Ville Otra-Aho

A PROJECT MANAGEMENT OFFICE AS A PROJECT ORGANIZATION’S STRATEGIZING TOOL
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Dissertation for the degree of Doctor of Science (Economics and Business Administration) to be presented with due permission for public examination and criticism in the Auditorium of the Student Union House at Lappeenranta-Lahti University of Technology LUT, Lappeenranta, Finland on the 12th of September, 2019, at noon.

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Abstract

Ville Otra-Aho
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Organizations are increasingly searching for ways to create value and enhance competitiveness. One way to increase the value contribution of an organization’s assets is to establish a project management office (PMO). A PMO orchestrates an organization’s assets by creating coherence between the assets and the organizational strategic goals; however, selecting consistent PMO processes that match the context to maximize value creation remains challenging. In a similar vein, the changing rate of operational environments affects the chosen roles’ and processes’ value contribution that creates extra challenges for PMO professionals.

The project management is an interdisciplinary research field and to avoid getting stuck with the theoretical and analytical siloes, which limit to look for new horizons the author utilizes two central theoretical concepts as the organizational contingency theory and the dynamic capability view. These theoretical perspectives provide structure, rationality, and guidance for building a fresh perspective of a PMOs purpose as a project organization’s strategizing tool. Then this dissertation shed light on the process how the PMOs orchestrate organization assets and increase organization competitiveness. Finally, this dissertation introduces two novel methodologies for defining and measuring fitness between the PMO roles, contextual variables measured with organizational value contribution.
This dissertation is divided into two parts. The first part gives a general overview of the relevant literature, the research design and the conclusions of the study. The second part comprises the four Publications.

**Keywords:** organizational contingency theory, strategizing, dynamic capability view, organizational project management, project management office
“The most beautiful and deepest experience a man can have is the sense of the mysterious. It is the underlying principle of religion as well as all serious endeavor in art and science. He who never had this experience seems to me, if not dead, then at least blind.

To sense that behind anything that can be experienced there is a something that our mind cannot grasp and whose beauty and sublimity reaches us only indirectly and as a feeble reflection, this is religiousness.

In this sense I am religious. To me it suffices to wonder at these secrets and to attempt humbly to grasp with my mind a mere image of the lofty structure of all that there is.”

Albert Einstein
Acknowledgements

I would like to thank Lappeenranta-Lahti University of Technology LUT for supporting my research team and me. You shared my vision of PMO’s role as a project-oriented organization renewal tool and an organization developer, never forgetting project people that strive development and the value creation processes.

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Ville Otra-Aho

September, 2019, Helsinki
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PART II: THE PUBLICATIONS
List of Publications


Author’s contribution

The contribution of the author of this dissertation to the appended research Publications I-VI is outlined below.

**Article I:** The author is a sole contributor to the article.

**Article II:** The author is responsible for developing the research design, collecting the data, conducting the analysis, writing the article with the other authors.

**Article III:** The author is responsible for developing the research design, developing and testing the research method, recruiting the firms and experts, analyzing and collecting the data, writing the main parts of the article with the second author and conducting the quantitative and qualitative assessments with the third author.

**Article IV:** The author is responsible for developing the research design, building strategy concept into a PMO context, collecting data, writing the main parts of the article with the co-author Stoklasa and participating in the analysis development with co-authors Stoklasa, Luukka, and Hallikas.
Main abbreviations

**Organization contingency theory:** An organization theory which takes a stance that the organization performance is contingent, i.e., dependent on organizations’ internal and external factors (Donaldson, 2001).

**Dynamic capability view:** Organizational high level processes which create, extend, and modify organization assets to make organization more dynamic (Eisenhart and Martin, 2000; Teece, 2007).

**Organization operational environment and performance:** Operational environment is a key mediator of the organization or its subsystem (such a PMO) performance. Environment rate of change resulted from environmental factors such as external turbulence, volatility, and internal complexity reduce organization capability continuously perform optimally. These factors are influenced by competition, customer negotiation power, and technological changes (Siggelkow and Rivkin, 2005).

**Performance vs. Value contribution:** Economic performance is a focal area of strategic research. This dissertation approaches performance from a value contribution perspective and organization capability to reach strategic objectives since organizational actions are not always driven by economic efficiency considerations (Aubry et al., 2007).

**PMO roles interactions and performance:** Measured as the three types of interactions between the PMO roles. The coherent PMO roles reinforce each other creating synergic interactions between organizations assets measured as performance. Parallel role interactions indicate the roles act independently regarding outcome. Antagonistic roles interactions indicate that the role interferes with each other operating in a counterproductive way.
**Strategy-as-Practice:** “Strategy as practice can be regarded as an alternative to the mainstream strategy research via its attempt to shift attention away from a ‘mere’ focus on the effects of strategies on performance alone to a more comprehensive, in-depth analysis of what actually takes place in strategy formulation, planning and implementation and other activities that deal with the thinking and doing of strategy” (Golsorkhi et al., p.1, 2015). In general, practice theory try to explain how practices lead to particular outcomes.

**Value (created):** Organizations and its functions create value for their shareholders. Value creation is measured as benefits per. sacrifices.
1 Introduction

1.1 Background and a literature review

Organizational change, as a phenomenon, is a given for every type of business and industry. Organizations are required to respond to changes in customer preferences and nuances of the competitive environment, as well as shifts in the technological landscape. They pursue this by reforming strategies, organizational structures, and processes (cf. Ansoff, 1980; Chandler, 1962). In so doing organizations create strategic guidelines that describe how they fit with the environmental requirements and how they meet the strategic goals (e.g., Miles and Snow, 1978).

One way to create and maintain organizational fitness is to establish a project management office (PMO). The PMO can broadly be defined as a function, a department, or a group of professionals that supports project organization (Darling and Whitty, 2016). The PMO may operate at low or high levels in the organization, depending on the role it takes (Aubry and Hobbs, 2010). The tasks of a PMO may include defining and maintaining methods and tools for project management; optimizing project resource usage; providing training, support, and guidance for ongoing projects; controlling project progress by monitoring and reporting; and maintaining the repository of project documentation (Dai and Wells, 2004; Aubry and Hobbs, 2010). The mandates and tasks of a PMO differ as widely as the industries and organizations that host them (Darling and Whitty, 2016). However, the primary purpose of a PMO can be concludes as to support organizations in meeting strategic goals and maintaining high organizational value contribution (Aubry and Lavoye-Tremplay, 2018).

Despite PMOs’ explicit purpose in a project organization, they face constant challenges with meeting senior management’s expectations to produce value. Generally, PMOs have a short
life expectancy – the average is two years (Hobbs and Aubry, 2007). One logical explanation for PMOs’ problems is that their roles and associated processes are not sensitive enough to environmental dynamics and capability of PMOs in rigid roles to produce value may erode over time as environment changes. Conversely, those PMOs that are capable renew their roles and processes in response to environmental changes will increase their likelihood of success (Aubry et al., 2009).

Previous studies of PMOs reveal wide variations in terms of how they contribute organizational value (Aubry and Hobbs, 2011; Dai and Wells, 2004; Liu and Yetton, 2007; Ward and Daniel, 2013). Recent studies have emphasized an approach in which a PMO contributes value to an organization function by being integrated into the organizational context as an evolving system (e.g., Aubry et al., 2011; Aubry and Lavoye-Tremplay, 2018). On the other hand, there is little empirical evidence of the PMO’s underlying value contribution mechanisms. This constitutes a gap in the research that requires more studies of PMO roles and their associations with organizational value contributions.

1.2 Research objectives and questions

This research aimed to investigate PMO roles and processes associated with organizational value contributions. Two considerations motivated the focus of this dissertation from both theoretical and practical perspectives. First, the widespread popularity of PMOs and the author’s interest in them presented a challenging and exciting research opportunity to invest in exploring the purposes of PMOs, their roles, and how they are associated with organizational value contributions from a theoretical perspective. Second, PMO-related literature indicates that implementing a PMO is not straightforward. This raised questions as to what
organizational role a PMO should take and how practicing the role might impact the creation of organizational value. This raised an additional question: How can PMOs and their processes maximize organizational value contribution and ensure that organizations meet their strategic objectives when the environment is characterized as turbulent? To investigate PMOs’ value contributions, the author posited the following three research questions:

1) Which PMO roles are associated with an organization's value contribution?

The author postulated that PMO role categories' and processes' value contributions differ from each other. For example, a successfully delivered project may not result a high organization value creation effect from the project. This issue requires further investigation.

2) Which PMO roles and processes are likely to interact with each other, and how? PMOs operate in several simultaneous roles, each of which carry their own processes. The author postulated that these roles are likely to interact. Logically, internally reinforcing roles and processes may produce more value than counterproductive roles; however, how to define, measure, and improve the interactions of the roles has remained unknown.

3) How does the PMO operational environment turbulence affect the PMO roles’ value contributions? Logically, it can be postulated that the impact of PMO environments (internal and external) is likely to affect value contributions of the PMO roles, as an open system.

1.3 Positioning the research

Project management is an interdisciplinary research field that inherits its structures and rationales from organizational theories (Hanisch and Wald, 2012). For example, Organization Contingency Theory of organization and fit (Donaldson, 2001) have been widely applied in a project context (e.g., Aubry and Lavoye-Tremplay, 2018; Miterev et al., 2017; Van Der Merwe, 1997, 2002). Similarly, studies of organizational dynamic capabilities (e.g., Helfat and Peteraf,
2003) have shed light on the project organization processes of how an organization renews its structures and creates core capabilities required for adaptation and high performance (e.g., Davies and Brady, 2000). In addition, strategy as practice research and more precisely, the practicing theory, and a constitutive process of a strategy enactment that focus on how do organizational practices lead to particular outcomes have guide the project organization maturity research (e.g., Cooke-Davies & Arzymanow, 2003).

These overlapping theoretical disciplines provided conceptual clarity for this dissertation, by anchoring a project management office in an organization strategic context such as in a role of developing future organizational capabilities to translate strategies into corporate governance practices through a PMO function, as shown in Figure 1.

Figure 1. Positioning the dissertation.

As part of an organizational project management studies whose focus is on the ways in which strategic portfolio and program practices support organizational value creation (e.g., Cicmil, 2006; Cicmil and Marshall, 2005; Drouin, 2013), this dissertation argues that a strengthening of the PMO’s facilitating role in an organizations’ strategy evolution and value creation
processes will provide a fresh perspective for further PMO research. This dissertation suggests an extension of PMOs’ purpose as an organizational strategizing tool creating contextual strategic guidelines will increase project organizations’ capability to meet the strategic objectives in a turbulent environment and differentiate from competitors.

1.4 Key concepts

The following chapters introduce the three core concepts of this dissertation. Additionally, they present the rationale behind each concept.

1.4.1 Project management office

The PMO is commonly situated alongside other areas of the organization (Darling and Whitty, 2016), and it may operate at various organizational levels. Not every PMO has the same mandate and responsibilities, and as such, the PMO’s role in the management of projects varies from organization to organization. In a similar vein, the duties of a PMO may range from the development of a project methodology to providing support for ongoing projects. Duties may also include assuming responsibility for the governance of the organization’s project portfolio and developing project capabilities.

Hobbs and Aubry (2007) found considerable diversity and a lack of consensus regarding the responsibilities that should be included in a PMO (see also Monteiro et al., 2016). Moreover, there is a great variety in the terms used to name the function and a role a PMO takes in an organization. Monteiro and colleagues (2016) identified 25 unique names and found that Project Office, Project Management Office, Project Support Office, Project Management Centre of Excellence, Project Portfolio Office, and Program Office were among the most widely used in the literature. This dissertation defined a PMO as a project-oriented organization
strategizing tool whose purpose is to renew organizational assets to maximize value contribution and to meet the organization strategic objectives.

1.4.2 Organizational fit, PMO, and organization value contribution

From an organization contingency theory perspective, organizational performance is the fit among an organization’s structures, assets, and the environment (e.g., Donaldson, 1987). In this situation, organizational assets interact with external environment as a system that produces desired outcomes (e.g., Miller and Friesen, 1984; Siggelkow, 2002). Organizational fitness of can be defined by using three criteria: 1) connectedness between the organizational assets, 2) synergy in which the interactions of the assets reinforce each other, and 3) coordination, as how a pattern of the assets support commonly agreed organizational objectives (Sankaran, Müller, and Drouin, 2017, p. 25).

Outcome of fitness can be measured as process efficiency; it is measured by the ratio of outputs divided by the inputs of a production process (e.g., McLaughlin and Coffey, 1990). In such a case, efficiency-related performance measures, such as process time, cost, and output quality, provide an accurate quantification of an outcome of the “fitness”. On the other hand, if the organization and its functions operate as an open system, then the production process inputs result in several outputs and outcomes that can be further refined as inputs of a cyclical process creating organization value. This type of open system adjusts itself by using feedback loops during the production process (e.g., Winter and Szczepanek, 2008), and it is necessary to quantify performance from a value creation perspective. For example, in an innovative delivery process, an organization and self-steering teams are likely to search for new value creation and co-creation possibilities with stakeholders, which need increased flexibility during the research & development phase and require non-financial performance indicators.
Similarly, Desouza and Evaristo (2006) suggested that shifting a PMO performance focus from efficiency to a holistic value creation perspective and the measures, such as project-, PMO-, or business value-centric, increases understanding how PMOs create value in a project organization. Further, Aubry et al. (2011) proposed that an organizational impact of a PMO should be defined as a balance between several value contribution dimensions. These dimensions are quantified with an examination of 1) rational goal accomplishments (such as those measures related to productivity), 2) benefits and growth of an organization, 3) capability development and learning, and 4) the organization’s internal process controls such as project processes efficiency, effectiveness, and process quality dimensions (Quinn and Rohrbaugh, 1983 in Aubry et al., 2011). This balanced value perspective is adopted in this dissertation.

