Expanding the Knowledge on Project Management Standards: A Look into the PMBOK® with Dynamic Lenses

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Abstract Despite the large number of available project management standards and the efforts for improving its content and application, projects still fail. Researchers have identified that project management standards are generic and abstract and there is still the need to expand our knowledge in how to use them properly. The aim of this work is to develop an analytical principle-based approach for project management by highlighting which of the processes contained in the PMBOK® are suitable to manage projects in moderately dynamic environments. Results of the work shows that PMBOK® processes could be considered as micro-foundations of a project management dynamic capability.

Keywords Dynamic capabilities · Project success · Principle-based approach Routines

1 Introduction

The role projects play in modern organizations has shifted from sporadic endeavors intended to implement changes to widespread practice for developing a firm's daily work and implementing an overall strategy (Irja 2006). This "projectification" process has come along with the rise of a whole discipline, i.e. project management, dedicated to improve the management of projects. In this sense, one of the main focus of project management has been the development of tools and techniques that, gathered in what it is called project management (PM) standards, pretend to

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increase chances of success in projects, and also serve as a basis for the certification of professional project managers (Hällgren et al. 2012; Vaskimo 2013).

PM standards influence the practices of the project management community and represent an institutionalized collective identity of project managers worldwide (Morris 2012; Hällgren and Söderholm 2010). Moreover, they are expected to harmonize the terminology of the project management field and so reducing conflicts within the project team as well as with a project's stakeholders (Ahlemann et al. 2009). Therefore, PM standards are increasingly considered as an important building block in modern organizations (Ahlemann et al. 2009). In fact, there is a wide range of available PM standards developed by several national and international project management associations, e.g. the Project Management body of Knowledge -PMBOK®- developed by the Project Management Institute, the IPMA Competence Baseline -ICB- developed by the International Project Management Association, the Projects IN Controlled Environments -PRINCE2- developed by the Association for Project Management, etc.

However, despite the efforts for developing and improving the content of PM standards, projects still fail (Lehtonen and Martinsuo 2006). Furthermore, the explanation of the positive relationship between the use of PM standards and the success of projects is still missing both theoretically (Milosevic and Patanakul 2005) and empirically (Joslin and Müller 2015).

Among the different problems that researchers have identified in using PM standards (e.g. Ahlemann et al. 2009; Milosevic and Patanakul 2005; Joslin and Müller 2015; Hällgren et al. 2012) two of them have received greater attention. First, PM standards are generic and abstract (Hällgren et al. 2012; Ahlemann et al. 2009). Since PM standards cannot be unlimited and must fit every project, they only contain those aspects that are easy to codify, while the most challenging or specific ones are missing (Hällgren et al. 2012). Moreover, the PM standards only cover a part of the practice (that which can be written down in a formal document) and present ideal situations that, in the best case, only partially fit into reality (Hällgren et al. 2012). Therefore, PM standards can be considered as creations of a made-up world that fits every theoretical project but do not represent any real one (Hällgren et al. 2012). Second, PM standards suffer from a lack of flexibility and adaptability (Ahlemann et al. 2009). Most PM standards are based on an engineering approach where problems are fully specifiable and can be fully solved through optimal solutions (Dybå and Dingsøyr 2008). Thus, PM standards contain predictable, fixed and relatively stable and simple models that allow project managers to specify the whole project management process into a project plan. However, today's projects are carried out in an extremely complex and turbulent environment (Shenhar and Dvir 2007), and so none of them can be specified as a linear sequence of operations (Styhre et al. 2010).

The problem of coping with a dynamic and uncertain environment affects not only the management of projects but the overall management of companies, and so it has been discussed by researchers in the field of strategic management.

Scholars posit that the time has come to broaden the traditional approach to strategic management and decision making with a new perspective founded on complexity science (Snowden and Boone 2007, 1). Managers cannot keep relying on approaches that work well just in a single set of circumstances, but they have to apply more flexible strategies (Snowden and Boone 2007). As an example of a flexible strategy, the Cynefin framework classifies the context into 5 categories based on the existence of cause-effect relationships and the possibility of achieving right decisions (Snowden and Boone 2007). Once managers sense which type of environment they are facing, they can choose an appropriate management style avoiding wrong decisions (Snowden and Boone 2007).

