Knowledge Management on PMO's Perspective: A Systematic Review

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Abstract: Much of the work developed in organizations occurs as projects and this tendency is crescent. The Project Management Office (PMO) is an organizational entity with responsibilities related to the centralization and coordination of projects under its domain. In fact, PMOs can fill many different roles or functions in different organizations. In this way, it is not possible to state that PMOs filling specific functions are better than others, more general and preemptive. The decision about which functions a PMO might fill in a specific context will most likely be influenced by this context. However, since too many organizations tend to repeat the same mistakes too often and also reinvent the wheel, knowledge management seems to be an important integrative function with impacts on organizational learning and consequentially on project performance. As project managers tend to give lower priority to everything that does not directly contribute to their project, if this knowledge management is not well done and adopted, it will simply be ignored. In this way, this conceptual paper aims to answer how PMOs manage project's knowledge. Through a systematic review-based approach in three search engines: ScienceDirect, Scopus, and Wiley, we obtained a classification divided into four themes: communities of practice, knowledge broker, lessons learned and project performance, which were then synthesized. The cyclic work composed by the first three themes tends to increase project performance and thus strengthening and legitimizing the PMO presence in an organization. Lessons learned refinement and storage in an accessible and readable way seem to be the strong one to be emphasized by PMOs. As the majority of studies were based on qualitative investigations sustained by interviews, observations and focus groups, it is necessary a major number of empirical studies about how PMOs can better facilitate the groups and how tacit knowledge can be better codified to be used in future cases.

Keywords: knowledge management, PMO, systematic review

1. Introduction

"A project is a temporary endeavor undertaken to create a unique product, service, or result" (Project Management Institute, 2013, p. 2) or, according to Söderlund (in Morris, Pinto and Söderlund, 2011), it is a temporary organization, with an intentional death, purposefully designed to provide benefits for a permanent organization or certain stakeholders through complex problem solving processes.

Despite efforts to define recognized standards, methods and processes for Project Management (PM), we must recognize we are not dealing with an exact science following given laws or established rules. It is, rather, a complex set of tasks largely based on human relations and the specific knowledge, experiences, character, observation, and cultural background of each individual (Hogberg and Adamsson, 1983). In fact, project management literature is rational, self-evidently correct and normative (Williams, 2005), focusing on scheduling, control and quality assessment and neglecting important areas, such as Knowledge Management (KM) (Oluikpe, Sohail and Odhiambo, 2009).

The relevance of KM to PM is linked to the increased volume and complexity of information and knowledge required during the project process (Milton, 2005). However, project managers tend to give lower priority to everything that do not directly contribute to their project.

In organizations in which products or services are developed by projects, it is important an effective knowledge sharing and integration within and between projects to avoid the risk of reinventing the wheel and so repeating the same mistakes (Schindler and Eppler, 2003). The presence of a Project Management Office (PMO), a formal layer of control between top management and project management within an organization (Kerzner, 2013), aims to be important mainly in organizations with a low degree on project management maturity.

According to the report published by PM Solutions (2014) about a survey evolving 432 organizations from different industries, PMOs are fairly commonplace: 80% of respondents have a PMO and 30% of those without a PMO plan to implement one within the next year. The results pointed that two of the five PMO challenges are: processes are seen as overhead (47%) and need for demonstrating the added value of the PMO (43%). In this way, knowledge management aims to be an important function evolved by a PMO in order to make the processes lean and improve the organizational performance.

Several literature reviews were done focusing on knowledge management in general (Alavi and Leidner, 2001; Christensen (in Buono and Poulfelt, 2005); Liao, 2003), but not on PMO's perspective. In this way, this paper aims to identify what evidence is available through a systematic review-based approach (Kitchenham and Charters 2007) and thus opening new topics for future research.

The remainder of this paper is organized as follows: Section 2 presents a discussion about knowledge management; Section 3 presents a discussion about recent studies on PMOs; Section 4 details on the research method; Section 5 presents the findings in knowledge management on PMO's perspective; and, finally, Section 6 presents our conclusions.

