OCs.

Most of the articles analyzed use qualitative methods and case studies of specific projects, which limits us to the level of scope of application of these DCs and results to other types of projects and may lack further validation in more cross-cutting terms at the project level. The following studies attempt to help clarify these limitations.

Regarding the qualitative analysis study of Project Management in the Development of Dynamic Capabilities for an Open Innovation Era, the number of interviews carried out was few, being a clear limitation of this study, as well as the number of companies in Portugal. In addition, the study was carried out only in Portugal, which limits its scope.

The quantitative analysis study about Impact of Project Management to capability transformation, presents limitations mainly at the level of sample size which is limited to 141 responses. It should also have been carried out at an international level.

5.6. Future research

This research leverages several future lines of research:

- Future study focused on deepening how the PM favours the CM in the transition from projects to operation, with proposed methodology for this purpose, since it was identified in the qualitative study that it would be one of the areas that needs further development, as well as a gap identified in the literature.
- MC is still an area somehow separated from PM, according to the respondents of the qualitative study, despite the fact that the agile methodology seeks to incorporate the MC in its routines. In this sense, it would be important to conduct an empirical study in order to deepen the knowledge of how the PM can favor the MC in organizations and in its methodology in order to develop DCs.

- Another line of future research would be the in-depth and organized analysis of DCs with processes, people and tools in PM, in order to create a methodology and assessment for this purpose that could be applied to organizations.
- The deepening of the relationship between current PM methodologies such as agile and DCs should be carried out, in order to evolve them to be a lever for the development of DCs in projects.
- The issue of turnover of project resources and its relationship with the passage of knowledge from project to project and to the organization continues to be an increasingly present reality and an increasingly important challenge in the construction of DCs in PM. Thus, it becomes important to deepen the analysis of the management and the impact of the turnover of project resources in the replication of knowledge from projects to projects.
- Empirically study the relationship between PM, DCs and Open Innovation
- Explore the relationship between DCs, PM and knowledge management
- The existence of a proposal for an area of knowledge of DCSs in PM becomes essential after these research works carried out, with inputs, tools and techniques and outputs. The studies carried out and reflected in the papers and this investigation allowed to obtain important inputs for a proposal of a DCs knowledge area to be incorporated into the area of project management, being necessary to validate it empirically, adjust it, detail it and complement it through an empirical study to be carried out after this thesis. In table 22 it is presented a proposal for an area of knowledge of DCS in PM for future research.

Table 23 - Proposal for future research: Dynamic Capabilities Knowledge Area in Project Management

Proposal for future research:
Dynamic Capabilities Knowledge Area in Project Management

Inputs	Tools and Techniques	Outputs
1. Involvement of senior management in decision making (Hermano and Martín-Cruz, 2016; Eriksson, 2014)	1. Project management methodology (use, compliance and knowledge) and integration of new methodologies (Hermano and Martín-Cruz, 2016; Gardiner, 2014; Sivusuo et al., 2018; Biesenthal et al., 2019)	1. Capacity development and reconfiguration (Freitas and Salerno, 2018; Davis and Brady, 2016)
2. Structural alignment (Hermano and Martín-Cruz, 2016)	2. Portfolio management	2. Utilization, integration, use and transformation of capabilities and knowledge (Eriksson, 2014)
3. Procedures and rules of the company and projects (Hermano and Martín-Cruz, 2016; Davis and Brady, 2016)	• Portfolio reporting and performance indicators (Biesenthal et al., 2019)	3.Capability modelling (Patrício et al., 2021)
4. Practices and routines of the organization (Hermano and Martín-Cruz, 2016; Eriksson, 2014)	• Capacity management techniques (Hermano and Martín-Cruz, 2016)	4. Resource allocation (Hermano and Martín-Cruz, 2016; Davis and Brady, 2016; Gardiner, 2014)
5. Defined workflows (Hermano and Martín-Cruz, 2016)	• Prioritization of projects (Hermano and Martín-Cruz, 2016)	5.Analysis deviations of the alignment between strategy and portfolio (Hermano and Martín-Cruz, 2016)
6. Capacities developed by managers (Hermano and Martín-Cruz, 2016)	3. Working procedures in the projects (Hermano and Martín-Cruz, 2016)	6. Knowledge expansion (Freitas and Salerno, 2018)
7. Experience of project managers (Clegg at al., 2018; Eriksson, 2014)	4. Strategy, protocols and decision-making capacity (Hermano and Martín-Cruz, 2016; Sivusuo et al., 2018)	7. Knowledge formalization and codification (Freitas and Salerno, 2018; García et al., 2018)
8. Management capabilities (Eriksson, 2014)	5. Staffing (Freitas and Salerno, 2018)	8. Organizational and strategic renewal and restructuring (Sicotte et al., 2014)
9. Current resources and capabilities (Eriksson, 2014)	6. Hiring (Freitas and Salerno, 2018)	9. Recycling knowledge from project to project (Davis and Brady, 2016)
10. Existing business models (Eriksson, 2014)	7. Networking (Biesenthal et al., 2019)	10. Transformation of operational capabilities (Eriksson, 2014)
11. Market, institutional and technological environment (Eriksson, 2014; Hermano and Martín-Cruz, 2016)	8. Specialization (Freitas and Salerno, 2018)	11. Support of the product or service developed (Davis and Brady, 2016)
		12. Execution of predictable routines (Davis and Brady, 2016)

