The changing roles of the PMO with the introduction of agile

Exploratory multiple case study

Abstract

Authors associate the PMO with an increase in the success rate of projects, reduce overall costs, and delivery time. Which explains why firms replicate and modify it while adopting project-based structures and strategies. PMOs in different organizations hold little similarities with each other. Staffing the PMO is an overhead cost to projects, and seeking to optimize resources organizations tend to allocate more functions to them. As a result, there is a broad range of activities a PMO can perform. This study found in literature 36 different functions associated with this structure.

Agile and traditional project management methodologies have fundamental differences in both planning and operational organization. Agile argues that overhead costs, requirements elicitation, and planning processes result in overspending and delaying innovative product development. These differences conflict with previously established roles, functions, and, more problematically, the people that perform them. In this sense, the introduction of agile ways of working is a disruption of traditional practices in the organization.

The change to agile methods has effects of various aspects of a firm's organizational structure, including the PMO, a symbolic figure from traditional project management. Agile standards have different approaches to the use of a PMO, and it is not clear whether the PMO in agile has similar roles and responsibilities as the PMO in traditional methodologies.

This study proposes to investigate the impact of the transition from traditional project management to agile on the PMO to address this gap. The main research question makes it explicit: *"How do the roles of Project/Program/Portfolio Management Offices change with the introduction of Agile methodologies to a large number of teams?"* This study adopted a descriptive exploratory approach to answering this question.

The study observed the changes in the roles of the PMO before and after implementations of agile with four case studies. The research conducted semi-structured interviews and applied surveys with nine professionals in these different companies. The contribution to science of this study is twofold. First, it contributes to the description of the PMO, enriching the field towards a unified theory of project management. Second, it provides empirical evidence for the changes in roles of the PMO with the introduction of agile.

This study found that there are wide disparities between the roles of the PMOs in different organizations. It also found that PMO performs different functions before and after the introduction of agile methods in a firm. It seems to be consistent that the PMOs are involved in the activities of monitoring, controlling, and standardizing project methodologies in both periods. A common theme across the participants' reports is that the PMOs participation got diminished or repurposed to a supporting and serving role with the introduction of agile. An explanation for this change is the shared responsibility the PMOs have with the agile teams on processes they were the sole or main responsible in traditional settings. Another common theme is the interfacing part the PMO plays, bridging traditional sectors and agile sectors of the firm. Participants in all firms believe the current state of the PMO is not final and expect it to continue to change.

1   Introduction

Agile methods became the project management standard in the software industry. The fast innovation rate of this industry fueled the competitive pressure of releasing new products faster and be flexible to adapt to the changing market demands. Other sectors are subject to similar forces as their workforce becomes increasingly digitalized, and their segments globalized (Barabasi & Frangos, 2002, pp. 199-218; Kettunen et al., 2019). As a result, the adoption of agile (Conforto et al., 2014) or some hybrid form of agile (Cooper, 2016) has been suggested or studied for other industries than software development and information systems technology.

Pure implementations of standardized agile frameworks are rare (Noll & Beecham, 2019). The PMI institute report that 23% of the 2018 respondents employ a hybrid, compared to 30% claiming to use agile (Project Management Institute, 2018). The process of changing the project management structure of a stablished firm usually encounters resistance (Cooper & Sommer, 2016). The use of hybrid frameworks could be a mitigation strategy to reduce this resistance. Some authors argue that agile cannot sustain multiple projects or large enterprises without incorporating traditional elements (Gill et al., 2018), and some argue that traditional and agile hybrids result from the skepticism of upper management. Nevertheless, it is not rare to find large firms with several agile teams and traditional project managers, project sponsors, and PMOs. However, it is not clear whether these roles remain the same or whether they change with the introduction of agile.

This study focuses on the PMO. Although the phenomenon of resisting change is a well-documented topic (Armenakis et al., 1993; Coch & French, 1948), the cover on the effects of agile on the PMO is not extensive. Authors investigate how the PMO can aid the transition to agile (Hodgkins & Hohmann, 2007), how the PMO should be in an agile environment (Elatta, 2012; Pinto & Ribeiro, 2018) and experience reports of establishing PMOs (Tengshe & Noble, 2007), but there are very few publications that observe existing PMOs in agile.

This study investigates if and how the roles of the PMO change with the introduction of agile to a large number of teams. Accenture motivated the choice to analyze the PMO. Accenture provides an extensive portfolio of consulting services that include planning and conducting agile transitions, coaching teams in agile practices, outsourcing project managers, PMOs, scrum masters, among others. Accenture was interested in the interface between PMOs and agile. This study, therefore, was initially motivated by the company's demand.

The Project Management Institute (PMI) defines the PMO as: "A management structure that standardizes the project-related governance processes and facilitates the sharing of resources, methodologies, tools, and techniques" (Project Management Institute, 2017, p. 40). In practice, PMO is a hypernym that can stand for program, project, or portfolio management office. Other names for the PMO include supporting office, center of excellence, and project office.

There is documentation associating the PMO with project success, and its responsibilities range from risk management to administrative support, but there is a wide disparity between the descriptions of the PMO in the different studies and cases. This variety may indicate a gap of knowledge in the literature on identifying the roles of the PMO in agile environments. Especially on providing theoretical explanations on how a firm transition to agile impacts these roles. This gap is discussed later in this section. To address it, this study focusses on the role and responsibilities of the PMO on firms who have implemented agile methods in their IT organization within more than ten teams (Dingsøyr et al., 2014). In the cases this study explores, the core business is not software development. However, the IT organization is critical.

This study conducted an exploratory research approach to answer the main research question. It pursued descriptive qualitative research with a grounded theory overtone using semi-structured interviews and surveys with nine professionals in four large firms (Corbin & Strauss, 2015; Sandelowski, 2000). This study did not reach a hypothesis formulation. Its contribution to science is twofold. First, it proposes a taxonomy framework that contributes to the description of the PMO, enriching the field

towards a unified theory of project management. Second, it provides empirical evidence for the change in roles of the PMO with the introduction of agile.

This study found that there are wide disparities between the roles of the PMOs in different organizations. It also found that PMO performs different functions before and after the introduction of agile methods in a firm. It seems to be consistent that the PMOs are involved in the activities of monitoring, controlling and standardizing project methodologies in both periods. A common theme across the participants' reports is that the PMOs participation got diminished or repurposed to a supporting and serving role with the introduction of agile. An explanation for this change is the shared responsibility the PMOs have with the agile teams on processes they were the sole or main responsible in traditional settings. Another common theme is the interfacing part the PMO plays, bridging traditional sectors and agile sectors of the firm. Participants in all firms believe the current state of the PMO is not final and expect it to continue to change.

Although enlightening, this study cannot claim statistical significance in these results. The sample is too small to be representative of the universe of PMOs in firms that have agile teams. The study observed similarities between cases, but also just as many distinctions. The common themes are sparsely present within a wide range of dissonant accounts. This study argues that the PMO is a context-specific entity but falls short from proposing a hypothesis that could explain the similarities and differences observed.

This document is based on the author's master thesis research. The research was conducted for the fulfillment of the requirements of the program Complex Systems Engineering and Management at TU Delft. The research was conducted as an internship at Accenture B.V.

1.1   Reading guide

This document reads as follows. Section 2 presents the literature review of this research. It serves as a base for the development of the interview protocol as well as the following interpretations. Section 0 presents the process used to collect data and describes the cases analyzed. Section 4 presents the results of the interviews. And Section 5 concludes this document positioning this study in the overarching scientific literature along with recommendations for future explorations.

2   Literature review

Defining the PMO is no easy task, and even though there has been considerable effort carried by several different authors, there isn't a unified taxonomy to date. Just as there is no singular description of the responsibilities of a PMO and the activities it performs (Desouza & Evaristo, 2006). This chapter presents the current status of research on the PMO. This research conducted a systematic literature review. The search contemplated peer-reviewed publications and yielded 3432 documents. The list was filtered to eliminate the usage of the acronym in other subject areas, following by a title and abstract scanning and reading of the remaining publications. Finally, the results were narrowed down to 21.