Regarding project management, practitioners have developed a new type of methodologies, i.e. agile methods, which instead of focusing on the development of a baseline plan, these agile methods assume customer satisfaction, continuous work deliver, welcome of changes, etc. as their principles (Beck et al. 2001). Moreover, scholars claim that there is a need to expand knowledge about how to use traditional PM standards by including instructions about which of their tools and methods are appropriate and relevant to each industry or project type (Hällgren et al. 2012). Furthermore, project management research needs a better foundation based on theoretical arguments that can be found in strategic management theories (Hällgren et al. 2012; Shenhar and Dvir 2007; Killen et al. 2012). In this sense, it is worth to mention the application of the dynamic capabilities approach for the treatment of uncertainty (Petit 2012), and for the achievement of project and portfolio performance (Biedenbach and Müller 2012; Killen et al. 2012; Petit and Hobbs 2010).

This article responds to the call for expanding the knowledge on PM standards. Specifically, the article seeks to take the first step for articulating a principle-based approach to project management that is applicable to a widely set of circumstances. Drawing on the dynamic capabilities approach, the aim of this work is to identify the elements of the PMBOK®, the world's leading PM standard (Ahlemann et al. 2009; Milosevic and Patanakul 2005), that are specially relevant for managing projects in moderately dynamic environments, where the introduction of new unknowns is constant as projects progress and there is the need for sensing emerging situations and allowing for plan reconfiguration (Styhre et al. 2010; Collyer and Warren 2009).

Section 2 starts with a review of the dynamic capabilities approach, the role and advancement of PM standards, and then an integrative framework of these two worlds is created. Section 3 identifies the elements of the PMBOK® that are relevant to manage dynamic projects by assessing how they deal with the roles and microfoundations of project dynamic capabilities. Finally, in Sect. 4, the main conclusions, managerial implications, limitations and the directions for future research are presented.

2 Theoretical Framework

2.1 The Dynamic Capabilities Approach

Frequently conceived as an extension of the resource-based view (Barney 1991; Peteraf 1993), the dynamic capabilities approach tries to answer why some organizations achieve abnormal results when performing in turbulent and dynamic environments (Teece et al. 1997; Zollo and Winter 2002; Eisenhardt and Martin 2000). First defined as "the firm's ability to integrate, build and reconfigure internal and external competences to address rapidly changing environments", dynamic capabilities are considered as the main source for achieving sustainable competitive advantages (Teece et al. 1997, 516; Teece 2009). Therefore, the dynamic capabilities approach positions itself as a feasible solution for the main problem of the resource-based view, which is no other than *its inherently static nature* (Priem and Butler 2001). Following the words of Di Stefano et al. (2010), there are three main papers building up the theoretical core of the dynamic capabilities framework; that is Teece et al. (1997), Eisenhardt and Martin (2000), and Zollo and Winter (2002). Despite of the fact that these three papers possess some differences, they can also be considered complementary in many respects. First, they offer a clear distinction between dynamic and ordinary capabilities. Second, dynamic capabilities imply change and evolution, and are the potential to do things (Easterby-Smith and Prieto 2008). Therefore, some authors claim that the real output of dynamic capabilities are the changes in ordinary capabilities (Winter 2003). Finally, learning is considered as a core element for building dynamic capabilities since the micro-foundations of the dynamic capabilities are the organizational routines and processes (Helfat and Peteraf 2003; Zollo and Winter 2002).

2.2 The Role of PM Standards

Throughout more than 60 years of project management as an independent discipline (Morris 2012), one of the most profuse research topics has been that of project success (Joslin and Müller 2015). Specifically, many papers have been written trying to properly identify what has been called critical success factors (CSFs) (e.g. Pinto and Slevin 1987; Fortune and White 2006). Thus, since companies' effectiveness partially depends on their projects success (Milosevic and Patanakul 2005), PM standards have become an important element for modern organizations and their development and improvement have become one of the main concerns for academics, practitioners, and especially for professional associations. Much of the PM standards, which are also the most widely used, are labeled as plan-based, and follow an engineering-based approach where problems are considered predictable and fully specifiable, hence they can be solved with an optimal solution (Dybå and Dingsøyr 2008). The benefits provided through the application of these plan-based

PM standards are helping in terminology harmonization, which facilitates communications, promoting the professionalization of the project management discipline, and enhancing project success (Collyer and Warren 2009).