12. Network and relationships (Eriksson, 2014)	9. Experience in the industry (Freitas and Salerno, 2018)	13. Process improvement (Davis and Brady, 2016)
13. Analysis of recurrent problems with periodic review of methodologies (Patrício et al., 2021)	10. Problem solving (Thattakath and Čiutienė, 2017; Manley and Chen, 2017; Eriksson, 2014; Davies and Brady, 2016; Davies et al., 2016; Pereira and Santos, 2018; Pereira et al., 2021).	14. Extending the life of existing products (Davis and Brady, 2016)
14. Formalizing decisions made (Patrício et al., 2021)	11. Creation of group discussion (Freitas and Salerno, 2018; Biesenthal et al., 2019)	15. Updating and renewal of project management methodologies (Gardiner, 2014; Biesenthal et al., 2019)
15. PMO Newsletters (Patrício et al., 2021)	12. Project reporting and its automation (Freitas and Salerno, 2018; Patrício et al., 2021)	16. Renewal of leadership practices (Gardiner, 2014)
16. Compliance with processes, rules and standards (Sivusuo et al., 2018)	13. Training and coaching (Freitas and Salerno, 2018; Sivusuo et al., 2018; Gardiner, 2014; Davis and Brady, 2016; Sivusuo et al., 2018; Biesenthal et al., 2019).	17. Renewal of human resources practices (Gardiner, 2014)
17. Creation of new departments (Freitas and Salerno, 2018)	14. Creation of administrative and operational routines (Hermano and Martín-Cruz, 2016; Freitas and Salerno, 2018)	18. Creating and changing organizational culture (Gardiner, 2014)
18. Team flexibility analysis (Freitas and Salerno, 2018)	15. Partnerships with the business, alliances, learning with partners, learning and sharing of resources (Freitas and Salerno, 2018)	19. Proactive adaptability (Teece et al., 1997; Sicotte et al., 2014)
19. Decision-making methods (Bernroider et al., 2014)	16. Empowerment, involvement of senior management (Hermano and Martín-Cruz, 2016; Sivusuo et al., 2018; Fernandes et al., 2014)	20. Business creation and strategies (Sicotte et al., 2014; Davies and Brady, 2016)
20. Definition of business objectives that drive projects (Daniel et al., 2014)	17. Analysis of risk opportunities (Patrício et al., 2021)	21. Business diversification (Davies and Brady, 2016)
21. Project management with technical and procedural knowledge of the company (Patrício et al., 2021)	18. PMO meetings, project status meetings and portfolio meetings (Thattakath and Čiutienė, 2017; Manley and Chen, 2017; Eriksson, 2014; Davies and Brady, 2016; Davies et al., 2016; Pereira and Santos, 2018; Pereira et al., 2021)	22. Leveraging resources (Sicotte et al., 2014)
	19. Business Cases Methodology (Gomes and Romão, 2018)	23. Opportunity capture (O'Reilly and Tushman, 2008; Teece 2007, 2014; Sicotte et al., 2014)
	20. Leadership development and strategic capabilities (Gardiner, 2014; Sivusuo et al., 2018; Sicotte et al., 2014; Davies and Brady, 2016)	24. Creation of new products and services (Davies and Brady, 2016)
	21. Knowledge management systems and practices (Gardiner, 2014; Sivusuo et al., 2018; Biesenthal et al., 2019; Yan et al., 2019; Medina and Medina, 2015).	25. Induction, adaptation and anticipation of change (Eriksson, 2014)