The findings of the literature research were contrasted with the standards behind the main large-scale agile methodologies as well as the main traditional standards. The traditional standards investigated were the PMBoK, PRINCE2 and ISO21500:2012. The study explored the agile standards described in the report State of Agile (VersionOne, 2019). The report is the longest recurring survey on industries' agile practices. This 13th annual edition collected data from over a thousand full responses from different organizations.

The literature study found 36 functions usually associated with the PMO, and 4 basic roles PMOs (coordinating, controlling, supporting, servicing) assume when performing tasks associated with those function. Overall, the literature is vague when describing factors that could make role transitions explicit. However, a shift from controlling to supporting and coordinating seems to be a common theme both in academic and trade literature.

2.1 The literature on the PMO

The landscape of academic literature on the PMO is mostly concentrated on exploratory research. The scope is diverse in several aspects with some addressing the task profile of PMO activities, some addressing its functions, some addressing its roles in an organization and some attempting to devise types of PMOs. The aim studies take also vary between studies that attempt to make sense of PMO transformations, studies that attempt to model or propose ideal PMO models and studies that evaluate current designs and their impact on project performance. The studies mentioned propose their own definition of PMO characteristics or build upon other author's definitions. It is worth mentioning that many authors use the definitions of professional sources or refer to other author's proposals, these were not included in this review (Lavoie-Tremblay et al., 2012; Too & Weaver, 2014).

Attempts on defining the role of the PMO take several twists and turns. Authors Thiry and Deguire (2007) argue that a successful project-based organization is vertically integrated through competent portfolio management and horizontally integrated through program management. In their framework, the PMO stands for program management office has the role of bridging Leadership and policies into processes and procedures. Much like the organizational model proposed by Aubry et al. (2007).

On the diversity of roles, Hobbs and Aubry (2007, p. 85) observe that "organizations establish a great variety of different PMOs to deal with their reality". The authors also mention that the PMO is short-lived in most of the companies evaluated in the study, with an average age of 2 years before dismantling or transformation. This could be explained by the changing nature of the PMO and the underperformance of young PMOs. Although PMO functions are associated with better project performance, there is a learning curve (Dai & Wells, 2004).

2.1.1 The roles of the PMO

The definition of the role is broad, and somewhat overlapping with that of functions. In psychology, role is defined as a set of behaviors, rights, responsibilities, beliefs and norms an actor expresses or is expected to abide in a social situation (Biddle, 1986). However, role can also be defined as "the function that somebody has something has or the part somebody/something plays in a particular situation" (Oxford Learner's Dictionary, 2019) Aubry and Hobbs (2011) use the functional approach for roles. In the present study, both terms are separated by a level of abstraction. Functions being deemed as closer to operational tasks than the roles presented above.

The PMO is often an entity outside the largest divisions of the firm while maintaining interface with a number of different actors within and outside a firm (Müller et al., 2013). As a result, the PMO assumes multiple roles in a company and these roles vary considerably across businesses (Aubry & Hobbs, 2011; Hobbs & Aubry, 2007; Müller et al., 2013). The most common types of PMO roles in literature are: coordinating, supporting, and controlling.

The **coordinating role** is more likely to be present in PMOs that manage multiple projects, a or some programs and portfolio (Too & Weaver, 2014). It is the role assumed by the PMO when conducting resource management functions and mediating stakeholders (Unger et al., 2012). Associated with this role are functions like resource allocation and mediating conflict.

The **controlling role** is associated with the traditional command and control style of management (Nerur et al., 2005). PMOs assume this role when enforcing project management standards, guaranteeing projects compliance with internal and external regulations and evaluating project performance. In this role, the PMO contributes to increasing transparency and stabilising an information system (Müller et al., 2013; Unger et al., 2012).

The **supporting role** is the role the PMO takes when it facilitates knowledge transferring between projects and teams and develops and maintains project management standards, for instance (Unger et al., 2012).

The **serving role** is the role the PMO takes when it provides services to other units. Be it by conducting training, consulting and administrative functions or specialized tasks. (Müller et al., 2013)

Artto et al. (2011) discuss the integrative role of the PMO, defined by interactive control systems and belief systems. Meaning that the PMO actuation is grounded on value-based influence in decision making on a different level of the company with a clear alignment with the firm's mission and vision. The authors, however, didn't observe any institution in this role. Instead, they showed that PMOs tend to exert their scope through formal control systems. As most of the interviewees have had a PMO for little time or the interviewees had short experience in the role, their argument concludes that with time the PMOs will transition to a Believe system or Interactive control system. The authors define four types of control mechanisms, suggesting that PMOs will benefit from migrating to a composition of the last two (integrative role):

Boundary Systems exert control by means of standardization and planning, limiting ways of working to pre-established agreements;

Diagnostic Control Systems relate to the most classic management approach of budget control, resource allocation and performance measurement;

Belief Systems direct portfolios, programs or projects through collective values and principles expressed in shared mission and vision;

Interactive Control Systems is a direct and personal influence of managers on the way tasks are conducted, this is done by frequent interactions formal or informal.

Müller et al. (2013) describe a Partnering role as "[the] PMO takes on a partnering role when it engages in equal knowledge sharing, exchange of expertise, lateral advice-giving, and joint learning with equal level stakeholders" (Müller et al., 2013, p. 61). The authors acknowledge the lack of coverage of this role in overall research. However, the proposed description resembles the serving and supporting roles mentioned above.

A complete understanding of how the PMO works require a combination of variables and dimensions that goes beyond roles and control systems. Desouza and Evaristo (2006) devise a framework to define the PMO. The definition is grounded on the level of scope: strategic, tactical and operational. Each encompassing a series of characteristic tasks: project knowledge management, Project process and procedures, training, resource management, portfolio management financial management. The authors derive their knowledge archetypes based on a dual classification system: administrative and knowledge-intensive.

A full picture of the roles of the PMO is, therefore, subject to different dimensions. The role of the PMO is dependent on its levels of scope (strategic, tactical and operational) (Desouza & Evaristo, 2006), it's functions (Hobbs & Aubry, 2007), it's relationships with other units (Aubry & Hobbs, 2011; Aubry et al., 2007; Thiry & Deguire, 2007), it's types of control mechanisms (Artto et al., 2011) and the nature of its tasks (Desouza & Evaristo, 2006). The combination of these factors results in a wide variety of PMOs observed. Aubry et al. (2007) suggest that the inner link between the different compositions is the primal nature of the PMOs contribution to an organization. That of constant checks and balances pairing stakeholders competing values with projects, programs and portfolio management.

2.1.2   The functions of the PMO

Functions are extensively covered in literature and an important part of the PMO roles. Both the ones proposed by authors and the functions they observe encompasses different fields of expertise. The most comprehensive list is presented by Hobbs and Aubry (2007). The authors identify 27 functions a PMO perform in their survey with 500 respondents. Table 5, in Appendix 1, summarizes the potential functions listed by Hobbs and Aubry (2007) and with the addition of contributions from other authors. Through a factorial analysis the authors group the functions in five groups, namely:

Monitoring and Controlling project performance – this group involves reporting to upper management, defining performance criteria, monitoring and controlling performance and managing the project's information system.

Development of Project Management Competencies and Methodologies - this groups relates to training, mentoring and coaching of project management professionals, defining project standards and spreading the firms' project management culture.

Multi-Project Management – this group relates to the management of the firm's portfolio, and it includes the allocation of resources among projects prioritizing the business strategic goals and orchestrating interdependencies between projects and programs.

Strategic Management – this group includes advising upper management, participating in strategic planning and stakeholder management.

Organizational Learning – this group deals with performance monitoring and control, project documentation, assessment, audition and cataloguing.

The literature specifically covering agile is far milder. Among the studies found there are single company reports. Tengshe and Noble (2007) describe the transition to agile of a firm in which the PMO performed training and coaching functions (functions 7 and 36) as well as creating their portfolio control standard (function 5). Scotland and Boutin [55] describe an ad-hoc hybrid agile implementation at "Yahoo!" demonstrating the roadmap of making traditional PMO and agile processes compatible. Hodgkins and Hohmann (2007) describe an institutionalization of a PMO performing backlog management (function 11) and stakeholder management (function 36) on a serving role.

On a similar note, Power (2011) describes the PMO at Cisco with the introduction of agile methods. The functions performed by the new institution include the development of standards (function 5), promoting agile within the organization (function 6) and training and mentoring personnel (functions 7 and 8 taking either serving or supporting roles. This apparent direction towards serving and supporting roles in agile is supported by Kulak and Li (2017). The authors argue that in agile the PMO must fill a serving or supporting role avoiding diagnostic control systems and boundary systems.