1.4.3 An impact of an environmental turbulence on organizational value contribution

Geraldi et al. (2011) introduced five types of organizational complexity dimensions: structural, environmental, dynamic, spatial, and socio-political complexity. Organizations manage this complexity by integrating and differentiating organizational structures, which in turn require integrative mechanisms such as a PMO and its processes to maintain high value creation of the organization assets. Generally, increased complexity decreases operational performance and value contribution, especially if complexity is not actively managed. However, properly-adjusted PMO roles and processes accelerate value creation and increase organization capability to meet strategic objectives in a complex environment.

Project organization complexity can be operationalized as the rate of change associated with the two intertwined dimensions of structural and dynamic complexity (Brady and Davies, 2014). Structural complexity is associated with internal project process and project’s product characteristics, such as interdependencies among the product elements. Dynamic complexity
is associated with the rate of unexpected external changes i.e. operational environment turbulence. These two project organization complexity dimensions are commonly used mediators in project literature, and they are associated with both project and project organization success (Brady and Davies, 2014). In addition, this dissertation separates external environments into two dimensions: the organizational environment and PMO operational contexts. For example, the organization external environment can be characterized according to customer negotiation power, technological changes, and competition which all increase dynamic complexity and create turbulence. PMO operational context complexity can be mainly characterized according product and production process complexity dimensions.
2 PMO as a strategizing tool

The following chapter describes how the theories related to fundamental concepts are adapted and used in this dissertation to define rationales for PMOs’ roles and processes in association with organizational value contribution and capabilities to meet the strategic objectives.

2.1 Contingency theory, strategy management, and fit

According to organization contingency theory, organizational performance associated with correct strategic and tactical decisions, relevant organizational structures, appropriate functions, and other assets in an operational environment (c.f. Ansoff, 1980). An optimal fit among structures, processes, and organizational assets results in high organizational performance (e.g., Burns and Stalker, 1961; Donaldson, 1987; Drazin and Van de Ven, 1985; Lawrence and Lorsch, 1967).

One concept of organizational fit is grounded in the rationale of the contingency theory of strategy management (e.g., Chandler, 1962; Venkatraman, 1989; Venkatraman and Camillus, 1984) and how organizations respond to the environment changes to maintain fitness (Lawrence and Dyer, 1980; Miles and Snow, 1978; Miller and Friesen, 1982). In this perspective, the fit refers to a senior management member’s strategic response to the environment, and the processes of adapting organizational resources and capabilities with environmental requirements to meet the strategic objectives (e.g., Siggelkow, 2001, 2002).

Despite the importance of fit and accomplishing the strategic objectives providing empirical evidence of the organization’s strategic process and practices, arriving at an organizational fit,
maintaining the fit, and measuring fit in order to manage it has been challenging (Shoonhoven, 1981).

For example, Lawrence and Lorsch (1967) defined, the higher the environmental certainty, the more formalized an organization’s structures and standardized processes are in contributing high value. Conversely, environmental uncertainty increases organization need for task differentiation and specialization with regard to maintaining high-value contribution. However, differentiation and specialization requires more integration and coordination between the organization assets. Miles and Snow (1978) defined three competitive organizational actions related to responses to the environment aimed at maintaining high performance and competitiveness. Each of these actions and state of fit was described as taking the form of analyzer, prospector, or defender. All these three proactive strategic activities outperformed the reactive activities. Furthermore, each response or organization configuration reflected a unique and a logical set of choices the organization had made regarding organization assets, and each provided information about the relationships between the assets. The configurations also described how the organization has aligned its assets with the context and the mechanisms by which it integrated the organization tangible and intangible assets to create coherence between them that results high organizational performance i.e., gestalts (Miles and Snow in DeSarbo et al., 2005; Miller, 1981).

However, the concepts fell short in defining associations among the high level processes of creating and maintaining evolving fitness. Nevertheless, maintaining high organization fitness requires continuous integration and differentiation of organizational assets, according to environmental requirements (Lawrence and Lorsch, 1967). Moreover, maintaining the fit in a dynamic environment is likely to require fine-grained cooperation such information sharing and leaning (e.g., Lawrence and Dyer, 1983), which is entangled with social practices between
the professional teams and shareholders (Andriopoulos and Lewis, 2009). This is especially the case in “knowledge-intensive” organizations such as those which are project-oriented, delivering high technology products and customer solutions. Finally, there may be more than one high-value contribution fit within an organizational performance landscape that organizations can aim for (e.g., Adler et al., 1999).

2.2 Dynamic capability perspective to the fitness

According to the resource-based view of organizations, competitive advantage is associated with a unique bundle of the organizational assets (Barney, 1991). Furthermore, an organization dynamic capability is the capacity of an organization to purposefully modify its resource base (Helfat, 2007, p.4). The organizational dynamic capabilities can be defined as high-level processes that build, integrate, and reconfigure organizational assets (e.g., Eisenhart and Martin, 2000; Teece et al., 2007; Teece, 2014). These include routines (or collections of routines) for “producing significant outputs of a particular type” (Winter, 2000, p.983). These capabilities can be seen as sources of organizational adaptation and strategic flexibility that enable an organization renew its assets to create high performance and maintain strategic direction while environment changes (Teece and Pisano, 2004) i.e. maintain contextual fitness.

From a project perspective, system integration capabilities, such as the ability to design and integrate subcontractors’ components into value contributing systems, are included in the description of a modern organization’s core capabilities (e.g., Hobday et al., 2005). Further, Davies and Brady (2000) introduced the concept of an organizational learning cycle that integrates a learning process, organizational renewal, and performance. Further, Cooke-Davies (2002) presented a cycle of capabilities development in which organizational processes and
practices were associated with individual project performance, resulting in changed project ordinary capabilities, and enhance in organization value creation.

2.3 A PMO as a project organization’s strategizing tool

Aubry et al. (2007, p.332) defined organizational project management as “a new sphere of management where dynamic structures are articulated as a means to implement corporate objectives through projects to maximize value.” A PMO can be broadly defined as an organization entity (Aubry et al., 2012; Aubry et al., 2009; Aubry and Hobbs, 2007; Monteneiro et al., 2016) which encompasses other organizational entities such as those involved with program and portfolio management and related operational processes. From the strategic perspective every organizational function (such as a PMO) and the processes by which it operates are intertwined with organizational strategic objectives. Analogically, PMO roles and processes act as a unified set of activities that define how the PMO acts and it is expected to act in favor of the objectives. As such, these PMO roles, processes, and related activities can be characterized as strategic when they are associated with creating a particular direction and outcome that increase organization competitiveness (e.g., Johnson et al., 2003; Vaara and Whittington, 2012).

Aubry et al. (2011) defined eight PMO role categories, covering more than thirty functions and related contextual PMO tasks. Desouza and Evaristo (2006) described three similar high level role categories as 1) supporters of organizational governance procedures, 2) information and knowledge managers, and 3) coaches. Unger et al. (2012) and Müller et al. (2013) identified PMO roles as controllers and coordinators, servers, and supporters or partners. These role categories were associated with the types of interactions between organizational assets a PMO
creates to maximize value contributions from and to projects. Further, a PMO’s capability to meet the strategic objectives and to deliver organization value is associated with the interactions of the selected roles and processes within environment i.e. PMO capability to create organizational fitness.
3 Research design

In the following chapters, the research paradigm is introduced through three arrays (ontology, epistemology, and methodology) (e.g., Guba, 1990), which were used to investigate the three research questions as which PMO roles are associated with an organization's value contribution, which PMO roles and processes interact with each other, and how and how does the PMO operational environment rate of change affect the PMO roles’ value contribution?

3.1 Research approach and theoretical perspectives

Ontology, epistemology, and methodology are the central elements of philosophy. Ontology describes the nature of being as an answer of questions related to what reality consists of and how our prior understanding contributes to our current understanding of the existence of things such as attributes, characteristics, and relationships among objects. Epistemology focuses on the theory of knowledge, methods, beliefs, and truths, which underlie our assumptions and contribute to answering the questions of how we know something. (Blaikie, 1993). The third element, methodology, speaks to how individuals find out about reality. The author focuses on PMO practices-in-use as the primary unit of analysis, and these three elements create the cornerstone for a research paradigm, i.e., how PMO’s value contributions should be addressed and investigated.

This dissertation is grounded in a realist-constructivist approach. More precisely, the research questions are investigated through a realist ontology and a constructivist epistemology. Realist researchers’ ontological perspectives define a social world that exists independent of human thoughts, actions, and observations (Blaikie, 2007). In other words, reality is objective such as knowledge of organization value creation is not dependent on the researcher or observers.
circumstances. A constructivist epistemology assumes that reality involves a learning process bounded by subjectivity and that it is associated with previous experiences (Järvensivu and Törnroos, 2010), as shown in Table 1.

<table>
<thead>
<tr>
<th>Approach</th>
<th>Naïve realism</th>
<th>Critical realism</th>
<th>Constructivism</th>
<th>Naïve relativism</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ontology</strong></td>
<td>Only one true reality exists.</td>
<td>Reality is specific and local. Truth is contingent.</td>
<td>There may be a reality that is specific and local. Truth is contingent.</td>
<td>There is no reality beyond the subject matter.</td>
</tr>
<tr>
<td><strong>Epistemology</strong></td>
<td>It is possible to know precisely what the reality is through objective empirical observations.</td>
<td>It is possible to move closer to local reality and truth through empirical observations that are bounded by community-based critiques/consensuses.</td>
<td>It is possible to understand local reality and truth through community-based knowledge creation and empirical observations bounded by subjectivity.</td>
<td>It is possible to form an understanding of the subjective reality through the analysis of the subject's account of knowledge.</td>
</tr>
<tr>
<td><strong>Methodology</strong></td>
<td>Direct empirical observations</td>
<td>Empirical observation bounded by subjectivity and community-based critiques/consensuses</td>
<td>Community-based knowledge creation through empirical observations bounded by subjectivity</td>
<td>Analysis of knowledge structures and processes by observing texts</td>
</tr>
<tr>
<td><strong>Research method and process</strong></td>
<td>Deductive reasoning, theory testing</td>
<td>Abductive; theory generating and testing</td>
<td>Abductive; theory generating and testing</td>
<td>Inductive reasoning; theory generating</td>
</tr>
</tbody>
</table>

Table 1, The Research Approach (adapted from Järvensivu and Törnroos, 2010).

For example, epistemological lenses uncover the meanings of relatively abstract phenomena such as a PMO’s value contribution. For example, the research process involves collecting knowledge from a wide selection of experts and data from various sources. The process may involve interviewing, collect information during focus group sessions, and execute surveys
supported by statistical analysis methods. In that sense, the constructivist paradigm defines truth as it is constructed by participants during the research process.

In this dissertation, PMOs’ value contribution is investigated as the products of partly social constructs of project experts through the theoretical lenses. The research process is supported by the analytical methods and quantifying tools which confirm findings of contingent truth. In that sense, truth becomes partially objective.

3.2 A description of the research process

The constructivist-realist approach aligns with the qualitative and quantitative research methods. The qualitative method explores the phenomena such as the organization value creation. The quantitative method quantifies the phenomena such as related constructs and their relationships. More precisely, the former views social reality as constructs of people, and the latter sees social reality as the observations of people, restricted from the environment, using known facts. The selected constructivist approach utilizes the benefits of both quantitative and qualitative methods, providing a deep understanding of abstract phenomena, such as PMO value contribution.

The research method is grounded into a sequential logical reasoning process, which includes phases of synchronized deduction, induction, and abduction. Each phase increases understanding of the investigated value creation phenomena. The deductive reasoning process tests the propositions and follows the general rules, resulting in an outcome. Conversely, the inductive reasoning process involves an iterative, stepwise process of increasing explanatory power until the only or the most probable solution is left. Finally, the abductive reasoning process focuses on finding the best theoretical foundation that results in the most probable
explanation for the phenomena supported by empirical observations. The constructivist research approach can be described by five phases, as shown in Figure 3.

Figure 3. A Constructivist Research Approach (modified from Kasanen et al., 2013).

For example, the abductive reasoning process follows observations (i.e., Publications I, II, and III), creating the most probable explanations for the PMO value contribution phenomena (Publications III and IV).

3.3 Relevance of the research process phases in the dissertation

For this dissertation, a construct was developed involving PMO roles and two main methodologies to investigate PMO role interactions in both PMO operational and organizational contexts. At first, this dissertation introduces a design of experiment methodology (DOE) to investigate the PMO role and process interactions in a specific context using expert group method. Second, this dissertation utilized a unique methodology that enables the investigation of several complex system interactions in a context. The methodology is drawn from the foundations of a qualitative comparative analysis (fsQCA). The following five phases describe the constructivist research process and relevance of the phases to this dissertation:
Phase 1: Focus on problems that organizations and people face every day.

Why are PMOs suffering from low performance, short lifecycles, and overall senior management dissatisfaction? Are there differences among PMOs’ value contributions, and why? Do environmental characteristics impact PMOs’ role selections and value contributions? Generally, what is the underlying rationale behind PMO value contributions?

Phase 2: Create constructs, i.e., the core PMO role categories, and develop a method to analyze PMO roles and processes impacting organizational value contributions in a sequential process, including the following:

Step 1. In Publication I, project managers’ capability to evaluate complex project i.e., customer solution performance and differentiate project performance from value creation processes, were investigated. Also, the publication utilized a service quality (SERVQUAL) value creation based framework to categorize key project performance metrics into organization value categories (Parasuraman et al., 1985). It also utilized an analytic hierarchy process tool (AHP) (Saaty, 1990) evaluate and commensurate with performance parameters of the projects into the value contribution categories.