	22. Portfolio innovation management methodology (Gardiner, 2014; Sicotte et al., 2014) 23. Stakeholder management (Gardiner, 2014) 24. Benchmarking (Eriksson, 2014; Bernroider et al., 2014; Manley and Chen, 2015; Medina and Medina, 2015) 25. Intrapreneurship (Sicotte et al., 2014) 26. Proactive adaptability (Teece et al., 1997; Sicotte et al., 2014) 27. Intra and inter-departmental collaboration and teamwork (Eriksson, 2014; Davies et al., 2016; Zhang et al., 2017; Manley and Chen, 2017; Gomes and Romão, 2018; Patrício et al., 2021) 28. Risk sharing (Davies et al., 2016) 29. Identification of project opportunities (Davies et al., 2016) 30. Acting on acquired learning (Davies et al., 2016) 31. Disciplined flexibility (Eriksson, 2014; Davies et al., 2016; Freitas and Salerno, 2018; Garcia et al., 2018; Biesenthal et al., 2019). 32. Commercial capacities (Zhang and Leiringer, 2016) 33. Brainstorming (Thattakath and Čiutienė, 2017) 34. Recognition and reward models based on engagement, initiative, creativity and results (Sivusuo et al., 2018) 35. Quality assurance of project management methodologies (Biesenthal et al., 2019) 36. Efficient process system (Gomes and Romão, 2018) 37. Change management methodology included in the project management methodology and project scope (Zhang et al., 2017; Biesenthal et al., 2019) 38. Leadership through Influence (Patrício et al., 2021)	26. Competitive advantage/performance (Teece et al., 1997; Eriksson, 2014)

	39. Reporting of lessons learned (Biesenthal et al., 2019; Freitas and Salerno, 2018) 40. Change Champions (Zhang et al., 2017; Biesenthal et al., 2019). 41. Trustworthiness (Zhang et al., 2017) 42. Direct involvement and integration of the operation in the project (Patrício et al., 2021) 43. Tailoring (of Project Management and Change Management methodologies) (Patrício et al., 2021) 44. Explanation and knowledge of all stakeholders of the purpose of the project (Patrício et al., 2021) 45. Capability-based framework (Patrício et al., 2021) 46. Formal record of the scope of projects included immediately in the operation (Patrício et al., 2021) 47. Customer and business involvement in projects and project management methodology (Patrício et al., 2021) 48. Visibility (Patrício et al., 2021) 49. Team commitment (Patrício et al., 2021) 50. Short-term goals (Patrício et al., 2021) 51. Communication skills and methods (Patrício et al., 2021) 52. Top-Down decisions (Patrício et al., 2021) 53 Culture of feedback and reflection (Patrício et al., 2021) 54. Turnover (Patrício et al., 2021) 55. Change management methodology included in project management methodology and project scope (Patrício et al., 2021) 56. Continuous improvement methodology included in the project management methodology and project scope (Patrício et al., 2021) 57. Methodology for implementing and monitoring KPIs included in the scope of the project (Patrício et al., 2021)	

	58. Creation of continuous improvement forums (Patrício et al., 2021) 59. Critical thinking (Patrício et al., 2021) 60. Continuous improvement assessments (Patrício et al., 2021) 61. Claims analysis (Patrício et al., 2021) 62. Meetings for reflection and continuous improvement (Patrício et al., 2021) 63. Events (Patrício et al., 2021) 64. Audits and Control (Patrício et al., 2021) 65. Certifications (Patrício et al., 2021) 66. Retention and backup strategies (of internal employees and staffing) (Patrício et al., 2021) 67. Meetings for sharing and passing on knowledge (Patrício et al., 2021) 68. Enterprise-wide capacity building on products or services developed in the projects (Patrício et al., 2021) 69. Project Management training at the organizational level (Freitas and Salerno, 2018) 70. Good Practice in requirements management (Patrício et al., 2021) 71. Implementation of pilots for new PM methodologies (Patrício et al., 2021)	

Source: authors' own elaboration, 2021

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Appendixes

Appendix A: Article acceptance letter - Paper Dynamic capabilities and project management: a systematic literature review

From: Inderscience Submissions <no-reply@indersciencesubmissions.com>
Sent: 23 de setembro de 2020 22:44
To: Leandro Ferreira Pereira | WINNING <leandro.pereira@winning.pt>; Renato Costa <renatojlc@gmail.com>; nelson.antonio@iscte-iul.pt; Vânia Sousa Patrício | WINNING <vania.patricio@winning.pt>
Subject: Inderscience Publishers: Article accepted for publication - IJBIR-57125

INDERSCIENCE Submissions
Article submission and peer-review system

Dear Dr. Vânia Patrício,

(Co-authors are copied into this email for information purposes.)