2. Knowledge management

According to Davenport and Prusak (2000), Knowledge Management is a method that simplifies the process of sharing, distributing, creating, capturing and understanding organization's knowledge.

There have been numerous KM life cycle models that describe the key aspects of KM, ranging from 3-stage model, which includes generate, codify/coordinate and transfer phases (Davenport and Prusak, 2000) to 7-stage model, which includes create, acquire, identify, adapt, organize, distribute and apply phases (Ward and Aurum, 2004). A consolidated model that represents all important phases is shown in Figure 1.
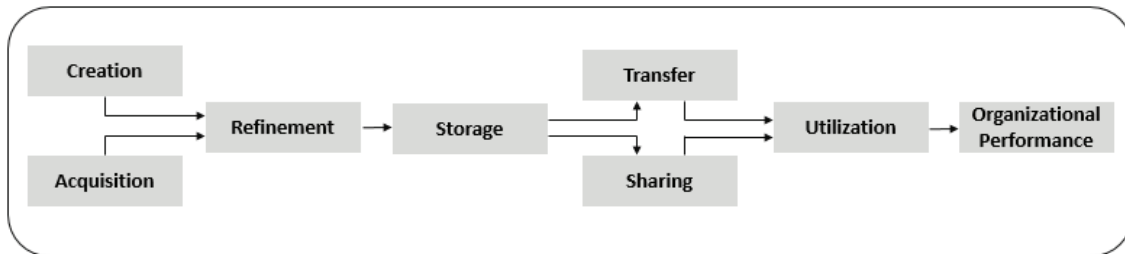

Figure 1: KM life cycle model (adapted from King, Chung and Haney, 2008)

Buono and Poulfelt (2005) claim that KM field is moving from first generation, focused on knowledge as a possession, something that could be captured and spread through tools, to second generation, focused on knowing-in-action, treating knowledge as a socially embedded phenomenon. In fact, the transformation of knowledge into use is not a linear process, where knowledge producers inform users about facts (e.g. in the rationalist/positivist model), but a complex construction including complex sets of interaction between actors from where knowledge emerges (Ward et al., 2010).

Nevertheless, information may be retrieved from the storage system to review results and rationales of past decisions and to clarify issues such as the existence of precedents (Choo, 1998). Through a research in public administration context, Handzic (2011) indicated that, although social initiatives were relatively more important than technical ones in supporting knowledge processes, both social and technical initiatives influence the development of organizational knowledge. Her findings suggest that leadership represents the single most important knowledge enabler, having both direct and indirect (via culture, measurement and technology) effects on processes.

3. Project management office

A Project Management Office is a "management structure that standardizes the project-related governance processes and facilitates the sharing of resources, methodologies, tools, and techniques" (Project Management Institute, 2013, p. 10). Although PMOs have been around since the mid to late 1990s, Kerzner (2013) observed that the vast majority of PMOs have either been recently created or restructured.

In the recent years, several researches has been done about PMOs. They focused on PMO characteristics and functions (Hobbs and Aubry, 2007), structure (Aubry, Hobbs, and Thuillier, 2007), performance (Dai and Wells, 2004), and transformation (Aubry et al., 2010).

A descriptive PMO model has recently been proposed to make sense of the variety of configurations that are found in reality (Hobbs and Aubry, 2010). This model includes two main groups of elements to describe the PMO: structural characteristics and roles or functions within the PMO mandate. The organizational knowledge management function is one of the least important when compared with others (Hobbs and Aubry, 2007).

This finding seems to be contradictory, since the known benefits of knowledge management (Choo, 1998). Often project managers start anew solving problems rather than learning from the experiences of previous projects. In this way, the presence of a PMO, as a permanent area in the organization, seems to be crucial to enhance knowledge creation, storage and sharing and so facilitating the cross-project learning.