Pinto and Ribeiro (2018) conclude that the PMO in an agile context is no different from the PMO in traditional methodologies regarding the functions that are performed. The differences, if any, are found on the way they are performed. That is, they differ in the roles assumed, the reach of their scope and their control mechanisms. Agile proposes control mechanisms relates to the definitions of belief systems and interactive control systems. The PMO associated with the functions of standardize work, centralize reporting, control project/program/ portfolio is linked with Boundary systems and Diagnostic Control systems. This explains why the institution of a PMO entity can incur in reducing the autonomy of different areas of the project-based organization (Artto et al., 2011). The PMOs in the studies presented here assume or are prescribed to assume serving and supporting roles when performing these functions (Hodgkins & Hohmann, 2007; Kulak & Li, 2017; Power, 2011). That is, the responsibility lies with the development teams and not directly with the PMO.

2.2   Taxonomy framework

This chapter discussed the literature available on the PMO extensively. Specifically, on the manner authors and standards address the role of the PMO. It proposed a terminology to discuss such roles that embrace the complexity of the topic (Figure 1)

There is no unified terminology to describe the PMO. Terms are sometimes used in contradicting ways by different authors, and analyses often rely on subjective perceptions of abstraction levels. This study proposed an analogy with the performing arts to describe the roles of the PMO. **Error! Reference source not found.** illustrates the terminology and framework this study devised from the available literature to describe the PMO. There are four basic roles (coordinating, controlling, supporting and serving) which can be assumed individually or in combination by the PMO when performing its

functions. Some of these functions can be easily associated with control mechanisms such as the monitoring and controlling of project performance groups containing functions related to diagnostic control systems and project management competencies and methodologies group to boundary systems. However, the combination of the attributes to a full description of the role id most likely a context-specific phenomenon.

The specific literature on the PMO in an Agile context does not build much further than the pre-existing general literature on the PMO. This can be a result of the novelty of the theme that is yet to catch interest momentum. However, there seems to be a trend in the effects of agile on PMOs. Most frameworks advocate for a reduced expenditure of resources in planning, reporting and scheduling, all activities usually associated with the PMOs.

Basic Role	Coordinating	Controlling	Supporting	Serving
Functions	Monitoring and Controlling Project Performance	Project Management Competencies and Methodologies	Multi-Project Management	Strategic Management

Figure 1 – Role Description Framework

3 Materials and methods

This study makes use of semi-structured interviews for collecting the data. The interviews were recorded and transcribed with the expressed consent of the interviewees. The contents were analyzed by creating a description of the cases and organizations, attributing codes to the transcriptions. The interviews, transcriptions and analyses were conducted by the author only between August and September 2019.

3.1 Case Selection

The object of study of this research is the PMO that oversees the largest aggregation level of projects and products on a financial sector organization. In this position, the PMO will have close links to the overall strategy as well as experiencing the impacts of agile. This study proposes the following criteria for selection:

- The organization has at least ten teams working with agile methods;
- The organization has a PMO and had a PMO before the agile implementation;
- The organization still has a PMO;
- The PMO in both cases is involved in all levels of product and project management;
- The teams work in projects with a strong IT focus;
- The organization has a significant part of its business in the financial sector.

The study resorted to Accenture's present and former clients and invited professionals directly involved with the phenomenon under observation. The invitations were sent to people who act or acted as a leader of the PMO, as a consultant in the transition to agile, as a member of the development teams or as the reporting point of the PMO. An initial list of 12 organizations was created, of which 6 were chosen to participate based on the availability for interviews. From these 6, 3 were included in this study due to the fit to the described criteria, knowledge of the processes involving the PMO by the participants, and completion of results.

3.2 Data collection

The semi-structures interview was chosen for this method allows for rich data systematic data. The interview remains conversational, which permits the researcher to dive deeper into different

questions. This freedom helps the interviewer to clarify ambiguities that may arise on the spot. The flexibility is fundamental for an exploratory study. Based on the literature presented in section 2, a protocol for the semi-structured interviews was created.

Nevertheless, this study has shown how vast the topic of PMO is. And the timeframe most respondents usually have available may not be enough to cover the full extent of it exhaustively. Moreover, the inquiries proposed in this research often spans years and resorts to the memory of the participant for clarification. To both serve as a point of triangulation of information and circumvent the difficulties the interview format imposes, a survey was included in this research.

The participants were asked to fill in a survey at the end of the interview. The survey consisted of the list of functions in Table 1. The task consisted of ranking each task on a five-point Likert scale for both the periods before the agile transition and after. Where five indicates that the function is a defining aspect of the PMO. And 1, the function is within the scope of the PMO. However, it is not a significant part of the job. The participants were also asked to indicate which one of the basic roles (coordinating, controlling, supporting or serving) were taken by the PMO when performing them, again for both periods.

The interviews were divided into three segments. First, the research was introduced briefly, and the stated consent forms were collected. Second, the semi-structured interview was conducted and recorded. Finally, the candidate was asked to fill in the survey.

3.3   Data Analysis

The data analysis part starts with a full description of each case. It is followed by a full transcription of each interview and coding. Finally, the quantitative survey data was analyzed. The interviews were coded on the platform Atlas.ti 8 using open coding, which gave a rich overview of the themes discussed by participants. The process of coding consisted of thoroughly reading all transcripts identifying relevant segments for analysis with an explanatory text. Whenever a new related topic was detected a new code was created. All sources were used collectively to form the narratives presented in this document. The research used inductive reasoning to identify patterns and common themes.

3.4   Case Description

The effort consisted of 13 semi-structured interviews with approximately 1h. The interviews were conducted either in the participants' offices or virtually with the use of Skype Broadcast. The interviews had the participation of the author and the participant only. In some instances, whenever the interview was conducted in a public area, other people may have been in the vicinity. However, there was no interaction with anyone else during the interview time.

Out of the 13 interviews conducted, 9 were used in the analysis. The remainder were disregarded wither due to incomplete data. One interview of Case A was used as a test to the process and excluded from the data. Table 1 summarizes the cases analyzed and excluded.

To ensure the validity of the findings and prevent respondents' biases, there was more than one interviewee per case with different experiences on the phenomena. Having different professionals describing the PMO enriches the analysis as the roles of the PMO are dependent on their relationship. (Aubry & Hobbs, 2011). **Error! Reference source not found.** summarizes the cases analyzed.

Table 1 Case Summary

Case	Industry	Agile method	Agile Teams	Interviewees	Status
Case A	IT Department of a Financial Group	DevOps, Scrum, and Kanban	100	Agile Coach – 1 PMO manager – 1 Project Manager – 1	Included (Agile coach used as a test)
Case B	IT Organization of an Insurance Company	Scrum, Kanban, eXtreme Programming and SAFe	100+	Consultant - 2	Included
Case C	Financial Services	SAFe	1000+	Release Train Engineer – 1 Member of the PMO - 1	Included
Case D	Retail	Scrum, LeSS	10+	Consultant - 3	Excluded

4   Case Results and Analysis

This chapter will present the results of the interviews conducted on the three cases investigated. The results in this chapter were extracted from semi-structured interviews with 6 professionals in three companies. These interviews were conducted in July and August of 2019, and the author was present in all of them.

4.1   The role of the PMO under agile in practice

The PMO in an agile environment performs a broad range of functions. Among these functions, the group "Monitoring and Controlling Project Performance" ranks the higher on average across all participant's reports in the study. At least five participants, out of the nine included in this study, have graded all four functions in the group above three, and two have grades above 4. "Development of Project Management Competencies and Methodologies" and "Multi-Project Management" tie in second (Table 2). Both with three out of five functions graded above three by at least five participants and one above four. The Supporting role is the predominant role in the population. It was the most frequently attributed to eighteen functions, followed by the controlling role attributed most frequently to thirteen functions, the coordinating role, eight and the serving role to seven.