Ref: Article title: "Dynamic Capabilities and Project Management: a systematic literature review"
Submission code: IJBIR-57125

I am pleased to inform you that your article has been accepted for publication in Int. J. of Business Innovation and Research.

You now need to upload the final revised version for this article and your author copyright agreement form(s) or your Open Access order form.

The reviewers' comments are added to the end of this email for your information. There may be some useful suggestions for improving your final version.

* INSTRUCTIONS *

Log in to the Inderscience Submissions system. There is a reminder facility there if you have forgotten your username or password.

Then use the following link, and you will be taken to the correct section for uploading:
https://www.indersciencesubmissions.com/track/index.php?action=submissiondetails&intSubmissionId=57125

1. Scroll down the page to the section called "Peer Review Progress".

Dynamic capabilities and project management: a systematic literature review

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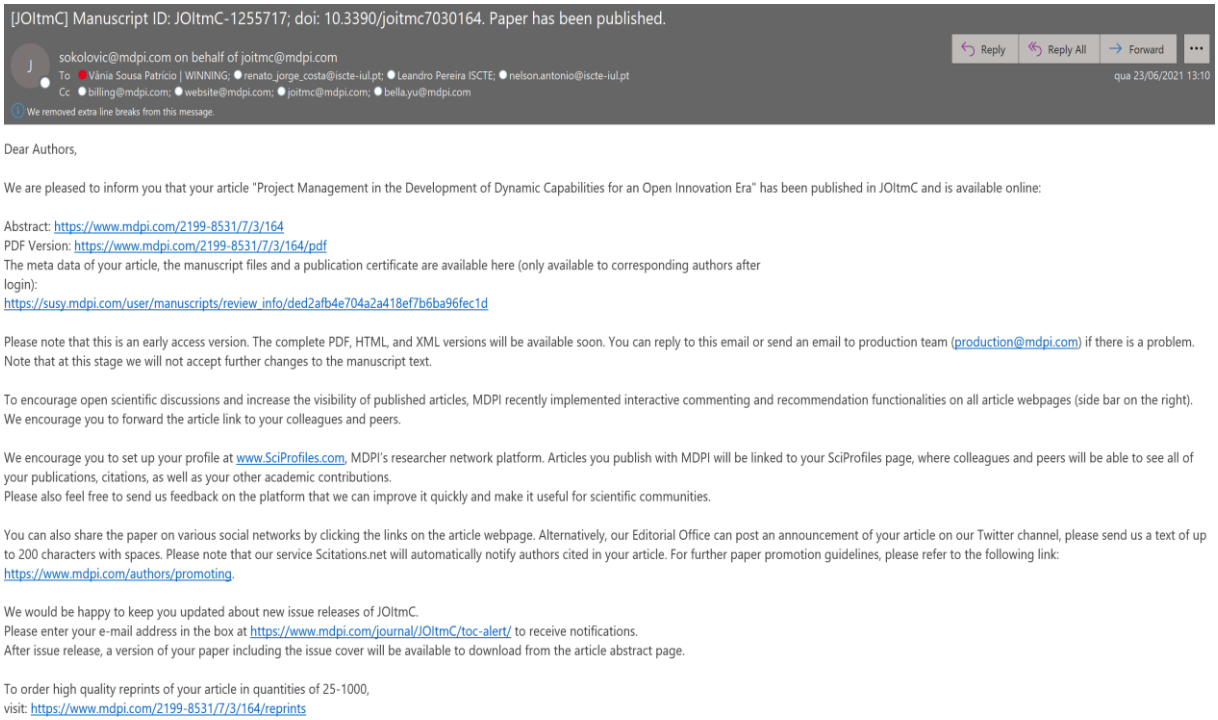
Abstract: Project management became a critical tool for today's management success. Nevertheless, the field's authors reflect the difficulty of sharing empirical knowledge between projects. This condition empowered the dynamic capabilities research to become an active branch of science. The research team reviews the literature in the scope through the access and assess of the 25 most cited papers, published from 2014 to 2019. The goal is to interpret and contribute to mitigating the project's missing link while pushing dynamic capabilities science. The findings point to the importance of two branches interrelation in the organisation's longterm success. The accessed papers emphasise common factors, mostly on dynamic capabilities on coming project management tasks. project management and dynamic capabilities, although different in goals and separated as science branches, can fulfil its missing links. The first working as an empirical knowledge provider to validate the second's theoretical models, and the later's improving the prior's continuous learning between projects.