4. Research method

The research method used is based on a systematic review in order to do a comprehensive and unbiased search distinguished from a traditional review of the literature (Kitchenham and Charters, 2007). The process covered some phases of a systematic review, resulting in a thematic map with its respective synthesis. Each step and their outcomes are shown in Figure 2.
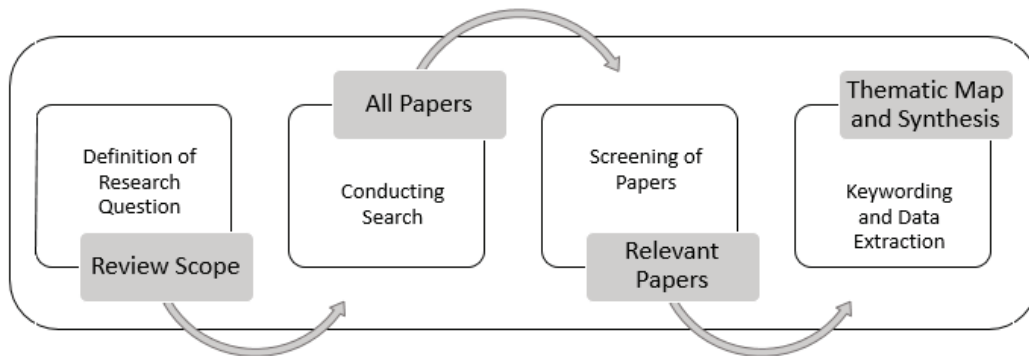

Figure 2: Research method

4.1 Definition of research questions and searching for primary studies

In order to evaluate the primary studies in knowledge management on PMO's perspective, it was elaborated the following research question: *RQ1 - How do PMOs manage project's knowledge?* This question was specified in another question to evaluate the impact of knowledge management activities on project performance as follows: *RQ1.1. How do knowledge management activities provided by a PMO impact on project performance?* The primary studies were identified by using the search string shown in Figure 3. The structure was driven by the research question and we used general keywords in the search in order to identify as many relevant papers as possible.
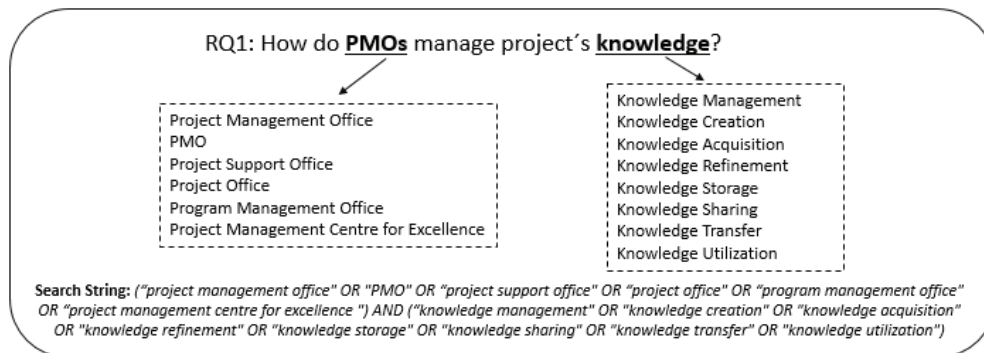

Figure 3: Search string

The search process was conducted through an automatic search in the following search engines: ScienceDirect, Scopus and Wiley Online Library. As Scopus contains papers of Project Management Journal only from 2010, we searched papers in Wiley engine to comprise papers published before 2010. A rapid search was also done in Google Scholar, but relevant papers found had already been obtained by previous engines. This process yielded 513 papers, which formed the basis for the next step.

4.2 Screening of papers

After the papers had been identified we eliminated duplicated titles that were obtained in more than one search engine, which resulted in 472 papers. To do so, it was used the software Mendeley. All titles and abstracts were read in order to remove the papers not related to the scope of this research, which resulted in 70 selected papers.

Considering the selected papers, 36% of articles referred to knowledge management in Project-based Organizations (PBOs) - organizational forms that create temporary systems for carrying out their work - without explicit PMO participation; 11% referred to lessons learned in project management without explicit PMO participation; 31% referred to PMOs configurations, such as characteristics and functions, structure and transformation and 6% referred to project management practices in PBOs. All these papers were not considered. The inclusion and exclusion criteria are resumed in Table 1.