However, the business environment is changing at an increasing pace and companies are increasingly implementing projects in dynamic and uncertain environments. Traditional plan-based PM standards suffer from several liabilities such as knowledge loosing, demotivation of talented project team members and separation between strategy makers (top managers) and strategy implementers (project managers), when applied in dynamic environments (Levitt 2011). In fact, the management of projects in dynamic environments is considered as an unresolved project management issue.

From a theoretical point of view, scholars claim that while classic projects can be managed by following a traditional plan-based approach, projects developed in dynamic environments are better managed under a learning strategy that involves continuum scanning, problem solving and flexibility (Pich et al. 2002). Regarding project management practice, facing the challenges of managing projects in dynamic environments asks for the development of a new type of PM standard - agile methods- that rather than following the engineering plan-based approach, is founded on recurring activities such as feedback loops, interactive reviews and close customer contact (Stettina and Hörz 2015). However, agile methods cannot be considered the silver bullets for managing projects in dynamic environments. Scholars have identified several liabilities in the application of agile methods like the absence of theoretical support for their claims and application problems when the project team is large and their members work in several projects at same time (Dybå and Dingsøyr 2008).

2.3 *Theoretical Cross-Fertilization Between Dynamic Capabilities and Project Management*

In some recent studies, different aspects of the project management discipline have been addressed through the dynamic capabilities approach. Theoretically, the building of project dynamic capabilities inside organizations is conceived as a way to overcome the tensions of having a dual structure- both project-based and functional (Melkonian and Picq 2011). Davies and Brady (2000; 2004) claim that only those organizations capable of learning and building project dynamic capabilities would be able to overcome the dichotomy between a projects' short-term objectives and organizations' long-term goals. Empirically, Jugdev et al. (2007) study which of the project management assets support project dynamic capabilities formation. Petit (2012) assesses the role played by project dynamic capabilities when managing portfolios in turbulent environments. Biedenbach and Müller (2012) study how the components of project dynamic capabilities, absorptive, innovative

and adaptive capabilities, enhance the performance of projects, programs and portfolios in the pharmaceutical industry.

As the interest of this work lies in the elements of PM standards especially suitable for managing projects in dynamic and uncertain environments, a dynamic capabilities perspective of project management is conceptualized. Based on previous analyses, it is posited that project managers enhance the development of project dynamic capabilities if they consider the following principles (Petit and Hobbs 2010; Boh 2007; Brady and Davies 2004; Kujala et al. 2010):

- To identify potential changes in a project's scope and in stakeholders behavior.
- To establish action plans and decision-making protocols for the opportunities and threats previously identified within a project environment.
- To modify a project plan and to redesign project activities and project teams as the project proceeds.
- To document lessons learned and to communicate them to subsequent projects.

This principle-based approach for project management highlights that the building of project dynamic capabilities help facing the challenges of managing projects in dynamic and turbulent environments and achieving organizational success through multiple project implementation.

3 Identifying the Dynamic Elements of the PMBOK®

3.1 Methodology

In order to take an initial step towards the operationalization of the principle-based approach for project management presented in Sect. 2.3 of the paper, the elements of a plan-based PM standard are identified that might help project managers to manage projects in moderately dynamic environments, i.e. complicated and complex environments. Specifically, the analytical concepts of the literature review performed in Sect. 2 of the paper have been applied on the practices proposed in the PMBOK®, *the global* de facto *standard for those engaged in project management* (Starkweather and Stevenson 2011, p. 31). First developed as a white paper in 1983, the PMBOK® is a formal document that describes norms, methods, processes and practices generally recognized as good practices by project management professionals (Project Management Institute 2008; Eskerod and Huemann 2013). Moreover, the PMBOK® has been accepted as a standard by the American National Standards Institute and is used globally as a basis for managing projects and certified professionals (Hällgren et al. 2012).