The respondents highlighted in the interviews the processes related to the "Monitoring and Controlling Project Performance" group as a fundamental aspect of the PMO. The PMO in agile environments is an external agent to the development and delivery teams in the case study. The PMOs are usually in charge of activities related to resource management, risk management, standardization of processes, reporting, compliance, and governance. The PMOs are also a bridge between the agile project organization and the traditional project organizations in the firm. All cases observed had agile and traditional practices coexisting. Reporting the development of agile teams to higher hierarchical levels using traditional processes is repeatedly a struggle that participants report. The PMOs perform all four roles (controlling, coordinating, supporting, and serving). However, the four cases at hand are very distinct from each other as it becomes clear from Figure 1.

Figure 1 shows the combination of functions and basic roles each PMO performs in each case in more detail. No two descriptions are the same, and the PMO's description varies between cases and within cases. There are specific facets in each of the analyzed reports, which may be a reflection of the peculiarities of each project (or collection of projects), causing the PMO to assume a different scope in each instance. The plot is a result of the data collected with the surveys at the end of each interview.

The PMO of Case A is mostly not involved in the functions from the groups "Development of Project Management Competencies and Methodologies" and "Strategic Management" because there is a separate entity responsible for the work and quality standards in agile. The primary focus of the PMO is managing the project's information. The responsibility for reporting is decentralized and mainly lies with the individual development teams. The software tools used to track performance automate most of the work of structuring and distributing the documentation. The PMO has two main concerns

monitor in aggregate the portfolio's performance and carefully control the high interest and high-risk development initiatives.

Table 2 - List of high grading functions of the PMO in agile environments

Function Group	Functions graded three or more by at least five participants
Monitoring and Controlling Project Performance	Report project status to upper management*
	Monitoring and control of project performance*
	Implement and operate a project information system
	Develop and maintain a project scoreboard
Development of Project Management Competencies and Methodologies	Develop and implement a standard methodology*
	Develop competency of personnel, including training
	Provide a set of tools without an effort to standardize.
Multi-Project Management	Coordinate between projects
	Manage one or more portfolios
	Manage one or more programs*
Strategic Management	Provide advice to upper management*
	Monitor and control the performance of the PMO
Other	Project administrative support*
	Portfolio problem solving
	Cost/benefit analysis of projects
*Graded four or more by at least five participants	

The PMO of case B performs most of the functions in the list with a predominant supporting and serving role. All function groups rank high (greater than 3) on average while the functions of the group "Development of Project Management Competencies and Methodologies" rank slightly higher. According to the interviews, the PMO in this firm proactively positioned itself at the center of the training and mentoring of the personnel processes.

The PMO of case C is mainly involved in the financial control of programs (Value Streams and Epics) expressed in the high ranks of the "Monitoring and Controlling Project Performance" group. The PMO performs the functions in this group through a combination of all roles while controlling and coordinating are slightly more expressive. The PMO is also involved in the functions of the remaining groups, where the supporting role is the most expressive one. There is a significant disparity between how the RTE (Release Train Engineer) sees the PMO and how the PMO reports itself. The discrepancy may reflect that the PMOs' functions have context-specific capacities. The interviewed PMO presents their views on their role while the RTE views relate to a broader group of PMOs.

The PMO of case D presents the most variance in the set. Consultant 1 worked as a Scrum Master in the agile period, and as a PMO in the traditional period, Consultant 2, as a PMO in both periods and Consultant 3 joined the firm only in the agile period in the same capacity. The disparities in the group of case D may reflect the specificities of each program under the scope of each PMO. Consultant 1 reported a predominantly supporting role for the PMO in most functions, while consultant 2 reported a balance between the controlling and the serving role, and consultant 3 reported a predominantly coordinating role.
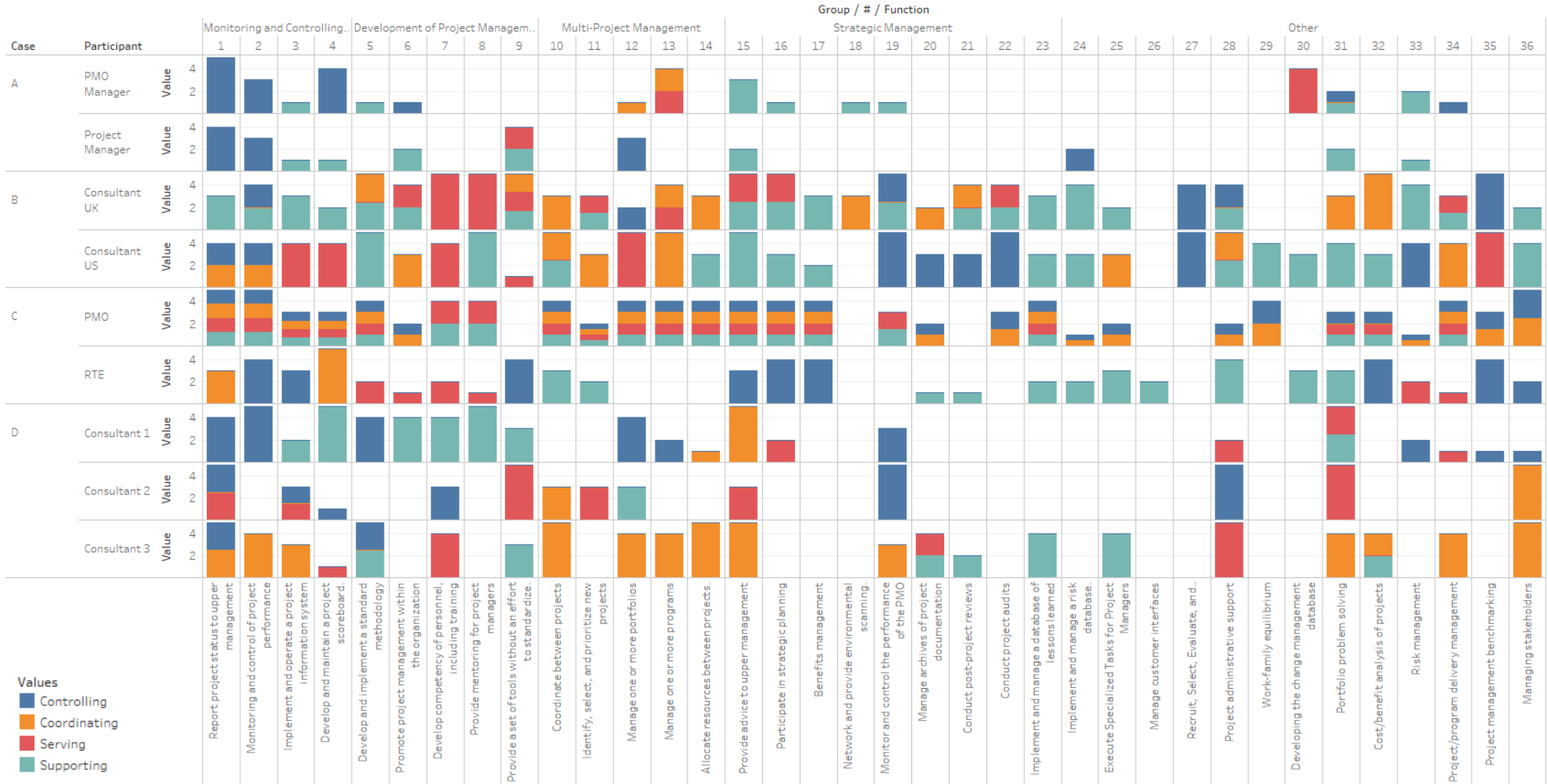
Figure 1 - Bar plot of function's marks stated by the participants on the PMO in an agile environment. Data collected in the post-interview survey. The Colors indicate the basic roles the participants associate with a given function. Multiple colors in a bar mean that there was more than one basic role used

4.2 Differences between the PMO before and after agile

The functions of the group "Monitoring and Controlling Project Performance" strongly related to the PMO within the traditional context, and remained so during the agile period. The functions "Develop and implement a standard methodology,"" Manage one or more programs,"" Project administrative support," and "Portfolio problem solving" similarly remained strongly related to the PMO after the transition to agile methods (Table 3).