Table 1: Inclusion and exclusion criteria

Inclusion Criteria	Exclusion Criteria
Papers describing empirical studies regarding to knowledge management on PMO's perspective published up to May 2014.	Keynotes, tutorials, white papers, abstracts, book's chapters and dissertations. Papers not published in English. Secondary and tertiary studies. Papers describing knowledge management on organizations, not referencing the existence of a PMO.

This process yielded to 11 papers, or 16% of the 70 papers, which formed the basis for the next step. Those papers related PMO to knowledge management in an explicit way.

4.3 Keywording and data extraction

The thematic analysis method (Bardin, 1977) was used to synthetize the data extracted from the primary studies. This method is used in qualitative researches and it is composed by three phases: pre-analysis, material exploration and results treatment and interpretation. After this analysis, it was verified that 8 of 11 papers had sufficient similarities in order to compare themselves and construct a coherent synthesis to clearly answer our research question. Table 2 lists the eight papers selected.

Table 2: Papers selected

ID	Reference
[P1]	Aubry, M., Muller, R. and Gluckler, J. (2011) *Exploring PMOs through community of practice theory*, Project Management Journal, Vol.42, No. 5, pp. 42-56.
[P2]	Walker, D. and Christenson, D. (2005) *Knowledge wisdom and networks: a project management centre of excellence example*, Learning Organization, Vol. 12, No. 3, pp. 275-291.
[P3]	Pemsel, S. and Wiewiora, Anna (2013). *Project management office a knowledge broker in project-based organisations*, International Journal of Project Management, Vol. 31, No. 1, pp. 31-42.
[P4]	Julian, J. (2008) *How Project Management Office Leaders Facilitate Cross-Project Learning and Continuous Improvement*, Project Management Journal, Vol. 39, No. 3, pp. 43-58.
[P5]	Desouza, K. and Evaristo, J. (2006) *Project management offices: A case of knowledge-based archetypes*, International Journal of Project Management, Vol. 26, No. 5, pp. 414-423.
[P6]	Muller, R., Gluckler, J., Aubry, M. and Shao, J. (2013) *Project Management Knowledge Flows in Networks of Project Managers and Project Management Offices: A Case Study in the Pharmaceutical Industry*, Project Management Journal, Vol. 44, No. 2, pp. 4-19.
[P7]	Dutton, C., Turner, N. and Lee-Kelley, L. (2014) *Learning in a programme context: An exploratory investigation of drivers and constraints*, International Journal of Project Management, Vol. 32, No. 5, pp. 747-758.
[P8]	Barclay, C. and Osei-Bryson, K. (2010) *An exploration of knowledge management practices in IT projects: A case study approach*, Proceedings of the 16th Americas Conference on Information Systems, pp. 368-378.

The analysis identified the presence of the following themes, besides PMO: Communities of Practice (CoPs), Lessons Learned, Knowledge Broker and Project Performance. Clark and Kelly (2005) referred to the significance of organizing knowledge brokering within communities of practice as a way of nurturing new knowledge or sharing existing tacit knowledge within a process of situated learning. As PMOs do not necessarily acts as brokers in a CoP, they were treated as distinguished themes.