Appendix B: Article acceptance letter - Paper Project Management in the Development of Dynamic Capabilities for an Open Innovation Era



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sokolovic@mdpi.com on behalf of joitmc@mdpi.com
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Article

Project Management in the Development of Dynamic Capabilities for an Open Innovation Era

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Abstract: The aim of the research is to explain how Project Management (PM) ensures the accumulation, integration, utilization, and reconfiguration of the capabilities and knowledge acquired in projects in order to build dynamic capabilities (DCs). This study also gives insight into how PM can develop DCs through the identification and implementation of project management opportunities. The result of 22 semi-structured interviews with 22 participants from 9 companies of different industries are detailed and framed within theoretical dimensions of DCs: knowledge accumulation, integration, utilization, reconfiguration, sensing, and seizing. As a result, we present the best practices, techniques, and PM tools that allow leveraging DCs in organizations. This qualitative study contributes to a theoretical and empirical discussion about how PM transforms knowledge acquired in projects into routines and learning practices that allow organizations to develop or reshape capabilities.

Keywords: dynamic capabilities; project management; sensing; seizing; qualitative analysis; open innovation

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1. Introduction

Through DCs, organizations reconfigure existing capabilities and develop and renew others [1]. DCs link resources with performance and influence operational capabilities [2]. They are also linked to the ability to respond to changes in the environment [2]. According to Eriksson [2], DCs consist of four core knowledge processes: accumulation, integration, utilization, and reconfiguration, which are also qualified as DCs. The same author argues that future research of these processes in more detail is needed, as well as the connection of DCs with PM [2]. Studies show the evolution of capacities in organizations [3].

This study is part of an investigation with the following phases: (1) systematic literature review about the interrelationship between PM and DCs; (2) how PM leverages DCs in organizations.

In phase 1 of the systematic literature review, 25 articles, published between 2014 and 2019, with research focused on the topic of DCs and PM, were analyzed. From the search, using DC and PM keywords, 733 articles were obtained; after refinement, an exclusion process, and detailed reading, 25 articles remained [4].

The study used the literature to analyzed the interrelationship between the two areas of study. It was found that there was a limited number of articles published in the literature with the relationship between CDs and PM.

This detailed analysis led us to conclude that one of the themes addressed by the literature is the relationship between the DCs and operational capabilities in projects [5–

Appendix C: Article acceptance letter - Paper Impact of Project Management to capability transformation

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Patrício, Vânia; Lopes da Costa, Renato; António, Nelson; Pereira, Leandro; Gonçalves, Rui; Jerónimo, Carlos.

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Impact of Project Management to Capability Transformation

Vânia Patrício [1], Renato Lopes da Costa [2], Nelson António [3], Leandro Pereira [4], Rui Gonçalves [5], Carlos Jerónimo [6]

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Rui Gonçalves, Business Research Unit – BRUIUL, ISCTE - Instituto Universitário de Lisboa
Carlos Hernandez Jerónimo, Business Research Unit – BRUIUL, ISCTE - Instituto Universitário de Lisboa

Abstract. A central question for researchers and practitioners is whether and which project management (PM) practices foster capability transformation in order to develop dynamic capabilities (DCs). To explore this question, this study seeks to empirically examine whether PM practices promote capability transformation. To this end, 141 surveys of professionals with project experience were analyzed. This research used PLS-SEM and empirically presents factors and practices that significantly facilitate the possibility of PM practices transforming capabilities in organizations, thereby leveraging DCs, through the accumulation, integration, utilization, and reconfiguration of knowledge gained from projects. This quantitative study contributes to the literature by presenting scales for measuring PM practices and factors that contribute to capability transformation, and highlighting those, thereby providing an important contribution to organizations and academia in developing DCs through PM.