Several papers have referred to PMBOK® for assessing how much their theoretical findings are in agreement with the practices in project management (Milosevic and Patanakul 2005; Hällgren et al. 2012; Eskerod and Huemann 2013; Collyer and Warren 2009). Specifically, for the purpose of this paper the PMBOK®

content is examined in an attempt to determine which of its sections and specific processes might be especially suitable for performing the three roles of dynamic capabilities builders (Teece et al. 1997) and the routines that constitute the microfoundations of project dynamic capabilities (Teece 2009). Moreover, disciplines such as accounting (Carmona and Trombetta 2008) or environmental regulation (Gunningham and Sinclair 1999) have built a principle-based approach by analyzing the available tools and standards, harnessing the strengths of each individual instrument while compensating for their individual weaknesses.

3.2 *Performing Dynamic Capabilities' Roles Through PMBOK® Application*

In their seminal paper, Teece et al. (1997) establish three different roles top managers should perform to develop dynamic capabilities within their firms: coordination/integration, learning, and reconfiguration/transformation (Teece et al. 1997). In this work, the PMBOK®'s content is studied to appoint to the sections and processes especially relevant for performing these roles. Moreover, Table 1 shows in greater detail, different examples and specific sections of the PMBOK® that represent how project managers might perform each of the three roles.

Table 1 The three roles performed by dynamic capabilities builders through PMBOK® content

Dynamic capabilities roles	PMBOK®'s areas and activities that might allow project managers to perform the three roles
Coordination/Integration role Tasks managers perform for coordinating and integrating activities inside the firm and also for the coordination of external activities and technologies (Teece et al. 1997, p. 518)	Chap. 4 is dedicated to project integration management and it includes the processes and activities needed to identify, define, combine, unify and coordinate the various processes and project management activities within the PM Process Group. Moreover, project integration management includes the activities aimed at ensuring the consistency of project documents, project plans and product deliverables. The PMBOK® (p. 72) includes an example of a situation where project managers need to perform the coordination/integration role: A cost estimate needed for a contingency plan involves integrating the processes in the cost, time, and risk knowledge areas. When additional risks associated with various staffing alternatives are identified, then one or more of those processes may be revisited. The project deliverables may also need to be integrated with ongoing operations of either the performing organization or the customers' organization

(continued)

Table 1 (continued)

Dynamic capabilities roles	PMBOK®'s areas and activities that might allow project managers to perform the three roles
Learning role Process by which repetition and experimentation enable tasks to be performed better and quicker (Teece et al. 1997, p. 520).	The concept of learning is pervasive in PMBOK®'s content and it is represented by the lessons learned term, which appears 56 times. The concept of lessons learned is defined in Sect. 2.4.3 where the different knowledge bases of a project are explained. The task of documenting and applying lessons learned is especially relevant during the closing phase (Sect. 4.6), where the PMBOK® talks about the importance of the historical information, when performing quality management, and finally, when developing the communications plan, where lessons learned of past projects might be used for guiding the planning of communication activities of the current project
Reconfiguration/Transformation role Refers to the need to reconfigure the organizational asset structure to address environmental changes (Teece et al. 1997, p. 520).	PMBOK® establishes change requests as an output for almost all of its 42 processes. Furthermore, PMBOK® advises project managers to perform the task-integrated change control that is explained in Sects. 3.6 and 4.5. The PMBOK® emphasizes the importance of change requests when describing how to direct and manage project execution. Specifically, it talks about approving change requests as an important part of the process of integrated change control: approved change requests are scheduled for implementation by the project team. Approved change requests are the documented, authorized changes to expand or reduce a project's scope. The approved change requests can also modify policies, the project management plan, procedures, costs, or budgets, or revise schedules. Approved change requests may require implementation of preventive or corrective actions (Sect. 4.3.1)

The coordination/integration role entails the project management routines performed to coordinate activities both within and outside the firm boundaries (Teece et al. 1997, p. 518). PMBOK®'s chapter four covers and discusses what it is called *project integration management* where the integration role is defined as *the processes and activities needed to identify, define, combine, unify and coordinate the various processes and project management activities within the PM Process Group (Project Management Institute 2008, p. 71). Project integration management entails making choices about resource allocation, making trade-offs among competitive objectives and alternatives, and managing the interdependences among the project management knowledge areas (Project Management Institute 2008, p. 71).*