5. Discussions and results

After thematic analysis, the selected themes resulting from this analysis were related to the evidence obtained in the 8 papers in order to describe in an interpretive way the collected information and also to ensure the traceability of results. The interactions between the themes and evidences are shown in Figure 4 and described in the next sub-sections.
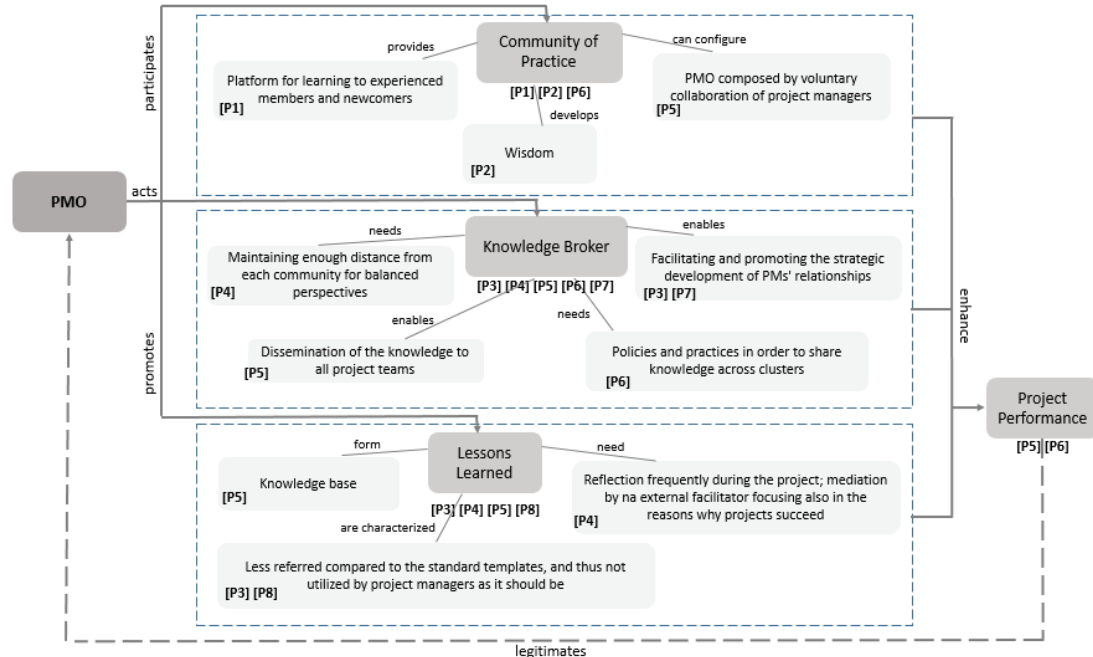

Figure 4: Thematic map

5.1 Community of practice

Communities of practice (CoPs) are groups of people informally bound together by shared expertise and passion for a joined enterprise (Wenger, 2008). They are composed by three fundamental elements: a domain of knowledge, which defines a set of issues; a community of people who care about this domain; and the shared practice that they are developing to be effective in their domain (Wenger, 2008). In this way, they differentiate from informal networks, professional organizations, interest groups and projects. The participation in CoPs can be seen as an essential process of learning (Barston and Tusting, 2005). Three studies related PMOs to CoPs. Two papers, P1 and P5, are results from case studies in 1 and 32 organizations, respectively. Paper P2 is result from an exploratory study of literature in order to propose a range of knowledge network types. The description and respective evidences are described in Table 3.

5.2 Knowledge broker

Brokering activities are social processes with the broker participating in the interactions (Brown and Duguid, 1998) and establishing connections between communities by introducing elements of one practice into another (Wenger, 2008). Effective knowledge brokers have to be capable of translating, coordinating and aligning different perspectives (Pawlowski and Robey, 2004).

Table 3: Results of 'communities of practice' theme

Description	Evidence
The community of practices of PMOs enhances the knowledge creation, since it is anchored in learning [P1], which may occur through both, formal and informal activities. Learning in action puts the practice at the front and enables newcomers acquiring knowledge from the experienced members [P1] and develop wisdom [P2]. PMOs can also be resulted of a bottom-up approach, formed by members indicated by project managers [P5].	[P1] "Within an organization, a community of practice of PMOs can be defined as a group of people (PMO managers or employees) informally bound together by shared expertise and passion for a joint enterprise. In other words, it offers a platform for learning to experienced members and newcomers. (…) It is oriented toward practice". [P2] "Thus far we have highlighted the CoI, CoP, PO (PMO, PSO and CPO), and CoE as classes of knowledge network structures that can be used to create, transfer and use knowledge and develop wisdom in people using this knowledge". [P5] "If the organization is decentralized - i.e. loosely structured, with decision rights available to individuals across all levels - it would do better with a PMO that is a result of voluntary collaboration of project managers (…); a bottom-up approach. (…) Under this model, project managers select PMO members, who then recommend processes and tools, but do not implement projects."

Brokering can come in different forms, like boundary spanners, who might take care of one specific boundary over time; roamers, who move between places and create connections; outposts, who explore new territories and bring news from the forefront; and pairs, whose brokering is based on a personal relationship (Wenger, 2008).