Keywords: Dynamic Capabilities; Project Management; PLS-SEM; Reconfiguration; Capability Transformation

Appendix D: Conference proceedings where the empirical essay was presented

Abstract:
Dynamic capabilities (DC) is a relatively young area, being a subject of interest and research of the recent year, hence its literature is mainly conceptual. In this article, we review briefly the current state-of-the-art, the literature over the past 10 years and how its related with competitive advantages and management. This article presents a brief literature review, proposing to guide future research, which will be conducted in a near future and work on a dynamic competency model which allows organizations to continuously develop these skills, aligned with the best models and to develop more effective strategies, which will lead to a continuously improvement.

Published in: 2019 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC)

Date of Conference: 17-19 June 2019

INSPEC Accession Number: 18936508

Date Added to IEEE *Xplore*: 12 August 2019

DOI: 10.1109/ICE.2019.8792629

ISBN Information:

Publisher: IEEE

Conference Location: Valbonne Sophia-Antipolis, France

Appendix E: Paper 2 - Interview corpus

Table 24 - Interview corpus. *Source:* authors' own elaboration, 2021.

Research Question (RQ)	Research Objective (RO)	Interviewees' Questions (IQ)	Theoretical Dimensions (TD)
1. How does PM leverage DCs?	Understand how project management contributes to the development of DCs		
		1. Context (number of employees in the company and the division to which the interviewee belongs)	
1.1 How does the PM ensure the accumulation, integration, use and reconfiguration of capabilities and knowledge acquired in projects in order to build DCs?	O1. Analyze how organizations ensure the development and generation of new capacities through projects	2. How does project management transform the knowledge and learning gained from projects (during execution and post-implementation) into day-to-day routines and practices?	2. Accumulation
		3. When the necessary knowledge and skills to execute a project are lacking, what do they do?	4. Integration
	O2. Identify which PM routines, best practices, and techniques enable the accumulation, integration, use and transformation of skills and competencies.	4. What routines, best practices, techniques, competencies, and project management processes have caused development, dissemination and visible change of capacities in the organization?	3. Accumulation and Reconfiguration
		5. What are the factors in project management and in projects that most facilitate and those that most hinder the development, replication and application of new competencies from project to project and to the organization?	5. Accumulation, integration, utilization
	O3. Analyze how change management and continuous improvement are related to project management in order to enhance DCs.	6. How does project management interrelate with change management and how does it thereby generate, transform competencies and ensure the use of knowledge acquired in projects?	6. Utilization, reconfiguration and seizing
		7. How does project management interrelate with continuous improvement and how does it generate, transform competencies and ensure the use of knowledge acquired in projects?	7. Utilization, reconfiguration and seizing
1.2 How does GP develop DCs by identifying and implementing project management opportunities?	O4. Analyze how PM captures opportunities for improvement in terms of methodologies and development of new competencies in PM and how it implements them	8. How do you identify opportunities through projects (opportunities for change, for new PM methodologies, for new products/services, etc.)?	Question 8. Sensing
	O5. Analyze how PM ensures the use, integration, accumulation and transformation of competencies related to new PM practices and methodologies	9. How do you ensure that the new PM methodologies are used and disseminated in the projects and teams?	Issues 9. seizing
	O6. Analyze if agile and waterfall methodology develop DCs differently	10. Do you consider that Agile and Waterfall methodology develop skills differently?	Question 10. reconfiguration
		11. What skills do they develop and how?	Question 11. reconfiguration
		12. Which one allows greater development and reconfiguration of competencies in the organization?	Question 12. reconfiguration
1.3 How does the resource turnover between projects allow for the accumulation, integration, utilization, and reconfiguration of knowledge?	O7. Identify what factors can mitigate the impact of resource turnover between projects on knowledge transfer, capacity utilization and codification	13. How is it ensured that the skills and knowledge developed in each project stay in the organization and are replicated and used in other projects given the nature of project turnover?	Question 13 - Accumulation

Appendix F: Paper 3 - Summary and interrelationships of the study

Table 25 - Relationship between the theoretical dimension, the variables of the conceptual model, the indicators and their source and the questions of the questionnaire