Step 2. In Publication II, the three PMO role categories (controller, coordinator, and supporter) association with project efficiency and effectiveness were investigated. The results indicated problems with PMOs’ controlling role and both project performance and organizational value contributions. These problems require further investigation into the high level roles PMOs take in an organization and also, the underlying logic of how PMOs’ roles and processes contribute to organizational value.

Step 3. In Publication III, a categorization of the PMO roles was created and further bridged to the operational context characteristics. The development process was
directed and redirected by the organizational contingency theory, providing a rationale and explaining value contribution mechanisms of the PMO roles in a context. Furthermore, the roles were divided into two categories as coordinative and cooperative types according to their interaction type and impact on an organization performance. The experimental design method for evaluating role interactions and organizational value contributions were used.

Step 4. In Publication IV, the PMO variables, PMO operational context, and environmental variables were drawn together and analogically tested with the propositions developed from the selected organizational theories. For testing purposes, a unique methodology was adapted.

**Phase 3: Create an open environment that promotes learning with various shareholders, i.e., construct workshops with the PMO and project experts.**

During the research processes (Publications I, III, and IV), the project and PMO experts were actively involved in the research processes and development of the methodologies, including several feedback loops and subsequent study phases.

**Phase 4: Bridge the results with current empirical knowledge.**

A primary objective of this dissertation was to investigate how a PMO contributes organizational value, and why. This study was designed to provide managerial implications for PMO experts. The empirical evidence of Publications II, III, and IV indicate that PMO roles and processes interact, and their value contributions are context-specific. These interactions are expected; however, empirical evidence has been scarce. In-depth data analysis of PMO value contributions revealed that 80% of the PMOs contribute low value (Publication IV). The
authors developed methods with project experts and analyzed data to investigate reasons for the low-value contribution phenomena in Publications III and IV.

The author postulated (Publication II) and later confirmed (Publications III and IV) that impacts of PMOs’ roles in value contribution are significantly associated with the PMO role characteristics, interactions, and environmental variables. By using the experimental design (DOE) and fuzzy set qualitative comparative analysis (fsQCA) methods, this dissertation shed light on how PMO roles contribute value.

In Publication IV, the six PMO configurations were identified (three predict high-value contributions, and three predict low contributions). The developed methods enable PMO experts to adjust unique PMO roles to maximize organizational value contribution.

Phase 5: Bridge the results with theoretical knowledge.

To investigate the types of fit described above, this dissertation utilized two organizational theories and frameworks to enrich the concept of fit, and to and clarify how an organization arrives at a fit. First, organization contingency theory, a configuring organizational structure and strategy management as a perspective were employed (e.g., Mintzberg, 1979; Miller, 1992) and rationale of the systemic interactions between organizational assets and environment were adopted (e.g., Chakravarthy, 1982, Hrebiniak, 1981). Second, a capability-based view was utilized (e.g., Teece, 1997; Winter, 2000) to describe links between an organization’s internal processes such a PMOs roles in arranging current assets, as well as creating new ones to maintain internal coherence between the assets and environment as measured by high organizational value contribution.

Also, included in this dissertation is the introduction and testing of a novel analytical framework for the validation of fuzzy rules using real-life data. The unique research
methodology applied in this paper is drawn from foundations a fuzzy set of qualitative comparative analysis (fsQCA) (e.g., Fiss, 2011; Ragin and Fiss, 2008). It was inspired by the fuzzified set-theoretic analysis theory (e.g., Stoklasa et al., 2017). Especially, in the fourth Publication, this dissertation investigated the PMOs’ role interactions with an environment as a system. In this Publication, the general organizational theory base constructs, and propositions were tested with the configurations emerged from our PMO data. During this process, we realized that premises of the organizational theories and underlying rationales were too generic to explain PMO value contributions. The PMO value contribution phenomena inherent in open system characteristics are equally effective in PMO configurations that include PMO roles with distinctive role characteristics. The configurations also acted in a nonlinear manner, which indicates that strategy evolution and strategy execution is a complex evolving process. The author identifies a project management office as an organizational strategizing tool facilitating the strategizing processes to meet the strategic objectives (e.g., Jarzabkowski and Kaplan, 2015). This dissertation aims to increase understanding of the project management office value creation logic in a field organizational project management.

3.4 The selected mixed methods research strategy

“The main objective of any research is to confront theory with the empirical world” (Dubois and Gadde, 2002, p.555). This dissertation adopted a mixed methods research strategy, including qualitative and quantitative research phases. More precisely, in the first Publication, qualitative data analysis was used to build an understanding of PMO value contribution phenomena. The following publication emphasized quantifying the value contribution and interpretation of the results; however, the process did not focus on finding a specific solution or configuration for PMO value contribution problems, i.e., the means associated with a pure
pragmatist research philosophy. For example, the second Publication focused on PMO roles and their relationships to organizational value contributions, using quantitative research methods and variable reductions to increase the explanatory power of the models. The third Publication focused on developing and adapting experimental design methodology to define and measure PMO role interactions and value contributions when environmental rates of change varied. The fourth Publication emphasized a qualitative study on the PMO value creation phenomena from a system perspective using a fuzzy set analysis method.

3.5 Strengths and weaknesses of a constructivist research approach and mixed methods research strategy

One of the key strengths of an abductive research process is the possibility for research process adjustments during iterations of the research process (Dubois and Gadde, 2002). For example, a sequential process increases understanding of the PMO value contribution mechanisms, extracting tacit knowledge from project experts during the induction phase, and testing the propositions during the deduction phase. The authors PMO and project management background allowed the author to create and pretest the constructs before the expert workshops such as focus group sessions. During the sessions, the background experience enabled the author to reflect on answers to the PMO operational environments such as those having to do with organizational culture, project best practices, and the theoretical background.

This research process can be characterized as a continuous discussion between the theories and the expert experiences i.e., empirical world guided by a frameworks and the identified problem. For example, during the research process, it was noticed that the organizational grand theories are too generic to describe and predict PMO value contribution phenomena, and more middle range theories are needed. Similarly, the developed analysis methods were able to identify that
80% of the PMOs were contributing low organizational value. Direction and redirection enabled the author to (pre)identify the challenges and collect data outside the original scope, and to redirect the theoretical frameworks and research process (see Figure 4).

![Diagram](image)

Figure 4, Matching the Theory and Empirical World during the Abduction Process (modified from Dubois and Gadde, 2002).

One of the key benefits of using the mixed methods over a single method research strategy is that a researcher can select the most effective methods (qualitative or quantitative or both) that fit into context and collect essential pieces of information to build a holistic description and an explanation of the phenomena.

### 3.6 Data collection

Research data were collected in two ways. Publications I and III used both qualitative and quantitative data, i.e., parallel way expert interviewees and focus group sessions supported by
best practice framework and statistical methods such as analytic hierarchy process and experimental design and analysis tools. Publications II and IV used one primary data source which were collected as survey data and supported by the sequential statistical analyses. For example, Publication IV used the fuzzy set qualitative comparative analysis method. The following chapters describe the two characteristics of the data.

3.7 Survey data

The survey used in the Publications II and IV was targeted to organizations operating in Finland. The web survey was sent to 140 project organizations that had a PMO or a similar type of project coordination unit within the organization. Before addressing the questionnaire, it was tested in a pilot survey whose participants included project academics, consultants, and PMO practitioners. In total, 73 answers were received (a response rate of 52%). The samples were collected from six industry sectors: information communication technology (27%), the public sector (23%), industry (13%), service sector (14%), insurance (12%), and other (11%). Also, 18% of the organizations had fewer than 100 employees, 35% had fewer than 500 employees, 72% had fewer than 2,000 employees, and 38% had between 2,000 and 10,000 employees. A majority of the organizations (51%) had a project allocation percentage between 10% and 40%. Most (77%) of the PMOs were three to six years old, and the PMOs were focused on 1) both internal and external project deliveries or 2) external project deliveries only (75% of the PMOs). Survey participants worked primarily in PMOs as full- or part-time employees (70%); 61% held positions in the organization as either the head of a PMO, or as a portfolio manager, project manager, or other PMO-related position.
3.8 Data from the interviewees, focus group sessions, and experiments

A combination of interview responses and statistical data analysis methods was used in Publications I and III. In the first publication, data were collected in two phases. In the first phase, the concept was built on a literature review and a SERVQUAL framework. During the second phase, the five project experts screened the seven customer solution projects using the selected value contribution variables. The detailed expert backgrounds and the customer solution project characters are introduced in Publication.

In the third publication, PMOs’ role performances were evaluated with the focus group, and then value contributions knowledge was used to build semi-structured interviews and configurations. The configuration structures were constructed by using experimental design software, and the PMO experts evaluated the configuration. Table 5 summarizes the samples, adopted methods, and analyzed data.

<table>
<thead>
<tr>
<th>Publication I</th>
<th>Publication II</th>
<th>Publication III</th>
<th>Publication IV</th>
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<tbody>
<tr>
<td>Sample</td>
<td>5 project experts</td>
<td>The selected 73 PMOs</td>
<td>10 project experts (focus group) and 9 PMO experts</td>
</tr>
<tr>
<td>Data collection method</td>
<td>Interviews and semi-structured questionnaires supported by an AHP tool and a SERVQUAL categorization</td>
<td>Web questionnaire</td>
<td>Expert panel and semi-structured questionnaire (experimental design)</td>
</tr>
<tr>
<td>Data characteristics</td>
<td>Postmortem analysis of the customer solution projects</td>
<td>Background information of the 73 project organizations</td>
<td>Background information of the PMO performance</td>
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<td>Experts’ opinions and experiences of the project</td>
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### Research design

**The analysis method**
- Interviews
- Service quality framework
- Analytic hierarchy process analysis method
- Factor and linear regression analyses
- Focus group sessions
- Experimental design
- Qualitative comparative analysis

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<th>The analysis method</th>
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<td>Interviews</td>
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<td>process analysis</td>
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Table 5. Sampling and Collection Methods of the Publications
4 Summary of publications I-IV


Clear performance targets enable project managers to make the right decisions in advance and aim the common organizational goals to improve both project and organizational success. In the first publication, the purpose was to test whether project experts could identify and differentiate performance and value indicators during the project lifecycle. The seven Information Communication Technology (ICT) projects were compared using a post-mortem analysis. Results indicated that the project experts were able to identify and overcome the contradictory value indicators and performance metrics using a SERVQUAL framework and an analytical hierarchy process. The results indicate that project output may not always be anchored to the value the customers and the organizations perceived from projects. Without the supportive tools for selecting the organization value indicators linked with the project performance metrics, the indicators are likely to conflict between project performance and organization and project success in the long run.

The Publication enriched three aspects of project performance measurement. First, it identified the impact of value and service in project performance. Second, it created a process of establishing overall value contribution indicators associated with the projects’ internal and external efficiency. Third, the paper introduced a tool to commensurate various contradictory performance indicators. The study suggested that firms should establish project objectives using value creation logic, link value with project performance, and track performance during the delivery phase. It also noted that firms could benefit from multidimensional performance systems by finding gaps in project value creation.
Publication II: Impact of the PMOs’ Roles on Project Performance, International Journal of Information Technology Project Management

In the second publication, data were collected from the project organizations to evaluate the impact of PMO roles and processes on project performance. By using factor and regression analyses, the authors showed that the PMO’s coordinator and trainer role related processes have a positive association with project performance. Surprisingly, a PMO in the role of a strategy manager has a negative impact on project effectiveness, i.e., meeting the project goals. Analogically, the results indicate that continuous challenges in achieving project goals harm organizational value contributions from project and decreases competitiveness. The study suggests further investigation into the mechanisms how PMO roles contribute to organizational value.

Publication III: Value contribution through a project management office, International Journal of Information Technology Project Management

Organizational theories indicate that control and management activities are likely to contribute the most value in a stable environment. Conversely, coordinative and supportive activities are expected to fit into the dynamic environment. (e.g., Burns and Stalker, 1961) Previous PMO studies postulate that the mechanisms by which PMO roles contribute to organizational value differ from one another. Also, it is expected that the PMO executes several simultaneous roles that interact with each other, and these interactions are sensitive to a PMO’s operational context.

This publication has three major contribution areas. It confirms that the PMO environment and interactions between PMO roles have a significant impact on the PMO’s value contributions. Also, the findings indicate that PMOs have an essential organizational role in renewing project-
oriented organizations and creating a fit between organizational assets within the context. The study adapts a design of an experiment method and collects PMO expert data to evaluate value contributions of the context-sensitive PMO roles.

Publication IV: A Role of a Project Management Office in an Organization Renewal, Conference proceedings PROMAC APAC

According to the organizational theories, and from an open systems perspective, it is suggested that organizations and their functions interact with the environment, creating a system of interactions i.e. gestalts. Similarly, the interactions between PMO roles and contingency variables are likely to have a significant impact on PMOs’ value contributions as a system.

This study has three primary contribution areas. At first, data revealed that 80% of the PMOs were low-value contributors. Second, results also confirmed that there are systematic and significant associations between the PMO, the contingency variables, and the organizational value contributions. Third, the authors did not find evidence that a high degree of PMO authority, project management centralization, multi-project administrator, process developer, learning facilitator, and information manager roles as a single items had significant effects on organizational value contributions.

The authors identified the three high-value contribution PMO configurations which the authors named as “vertical integrator,” “organization administrators,” and “organization facilitator.” Also, the authors identified three low-value contribution configurations. These configurations emerged from the data indicated the high value contributing PMO roles act as a system of items called PMO configurations, that the managers and project organizations should aim.