Moreover, project integration management includes those activities aimed at ensuring the consistency of project documents, project plans and product deliverables. Regarding the second role, learning, it is defined as a process by which repetition and experimentation enable tasks to be performed better and quicker (Teece et al. 1997, p. 520). Through the learning role, managers sense dysfunctional routines and avoid strategic blind spots (Teece et al. 1997, p. 520). The learning role is pervasive in the PMBOK®. The PMBOK® includes a routine called *document lessons learned* as a component of the closing process group (Project Management Institute 2008). The concept of lessons learned appears 56 times and it is especially relevant during the closing phase of the project (Sect. 4.6), and when performing project quality management (Sect. 8.3.3) and developing the communications plan (Sect. 10.2). Finally, the reconfiguration/transformation role implies the reconfiguration and update of organizational routines and asset endowment, so environmental changes are addressed (Teece et al. 1997, p. 520). PMBOK® advocates to perform what it is called *change requests* as an output of almost all of its 42 processes. These change requests consist in the changes that should be introduced in project activities, or documents. These changes are sensed by the project team during the life of a project. Moreover, PMBOK® also asks project managers to perform the task called *integrated changed control* (Sects. 3.6 and 4.5). *Integrated changed control* consists on reviewing all change requests, and deciding for any request whether the proposed change has to be made or not (Project Management Institute 2008).

3.3 PMBOK® Processes and Outputs as Microfoundations for Dynamic Capabilities

Project dynamic capabilities lead to achieve project performance under conditions of uncertainty and changes in client needs. Project dynamic capabilities are defined as those routines and processes that allow project teams to detect project opportunities and threats, and to establish and execute decision-making protocols for exploiting these opportunities and defend against these threats. In order to operationalize project dynamic capabilities, Teece's model (2009) is applied, in which dynamic capabilities disaggregate into three different sets of routines: routines to sense opportunities and threats, routines to seize opportunities, and routines to maintain competitiveness by reconfiguring organizational capabilities. As Table 2 shows, the application of some of the processes described in the PMBOK®, mainly those related to monitoring and controlling, generates outputs that might be considered as microfoundations for project dynamic capabilities.

Project sensing routines comprise routines aimed to identify potential changes in a project's scope, to assess stakeholders' behavior and to sense changes in the project environment (Aaltonen and Kujala 2010; Hermano 2013). An updated version of risk management principles claims that despite planning activities are

Table 2 PMBOK® processes, activities and outputs as microfoundations of project dynamic capabilities

PMBOK® processes (sections they are contained in)	PMBOK® activities and outputs
Monitor and control project work (3.6.1 and 4.4) Process of tracking, reviewing and regulating the progress to meet the performance objectives defined in the PM plan	Sensing: comparing actual project performance against the plan Seizing: change requests Transforming: updates in PM plan and documents
Perform integrated change control (3.6.2 and 4.5) Process of reviewing all change requests, approving changes, and managing changes to the deliverables, organizational process assets and PM plan	Sensing: - Seizing: reviewing all change requests and approving changes Transforming: managing the approve changes/ updates in PM plan and documents
Verify scope (3.6.3 and 5.4) Process of formalizing acceptance of the completed project deliverables	Sensing: measuring and verifying to determine whether work and deliverables meet requirements Seizing: change request Transforming: updates in PM documents
Control Scope (3.6.4 and 5.5) Process of monitoring the status of the project and product scope and managing changes to the scope baseline	Sensing: work performance measurements Seizing: change requests Transforming: updates in organizational process assets, scope baselines, and in the traceability matrix
Control Schedule (3.6.5 and 6.6) Process of monitoring the status of the project to update project progress and mange changes to the schedule baseline	Sensing: work performance measurements (schedule performance index) Seizing: change requests Transforming: updates in organizational process assets, schedule baseline, and schedule data
Control Costs (3.6.6 and 7.3) Process of monitoring the status of the project to update the project's budget and managing changes to the cost baseline	Sensing: work performance measurements (cost performance index, budget forecasts) Seizing: change requests Transforming: updates in organizational process assets, cost performance baseline, and costs estimates
Perform Quality Control (3.6.7 and 8.3) The process of monitoring and recording results from executing the quality activities in order to asses performance and recommended necessary changes	Sensing: - Seizing: validate changes and deliverables Transforming: updates in quality management plan and process improvement plan
Manage Stakeholders Expectations (5.2.3) Process of communicating and working with stakeholders to meet their needs and addressing issues as they occur	Sensing: identifying concerns that have not become issues yet Seizing: clarifying and resolving issues that have been identified Transforming: updates in stakeholder management strategy, stakeholder register and issue log
Risk Management (Chap. 11) The objective of risk management is to increase the probability and impact of positive events, and decrease the probability and impact of negative effects	Sensing: Identify risks Seizing: Perform both qualitative and quantitative risk analysis; Plan risks responses Transforming: Implementing risks response plans