Five studies related PMOs to knowledge broker, including those ones that did not use brokering in an explicit way, but used brokering-related words, like coach and facilitator. Three of them, P3, P4 and P5, are results from a cross-case analysis in 7, 32 and 20 organizations, respectively. Two papers, P6 and P7, are results from an exploratory qualitative investigation in one organization. The description and respective evidences are described in Table 4.

Table 4: Results of 'knowledge broker' theme

Description	Evidence
As knowledge brokers, PMOs have to facilitate and promote the relationship between PMs and stakeholders and also act as coaches, negotiators and trainers in order to ensure competence development [P3] [P5], maintaining a distance from each community in order to get balanced perspectives [P4]. Through policies and practices stimulated by PMO members [P6], they will share and transfer knowledge to all project teams [P5] [P7] creating an awareness about existing tacit and explicit knowledge [P6].	[P3] "This research found that the PMO needs to possess multiple knowledge brokering capabilities in order to support and meet PMs' knowledge sharing behaviors. The suggested capabilities are: (a) facilitating and promoting the strategic development of PMs' relationships with diverse stakeholder groups (…) (b) govern, control and support PMs in their operation to ensure efficient knowledge flows; (c) adopt coaching, negotiating and training roles to ensure competence development." [P4] "As knowledge brokers across multiple communities of practice, PMO leaders must maintain enough distance from each community in order to be able to offer balanced perspectives" [P5] "A knowledge-intensive PMO calls for a more complex framework that (…) disseminates the knowledge to all project teams in order to promote comprehensive knowledge transfer and reuse. (…) The Coach is (…) a house of best practices and knowledge on the state of project management in the organization" [P6] "Processes and practices should allow for sharing of knowledge and creation of awareness about existing tacit and explicit knowledge at the cluster level. This should be facilitated by the respective PMO in the PMO network or hierarchy. (…) policies and practices should allow sharing knowledge across clusters. This should be stimulated by the PMO members." [P7] "(…) at the sub-project level, PMOs can be effective facilitators of project-level knowledge transfer within their respective programmes (…)"

5.3 Lessons learned

While the concept of capturing lessons learned is widespread and appreciated by organizations, it is often still performed poorly due to time, resource and incentive constraints (Williams, 2008). In this sense, it has a negative consequence in organization learning and decision making processes.

According to Tversky and Kahneman (1974), people rely on heuristics, or general rules of thumb, when they make judgments. In other words, they use mental "shortcuts". In certain situations heuristics can cause inconsistencies and promote cognitive biases, like judging the probability of the occurrence of events by how easily these events are brought to mind (Virine and Trumper, 2008). Decision making in organizations is sensitive to the need to appear rational and accountable, so the maintenance of a stored history of decisions is recognized as necessary (Choo, 1998).

Four papers related PMO to lessons learned. Three of them referred also to knowledge broker (P3, P4, P5), as described in earlier section. Paper P8 is result from a case study in one organization. The description and respective evidences about lessons learned are described in Table 5.

Table 5: Results of 'lessons learned' theme

Description	Evidence
Lessons learned refinement and storage are important to create an organizational memory in order to avoid repeating the same mistakes and reinventing the wheel [P5]. However, PMOs struggled to make the PMs utilize these lessons learned repositories cause they are not systematically organized [P3]. Referring to lessons learned items is not deemed necessary when compared to referring to the standard templates to prepare an implementation project plan [P8]. In this sense, it is necessary that PMO leaders encourage project teams to reflect about lessons learned during all phases of the project and not just in its closing [P4]. PMO leaders also have to provide an external facilitator to mediate the lessons learned sessions focusing also in the reasons why projects succeed and not just in failure cases [P4].	[P3] "PMs reported that lessons learned databases contained large information that is not systematically organized. As a consequence, PMs commented that those lessons learned databases were underutilized and most PMs did not make use of them as a source of knowledge in future projects. PMOs thus struggled to make the PMs utilize these lessons learned repositories." [P4] "It is recommended that PMO leaders actively engage successful project teams in formal learning practices not only to make the learning process more effective and engaging, but also to discover the reasons why projects succeed so this knowledge can also be embedded into future project routines. (...) It is recommended that PMO leaders encourage project teams to reflect more frequently over the course of the project life cycle (...) It is recommended that PMO leaders provide a means for project teams to utilize a trained facilitator from outside the project team who can help the team uncover its tacit knowledge and provide conditions that foster equal participation so organizational members' defensive routines do not undermine the session." [P5] "The primary purpose of a PMO is to centralize information in order to create a knowledge base." [P8] "The PMO uses repositories to store copies of the project documents and provide access to information during and after a project. (...) However, there is a difficulty in storing information/data that can be retrieved easily. (...) Referring to lessons learned items is not deemed necessary when compared to referring to the standard templates to prepare an implementation project plan."