Table 3 - List of high grading functions of the PMO in traditional environments

Function Group	Functions graded three or more by at least five participants
Monitoring and Controlling Project Performance	Report project status to upper management*
	Monitoring and control of project performance*
	Implement and operate a project information system*
	Develop and maintain a project scoreboard*
Monitoring and Controlling Project Performance	Develop and implement a standard methodology*
	Promote project management within the organization
Multi-Project Management	Manage one or more programs*
	Allocate resources between projects
Strategic Management	Manage archives of project documentation
Other	Implement and manage a risk database*
	Execute Specialized Tasks for Project Managers
	Project administrative support*
	Portfolio problem solving
	Risk management*
	Project/program delivery management*
	Managing stakeholders
Graded four or more by at least five participants	
In bold are the functions that remained strongly related to the PMO within agile.	

On the other hand, the respondents report significant differences between the PMOs in each firm before and after the introduction of Agile. The change is also present in the survey results. There seems to be a migration from a predominantly controlling profile to a balance between supporting and controlling with the introduction of agile (Table 4).

Table 4 – Number of times a role was the most attributed to a function in each period

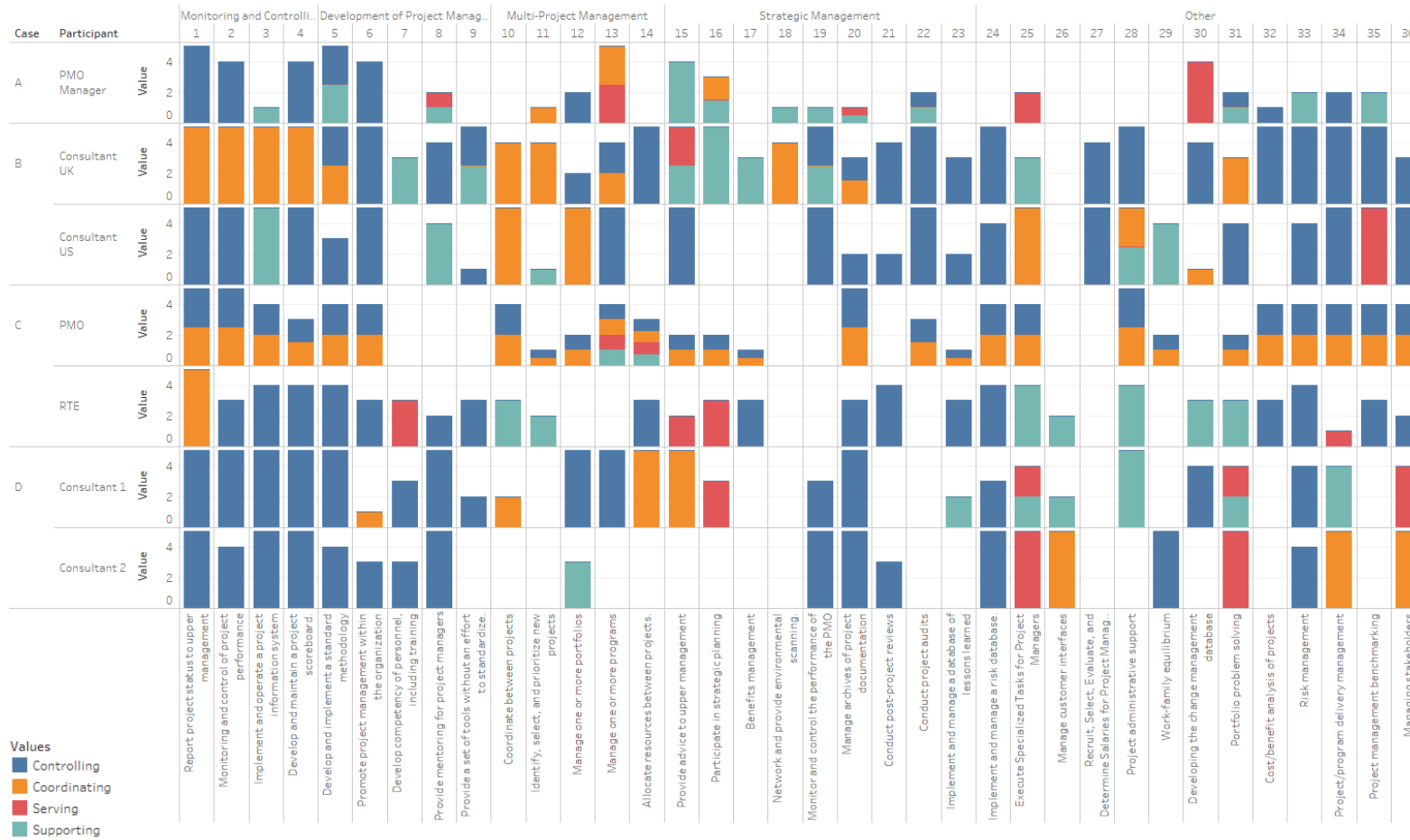| Role	Traditional	Agile
Coordinating	5	8
Controlling	27	13
Supporting	6	18
Serving	2	7

Figure 2 - Bar plot of function's marks stated by the participants on the PMO in a traditional environment. Data collected in the post-interview survey. The Colors indicate the basic roles the participants associate with a given function. Multiple colors in a bar mean that there was more than one basic role in use.

In all cases, there was some change in the role the PMO performs or in how related a function was to the PMO's scope. In Case A, over 70% of the function the PMO performs changed. In cases B and c, over 85% and, in Case D, almost all functions saw some change. Participants mentioned that the introduction of agile renders some functions obsolete and decentralizes the responsibilities of other functions to include the teams and other actors, which is one explanation to the changes in roles and relevance of the functions to the PMO. One respondent exemplifies this phenomenon by mentioning that his firm redirected the responsibility for budget planning to the Scrum Masters:

> *"[On] Budgetary control, [the PMO] had taken a very strong ownership of it before I was there. But, increasingly, they [the firm] were looking to move some of those responsibilities onto the scrum master's shoulders [...]. So budgetary commitments were something that was distributed out to scrum masters [from the scope of the PMO]." (Case B – Consultant UK 00:09:25)*

Contrasting Figure 2 and Figure 1, there is a significant reduction of the scope of the PMO in Case A. As a result of the agile transition, the firm created an independent structure to curate the agile standards. Therefore, the group "2: Development of project management competences and methodologies" grade much lower in agile than it did in the traditional environment for Case A's PMO. In cases B and C, on the other hand, the PMO incorporates scope in both group 2 and group "4: Strategic Management", which could be a result of the reduction of more administrative work in their scope.

There is a shallow resemblance between the accounts of the participants of case D. There seems to be a core attribution of the PMO within the functions of the group "Monitoring and Controlling Project Performance" while the remaining groups appear to behave on an ad-hoc basis.

4.3   Patterns observed

The previous section described how the roles of the PMO are different from traditional methods to agile methods; most of the cases had significant differences between the two periods. This section's goal is to identify possible patterns in these cases.

4.3.1   Rise of supporting and serving roles

The first pattern is the tendency to reduce the controlling participation in the role mix, favoring the increase of supporting and serving roles. Figure 3 illustrates this shift. There, the share of functions classified as controlling reduces, and the share classified as supporting and serving increases in every case. The pattern is not apparent in Case A due to the descoping of the PMO described in Chapter 3. One participant clearly states this in the passage:

> *"I see retrospectively the journey that this particular client took was to try to move away from the PMO as a control organization and more into the other three types [**Coordinating, supporting and serving**] [...]I mean a lot of these [**functions**] started [**in the period before the transition**] as a control mechanism and then [**with agile ways of working**] pivoting into those others." (Case B – Consultant 2 00:43:18)*

Number of functions within a role grouped by case and period; labels indicate the number of functions reported by the respondent

Case	Period	CR	CT	SP	SV
A	Traditional	3	10	12	5
	Agile	2	6	8	2
B	Traditional	5 11	21	7	1
	Agile	10	8	21	6 10
C	Traditional	1 27	17 27	2 7	4
	Agile	2 25	9 27	11 20	6 20
D	Traditional	4	15	1 6	4
	Agile	2 13	9	1 7	6