necessary, there are constraints that cannot be taken into consideration at an early stage (Perminova et al. 2008). Therefore, project managers should scan the project environment during the whole project's life in order to detect uncertainties that could affect the project, both negatively and positively, and may imply changes in a project's scope and plans (Hermano 2013; Pollack 2007).

Besides, the role and influence of stakeholders over project performance is being increasingly studied (Eskerod and Huemann 2013). The sensing of environmental changes must be complemented through the study of stakeholders' behavior, with special attention to their ability to redefine project scope, and project performance (Hermano 2013; Petit and Hobbs 2010). Therefore, by developing sensing routines, project plans become flexible enough to allow for revisions and the incorporation of new ideas, improving their accuracy and suitability with the project dynamic environment (Pollack 2007; Petit and Hobbs 2010). As depicted in Table 2, monitoring and controlling processes (Sects. 3.6.1 and 4.4) described in the PMBOK® capture the essence of sensing routines since they urge project managers to evaluate the progress of the project in an attempt to identify possible deviations and environmental changes.

Project seizing routines are the structures, procedures, designs, and incentives for identifying changes required once an opportunity or threat is sensed (Teece 2009). By developing project seizing routines, project managers evaluate the influence of changes previously sensed over project content and project management decision-making process. Thus, project seizing routines imply establishing action plans for all the opportunities and threats previously sensed in each project (Hermano 2013). First, project managers determine how the opportunities and threats previously sensed would affect project content, and then, decision-making protocols and governance rules must be established to determine the changes that are actually going to be undertaken (e.g. if several changes in customers' needs have been sensed, project managers should establish decision-making protocols determining which of those customers' needs are aligned with the organization's business model and thus, have to be addressed). Seizing routines might be contained into the PMBOK® group of processes named *performing integrated change control* by which project managers review and evaluate the changes requests made due to environmental changes previously sensed (see Table 2).

Finally, project transforming routines imply managing threats and reconfiguration (Teece 2009). When competing in dynamic environments, firms have to address environmental shifts if they want to maintain their competitive advantage. (Teece 2009).

Reconfiguration routines imply the execution of the action plans previously designed for facing environmental shifts previously sensed (Petit 2012). Moreover, by performing reconfiguration routines, project managers modify the project plan and redesign project activities and even the project team (Hermano 2013). Therefore, by developing reconfiguration routines, project managers achieve semi-continuous projects' asset orchestration and PM processes renewal (Teece 2009).

As Table 2 shows, the PMBOK® provides several processes for updating project plan and documents during a project's life-cycle that might be considered as project transforming routines. Moreover, the PMBOK® assumes the need for reconfiguration by establishing the *rolling wave of planning* and *progressive elaboration* as guidelines when developing project plans. Both the rolling wave of planning and progressive elaboration establish a policy where the project plan is not fully developed but only outlined during project initiation and is then developed in greater detail as the project progresses (Collyer and Warren 2009).