The paper introduced a novel method based on qualitative comparative analyses and fuzzy sets to investigate the validity of selected rules representing patterns in data. From a theoretical
perspective, the Publication extends organizational project management and a role of a PMO toward a strategy as practice and a system thinking concepts.
5 Discussion

The following chapters interpret the findings and answer the following three research questions: 1) Which PMO roles are associated with an organization’s value contribution?; 2) Which PMO roles and processes interact with each other, and how?; and 3) How does the rate of change in the organization’s context and environment affect the PMO’s value contributions? Also, the chapters provide remedies for the general PMO problems such as senior managers’ dissatisfaction and a short PMO lifecycle.

Results in Publication I indicate that project managers have a deep understanding of how projects create organizational value. On the other hand, key performance indicators of the senior management and projects, i.e., expectations what organization value projects should deliver and how value is defined or measured during project, are sometimes conflicting. The statistical analysis and results in Publication II indicate similar conflicts in the PMO controlling role and project performance. Data revealed that PMO supporting and coordinating roles have a positive impact on project efficiency and effectiveness. The result indicate that a PMO strategic “controlling” role may harm a long-term organization and project success, i.e., effectiveness. A reason for these conflicts and PMO value creation mechanisms were further investigated in Publications III and IV.

The papers show significant environmentally-dependent interaction effects between PMO roles (Publications III and IV). For example, the controlling role and processes are associated with organizational value contributions, however, the interaction mechanisms differ from the other PMO role types such as coordinative and supportive PMO roles (Publication II). The controlling roles and processes as an independent role can even have a negative value contribution effect, which is unexpected. Furthermore, the results in Publication III revealed
that the PMO's project developer role may act as a core role with the highest environment-independent value contribution. Also, the strategic coordinator and the knowledge manager roles are both environment-independent value contributors.

On the other hand, the value contributions of the performance coordinator and multi-project administrator roles are environment-dependent. The performance coordinator role contributes the most value when the environment rate of change is low; however, value contribution of the role decrease, when the rate of environmental change increases. The value contribution of the multi-project administrator role is the highest, when the environment rate of change is high. This result indicates that “extra” coordination may not provide sufficient value, when the environment is stable; however, when environmental turbulence increases the additional effort of coordinating multiple simultaneous projects will provide significant organizational value.

Finally, the results (Publication IV) indicate the significant single variables and interaction effects between the contingency variables as a system of interactions. Conversely, the results did not indicate evidence that a high degree of PMO authority, project management centralization, multi-project administrator, process developer, learning facilitator, and information manager roles as single independent variables have significant effects on organizational value contribution. Further, the authors were able to identify the three simple PMO role configurations. Adjustment of these configurations creates a path toward the organizational strategic objectives. These findings suggest that while the PMO executes several roles, an internal coherence between the roles and environment become critical for PMO’s capability to generate organization value.

Results of Publication III and later Publication IV indicate that the PMO coordinative roles (such as knowledge manager [Publication III], multi-project administrator, and developer
[Publication III and IV]) act as the core PMO roles in which the PMO manager can align with the peripheral PMO roles and processes. These peripheral integrative roles include strategic coordination, performance coordination, and information sharer roles (see meta-routines, e.g., Adler et al., 1999).

The PMO and project experts in Publication I indicated that learning and information sharing contributed project value. Surprisingly, the results of Publication IV did not confirm significant or constant interactions between learning, information sharing and the other roles (i.e., roles focused on supporting team cooperation efficiency). There may be few logical explanations for the phenomena. For example, a value contribution of the roles is significantly dependent on the environmental characteristics and the roles interactions with each other. The roles’ interaction effects indicate that PMOs’ cooperative and supportive roles are likely to benefit from some degree of formalization and vice versa. The results in Publication III show that only few PMO core roles are environment-independent high-value contributors, and the peripheral roles support value contributions of these core roles.

However, value contribution of a PMO multi-project manager role is high only when the environment rate of change is high. When the rate of environmental change increases the controlling and coordinative roles (such as that of the strategic coordinator) may start to resonate with other high-value contribution roles such as that of the multi-project manager and the project developer roles. These interaction effects may explain the underlying phenomena of the PMOs’ controlling role negative interaction in Publication II.

From a PMO and organization maturity perspective, the low maturity PMOs may have been focused on managing operational complexity through implementing best practices and simplification such as formalizing organization vertical management structures and
standardizing processes without paying attention to feedback and forward information flows. These vertical information flows may hide hidden political agendas inside the information flow. These hidden agendas may contain a high amount of conflicting information, likely to affect team focus in a negative way. In addition, the transparent governance processes may lure senior managers into involving themselves in managing project tactical operations. Further, senior managers’ controlling activities may amplify the effects of already rigid project governance models, thereby creating confusion and reducing project team autonomy and performance. These activities may include the risk of neglecting changes in organizational value chains that continuously occur in a turbulent environment. Also, the informal management processes are likely to erode rigid organizational structures and the management processes over time.

Finally, small organizations may have a limited number of resources and alternative value contribution paths to produce value with customer. In cases such as these, they are likely to focus on the PMO cooperative roles and learn to co-produce value i.e. co-specialize with customers that require organizational and team flexibility.
6 Conclusions

The author selected a theory-based and empirically-validated approach to evaluate PMO roles’ value contributions in a pluralistic project organizational context, in which power is diffused, work is knowledge-based, and influenced by conflicting goals. By using the developed methods, we were able to identify the five most value contribution roles and analyze their interactions. The following chapters conclude theoretical, managerial, and methodological implications of this dissertation.

6.1 Theoretical implications

The concept of organizational fit and arriving at fit is grounded in the rationale of organization contingency theory and linked to the processes of adapting organizational assets with environmental requirements. However, rigid organizational structures, elements, and contingencies reflecting past changes may be too rigid to be proactive and efficient in a turbulent project organization environment, where work is knowledge-based. Furthermore, a dynamic capability view provided a fine-grained perspective of organizational processes that create, extend, and modify organizational assets in the process of maintaining a strategic course and a fit. These theoretical premises provided a solid ground to investigate PMOs’ value contribution phenomena; however, they approved to have a limited capability to explain the inter-organization strategizing process and the role of a PMO in the process.

The previous studies indicate that a PMO is tightly aligned with a project’s organizational functions (Aubry et al., 2009) and organizational value contribution processes (Aubry et al., 2012). This study indicate that a PMO can be characterized in an important organizational
function and can be anchored into strategizing process context executing strategic activities. This dissertation extends the view and shows that the PMO role and processes can be identified as strategic because they are associated with creating a direction, outcome, or competitive advantage of the organization (see, e.g., Johnson et al., 2003). In addition, the results of this dissertation asserted that a PMO could be seen as a strategy practitioner and an actor who shapes the constructions of low level processes and practices (Jarzabkowski et al., 2007). More precisely, a PMO acts as a strategic actor, and the PMO roles can be characterized as high level contextual strategizing processes which comply with situation-specific activities in a process that bridges strategies to everyday work (e.g., Jarzabkowski et al., 2007; Langley and Tsoukas, 2010; Vaara and Whittington, 2012). Generally, a PMO acts as a “middle manager” entangling organizational units (Balogun and Johnson, 2004), unifying divergent ideas, and solving the organization’s conflicting strategic objectives (Floyd and Wooldridge, 2000; Jarzabkowski and Sillince, 2007) and acting as a modern strategy support function (e.g., Paroutis and Heracleous, 2013).

A PMO and its high level roles can also be identified as a project organization dynamic capability, a high level method that creates, extends, or modifies organization project resources (ordinary capabilities). For example, Jarzabkowski (2008) introduced a repeatable evolutionary strategizing process that involves simultaneous interaction with organization members about administrative procedures and performance monitoring as these low level procedures are modified. Similarly, the efficient PMO processes creates coherence between the project resources to maximize value contribution and modifies the resource base to meet the strategic objectives efficiently.
Conclusions  53

Gulati et al. (2012) defined the types of collaborative processes – coordinative and cooperative – from which distinctions can be applied to PMO roles and process context. The coordinative PMO processes are grounded in centralization are driven by an administrative type of collaboration processes. The cooperative PMO processes are mainly driven by social interactions and relational attachments, as well as integration methods which are inspired by a voluntary type of collaboration and mutually beneficial relationship that creates value. The outcome of successful coordination results in high efficiency, effectiveness, and flexibility within the organization. However, fruitful cooperation creates stability and equality, as well as a shared vision toward the strategic objectives. (Gulati et al., 2012). Similar distinctions between coordination and cooperation activities can be identified in a project context (e.g., Morris et al., 2012).

The project management office’s strategist organizational role includes acting as a close facilitator of an organizational strategizing processes such as transforming senior management intentions into strategic action, creating methods for supporting cooperation between project professionals, overcoming defensive routines. However, more fine-grained theoretical framework anchored practicing theories and structuration theory (e.g., Jarzabowski, 2008) may narrow the gap between the organization strategy formulation processes and contextual PMO activities. Furthermore, more research is needed on how PMO operates, including forms of strategizing and linkages with organization strategy evolution processes under different contingencies, how a PMO renew organization ordinary project capabilities, and other aspects of the organizational value creation from projects.
6.2 Managerial implications

PMO managers should actively focus on searching high-performing configurations and avoid low-performing ones. This work means defining and continuously selecting core and peripheral PMO roles, which contribute the most desired organizational outcomes. However, configurations which lead to a high PMO value contribution differ significantly from configurations which lead to a low PMO value contribution. For example, Publication III indicated significant context-specific interaction effects between the roles. Publication IV confirmed these interaction effects, and also, the low-value contribution configurations are associated with one core PMO role or environmental characteristic. This process searching process may require statistical tools.

PMO roles (not organizational strategies) should occasionally be questioned. PMO configurations should be “reconfigured” during PMOs’ evolution as part of a continuous PMO learning process. During the process, value contributions of the PMO roles and processes should be monitored, measured, and adjusted according to data. At the same time, there should be deep understanding of the impact of the PMO roles and processes involved in the adjustment. For example, results in Publication II show that the PMO’s coordinator and supporting roles are entangled with project performance and success; results further indicate that the other roles and processes do not contribute to organizational value. Value contributions of the PMO controller role differ significantly from those of the coordinator and cooperator roles and the results also suggest that under some circumstances, increased control activities may even reduce organizational value contributions.

To demonstrate a complexity of the systemic interactions, the dynamic capability view suggests that cooperative based value creation such as learning, and information sharing have significant
positive impacts on organizational renewal, adaptation, and success (e.g., Eisenhart and Martin, 2000; Winter and Zollo, 2002). Furthermore, Lüsher and Lewis (2006) indicate that active collaborative processes can act a mean to work through organizational paradoxes, which will increase organizational competitiveness (see Burgeois and Eisenhart, 1988). The author expected, however, did not find even more significant interaction effects between PMOs’ coordinative and cooperative role types. Publications III and IV indicate significant conflicts between the PMO strategic coordinative roles and the supportive, cooperative roles such as learning. The results indicate that PMO roles interact with the environment in a context-specific system that outcome is hard to predetermine. Further, managing PMO performance with irrational adjustment of the PMO roles, performance indicators or strategic objectives is likely to create wrong configurations and even more conflicting objectives, thereby losing project team focus and misleading team energy to meet a goal. Every change in organization objectives increases insecurity, consumes the organization’s time and energy. If the performance measures are loosely anchored to strategic objectives in a turbulent environment, project experts may start waiting when the next unexpected and conflicting performance indicator pops up.

Drawn together, a PMO is a versatile project organizational tool which includes processes, procedures, methods, and tools that support strategy implementation and reduce organization conflicts. A talented PMO manager may “find” several synchronized PMO configurations (roles, processes, and procedures) that result in high-value contributions (or several non-conflicting value contribution streams). A PMO manager can create rational metrics by using the developed tools and select the highest performing PMO roles (Publication I and II). Then, they may analyze and improve value contributions with developed methods (Publications III and IV). The developed PMO data grounded tools may help PMO experts to manage
organizational project processes and find a way to optimize value contributions. A talented PMO manager may select a PMO configuration that leads to high-value contributions in a most cost-efficient way.

6.3 Methodological contribution

Numerous strategic studies provide both conceptual and empirical evidence of organizational strategizing processes, arriving at an organizational fit, and explaining how vital it is to maintain fit for organizational success. Measuring fit has been challenging because interactions are seldom linear (e.g., Shoonhoven, 1981) and organizational changes are changes in a whole organizational system. The previous organization and PMO studies confirmed by Publications III and IV indicate that the PMO activities facilitate organizational strategy and create a balanced fit between strategic organizational objectives, value contribution, and project resources; however, the concrete evidence has been scarce.

This dissertation utilized several integrated frameworks and methods to evaluate systemic interactions in a PMO context; however, it has three main methodological contributions. First, the framework of PMO role typology developed in Publication III enabled the author to align the PMO roles with organizational theories. The framework provided conceptual clarity on PMO roles and supported PMO experts in evaluating and adjusting role behaviors more precisely than is possible when bundling all the roles together. Second, we introduced a statistical method, experimental design (DOE), and a Plackett-Burman design. The adopted Design of experiment (DOE) method has been traditionally developed to support manufacturing and process improvements, however, the method is also known outside traditional manufacturing environments, such as sales and marketing research (Bell et al., 2006). Design of experiment (DOE) is one of the key methods used in Lean Six Sigma quality
management concept and initiative used successfully in several companies such as Caterpillar, Lockheed Martin, and Samsung. It is a structured tool with techniques of quality management, and it can lead to new, better business results through its applications on a project basis.

The adapted DOE method was used to distinguish PMO core roles from peripheral roles, and to measure the most significant contextual interactions associated with PMO value contributions. The framework and its method allowed for a shifting of the focus from a measurement of a single PMO role value contribution to a PMO as a “part” of an organization strategic process (e.g., Jarzabowski, 2008). Third, the authors adopted an analytical methodology for measuring fit as an open system of interactions. This novel methodology used in the fsQCA to analyze the data was inspired in its essence by the fuzzified set-theoretic analysis (see Stoklasa et al., 2017) and the method draws its foundations from the fuzzy set qualitative comparative analysis (fsQCA) (c.f., Fiss, 2011; Ragin and Fiss, 2008).