Participant
- Consultant 1
- Consultant 2
- Consultant 3
- Consultant UK
- Consultant US
- PMO
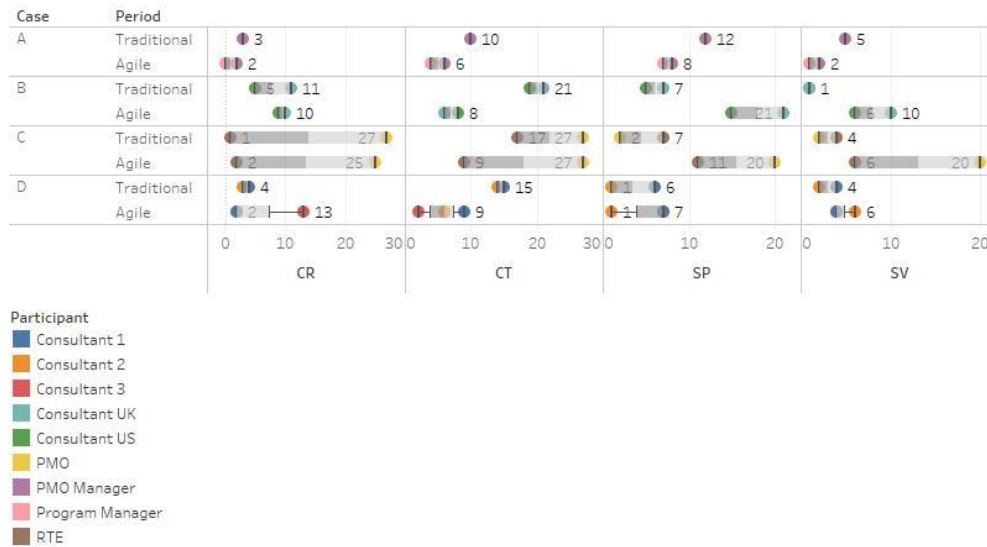- PMO Manager
- Program Manager
- RTE

Figure 4 – Number of functions classified in each role according to the participants' reports grouped by case, period, and role. The labels illustrate the total number of functions the participant associated with the PMO. CR stands for the coordinating role, CT for the controlling, SP for the supporting, and SV for the serving.

4.3.2 Software tools enabled the distribution of tasks

The reports of the participants from cases B and C indicated that a new generation of project management software tools associated with the agile process designs enabled the teams to take the responsibility of tasks usually related to the PMO. What was once a very specialized skill could be done with relative ease with the use of tools such as JIRA and Confluence. It is was not possible to isolate the findings in this research from the implementation of automated processes. The tools allow repetitive work to be automated, reducing knowledge barriers to their execution. This way, most of everyday reporting and risk management became part of the development team's scope and reduced the time the PMO spent with administrative tasks. The following quote illustrates how a participant from case C perceived the phenomenon.

> *"[With JIRA], there is no manual effort required to check what is my delivery output for a certain sprint or cadence. Even for a release, [a full release requires a collection of sprints]. So I think a lot of this stuff, which probably earlier was done manually […] comes out of the tool just on the click of a button. And that[…] has given some ease there. […]I would say processes have been optimized and […] reduced to the minimum required." (Case C – RTE 00:18:29)*

4.3.3 Emergence of structure

In all cases explored in this research, the autonomy of development teams goes as far as choosing their ways of working independently. That means that the operational level of development is not standardized in the cases discussed. As a result, different teams use different indicators to track their progress. The participants report that this practice harms inter-team comparability and communication, which limits the integration of the output of different teams.

There are two complications derived from the inter-team dissonance. First, decision-makers in the firm have a tougher time making sense of the different streams of data and are more prone to error. Second, the teams caught up in the continuous delivery loop get alienated from the firm's long-term mission, goals, and strategies.

These issues are not new to the firm, and enterprises have devised means to coordinate work in several complex scenarios. A participant exemplifies how the need for structure manifests itself, and traditional methodologies can be incorporated into the agile environment to solve this coordination issue.

> *"Well, it goes with the agile transition that people start getting a bit at allergic to any kind of standardization. So, then you usually go through a cycle that first people say: 'well, we had the old way of working and now we have got agile. So, we forget everything [we did before]. We will just find it out [, **the best way of working, independently by**] ourselves.' And [...] now they are gradually going back **[on this decision]**. Because, well, you do have to meet some standards. At least the external standards that are set by the regulators. And then it helps if you have a quality system if you have things [**tools and processes**] available. That you do not have to reinvent the wheel every time." (Case A - PMO Manager 01:03:56)*

4.3.4 The PMO is continuously changing

The interviews closed with an open question for the participant to share insights on what they felt was relevant to understand the PMO in their organization further. Most of the responses hinted to an unsettlement of the PMO. The PMO and possibly other actors in the firm are not yet accommodated, in the sense that they are always incorporating extra functions, participating in new networks, and tweaking the way they do their jobs. One participant brings a personal anecdote to illustrate that agile will not be the end of the changes because there will always be a new thing.

> *"There is always [**a new philosophy**], I have seen that a number of times in this company, but also elsewhere. That there is always this balance [**of**] going this way and that way. [**As an example,**] everybody goes into PRINCE2. And then the theory of constraints. We have had them all." (Case A - PMO Manager 01:06:45)*

5   Conclusions

The main objective of this thesis was to explore the impact on the roles of the PMO of the introduction of agile in several teams. The idea is that by exploring the theme, the study would be able to formulate a hypothesis that future studies could test on how the roles of the PMO change and help businesses to better prepare for an extensive transition to agile. The motivation for this study is the lack of consensus in the roles of the PMO across project management methodologies, but especially in agile methods. As a result, firms create a PMO without a clear view of how to design the PMO to achieve the expected goals. PMOs are an ambiguous entity that is associated with better project performance while surviving an average of two years before dissolution.

This study proposed the research question "How do the roles of Project/Program/Portfolio Management Offices change with the introduction of Agile methodologies to a large number of teams?" to address the knowledge gap on the changing roles of PMOs with agile.

Chapter 2 pursued the answer to the first two questions through a systematic literature study covering publications in traditional and agile methods, and a review of the principal available standards. This study observed that the PMOs' roles vary; they are path-dependent and in constant change. As a result, there is no unified terminology to describe the PMO, which makes this task challenging. Different authors use similar terms with different meanings, and analysis often relies on abstract and subjective perceptions. The specific literature on the PMO in an Agile context does not build much further than the pre-existing general research on the PMO.

To overcome the description problem, this thesis proposed a taxonomy framework to objectively describe the PMO and analyze the changes of roles due to agile. The framework, available in **Error! Reference source not found.**, uses a combination of thirty-six functions and four basic roles to explain

the mandate of the PMO. This study applied this framework in four cases. The data collection in the case studies was conducted through semi-structured interviews and surveys with nine respondents, two per case, and three in one case. The survey was the source of the quantitative data used in the analysis, and the interviews' transcripts, the qualitative data.

The application of the framework captured detailed insights n the case and possibilities the mapping of the PMO roles before and after the introduction of agile. The main results of this study are the following: 1 - There seem to be significant differences between PMOs from different companies; 2 - The data analyzed from the cases in this thesis seem to indicate that the changes in roles of the PMO between the traditional period and the agile periods are related to the introduction of agile, although this study did not establish a causation relationship.; 3-There are indications that PMO remains a crucial piece in the functions listed in the groups "Monitoring and Controlling Project Performance" and "Development of Project Management Competencies and Methodologies."; 4-The change in the roles of the PMO is a reduction of the overall scope of the PMO and a shift from a predominant controlling role to a supporting and serving role.

This study confirmed the observations of previous research on the diversity of PMO designs; it observed that the PMOs change as a result of the introduction of agile and that the governance and control are essential attributions of the PMO. The PMO's descriptions given by participants vary considerably from case to case and within cases. However, there are some similarities in the different reports.

The agile scope of the PMOs this study observed concentrates on the functions of the groups "Monitoring and Controlling Project Performance" and "Development of Project Management Competencies and Methodologies. "The PMO performs these functions in all four basic roles of the model. The PMO is strongly related to reporting, governance, and risk management functions, It shares this responsibility with development teams and business units.

The difference between the PMO in traditional and agile environments lies in the PMO's reduction of scope due to the autonomy development teams gain, and the simplification of management processes. The PMOs shift from a predominantly controlling profile to a supporting and serving profile. The PMO remains a crucial piece in "Monitoring and Controlling Project Performance" and "Development of Project Management Competencies and Methodologies. "but the standards are flexible, and there is less emphasis on enforcing them.