4 Conclusions, Limitations, and Direction for Future Research

In an empirical study on innovation projects from a major multinational pharmaceutical company, Styhre et al. (2010, 134) state that "no [project] can be fully self-enclosed and rendered as a linear sequence of operations, but there is always a need for recognizing emergent properties of the system and to allow for some deviance from the prescribed procedures." Thus, in order to manage projects in dynamic and uncertain environments, we have to "expand knowledge of how standards are used" (Hällgren et al. 2012, p. 480).

Drawing on the dynamic capabilities approach, this paper takes an initial step towards a principle-based methodology for project management by identifying the PMBOK® sections and processes that might be especially suitable for managing projects in moderately dynamic environments. Exploring PM standards through a dynamic capabilities lens, might enable development of both strategies and tools to assist project managers when managing projects in dynamic environments, where traditional plan-based standards have been claimed as not suitable or even counterproductive (Koskela and Howell 2002). As an initial step in this direction, this paper maps the fundamental concepts of dynamic capabilities contained in PMBOK®'s content. Mapping the fundamental concepts of the dynamic capabilities approach to the project management processes is the first step in the development of a framework that synthesizes the dynamic capabilities and project management literature.

Furthermore, as many scholars highlight, the application of strategic management theories to the study of projects and project management is highly potential (Grundy 1998; Killen et al. 2012). Specifically, the implications of this PMBOK® revision are threefold. First, we respond to the need to determine which processes and project management methods are appropriate for managing projects in dynamic and uncertain environments (Ahlemann et al. 2009, 294; Collyer and Warren 2009). The specific features of projects developed in dynamic environments drive project managers to abandon methods based on the plan-based approach turning towards learning strategies based on problem scanning and flexibility (Pich et al. 2002).

This paper shows which of the sections and processes of the PMBOK® are especially relevant to develop that learning strategy.

Second, the cross-fertilization among project management and dynamic capabilities approach provides the project management discipline with a strong theoretical framework. The lack of stable theoretical foundations is recognized as one of the most important obstacles for the project management progress (Koskela and Howell 2002; Pollack 2007). Thus, by applying the dynamic capabilities approach to project management, we strengthen the incipient theoretical framework, helping project management discipline to understand its main assumptions. The dynamic capabilities approach might shed light into project management problems, the root cause of which is managerial rather than technical (Koskela and Howell 2002; Kharbanda and Pinto 1996). Specifically, recent studies claim that project management should focus on managerial aspects instead of technical ones (Sauser et al. 2009; Shore 2008; Shepherd et al. 2011).

Finally, this paper provides several implications for project management professionals. On the one hand, project managers should not be slaves of project plans (Hermano 2013). Although planning is necessary, some constraints cannot be sensed at an early stage. Thus, project plans need to be flexible enough to allow for modifications as a project proceeds (Hermano 2013). Project managers need to continuously scan project environment in a search for uncertainties that could affect the project, both negatively and positively. On the other hand, project managers should understand that PM standards are not a panacea that automatically leads to project success, but they have to be interpreted and adapted to the specific features of each project.

Two different limitations can be identified in this paper. First, the analysis made is based on secondary data since PMBOK® was used as the only document in this study. Thus, it cannot be assured that the PMBOK® content represents the project management practices carried out by project management professionals. However, PMBOK® is considered the world's leading standard and it is used as a basis for the certification of project management professionals, hence, it is assumed that many people have studied it, and therefore, its prescriptions and processes are known. Second, although the sections and processes of the PMBOK® especially suitable for managing projects in moderately dynamic environments have been identified, its overall philosophy focuses on bringing activities in line with a plan which ultimately may lead to project failure in turbulent and dynamic environments (Collyer and Warren 2009). Therefore, the majority of the sections and processes of the PMBOK® might hamper the building of project dynamic capabilities, hence shattering the benefits of the dynamic elements previously identified.

It is suggested that future research on the topic should advance the development of the project management principle-based approach by continuing with the strategy of harnessing the strengths of each PM standard. The dynamic review of the PMBOK® should be replicated for all available PM standards in a search for the processes and routines that foster project dynamic capabilities building. Secondly, future studies should include both empirical and case studies where the actual practices developed by project management professionals are analyzed.

Furthermore, the study of project dynamic capabilities could be extended to the portfolio and the overall firm level.

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