Without these developed and adapted methods, the interactions patterns of the PMOs’ processes are very hard to identify and measure. By using the methodologies, the authors were able to both reveal consistency between the roles and the interactions between them. Also, the authors were able to propose the alternative PMO configurations which emerged from data. The methodologies, methods, and context-specific configurations can be used simulating PMO roles value contribution in a context before going live with a PMO. These "dress rehearsals" are likely to increase resilience of the roles in a turbulent environment.

6.4 Research process and quality of research

According to Lukka (2000), an outcome can be evaluated through several quality perspectives such as a clear research design, a relevant theoretical alignment, a significant theoretical contribution, and relevance of the results. Examples of these include a clear research design, a
credible study, and a report on the impact of the study. This dissertation continuously utilizes the four main quality assessment methods to evaluate the research process from the four perspectives as internal validity, external validity, construct validity, and reliability of the selected methods.

External validity is associated with generalizability of the results, i.e., the result applies in the other context. Internal validity is associated with the relevance of the causal relationships between the constructs. The construct validity is associated with operationalization of the measures. Reliability is related to replicability of the research process and consistency of the results. (Yin, 2003). These four quality dimensions create a grounding of quality of data collection, selected methods, and the data analysis process.

A constructivist research approach and a mixed-method research strategy were executed as a sequential logical reasoning process inside and between Publications. From an external validity perspective, the Publications (I-IV) show an explicit chain of interactions between PMO roles, processes, and organizational value contributions moderated by the environment. During the research process the triangulation methods were actively used with the participating research groups during the sequential process phases to elicit explicit qualitative data from the project and PMO experts and adopt the peer debriefing procedures with the external people of the study to study the relationships (e.g., Cresswell and Miller, 2000). Finally, the papers were published in peer-reviewed international journals.

The reliability, internal validity, and construct validity perspectives were evaluated for each publication separately. In the first publication, a customer delivery-oriented performance framework based on a literature review on project performance measures and SERVQUAL framework was adapted to create constructs for the selected performance indicators from the
literature review. Next, an analytic hierarchy process was used to prioritize the leading and lagging indicators of the seven customer delivery projects as a postmortem analysis. The selected project experts had substantial real-life experience in managing complex projects and leading project-oriented organizations. The constructs were developed using a SERVQUAL framework as a guiding line for the selection of performance indicators. Each indicator was selected separately by the expert. Also, the interviewer explained the indicators to the interviewees, and the interviewees were able to add a missing indicator to the framework during the evaluation process which increased reliability and internal validity.

A statistical method (AHP) was used to evaluate a consistency ratio between the given answers and the measures in the context. This step-by-step process ensured that data was context specific. Variations of expert answers were controlled by the software. The controlled sequential process had a positive impact on internal validity, as well as construct validity and reliability of the results.

In the second Publication, the PMO roles, processes, and project performance constructs were generated using standard factor and linear regression analyses. For each solution, explanatory power was evaluated separately ($R^2$). Also, the software calculated Cronbach alpha reliability values.

In the third Publication, we focused on PMO coordination and cooperation roles that created the most project-oriented organizational value according to the previous Publications. The PMO roles, processes, and impacts on organizations were screened in the separate focus group workshop. To avoid biased results, the constructs of the screened roles were created by a DOE software (Plackett-Burman design) and evaluated with the nine PMO experts. The selected
statistical methods evaluated itself the explanatory power of a created model and internal consistency ratio of the given answers.

In the fourth Publication, we developed a unique fuzzy set fsQCA-based methodology to extract the highest performing PMO configurations from the data. We used PMO experts to evaluate the constructs and operationalization of the linguistic values, which increased both eternal validity and reliability. Also, the authors assessed the results using two measures. First, the authors calculated the examples in relation to counter example i.e. ECER ratio from the data set for the configurations. Second, we calculated a relative indicator of the specific PMO configurations that fully or partially applied within the data i.e. NC/NFC ratio. These reliability and validity measures enabled us to evaluate the plausibility of propositions generated from organizational theories. Results revealed that the organizational theory-based propositions were too general. However, we were able to find context-specific modified propositions from the data using the developed methodology.

6.5 Limitations and future research

The common language between an interviewer (the author) and interviewees is likely to increase internal validity and reliability as one of the critical quality elements of constructivist research. For instance, a common language enabled objective discussion with the senior business executives, the PMOs, and project professionals during the research process. However, my previous knowledge on the subject may have unintentionally led to biased results. Interviewees may have aligned the answers with my opinions, resulting in poor objectivity. To avoid this challenge, this dissertation applied a constructivist approach and mixed-methods research that included data triangulation. The author intentionally distanced himself from the evaluation practices and evaluated the adapted constructs with project experts.
Furthermore, the small sample size may have had a negative effect on the generalizability and replicability of the results, which is a challenge of every mixed methods research project that focuses on abstract phenomena such as value contributions among PMO roles.

To explain these phenomena, the PMO was anchored into the premises of the Contingency Theory of organizations, strategizing process and fitness, as well as the Dynamic Capability View. Theoretical anchoring and testing improved construct validity, reliability, and overall rationales for this dissertation. For a future research, a strategy as practice (SAP) research area, practicing and structuration theories can provide the potential mainland for future PMO studies as strategizing comprises those actions and interactions of multiple actors and the situated practices.
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ABSTRACT

Project firms are increasingly integrating tangible products and intangible services when building customer solutions aiming to increase firms’ competitiveness. On the other hand, the efficient customer solutions increase firms’ competitiveness only when the solution projects can utilize all of its performance potential. Efficient integration requires both the product and service oriented multi-dimensional success criteria and the context-specific performance measures. The purpose of this Publication is to evaluate the project professional’s ability to create and prioritize the multidimensional success criteria for the customer solution projects. The results indicate that the project professionals are capable of prioritizing the success criteria for the customer solution projects. Conversely, the critical customer specific success criteria are not effectively used in the customer solution projects.

Keywords: Project Management, Customer Solution Projects, Success Criteria Selection

SERVQUAL, Analytic Hierarchy Process, Project performance
INTRODUCTION

Firms are increasingly servicizing, as adding services components to the product offerings and creating customer solutions (Baines, Lightfoot, Peppard, Johnson, Tiwari, Shehab, & Swink, 2009). Adding services has a positive impact on the project firms such as increasing project delivery performance and improving the project firms' competitiveness (Artto, Wikström, Hellström, & Kujala, 2008). On the other hand, adding services to the projects and products increases project complexity and requires efficient methods to manage the integration from a performance perspective.

Performance has been characterized as a phenomenon including operational profitability, productivity, and the other non-cost factors (Tangen, 2004). Moreover, performance aligns with the multiple organization dimensions such as operational (e.g., Parasuraman, Zeithaml, & Berry, 1991; Westerfeld, 2003) and strategic dimensions (e.g., Norton & Kaplan, 1992) which make it hard to commensurate and measure. Performance can be characterized as a phenomenon or a relative outcome of a measurement process which operationalize different performance dimensions. For example, to create successful customer solutions firms are required to manage customer interaction and align the customer and the project firm value creation processes in a specific context (Vandermerwe & Rada, 1988). Moreover, while projects shareholders’ interests and projects' operational environments differ significantly from each other (e.g., Turner & Cochrane, 1993) the generic frameworks such as the service quality framework (Parasuraman, Zeithaml, & Berry, 1991) and the diverse project success criteria and measures (e.g., Basten, Joosten, & Mellis, 2011; Keegan, Eiler, & Jones, 1989; Turner & Zolin, 2012; Wateridge, 1995; Zwikael & Globerson, 2006) are required to fit tightly into a context.
The previous project business and customer solution grounded research has shifted focus from a tangible product and delivery efficiency to creating and measuring value and success created with the project product during the project process (e.g., Ahola, Laitinen, Kujala, & Wikström, 2008; Brady, Davies, & Gann, 2005; Kujala, Kujala, Turkulainen, Artto, Aaltonen, & Wikström, 2011; Kujala, Ahola, & Huikuri, 2013; Winter & Szczepanek, 2008). At the same time, the operational project success criteria and performance measures have remained grounded mostly in the firm’s internal project processes and customers considered as opposite to the firm (Müller & Jugdev, 2012). Moreover, the researchers indicate that the success criteria and performance measures have remained generic or loosely interconnected to operations (e.g., Neely, Mills, Platts, Richards, Gregory, Bourne, & Kennerley 2000). Addressing this gap and this paper position the following research question:

*How can the project firms integrate the product-based and the service-based success criteria into a coherent set of the multidimensional success measures for the customer solution projects?*

Rather than just introducing a new performance framework and a vast number of new performance measures, this interdisciplinary research adopts a known framework, a simple method and standard set of criteria which focus on the supplier – customer interaction context. The findings of this research indicate that the project professionals can select and prioritize the project and service-based success criteria in the customer solution context using Service quality (SERVQUAL) framework and analytic hierarchy process method (AHP). The findings also indicate that that the project organizations and project professional are not actively using the customer-centric success criteria in the customer solution project deliveries. This paper is organized into the three sections. The first section introduces customer solutions projects from
the both product and service perspectives. During the section, the relevant project and service-based success criteria for the customer solution projects were reviewed and the SERVQUAL framework was adapted. In the second section, the interviewees convert the multidimensional success criteria into the performance measures and evaluate the seven customer solution projects using the AHP method. Finally, the study closes with concluding remarks and future research avenues.

LITERATURE REVIEW

Customer Solution Projects

Projects produce a unique product with a novel project process (Turner & Keegan, 1999) in the uncertain project operational environment (e.g., Turner & Müller, 2003). The actuality of successful project can be defined as “doing things right” measured with the project efficiency criteria and “doing right things” measured with the project effectiveness criteria (Crawford & Bryce, 2003). Moreover, the complex products, such as customer solutions in a turbulent project environment require special attention of management and control to be able to utilize the whole project performance.

The unique project products such as solutions can be divided into a continuum between tangible good led deliveries and intangible service led deliveries (e.g., Oliva & Kallenberg, 2003) depending on the dominance of tangible or intangible components in the product. On the other hand, drawing a line between product or service dominance in a solution is difficult without understanding a role of both product and service also in a delivery process. For example, the complex products and systems (CoPS) are characterized as the high-technology, capital-intensive tangible products (Davies & Brady, 2000), such as the radio base stations, including several interconnected and tailored product components (e.g., Hobday, 2000). In the CoPS deliveries, a role of service rather acts as a platform for the engineering product delivery.
In the other end of the product service continuum is the service led customer products such as service offerings (e.g., Edvarsson, 1997) in which the core intangible service is structured to meet the primary customer needs and the supplementary intangible and tangible products to fulfill the customer's secondary needs. The both primary and secondary needs of the offerings are associated with customer value creation processes (e.g., Grönroos & Gummerus, 2014) and the tangible product act as a platform for the delivering the intangible service products. The service offerings can be categorized into four main categories according to a role of service in a product and delivery process as 1) component services (for example elevator maintenance service), 2) semi-manufactured services (for example outsourced operations supporting the core operations or product for example elevator assembly service), 3) instrumental services (for example elevator assembly and maintenance related training services), and 4) consumable services (for example elevator cleaning services) (Wynstra, Axelsson, & Van Der Valk, 2006).

In the component service delivery process, performance is a balance between quantity and quality aspects of the production process. On the other hand, the semi-manufactured service emphasizes the customer implementation phase and configuring the service as part of the customer internal value creation processes. Furthermore, the instrumental services itself support and align with the customer's core value creation processes, while the role of the consumable service is to support the core customer processes. The common denominator for the service service-dominant project deliveries and service performance is the service firm's ability to integrate the product into the customer value creation processes during project delivery process (Wynstra et al., 2006).

The both complex products and service offerings have similar characteristics such as a configurable product structure which adapt to customer environment. For example, Kujala et al. (2013) concretize the customer solutions strcuture as a “union” including a core project
delivery of the intangible or tangible product surrounded by the additional tangible and intangible product layers. This modular approach has similarities with the approach of Oliva and Kallenberg (2003) in which the both tangible and intangible products supplement the core solution as add-ons. As such, the supplementary layers of the core solution can be categorized as the facilitating and supporting products depending on the additional product role in relation to the core delivery product (Kujala et al., 2013). In the modular product structure, the facilitating products are used as a platform for delivering the core product functionalities and the supporting products are used to deliver additional functionalities which enable to create extra value for the core product delivery. This paper follows this “union” structure approach to the customer solution projects (e.g., Kujala et al., 2013; Oliva & Kallenberg, 2003) and defines broadly the customer solutions projects as the customer specific tangible and intangible solutions delivered with the unique customer-centered project process, and in which both product and process create value for the firm and customer.

When delivering the customer solutions, the firm needs to adopt a relational based operational model with customers (Chandler & Lusch, 2015; Oliva & Kallenberg, 2003; Viio & Grönroos, 2014). Successful operations in the relational model require a focus on managing and controlling a quality of the project product well as a quality of the project delivery process (Grönroos & Helle, 2010; Silvestro, Fitzgerald, Johnston, & Voss, 1992; Windahl & Lakemond, 2006). Moreover, a role of the solution supplier is to facilitate the value creation process and provide an efficient value creation environment during the customer interaction (e.g., Grönroos, 2011) such as proving project resources for the value creation processes. During the value creation process, supplier such as a project firm acts as a resource integrator and the customer as a co-creator of value the both adding resources to the coproduction process and aiming to maximize value from the process (e.g., Grönroos, 2011; Lusch, Vargo, & O’Brien,
This is one of the key differences between the traditional sequential product production process and sequential customer value creation process. In the service oriented process, a customer interaction such as time spent serving a customer and ability to solve the customer’s problems is likely to increase customer's trust and willingness to collaborate (Grönroos & Helle, 2010; Storbacka, Strandvik, & Grönroos, 1994) and in addition, increase customer oriented firm's competitiveness (Shenhar, Tishler, Dvir, Lipovetsky, & Lechler, 2002).