The acquired freedom teams have on the ways they organize their work and how they track their performance causes friction when the interdependency between different team grows. The complexity of coordinating the delivery of a large number of development groups leads to the emergence of a need for an orchestration structure. As most agile standards do not include this structure, the PMO incorporates functions that help to steer the teams and conciliate interdependencies.

The modernization of software tools that make knowledge sharing more accessible and automate control intensive and administrative tasks seems to enable the distribution of responsibilities from the PMO to the teams. Although this factor is not directly related to agile methodologies, it was not possible to separate it from the overall phenomenon. The different agile standards propose their set of artifacts and rituals related to knowledge management and communication. It seems that software developers have caught up with the trend to adopt agile and provide firms with the products that fit these artifacts' purposes in such a way that the use of non-digital alternatives is seldom.

5.1   Contributions

The contribution to science of this study is twofold. First, it contributes to the description of the PMO, enriching the field towards a unified theory of project management. Second, it provides empirical evidence for the changes in roles of the PMO with the introduction of agile.

5.2   Implications to the industry

The direct implication of this study is the recommendation for further investigation. The approach taken in this study did not attempt to test the underlying perception of the value a PMO adds to a firm but to explore its configurations and effects of agile. In this sense, the study has not found specific patterns that lead to immediate courses of action. Instead, it confirms claims of previous research on the specificity of the PMO's design to the context surrounding it. Despite the clarifications brought by the findings of this study, the effects of agile in the role of the PMO remain nebulous and unclear in the sense that there is still no theoretical explanation.

It seems that the trend to the PMO is to concentrate on supporting and serving roles, standardizing processes without enforcing their mandatory adoption. This approach gives the development teams enough freedom to be innovative and flexible as agile proposes while preventing wasteful expense in "reinventing the wheel" each time some routine needs standardization. The findings of this study seem to indicate that the firms with a large number of teams working in agile will have a greater need for a coordination structure.

5.3   Limitations

The work presented here has some limitations to validity and generalization. First, the study was not able to fully separate the effects of the agile transition from other organizational changes. Second, the study relies on the memory of participants to collect data. This study attempted to mitigate this risk by interviewing multiple participants in each case and using a survey to guide participants on the process. For privacy concerns, the study had no access to any documentation that could help further substantiate the findings in this research. Third, the sample is too small to establish the statistical significance of the observed conclusions. The studies that attempted to do so resorted to massive scale surveys. Forth, it is in people's nature to improve their environments and quality of life. Regardless of project management standard or management philosophy, people will always strive to improve, and the change is constant. And, finally, this study investigated firms which have kept the PMO after introducing agile, overlooking the companies which didn't.

5.4   Future work

All topics addressed or touched upon in this research are vast. At several points on the design and development of the study, different ideas and directions crept the scope at hand. Although it was not possible to address all fronts, the author offers this section to recommend future work following the efforts presented in this document.

This work is strictly exploratory and gives insights on what are the changes to the role of the PMO. There are two natural extensions to this effort; the first one is to explore the impacts of agile in other positions of the organization associated with traditional project management. The findings in this research indicate that not only the PMO responds to the changing environment in the firm, but other actors in the network would react to it as well. This branches to further questions such as: How do the socio-political structure of the firm shapes organizational change?

Second, while other studies have investigated the patterns in which the PMOs change (not restricted to agile), this study attempted to identify patterns that emerge specifically when the PMO changes due to the introduction of agile. The fact that the PMO remains in this hybrid construct of agile and traditional methods can't be said to be good or bad. Although the testimony of most participants advocated for the improvement the new format represents, the research conducted here did not assess it. Therefore, there remains the question: to what ends do the choices made during the transition to agile serve?

This study investigated the changing roles of PMOs in companies that have maintained a PMO after the introduction of agile. Future work should also contemplate the firms that have disbanded their PMO structures.

6 Declaration of interest

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Appendix A   Functions of the PMO

Table 1 - PMO functions (adapted from Hobbs and Aubry (2007, p. 82))

Group	Id	Function	Source
Monitoring and Controlling Project Performance	1	Report project status to upper management	(Hobbs & Aubry, 2007)
	2	Monitoring and control of project performance	(Bredillet et al., 2018a, 2018b; Hobbs & Aubry, 2007; Pellegrinelli & Garagna, 2009; Salameh, 2014; Thiry & Deguire, 2007)
	3	Implement and operate a project information system	(Bredillet et al., 2018a; Hobbs & Aubry, 2007; Kerzner, 2003)
	4	Develop and maintain a project scoreboard.	(Hobbs & Aubry, 2007)
Development of Project Management Competencies and Methodologies	5	Develop and implement a standard methodology	(Andersen et al., 2007; Bredillet et al., 2018a, 2018b; Dai & Wells, 2004; Hobbs & Aubry, 2007; Kerzner, 2003; Pellegrinelli & Garagna, 2009; Salameh, 2014; Thiry & Deguire, 2007)
	6	Promote project management within the organization	(Bredillet et al., 2018a, 2018b; Hobbs & Aubry, 2007; Power, 2011)
	7	Develop competency of personnel, including training	(Andersen et al., 2007; Dai & Wells, 2004; Hobbs & Aubry, 2007; Kerzner, 2003)
	8	Provide mentoring for project managers	(Dai & Wells, 2004; Hobbs & Aubry, 2007; Kerzner, 2003; Pellegrinelli & Garagna, 2009)
	9	Provide a set of tools without an effort to standardize.	(Hobbs & Aubry, 2007; Pellegrinelli & Garagna, 2009)
Multi-Project Management	10	Coordinate between projects	(Hobbs & Aubry, 2007)
	11	Identify, select, and prioritize new projects	(Hobbs & Aubry, 2007; Pellegrinelli & Garagna, 2009)

Group	Id	Function	Source
	12	Manage one or more portfolios	(Hobbs & Aubry, 2007; Salameh, 2014)
	13	Manage one or more programs	(Hobbs & Aubry, 2007)
	14	Allocate resources between projects.	(Bredillet et al., 2018b; Dai & Wells, 2004; Hobbs & Aubry, 2007; Kerzner, 2003; Pellegrinelli & Garagna, 2009; Salameh, 2014; Thiry & Deguire, 2007)
Strategic Management	15	Provide advice to upper management	(Andersen et al., 2007; Hobbs & Aubry, 2007)
	16	Participate in strategic planning	(Hobbs & Aubry, 2007; Salameh, 2014)
	17	Benefits management	(Hobbs & Aubry, 2007)
	18	Network and provide environmental scanning.	(Hobbs & Aubry, 2007)
	19	Monitor and control the performance of the PMO	(Artto et al., 2011; Hobbs & Aubry, 2007)
	20	Manage archives of project documentation	(Bredillet et al., 2018a, 2018b; Dai & Wells, 2004; Hobbs & Aubry, 2007; Kerzner, 2003)
	21	Conduct post-project reviews	(Hobbs & Aubry, 2007)
	22	Conduct project audits	(Hobbs & Aubry, 2007)
	23	Implement and manage a database of lessons learned	(Hobbs & Aubry, 2007)
Other	24	Implement and manage a risk database.	(Hobbs & Aubry, 2007)
	25	Execute Specialized Tasks for Project Managers	(Andersen et al., 2007; Hobbs & Aubry, 2007)
	26	Manage customer interfaces	(Hobbs & Aubry, 2007)
	27	Recruit, Select, Evaluate, and Determine Salaries for Project Managers	(Hobbs & Aubry, 2007)
Not Listed in Hobbs and Aubry (2007)	28	Project administrative support	(Andersen et al., 2007; Artto et al., 2011; Dai & Wells, 2004; Pellegrinelli & Garagna, 2009; Salameh, 2014)

Group	Id	Function	Source
	29	Work-family equilibrium	(Aubry, Hobbs, et al., 2010)
	30	Developing the change management database	(Bredillet et al., 2018b; Salameh, 2014)
	31	Portfolio problem solving	(Bredillet et al., 2018b)
	32	Cost/benefit analysis of projects	(Kerzner, 2003; Pellegrinelli & Garagna, 2009)
	33	Risk management	(Artto et al., 2011; Pellegrinelli & Garagna, 2009)
	34	Project/program delivery management	(Desouza & Evaristo, 2006; Salameh, 2014)
	35	Project management benchmarking	(Kerzner, 2003)
	36	Managing stakeholders	(Kerzner, 2003)