5.4 Project performance

There are many dimensions for evaluating project performance (Dvir et al., 1998). According to Yu, Flett and Bowers (2005), different project definitions might warrant different success criteria. In other words, the Iron Triangle - time, cost and quality - is not sufficient to cover all the particularities of each project. So, each project manager has to develop her/his range of Key Performance Indicators (KPI) incorporating the local project specificities. Another approach to studying project performance has been through the investigation of critical success factors (CSFs) as predictors of performance. Pinto (1986) identified 10 CSFs, ranging from project mission, top management support, project schedule/plan, client consultation, technical tasks, communication to personnel recruitment/selection and training.

Two papers related PMO to project performance, considering its knowledge management activities. Both of them, P5 and P6, were based on interviews. In the first case, it was done with senior managers/directors of

PMOs and in the second case, with project managers. The description and respective evidences about project performance are described in Table 6.

Table 6: Results of 'project performance' theme

Description	Evidence
Knowledge management activities, like managing best practices gained through successful and failed projects [P5] and sharing them with project managers [P6], aims to improve project performance.	[P5] "Knowledge-intensive PMOs, on the other hand, take an active role in managing best practices of project management, learning from projects (both failures and successes), (...) They make a purposeful effort to develop and apply knowledge to improve performance." [P6] "(…) About the importance of the PMO in knowledge sharing, project managers say they cannot produce equivalent results without the PMO or their fellow project managers."

PMOs need attaining a degree of legitimacy within the organization in order to mobilize attention. Since knowledge management activities contribute to the project performance, it is hypothesized that, if it is well done, PMOs can form a strong network across communities in order to enlist support and effectively negotiate practice connections, and thus gaining legitimacy, as shown in Figure 4.

6. Conclusions

As the main objective of a PMO is to align project and organization meeting the needs of the organization, it is not possible to assert that a PMO is better or worse than another based on its structures and functions. However, considering the temporality of projects and the low priority of project managers in knowledge management activities, the PMO presents itself as a key role in this scenario.

This study aimed to evaluate how PMOs manage project's knowledge through a systematic review-based approach, which resulted in four themes: communities of practice, lessons learned, knowledge broker and project performance. Findings related the creation of a PMO as a community of practice by itself or as part of a knowledge network promoting learning in action. Acting as knowledge broker in a community of practice, PMOs promote knowledge sharing. In order to avoid repeating the same mistakes, it is important that those actions be supported by refined and stored lessons learned in an accessible and readable way. This last point seems to be the strong one to be emphasized by PMOs. This cyclic work tends to increase project performance which strengthens and legitimizes the PMO presence in the organizational context.

The synthesis were based on only eight papers, which limits the validity of conclusions. As the majority of studies were based on qualitative investigations sustained by interviews, observations and focus groups and thus, resulting in a diagnostic of current state, it is necessary a major number of empirical studies emphasizing in how PMOs can better facilitate the groups and how tacit knowledge can be better codified to gain credibility and thus be used by projects managers in future similar problems. In a socio-technical approach of knowledge process, communities of practice and knowledge broker role can be considered as social enablers and repositories of lessons learned as technical ones. Further research is required about a broader systematic review of KM in PM´s perspective and considering PMO as a structural enabler.

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