The Successful Customer Solution Projects and a Role of Quality

In a successful customer solution project a role of intangible service and a tangible product might change between the projects or even during the project delivery phase for example according to the firm's business goals and aim of the delivery (e.g., Artto et al., 2008; Wikström, Hellström, Artto, Kujala, & Kujala, 2009), according to the selected delivery process (e.g., Grönroos & Gummerus, 2014; Kujala et al., 2011) and a nature of the core product (e.g., Hellström & Wikström, 2005; Kujala et al., 2013). This creates a challenge to operationalize success in a customer solution context.

The project literature quantifies project success with the project success factors and the project success criteria (e.g., Müller & Jugdev, 2012). The former refers the factors that precede project success and the later refers results of projects. The project success criteria are divided into the two intertwined categories (e.g. Shenhar et al., 2002). The first category operationalizes success as meeting the predetermined project short-term objectives such as the time, monetary, technical and functional project goals. The second category operationalizes success as the benefits for project shareholders such as meeting the customer requirements and the satisfied customer related criteria. The first category of the criteria focuses on internal project process
efficiency as doing things right. The second category of the criteria focuses on effectiveness as reaching the project goals and value produced by the project as doing right things.

In the service integrated product and project processes, such as the customer solution projects, quality, and customer satisfaction act as one of the key success indicator (e.g., Müller & Judgev, 2012) which bridges the both success categories. Quality has a causal association with the project success factors such as the customer expectations of the project delivery and the project success criteria such as the customer experienced project delivery measured with customer satisfaction. The quality of the customer solution can further be determined as a quality of a delivered product and project process quality as functional quality (Grönroos, 1998). Functional quality of the customer solution delivery is created during the routine and non-routine project phases in which the customer interacts with the solution provider’s systems, processes, and product (Parasuraman, Zeithaml, & Berry, 1988; Storbacka et al., 1994). In many cases, the routine project processes such as the routine solution deliveries include the non-routine phases such as the information problem-solving procedures and tasks (Pinto & Prescott, 1998) which act as the critical episodes for a customer relationship. During the episodes, both the firm and the customer can increase quality. Conversely, minimizing the critical episodes might reduce project costs and improve process cycle time, however, this might have a long-term negative impact on the firm’s ability to increase project quality and value creation with a customer (Grönroos & Gummerus, 2014; Ravald & Grönroos, 1996).

The quality of the customer delivery process is a relative success measure grounded into efficiency and effectiveness. To be able to quantify and measure a multidimensional quality of the projected customer solutions the project success criteria such as the time, cost and product quality criteria need to be expanded toward the customer-related quality and success criteria (e.g., Berry, 1997; Grönroos, 1998; Oliva & Kallenberg, 2003). On the other
hand, the selected measures should cover the performance area and at the same time be coherent and accurate in a context. Parasuraman et al. (1988) introduced the ten customer related quality elements which are actively involved in a customer interaction and reflect customer perceived quality. The ten quality elements were further simplified into the five categories as 1) tangibles based quality, such as the appearance of facilities, equipment, and personnel, 2) reliability based quality and ability to perform a promised service dependably and accurately, 3) responsiveness based quality and ability or willingness to help customers and provide prompt service, 4) assurance based quality as knowledge and courtesy of the supplier employees and the employees ability to increase trust and customer confidence, and 5) empathy based quality as caring, individualized attention which the supplier provides to its customers (Parasuraman et al., 1991). This SERVQUAL framework can be used as a solid backbone for categorizing and balancing the diverse success criteria.

**METHODOLOGY**

This study was executed in the two phases and using the stepwise method introduced by Chang and Torkzadeh (2013). The selected five firms and seven customer solution projects were chosen for the study according to the following criterion. First, the chosen firms need to indicate that the project operations has a central role in firms’ success. Second, the selected seven customer solution projects need to include the core tangible product with the additional service components. Table 1 represents the key characteristics of the evaluated projects.

Table 1. The characteristics of the case projects.
In the first phase, the relevant success criteria were screened from the literature. The criteria selection process emphasized on quality aspects introduced by Malina and Selto (2004) which determine that the relevant performance criteria should be diverse, complementary, objective, and accurate. In addition, the criteria should also be informative, logically and causally interconnected. To meet the criteria this research select the success criteria from two primary sources of literature as from the project grounded literature (Dvir, Lipovetsky, Shenhar, & Tishler, 1998; Griffin & Page, 1996; Keegan et al., 1989; Turner & Zolin, 2012) and from the service grounded literature (Gummesson, 1998; Storbacka et al., 1994). The research adapted the SERVQUAL framework (Parasuraman et al., 1991) which is one of the most efficient frameworks measuring customer perceived quality (Grönroos, 1998) and placed the success criteria into each SERVQUAL elements. The four adapted SERVQUAL elements ensured that the success criteria were complementary focusing on the customer solution delivery project success avoiding and avoiding pure engineering perspective to the project performance, Table 2.
Table 2. The adapted SERVQUAL elements (Parasuraman et al., 1991) and the project success criteria from the literature.

<table>
<thead>
<tr>
<th>SERVQUAL categories</th>
<th>Success criteria</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tangibles</td>
<td>Quality of product</td>
<td>Gummesson (1998); Griffin &amp; Page (1996);</td>
</tr>
<tr>
<td></td>
<td>Quality of service process</td>
<td>Keegan et al. (1989); Storbacka et al. (1994);</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Turner &amp; Zolin (2012)</td>
</tr>
<tr>
<td>Reliability</td>
<td>Meeting the budget goals</td>
<td>Dvir et al. (1998); Gummesson (1998);</td>
</tr>
<tr>
<td></td>
<td>Meeting the schedule goals</td>
<td>Griffin &amp; Page (1996); Keegan et al. (1989);</td>
</tr>
<tr>
<td></td>
<td>Meeting functional requirements</td>
<td>Storbacka et al. (1994); Turner &amp; Zolin (2012)</td>
</tr>
<tr>
<td></td>
<td>Meeting technical requirements</td>
<td></td>
</tr>
<tr>
<td>Responsiveness</td>
<td>Quality of service</td>
<td>Dvir et al. (1998); Storbacka et al. (1994);</td>
</tr>
<tr>
<td></td>
<td>Problem solving ability</td>
<td>Turner &amp; Zolin (2012)</td>
</tr>
<tr>
<td></td>
<td>Responsiveness to customer needs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Responsiveness to organization needs</td>
<td></td>
</tr>
<tr>
<td>Assurance</td>
<td>Customer satisfaction</td>
<td>Dvir et al. (1998); Gummesson (1998);</td>
</tr>
<tr>
<td></td>
<td>Quality of service</td>
<td>Griffin &amp; Page (1996); Keegan et al. (1989);</td>
</tr>
<tr>
<td></td>
<td>Shareholder satisfaction</td>
<td>Storbacka et al. (1994); Turner &amp; Zolin (2012)</td>
</tr>
<tr>
<td></td>
<td>Value created during the project</td>
<td></td>
</tr>
</tbody>
</table>

In the second phase, the five project professionals which have an average of ten years project experience were interviewed. The project professional possessed titles such as department manager, project director, and project manager were interviewed. The project professional selected the ten most relevant success criteria and evaluated the seven-customer solution project using the criteria.

The used AHP method was used as an efficient tool for evaluating, selecting and prioritizing the multidimensional criteria (Saaty, 1978; Saaty, 1990). The method has been applied in the various research fields from social science to engineering, and project management (Vaidya & Kumar, 2006). For example, the AHP method has been previously used in a project management research for selecting the most efficient project delivery process (e.g., Al Khalil, 2002), evaluation of projects such as cost-benefit analysis, and identifying tradeoffs between the selected criteria (e.g., Yadav et al., 2015). The AHP method and evaluation process was supported by the Expert Choice software (Arlington, Virginia, US). The method enables
to prioritize and establish a hierarchy between the selected success criteria and measures using pairwise comparison process. This process and selected method ensured that the evaluated success measures were logically interconnected to the projected customer solution context, accurate, informative, and objective for the final project evaluation.

RESULTS

The success criteria evaluation process was done in three steps using an AHP method and Expert Choice software. During the first screening step, the interviewees select the most relevant success criteria from the each SERVQUAL categories. During the second step, the success criteria were further converted into the project-specific performance measures answering the questions “which of the ten success criteria related measures are the most relevant for the selected customer solution projects”, Table, 3. During this second step, few measures were renamed to fit better with the evaluation context and the number of the success measures were limited to 10, Tables 3.

Table 3, the relevant performance measures. Table 4, the evaluation criteria for the measures.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Priorities</th>
<th>Verbal rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cost of delivery</td>
<td>Equally preferred</td>
<td></td>
</tr>
<tr>
<td>2. Cost per. Operational hour</td>
<td>Equally to moderately preferred</td>
<td></td>
</tr>
<tr>
<td>3. Lead time</td>
<td>Moderately preferred</td>
<td></td>
</tr>
<tr>
<td>4. Quality of the delivery</td>
<td>Moderately to strongly preferred</td>
<td></td>
</tr>
<tr>
<td>5. Customer partnership level</td>
<td>Strongly preferred</td>
<td></td>
</tr>
<tr>
<td>6. Customer acceptance</td>
<td>Strongly to very strongly preferred</td>
<td></td>
</tr>
<tr>
<td>7. Time overrun</td>
<td>Very strongly preferred</td>
<td></td>
</tr>
<tr>
<td>8. Service cost</td>
<td>Very strongly to extremely preferred</td>
<td></td>
</tr>
<tr>
<td>9. Ability to respond to customer problems</td>
<td>Extremely preferred</td>
<td></td>
</tr>
<tr>
<td>10. Process flexibility</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In the third step, the selected performance measures were used to evaluate the seven-customer solution project by answering the question “which of the measures were prioritized when the selected customer solution projects were delivered” using the standard AHP 1-9 scale (e.g., Saaty, 1990), Table 4. The weighted priorities between the selected measures were calculated using an Expert Choice software. Table 5 shows the sums for the weighted priorities of each measure.

Table 5. A hierarchy of the leading success measures.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Weighted priorities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivery cost</td>
<td>0.218</td>
</tr>
<tr>
<td>Cost per operational hour</td>
<td>0.169</td>
</tr>
<tr>
<td>Lead time</td>
<td>0.092</td>
</tr>
<tr>
<td>Quality of the delivery</td>
<td>0.085</td>
</tr>
<tr>
<td>Customer partnership level</td>
<td>0.085</td>
</tr>
<tr>
<td>Customer acceptance</td>
<td>0.082</td>
</tr>
<tr>
<td>Time overrun</td>
<td>0.076</td>
</tr>
<tr>
<td>Service cost</td>
<td>0.074</td>
</tr>
<tr>
<td>Ability to respond to customer problems</td>
<td>0.073</td>
</tr>
<tr>
<td>Process flexibility</td>
<td>0.048</td>
</tr>
</tbody>
</table>

The Expert Choice software calculates the weighted priorities for each measure as dividing the given priority value of the measures by the sum given values of the rest of the measures. This operation enables a transformation of the measures into the hierarchy between the measures.

The mostly adapted success measures were: 1) delivery cost (0.218), 2) the cost per operational hour (0.169), and 3) lead time (0.092). The less important measures were: 1) the service cost (0.074), 2) ability to respond to customer problems (0.073) and 3) process flexibility (0.048).
A consistency ratio of the selections was 0.07 (<0.1) given by the Expert choice software was acceptable.

SYNTHESIS AND DISCUSSION

The customer solution projects have a multidisciplinary nature and can be characterized as complex projects from performance evaluation perspective. The purpose of this paper is to create a method for the project professional to select and prioritize the multidimensional success criteria and performance measures for the customer solution projects. Moreover, this paper tests the method with the seven-customer solution project. The results indicate that the project professionals can prioritize the relevant success criteria and performance measures for the customer solution project using SERVQUAL framework and the AHP method. Conversely, the evaluation and the implemented method reveal that the customer specific success criteria are not highly prioritized during the project execution phase among the selected projects.

The result indicates that a combination of the SERVQUAL model and the AHP method complement each other creating a coherent and causally interconnected success criterion. This has practical value for customer-oriented firms. For example, this method could be used as a development method to improve the specific project firm performance areas such as to improve project capabilities such as processes (e.g., Taylor & Woelfer, 2010). Surprisingly, the results reveal that the selected project are “strongly” focusing internal measures when leading external customer projects. Two out of the ten leading success measures obtain total 30% (28.7%) of the prioritization value scores. The remaining eight measures received an average of 7.7% of the total given scores with low variance. Total variance between the results was insignificant (SD 1.33), and the interviewees did not indicate high project failure rates which would explain the results. The results indicate that projects are actively focusing on the measures which the
projects expected to have a direct short-term impact during the delivery process, including the following: 1) delivery cost (0.218), 2) cost per operational hour (0.169), and 3) lead time (0.092). Conversely, the relevant customer-oriented success measures: 1) service cost (0.074), 2) ability to respond to customer problems (0.073), and 3) process flexibility (0.048) scored low priority values. The results are in line with the previous studies as project managers' lead and prioritize projects according to the time and cost related measures (e.g., Wateridge, 1995). The result might also indicate the organization goals, success criteria goals and performance measures are loosely connected in customer solution project context which might prevent the selected firms to utilize the whole performance potential from servitization.