Theoretical Dimension	Variable (dependent; independent)	Indicator Code	Indicators	Source of indicators (literature review)	Questionnaire items (answers with a scale of 1 to 5)
					Please rate your agreement on whether the project management practices listed below can contribute to capacity transformation in your organization (1- strongly disagree; 5- strongly agree):
Reconfiguration	Dependent variable: what is the possibility that PM practices promote the transformation of capabilities	CTP-1	Knowledge of the client area in project management methodology	Patricio et al. (2021b), Gardiner (2014), Davis and Brady (2016), Sivusuo et al. (2018)	Develop knowledge of Project Management methodologies used to all areas involved in projects.
		CTP-2	Requirements Analysis Best Practices	Patrício et al. (2021b)	Implement Requirements Analysis methodology.
		CTP-3	Business Case methodology implementation	Patrício et al. (2021b), Gomes and Romão (2018)	Implement Business Case methodology.
		CTP-4	Methodology, standardization and process documentation	Patrício et al. (2021b), Gardiner (2014), Davies and Brady (2016), Hermano and Martín-Cruz (2016), Biesenthal et al. (2019), Freitas and Salerno (2018), Gomes and Romão (2018)	Standardize methodologies and document processes.
		CTP-5	Visibility	Patrício et al. (2021b)	Constantly provide visibility of work performed on projects to the organization and Top Management.
		CTP-6	Team commitment	Patrício et al. (2021b)	Create process that ensures team commitments in resolving each assigned issue.
		CTP-7	Management and leadership	Patricio et al. (2021b), Gardiner (2014), Sivusuo et al. (2018), Sicotte et al. (2014)	Develop management and leadership skills (train leaders, conduct one-on-one coaching sessions with team members, develop people, create reflection and feedback routines).

		CTP-8	Root cause analysis, action plan and problem solving	Patrício et al. (2021b), Thattakath and Čiutienė (2017), Manley and Chen (2017), Eriksson (2014), Davies and Brady (2016), Davies et al. (2016), Pereira and Santos, (2018), Pereira et al. (2021)	Create routine use of root cause analysis, action plan and problem solving in the methodology and projects.
		CTP-9	Portfolio Management	Patrício et al. (2021b), Hermano and Martín-Cruz (2016), Davis and Brady (2016), Gardiner (2014), Daniel et al. (2014), Biesenthal et al. (2019), Clegg at al. (2018)	Apply Portfolio Management methodology.
		CTP-10	Project meetings	Patrício et al. (2021b), Biesenthal et al. (2019), Freitas and Salerno (2018)	Hold project meetings.
		CTP-11	Building innovation methodologies and capabilities	Gardiner (2014), Zhang et al. (2017), Sivusuo et al. (2018), Davies et al. (2016)	Develop and apply innovation capabilities and methodologies.
		CTP-12	Quality assurance of project management methodologies	Biesenthal et al. (2019)	Apply quality assurance methodology in project management.
					Below are mentioned Project Management practices. Please rate your agreement in terms of the contribution of each one with respect to (1- strongly disagree; 5- strongly agree): **Practices that favor the transformation of project knowledge into routines:**
Accumulation, integration, reconfiguration	Independent variable: Practices that favor the transformation of project knowledge into routines	TKR-1	Training and Coaching	Patrício et al. (2021b), Freitas and Salerno (2018), Sivusuo et al. (2018)	Establish periodic training and coaching programs.
		TKR-2	Problem Solving	Patrício et al. (2021b), Thattakath and Čiutienė (2017), Manley and Chen (2017), Eriksson (2014), Davies and Brady (2016), Davies et al. (2016), Pereira and Santos, (2018), Clegg et al. (2018), Pereira et al. (2021)	Apply the Problem Solving methodology in problem solving, risks, and project issues.
		TKR-3	Explanation and knowledge of all stakeholders of the project's purpose	Patrício et al. (2021b)	Explain to all stakeholders the purpose of the project, the methodologies to be followed, and the critical success factors.
		TKR-4	Cognitive flexibility	Patrício et al. (2021b)	Develop cognitive flexibility in project teams and in the organization.