Appendix B   Literature review findings

Table 2 - Summary of literature review

Group	ID	Source	Topic	Data	Data collection	Method	Results
General	1	Desouza and Evaristo (2006)	Knowledge archetypes of the PMO.	Primary	Semi-structured interview	Exploratory narrative	Defined Administrative and Knowledge-intensive archetypes of PMOs.
	2	Artto, Kulvik, Poskela, and Turkulainen (2011)	Types of control mechanisms used to manage projects.	Primary	Semi-structured interview and literature review	Exploratory narrative	The tendency of migrating from a boundary and diagnostic control systems to belief and integrative. Relationship between controls systems and strategy.
	3	Hobbs and Aubry (2007)	The relation between the functions of the PMO and project success.	Primary	Survey	Factor analysis	Listed and grouped by association the functions of the PMO.
	4	Giraudo and Monaldi (2015)	History of the PMO.	Secondary	Literature Study	Exploratory narrative	The PMOs change with technological and social advancements.
	5	Bredillet, Tywoniak, and Tootoonchy (2018a)	Co-evolution of the PMO and portfolio management.	Primary	Interviews, case study observations and documentation.	Content analysis	Validate that the PMO has an ongoing transformative nature. Propose that equilibrium explain better the relationship between PMOs and portfolio management.
	6	Bredillet, Tywoniak, and Tootoonchy (2018b)	Drivers of the PMO changes.		Multiple case studies (Interviews, case study observations and documentation.)	Structural Analysis.	Validate the dynamic stability of the PMO and portfolio management. Validate that changes in the organizational context trigger changes in routines and roles of PMO and portfolio management.
	7	Salameh (2014)	Best practices on establishing a PMO	Secondary	Literature review	Narrative	A framework for establishing a PMO
	8	Aubry, Hobbs, and Thuillier (2007)	Organizational project management	Secondary	Literature review	Narrative	A conceptual framework linking organizational theory, innovation theory and sociology to study the PMO and organizational project management
	9	Pellegrinelli and Garagna (2009)	PMO changes	Primary	Participatory inquiry with attendants in a forum	Narrative	Conceptualization of PMOs an agent and subject of change. Introduction of the idea that the PMO exists to solve a problem, and once solved it becomes redundant.

Group	ID	Source	Topic	Data	Data collection	Method	Results
	10	Dai and Wells (2004)	Effects of PMO in project performance	Primary	Two surveys (7-point Likert-scale): random sample and selected population	Statistical analysis	A high correlation between project management standards with project performance.
	11	Aubry and Hobbs (2011)	Contribution of Project Management to Organizational Performance	Primary	Multiple case studies: interviews + questionnaires (5-point Likert-scale)	Narrative	Conceptualizes the PMO as the centre of different aspects of organizational performance.
	12	Andersen, Henriksen, and Aarseth (2007)	Best practices on establishing a PMO	Primary	Two sets of interviews: The first with large companies integrating the research consortia, the second with large global companies for benchmarking.	Narrative.	A framework for establishing a PMO
	13	Müller, Glückler, and Aubry (2013)	Roles of the PMO	Primary	Multiple case studies (	Cross case study analysis.	The role profile of the PMO is dependent on the counterpart of the interaction. Evidence that the controlling role of the PMO is the most common and lack of knowledge sharing mechanisms is a characteristic of this role.
	14	Aubry, Müller, Hobbs, and Blomquist (2010)	PMO change.	Primary	Multiple case studies (interviews)	Qualitative text analysis.	Derived three patterns of change of the PMO.
	15	Unger, Gemünden, and Aubry (2012)	Effects of PMO in project performance	Primary	Survey (7-point Likert scale)	Exploratory factor analysis, regression analysis.	First quantitative empirical evidence of the impact of the PMO roles in project performance.
Agile	16	Tengshe and Noble (2007)	Experience report on establishing a PMO	Primary	Observation		The experience of the PMO can be used to improve the experience of transitioning to agile methods.
	17	Scotland and Boutin (2008)	Experience report on adopting Scrum	Primary	Observation		The experience of the PMO can be used to improve the experience of transitioning to agile methods.
	18	Hodgkins and Hohmann (2007)	Experience report on implementing agile methods.	Primary	Observation		The PMO is fundamental for the adoption of agile methods in multi-product portfolios.
	19	Power (2011)	Experience report on implementing agile methods.	Primary	Observation		The PMO is a link between departments of the firm that run traditional and agile methods.

Group	ID	Source	Topic	Data	Data collection	Method	Results
	20	Pinto and Ribeiro (2018)	Characterization of a PMO in an organizational environment that uses agile methods.	Secondary	Literature review	Narrative	The changes in the PMO are not in the activities performed but in the form, they are conducted.
	21	Kulak and Li (2017)	Enterprise agility	Secondary	Literature review	Narrative	The book discusses the complications of scaling agile and how the demises are self-inflicted by the teams.

Appendix C   Changing patterns

Table 3 - Concurrent changes in the functions of the PMO

GROUP FUNCTION	CHANGE IN GRADE	COORDI NATION	CONTR OLLING	SUPPO RTING	SER VIN G	DESCRIPTION
1:MONITORING AND CONTROLLING PROJECT PERFORMANCE						
DEVELOP AND MAINTAIN A PROJECT SCOREBOARD.	0	0	0	1	1	All cases assumed a supporting role. Cases B and C assumed a serving role.
IMPLEMENT AND OPERATE A PROJECT INFORMATION SYSTEM	0	0	0	0	1	Cases B and C assumed a serving role.
MONITORING AND CONTROL OF PROJECT PERFORMANCE	1	0	0	1	0	The function lost importance for cases A and B. Cases B and C assumed a supporting role.
REPORT PROJECT STATUS TO UPPER MANAGEMENT	0	0	0	1	0	Cases B and C assumed a supporting role.
2:DEVELOPMENT OF PROJECT MANAGEMENT COMPETENCIES AND METHODOLOGIES						
DEVELOP AND IMPLEMENT A STANDARD METHODOLOGY	0	0	1	1	0	The function was waived on Case A. While Cases B and C assumed a supporting role.
PROMOTE PROJECT MANAGEMENT WITHIN THE ORGANIZATION	0	0	0	1	1	Cases A and B assumed a supporting role.

GROUP FUNCTION	CHANGE IN GRADE	COORDI NATION	CONTR OLLING	SUPPO RTING	SER VIN G	DESCRIPTION
PROVIDE A SET OF TOOLS WITHOUT AN EFFORT TO STANDARDIZE.	0	0	0	0	1	Cases A and B assumed a serving role.
PROVIDE MENTORING FOR PROJECT MANAGERS	0	0	1	0	1	Cases B and C stopped having a controlling role and assumed a serving one
3:MULTI-PROJECT MANAGEMENT						
IDENTIFY, SELECT, AND PRIORITIZE NEW PROJECTS	1	0	0	0	1	Cases B and C saw an increase in the importance and the introduction of a serving role.
MANAGE ONE OR MORE PORTFOLIOS	0	0	0	0	1	Cases B and C assumed a serving role.
4:STRATEGIC MANAGEMENT						
CONDUCT POST-PROJECT REVIEWS	0	0	0	1	0	Cases B and C assumed a supporting role.
IMPLEMENT AND MANAGE A DATABASE OF LESSONS LEARNED	0	0	0	1	0	Cases B and C assumed a supporting role.
NETWORK AND PROVIDE ENVIRONMENTAL SCANNING.	1	0	0	0	0	Cases A and B saw a reduction in importance.
5:OTHER						
COST/BENEFIT ANALYSIS OF PROJECTS	1	0	1	1	0	Cases B and C saw an increase in the importance and the introduction of a supporting role. Case A and B stopped having a controlling role
EXECUTE SPECIALIZED TASKS FOR PROJECT MANAGERS	1	0	0	0	0	All cases saw a reduction of importance.
IMPLEMENT AND MANAGE A RISK DATABASE.	0	0	0	1	0	Cases B and C assumed a supporting role.
PROJECT/PROGRAM DELIVERY MANAGEMENT	1	0	0	1	0	Cases A and B saw an increase in importance. Cases B and C assumed a supporting role.
RISK MANAGEMENT	1	0	0	0	0	All cases saw a reduction of importance.