The important shift of mindset from the product production process toward service and customer relationship processes is likely to create a positive long-run impact on customer-oriented firms such as gain a better understanding of customer value processes, create efficient project processes, and increase revenue such as ability sell additional complementary services (e.g., Artto et al., 2008; Galbraith, 2002). Implementing the multidimensional success measures and focusing on measuring for example return of value from the service investment during the customer project deliveries the project firms might help this shift of mindset. From customer interaction perspective, the transparent success criteria and performance measures might also have a benefit of increase trust between project stakeholders and prevent firm's unexpected conflicts in advance (e.g., Grönroos & Helle, 2010; Storbacka et al., 1994).

CONCLUSION
This paper enlightens use of the SERVQUAL framework and the AHP method as the efficient tools to support a process of selecting, comparing and prioritizing the success criteria and creating the multidimensional performance measures for the customer solution delivery
projects. The result indicates that using the SERVQUAL framework and the AHP method might help organizations to coordinate and simplify measurement selection procedure and facilitate the success criteria and performance measure evaluation. In addition, the result reveals that organizations are not effectively using the customer-oriented performance measures when leading customer solution projects.

On the other hand, the customer solution orientation might be a big “leap” for the product manufacturing firms, requiring new resources and abilities. This leap in a project context requires preparations, for example, pre-project information, and planning, knowledge how the key customers interact during the collaborative product delivery process, and how the collaboration processes impact on customer quality.

Conversely, the firm’s poorly managed step toward unknown value co-creation processes might include a risk of losing quality and value, and resulting increased costs (e.g., Edvardsson, 1997). For example, without transparent and iterative success criteria evaluation process and supportive tools the success criteria evaluation, selection, and prioritization process might create various loosely connected operational level performance measures which cannot be accurately controlled as the cornerstone of the efficient performance management (e.g., Bourne, Mills, Wilcox, Neely, & Platts, 2000; Bourne, Kennerley, & Franco-Santos, 2005). The loosely connected performance criteria and measures, are likely to create difficulties in utilizing whole project performance potential (e.g., Baloch & Khan, 2013; Herod & Kovach, 2015; Müller & Jugdev, 2012) and the loose criteria and the invalid performance measures might even lead an organization to the wrong direction and increase project failures (e.g., Belassi & Tukel, 1996).

As a limitation of this study is that the results do not represent the absolute truth of the success measures for the customer solution projects. Some of the evaluated service deliveries
can be characterized as pure component service supported by semi-manufactured services and the other as core component service supported by instrumental services. Yet, the success measures from the literature were selected with the project professionals and evaluated with the familiar projects increase a validity of the method and reliability of the results in the context. Furthermore, the standard deviation between selected measures was also very low which might indicate the final success criteria might not be significantly diverse in a similar context.

For the future research, it would be interesting to measure the differences between the projects which are led using traditional measures and the project led using the customer-oriented measures. This evaluation might also reveal if projects have a tendency to adapt to a low project performance state over time (e.g., Flyvbjerg, Holm, & Buhl, 2002)
REFERENCES


Abstract: Organizations increasingly often set up project management offices (PMOs) in order to overcome the challenges of increased complexity and importance of projects, and thereby create value, but evidence for value creation, such as improved project performance, has remained scarce. We use a sample of Finnish firms to evaluate the impact of PMO roles and processes on project performance. Using factor analysis and regressions, we show that the PMO’s coordinator and trainer processes have a positive association with project performance. However, a PMO in the role of a strategy manager has a negative impact on project performance.

Keywords: Project Management Office (PMO); PMO roles and processes; project performance
Introduction

There are different reasons why it has become not only harder but also critical for organizations to run projects successfully (e.g., Shenhar, Dvir, Levy, & Maltz, 2001). First, it has become pivotal for managers to align their project processes with the strategy and structure of the organization (Dietrich and Lehtonen, 2005; Meskendahl, 2010, Van Der Merwe, 2002). Second, recent cases have shown that the degree of complexity in projects has increased. Third, projects are increasingly grounded in the value creation – for the organization itself as well as for its customers (e.g., Ahola, Laitinen, Kujala, & Wikström, 2008; Brady, Davies, & Gann, 2005; Kujala, Kujala, Turkulainen, Artto, Aaltonen, & Wikström, 2011).

In order to overcome the challenges of increased complexity and importance of projects in organizations, management offices (PMOs) may be an attractive solution. A PMO is an organizational unit that is permanently integrated into the project business of the organisation (Aubry et al., 2011). Structures, functions and processes of the organization aim at maximizing its value (Aubry et al., 2007). While some studies have shown that the PMO is able to improve project performance (e.g., Aubry & Brunet, 2016; Dai & Wells, 2004), others have failed to find evidence of a positive relationship between PMO, project performance and project success (e.g., Darling & Whitty, 2016; Unger, Gemünden, & Aubry, 2012). Typically, a PMO specializes in specific groups of tasks, and responsibilities such as ensuring that projects align with organization strategies, conducting project evaluations, gathering and disseminating project knowledge, developing competences and implementing standard (Desouza and Evaristo, 2006; Aubry et al., 2010). It may thereby adopt an individual behavior pattern as if it performed a particular “role” towards its stakeholders within the organization. Previous studies have identified the PMOs as an organization strategy manager (Aubry, Hobbs & Thuillier, 2007; Monteiro, Santos, & Varajão, 2016), a knowledge manager and knowledge broker (Desouza & Evaristo, 2006; Julian, 2008), or a project performance upgrader (Artto, Kulvik,
We have chosen an approach by Müller et al. (2013) and Unger et al. (2012) and will define three roles, which a PMO may adopt: (1) the controller, (2) the coordinator, and (3) the supporter. Despite the apparent purpose of the PMO, which is to improve the performance and success of projects, empirical research has struggled to find correlations between PMO roles and project performance.

In this paper, we address this gap. This empirical study will collect evidence in order to answer the question, which of these roles of the PMO affect project performance positively. More specifically, we analyze if a specific role is positively associated with project efficiency and effectiveness.

This study contributes on PMO performance literature (Aubry & Hobbs, 2011; Aubry, Richer, Lavoie-Tremblay, & Cyr, 2011). We adopt a typology of the PMO roles and processes by Müller, Glückler, Aubry, & Shao (2013) and Unger et al. (2012). We use in-depth primary data collected from 73 PMO managers in Finland in 2015. In the remainder of this paper will first introduce our concept of PMO roles and a measure of project performance. In the second section, we outline how we derived our hypotheses. Finally, we will show our empirical results, point out some critical managerial and practical implications, and provide some directions for future PMO research.

**The roles of the PMO**

The specific sets of tasks, responsibilities and individual behavior patterns of a PMO that we call the roles of a PMO, determine how the PMO acts towards its stakeholders and describes the way in which the PMO accomplishes its goals. The roles may set expectations about methods and tools that are used in the PMO. Following the approach of Müller et al. (2013) and Unger et al. (2012) we define three separate roles, which PMOs may adopt: (1) the controller role, (2) the coordinator role, and (3) the supporter role.
The notion of management control in general comprises the tactics, techniques and methods that are used in an organization in order to lead its sub-units in line with strategic goals (e.g., Ouchi, 1977). With regard to project management, control is often associated with authority, governance models, and restrictive rules that help to coordinate the project business. When PMOs adopt a controlling role, they may be responsible for program processes (e.g., Lycett, Rassau, & Danson, 2004), for portfolio processes (e.g., Meskendal, 2010), and for project management processes (Martinsuo & Lehtonen, 2007). They will be the home of procedures and tools that help to prioritize projects, to allocate resources and to lead people according to the goals of the organization. With regard to governance, PMOs may help to clarify objectives and interdependencies of single projects, and they can assist in defining procedures for reporting and monitoring (e.g., Lycett et al., 2004; Pellegrinelli, Partington, Hemingway, Mohdzain, & Shah, 2007). They ensure that projects will have a good fit with strategies, with structures and with the assets of the organization. They may ensure that long and short-term monetary benefits and risks of the project portfolio will stay balanced when new projects are added (Meskendahl, 2010).

The coordinator role

The term 'coordination' points to methods that allow processes and activities of organizations to be arranged in a way which creates synergy and allows operations to become effective (e.g., Artto et al., 2011). For example, organizations may need to reorganize their activities in order to adapt to a turbulent business environment. This requires an appropriate level and type of coordination between the functions and activities of an organization (e.g., Aagaard, Eskerod, & Madsen, 2015). An organization may use integrative methods such as portfolio and program management, on the one hand. On the other hand, PMO’s may avoid direct supervision and rather facilitate the interactions of different project teams.
The supporter role

Customer and product support typically is done at the operational level of an organization. Analogically, supporting activities of a PMO operate close to project operations, though without direct participation in those activities. The supporter role consists mainly of coaching and supporting project teams, facilitating project action and developing processes and procedures without direct supervision. More in detail, supportive activities consist of tasks such as providing assistance to project stakeholders, adopting tools for project managers, developing capabilities of project managers. They comprise skills, such as giving learning assistance, training, and arranging lessons-learned meetings (e.g., Aubry et al., 2011; Dai & Wells, 2004; Desouza & Evaristo, 2006).

Project performance

Successful project organizations are capable of aligning the organization and business strategy into a coherent set of effective projects (e.g., Dietrich & Lehtonen, 2005; Meskendahl, 2010). Furthermore, the success of projects depends on the support of the top management, coherent goal setting, efficient governance and productive management processes. Additionally, active communication, and the availability of capable resources have a key effect (e.g., Belassi & Tukell, 1996; Dvir, Lipovetsky, Shenhar, & Tishler, 1998; Pinto & Prescott, 1988).

The project literature measures project performance in two primary dimensions: The first is efficiency, which is defined as an organization’s ability to transform given resources into project outputs (e.g., Tangen, 2004). The second dimension is effectiveness, which is defined as the project team’s ability to reach project goals and to create high-quality outcomes, most importantly to meet customer requirements (Dvir et al., 1998) and to produce customer value (e.g., Winter & Szczepanek,
Both dimensions are interdependent and may reinforce and complement each other (e.g., Westerveld, 2003). Our research framework is illustrated in Figure 1.

Figure 1. The research framework.

Also, the PMO is not limited to one role. Different roles may co-occur and overlap. A PMO may facilitate functions that it has inherited from the controller, coordinator, or the supporter role respectively (e.g., Müller et al., 2013). Roles may even synergize, which may result in especially high performance (Aubry et al. 2011). In the following paragraphs, we develop our hypotheses about the relationship between the three PMO roles and their respective association with project performance.

**Hypotheses**

*There is a positive impact on project performance when the PMO acts in a controller role*

The above mentioned activities of a PMO that belong to the controller role have a positive impact on the efficiency of operating projects and help to meet the predetermined goals (Zwikael & Globerson, 2006). Activities such as monitoring project performance, maintaining and developing the project scorecard and ensuring relevant information for the tollgate procedures are expected to have a positive
effect on project success (e.g., Zwikael & Globerson, 2006). Therefore, hypothesis 1 positioned as follows:

**Hypothesis 1:** As a controller role, the PMO contributes positively towards project efficiency and effectiveness

There is a positive impact on project performance if the PMO acts in a coordinator role

The capabilities of the PMO to supervise project managers and project teams, to define responsibilities, and to develop project culture are essential for successful coordination of departments. Efficient coordination will help to speed up responses to environmental changes and increase accuracy of decision making (Unger et al., 2012). This will reduce process slack and improve performance. Coordination between project teams will determine how much employees will be able to learn from projects (e.g., Garrety, Robertson, & Badham, 2004) and will therefore increase project effectiveness in a sustainable way (Aagaard et al., 2015). Furthermore, a balance between control and coordination will glue teams together (e.g., Tsaturyan & Müller, 2015). This may help to set the direction for the project work and will increase effectiveness without harming team identity. Therefore, hypothesis 2 is positioned as follow:

**Hypothesis 2:** As a coordinator role, the PMO contributes positively towards project efficiency and effectiveness

There is a positive impact on project performance if the PMO acts in a supporter
PMOs can support the organization to learn new project methods and implement them correctly. This will lead to better project performance (e.g., Davies & Brady, 2000; Mayoral, Palacios, Garcia-Crespo, & Berbis, 2010). Supporting activities may develop project managers’ competencies, therefore increase project managers’ success (Turner & Müller, 2010), and finally project performance (Pinto & Prescott, 1988). Supportive activities that allow a PMO to act as a coach for project teams will improve collaboration between teams. PMOs may initiate information sharing and build trust between project teams, which also will increase the quality of teamwork and performance (e.g., Hoegl & Parboteeah, 2007; Hoegl & Wagner, 2005; Kratzer, Gemünden, & Lettl, 2008). Therefore, hypothesis 3 is positioned as follow:

Hypothesis 3: As a supporter role, the PMO contributes positively towards project efficiency and effectiveness

Primary Data on PMO roles and success

In order to test our hypotheses, we use a sample of organizations that dispose of a PMO. They all operate in Finland, which is a country that boasts of high-quality infrastructure for business and is a top performer in different performance indicators such as educational attainment and educational quality, economic competitiveness, civil liberties, quality of life and equal opportunities. Since firms in Finland have equal and good access to these different types of infrastructure, we do not expect any confounding impact from society on the relationship between the roles of the PMOs and project performance.