		TKR-5	Management empowerment	Patrício et al. (2021b), Hermano and Martín-Cruz (2016), Sivusuo et al. (2018)	There is management empowerment in the projects.
		TKR-6	Alliances, management and relationship with suppliers	Patrício et al. (2021b), Teece (2012), Freitas and Salerno (2018)	Establish alliances, create partnerships and good relationships with suppliers.
		TKR-7	Capability-based framework	Patrício et al. (2021b)	Create model of capabilities in projects (model that allows you to understand, for each type of project, which capabilities are needed, anticipating their existence to execute the defined projects).
		TKR-8	Proactive Adaptability	Sicotte et al. (2014), Teece et al. (1997)	Create dynamics and a model that allows the organization to discuss and analyze how to proactively adapt to the market and renew competencies in advance.
		TKR-9	Industry Experience	Freitas and Salerno (2018)	Develop project teams' experience in the sector/industry in which the project operates.
					Practices that facilitate answers to lack of knowledge in projects:
Accumulation, utilization, reconfiguration	Independent variable: Practices that facilitate responses to lack of knowledge in projects	PLK - 1	Coaching	Patrício et al. (2021b), Freitas and Salerno (2018), Sivusuo et al. (2018)	Establish coaching routines.
		PLK - 2	Training internal resources	Patrício et al. (2021b), Freitas and Salerno (2018), Sivusuo et al. (2018)	Train internal resources.
		PLK - 3	Learning with partners	Patrício et al. (2021b), Freitas and Salerno (2018)	Establish in the projects learning processes with the partners involved.
		PLK - 4	Implementation of learning assessment indexes and trainings	Patrício et al. (2021b)	Implement evaluation indicators in trainings (both in terms of participation and performance of each individual in the proposed trainings).
					Factors in Project Management that facilitate the development and replication of new capabilities from project to project:
Accumulation, integration, utilization, reconfiguration	Independent Variable: Factors in PM that facilitate the development and replication of new capabilities from project to project	CRF_1	Capacity Management - Work volume and execution capacity	Patrício et al. (2021b), Hermano and Martín-Cruz (2016)	There is management of execution capacity vs. workload.
		CRF-2	Behavioral, management and organizational skills	Patricio et al. (2021b), Gardiner (2014), Sivusuo et al. (2018), Sicotte et al. (2014)	There are behavioral, management and organizational skills in project managers.

		CRF-3	Empowerment, top management involvement	Patrício et al. (2021b), Hermano and Martín-Cruz (2016), Sivusuo et al. (2018), Fernandes et al. (2014)	There is empowerment and involvement of top management in the projects.
		CRF-4	Project Meetings	Patricio et al. (2021b), LR (Biesenthal et al. 2019, Freitas and Salerno, 2018)	Hold project meetings (weekly project status meetings, regular meetings with the organization's project managers).
		CRF-5	Flexibility and adaptation to change	Eriksson (2014), Davies et al. (2016), Freitas and Salerno (2018), Garcia et al. (2018), Biesenthal et al. (2019)	Develop in individuals cognitive flexibility and adaptability to change.
		CRF-6	Disciplined flexibility	Eriksson (2014), Davies et al. (2016), Freitas and Salerno (2018), Garcia et al. (2018), Biesenthal et al. (2019)	Allow flexibility (with discipline) and adaptability of processes, rules, and methodologies.
		CRF-7	Application of Business Case methodologies	Patrício et al. (2021b), Gomes and Romão (2018)	Apply Business Case methodologies.
		CRF-8	Root cause analysis, problem solving, action planning and critical thinking.	Patrício et al. (2021b), Thattakath and Čiutienė (2017), Manley and Chen (2017), Eriksson (2014), Davies and Brady (2016), Davies et al. (2016), Pereira and Santos (2018), Pereira et al. (2021)	Develop critical thinking in individuals, associated with the use of root cause analysis, action planning, and problem-solving techniques in day to day projects.
		CRF-9	Portfolio Management		There is methodology and portfolio vision.
					Below are practices that favor the interrelation of project management and change management. Please rate your agreement as to what each one contributes to the transformation and use of the knowledge acquired in the projects (1-Strongly disagree; 5-Strongly agree):
Utilization, reconfiguration, seizing	Independent variable: Practices that favor the interrelation of Change Management with Project Management	CCM-1	Leadership through Influence	Patrício et al. (2021b)	Develop in project managers leadership through influence in order to facilitate change.
		CCM-2	Change Management Communication Plan	Patrício et al. (2021b)	Create change management communication plan.
		CCM-3	Methodology for implementing and monitoring KPIs	Patrício et al. (2021b)	Define and monitor KPI's regarding what you want to achieve with the change.
		CCM-4	Company-wide capacity building on products or services developed in the	Davis and Brady (2016)	Develop enterprise-wide project capabilities of supporting the product or service developed and executing routines, extending the life of the products.

		projects		
	CCM-5	Change management processes and frameworks	Zhang et al. (2017), Biesenthal et al. (2019)	Implement a strong monitoring and control component of the routines configured in the project and change.