Our data was collected in an online survey of project organizations that had a PMO or a similar type of project coordination unit within the organization. The questionnaire was previously tested in a pilot survey of academics, consultants, and PMO practitioners. The sample consists of a total of 73
answers, which equals to a response rate of 52% given that 140 organizations had been contacted. Compared to the size of other surveys on the PMO and given the size of the Finnish economy our sample size is good. Further, judging from which firms have denied to respond and which have participated, we do not expect any sample bias. More specifically, the organizations in our sample are from different industries that comprise all three main industry sectors: information communication technology (27%), public sector (23%), industry (13%), service sector (14%), insurance (12%), and other (11%). Our organizations run across all firm sizes: 18% of the organizations had fewer than 100 employees, 35% fewer than 500 employees, 72% fewer than 2,000 employees, and 38% between 2,000 and 10,000 employees. A majority of the organizations (51%) had a project allocation percentage between 10% and 40%. Most PMOs (77%) were three to six years old. They focused either on only external project deliveries (75% of the PMOs) or had both, external and internal ones. The representatives of the organizations that participated as interviewees were senior enough to have knowledge about the PMO and its processes. They worked primarily in a PMO as full- or part-time employees (70%) and/or held positions in the organization as a head of a PMO, as portfolio manager, as project manager, or another PMO-related title (61%).

Operationalization of the variables

The operationalization framework for this PMO role-based approach has been developed in earlier studies (e.g., Müller et al., 2013; Unger et al., 2012). Variables and items are taken from the PMO literature (e.g., Aubry et al., 2011; Unger et al., 2012; Müller et al., 2013). A five-point Likert scale, ranging from “agree” to “disagree” was used to measure the constructs. A factor analysis was run to identify the principal components of the PMO’s roles to reduce the number of variables and items. Composite measures were obtained using a principal component analysis using the Varimax rotation method with Kaiser normalization. The Kaiser criterion identified two principal components under
each PMO role, all Eigenvalues were over 1. Detailed information about the variables, items, factor loadings, communality and measures of sampling adequacy (MSA) values is available in Appendix 2.

*Project performance variables — efficiency and effectiveness*

We defined input and output variables in line with our research framework (see Figure 1), input variables being project roles, and output variables being the efficiency and the effectiveness of projects. Project efficiency is a function of time and cost variables, and project effectiveness is a construct of variables that are related to the project meeting the quality specifications and the business goals. The performance variable alpha values were close to an acceptable limit at 0.7 (e.g., Hair, Anderson, Tatham, & Black, 1998). The Spearman-Brown split half-sample test ensured the reliability of the project efficiency variable (alpha 0.69) and the project effectiveness variable (alpha 0.62). Both factors were accepted to the model. The time and cost items explained 76.4% of the project efficiency variable variance. The project quality and goal accomplishment items explained 72.3% of the project effectiveness variable variance.

*The PMO’s role variables*

The PMO controller role is loaded with five items, forming two separate variables, namely, “Strategy manager” with a Cronbach’s alpha value of 0.82 and “Resource manager” with a Cronbach’s alpha value of 0.89. Both factors explained 81.7% of the PMO’s controller variable variance. The PMO coordinator role loaded significantly, with four items forming two variables, namely, “Supervisor” with a Cronbach’s alpha value of 0.91 and “Coordinator” with a Cronbach’s alpha value of 0.53, which was a bit low. The Coordinator variable was accepted as part of the tested construct because it increased the explanatory power of both the regression Models 1 and 2. Jointly, the variables explained 80.9% of the PMO’s coordinator variable variance. The supporter role was loaded with seven items forming
two variables, namely, “Trainer” with a Cronbach’s alpha value of 0.84 and “Information sharer” with a Cronbach’s alpha value of 0.91. Both variables explained 75.4% of the PMO’s supporter variable variance. Table 1 gives the key measures and indicators, mean values, standard deviations (SDs), and Cronbach’s alpha values.

Table 1. Key measures and variables.

<table>
<thead>
<tr>
<th>Measure and variables</th>
<th>Mean Value</th>
<th>SD</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project efficiency</td>
<td>3.26</td>
<td>0.70</td>
<td>0.69</td>
</tr>
<tr>
<td>Project effectiveness</td>
<td>3.38</td>
<td>0.65</td>
<td>0.62</td>
</tr>
<tr>
<td>PMO controller role</td>
<td>3.84</td>
<td>1.22</td>
<td>0.82</td>
</tr>
<tr>
<td>Strategy manager</td>
<td>2.83</td>
<td>0.86</td>
<td>0.89</td>
</tr>
<tr>
<td>Resource manager</td>
<td>3.80</td>
<td>1.27</td>
<td>0.91</td>
</tr>
<tr>
<td>PMO coordinator role</td>
<td>2.12</td>
<td>0.72</td>
<td>0.53</td>
</tr>
<tr>
<td>Supervisor</td>
<td>3.32</td>
<td>1.22</td>
<td>0.84</td>
</tr>
<tr>
<td>Coordinator</td>
<td>2.74</td>
<td>0.78</td>
<td>0.91</td>
</tr>
<tr>
<td>PMO supporter role</td>
<td>3.12</td>
<td>1.22</td>
<td>0.84</td>
</tr>
<tr>
<td>Information sharer</td>
<td>2.74</td>
<td>0.78</td>
<td>0.91</td>
</tr>
</tbody>
</table>

Specific measures, such as reliability, a measure of sampling adequacy (MSA), and commonalities, as well as the explanatory power of the variables are listed in Appendix 2.

**Control variables**

We use three control variables in regressions: the (1) number of employees, the (2) percentage of project allocation (PAP), and the (3) importance of external projects. First, we expect that the size of the organization measured as the number of employees is correlated with the quantity of projects. Second, the number of projects in the organization may affect project performance in two ways: a large number of projects may increase the need for control and coordination and thereby decrease project performance, whereas learning effects, standardization, and scale effects may increase project performance. We measure PAP as person-hours allocated to project work divided by person-hours allocated to line work. Third, we know if the PMOs primarily delivers internal or external projects. We
expect that a large share of external projects make project delivery management more complex than a large share of internal projects would do. For example, customer solutions are likely to consist of interconnected products and service components that need to be tailored to requirements. Necessity to adapt to the customer environment may decrease project performance.

**Results**

*Factor and Regression analyzes*

We use a factor analysis to reduce the number of items in the variables, followed by linear regressions in order to estimate partial effects from the control and roles variables on project efficiency and effectiveness. We apply a linear regression model – scatter plots of the dependent and the independent variables do not indicate any need of non-linear specifications. OLS-regression results are given in Table 2. In addition to the efficiency regression (Model 1) and the effectiveness estimation (Model 2) we run regressions with control variables only.

![Table 2](image)

In contradiction to our hypotheses, we find few evidence for the impact of our control variables. The number of employees and the importance of internal projects do not affect efficiency, nor do they affect the efficacy of projects. But PAP has a highly significant positive impact on efficiency as well as on efficacy.
In Model 1, the coordinator and trainer variables have a positive partial effect on project efficiency, a finding that supports hypotheses 2 and 3. In Model 2, the strategy manager variable has a negative partial effect on project effectiveness, which contradicts hypothesis 1. As already pointed out, the control variable PAP has a significant positive partial effect on project effectiveness. A summary of our hypothesis tests is shown in Table 3.

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 1: As a controller role, the PMO contributes positively towards project efficiency and effectiveness</td>
<td>Project efficiency Project effectiveness</td>
</tr>
<tr>
<td>The PMO as a strategy manager is positively associated with</td>
<td>Reject Reject</td>
</tr>
<tr>
<td>The PMO as a resource manager is positively associated with</td>
<td>Reject Reject</td>
</tr>
<tr>
<td>Hypothesis 2: As a coordinator role, the PMO contributes positively towards project efficiency and effectiveness</td>
<td>Project efficiency Project effectiveness</td>
</tr>
<tr>
<td>The PMO as a supervisor is positively associated with</td>
<td>Reject Reject</td>
</tr>
<tr>
<td>The PMO as a coordinator is positively associated with</td>
<td>Reject Accept</td>
</tr>
<tr>
<td>Hypothesis 3: As a supporter role, the PMO contributes positively towards project efficiency and effectiveness</td>
<td>Project efficiency Project effectiveness</td>
</tr>
<tr>
<td>The PMO as a trainer is positively associated with</td>
<td>Accept Reject</td>
</tr>
<tr>
<td>The PMO as an information sharer is positively associated with</td>
<td>Reject Reject</td>
</tr>
</tbody>
</table>

Table 3. The hypotheses and results.

We do not expect multicollinearity between the independent variables. Our supposition was buttressed by a reliability test. After manually checking the different variables in the factors and the multicollinearity, no variable was removed. More in detail, the number of employees is positively correlated with the PMO coordinator variable. PAP has a significant positive correlation with project effectiveness, however, negative association with the strategy manager variable. The predominance of
internal projects is negatively correlated with the PMO trainer variable. The variance inflator factor (VIF) values were acceptable (1.1 < VIF < 3.5), except for the PMO as a trainer variable, which VIF was a bit high (5.3). The detailed bivariate correlations of the variables are documented in Appendix 1.

Synthesis and discussion

We used linear regression techniques to estimate if the project performance of organizations is improved when its PMO plays one of three roles, the controller, coordinator, or supporter role. Model 1 revealed a significant positive partial effect from the PMO coordinator and the trainer role on project efficiency. This finding is supported by earlier studies. For example, Dietrich and Lehtonen (2005) showed in their empirical study a significant positive association with selecting a management approach that fit the context, formal decision making during project and monitor organization strategy alignment to the project level. Similarly, Lind and Culler (2011) showed that if project goals are set clearly, project performance improves. Mohapatra and Gupta (2014) showed a positive relationship between project tools, skills, and productivity. More importantly, some studies indicate a positive impact of governance processes on project success (e.g., Zwikael & Globerson, 2006).

We did not find any impact from the controller role on project performance. Further, our results indicate that assuming the role of a strategy manager has a negative effect on project effectiveness (Model 2). There may be some reasons why the PMO when it takes the role of a strategy manager has a negative impact on project efficacy (but not on efficiency). A misfit of the organization’s strategies, PMO tactics, and projects techniques may cause senior management dissatisfaction and problems with the governance models, defining strategic goals and monitoring performance. Due to that, the senior managers might feel as if they are losing control over the projects, being “blindfolded,” and lacking relevant information from the project teams (e.g., Lipshitz & Strauss, 1997). The losing a control of projects “feeling” may result senior managers need for increased oversight of a PMO, bypass the
agreed governance methods and command project operations. Similar problems may occur in the young project organizations, which have an active senior management, where the project governance processes are not adequately in place and performance measures undetermined. For instance, Ward & Daniel (2013) indicated that a presence of a PMO does not increase senior managers’ satisfaction, but project success (i.e. effectiveness) has a significant positive association with senior managers’ satisfaction. Low project performance may result senior managers active participation on project operations involving politics and opportunistic behavior (e.g., Aubry et al., 2010, Müller, Hobbs, & Blomquist, 2010), such as prioritizing resources and work according to a single senior manager’s interests (Engwall & Jerbrant, 2003) i.e. promise to give customer what they want, resulting extra work, and decreased project team performance (i.e. efficiency).

**Conclusion**

Selecting effective and efficient roles for the PMO is a challenging task for organizations. In this paper we argued that PMOs may choose from a broad set of context-specific roles and role-related processes. We used linear regression techniques in order to estimate if the project performance of organizations is affected when the PMO plays one of three roles: the controller, coordinator, or supporter role. Our empirical findings show that taking the role of a coordinator, i.e. when the PMO formalizes project processes, project performance will be increased.

We further find that a PMO that acts as a strategy manager has a significant negative impact on project effectiveness, but no effect on project efficiency. We argued that this result sheds some insight on how to cope with strategic management principles: Even though projects should be aligned with organizational strategic goals to some extent, a PMO that takes the role of a strategy manager will not increase project efficiency and even hamper project efficacy. Consequently, a project organization should pay more attention to organizational strategies and how they are aligned with value creation
and project performance. In any case, they should not overstate the task of the PMO as a strategy watchdog.

From a managerial perspective, we propose that one of the first steps in the process of establishing a PMO be a clear definition of roles between senior management and the PMO. We recommend defining performance metrics for daily operations and projects of the PMO. One of the PMO’s necessary roles in the future might be acting as a tactical project leader that is able to strengthen organization project culture. The tactical leader role may include tasks such as setting objectives for the portfolios and providing governance models for project-oriented organizations. It should help to create methods for cooperation, information sharing (feedback and feedforward), and organizational renewal. This is likely to reduce conflicts between senior management and operations resulting in increased operational performance.

Sample size and the homogeneous respondent group in our study ensure validity and reliability of our results. Nevertheless, our study has some limitations regarding scope and methodology. However, the impact of context-specific variables may still be considerable. Compared to what is to be expected from cross-sectional regressions, Model 1 and 2 provide a quite some explanatory power (with $R^2$ of 26% and 31%). But, there may be some time related effects that are not captured in our estimations, e.g. PMO maturity.

For further research, it would be interesting to search for the PMO roles and contextual variables, which create low-performing, high-performing, and very high-performing PMOs. Also, it would be captivating to measure the impact of PMO environment on PMO value contribution in both stable and dynamic project organization environments.
REFERENCES


Appendices

Appendix 1. Correlations between the PMO variables.

<table>
<thead>
<tr>
<th>Number of employees</th>
<th>Project allocation % (PAP</th>
<th>Project type (internal/external)</th>
<th>Project efficiency</th>
<th>Project effectiveness</th>
<th>Strategy manager</th>
<th>Resource manager</th>
<th>Supervisor</th>
<th>Coordinator</th>
<th>Trainer</th>
<th>Information shared</th>
</tr>
</thead>
<tbody>
<tr>
<td>154</td>
<td>-0.1</td>
<td>-0.05</td>
<td>-0.06</td>
<td>-0.01</td>
<td>-0.03</td>
<td>-0.01</td>
<td>-0.01</td>
<td>-0.02</td>
<td>-0.02</td>
<td>-0.02</td>
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</table>

**p < 0.05

**p < 0.01

***p < 0.001

Appendix 2. Results of the factor analysis.
Abstract

Many project-oriented organizations have implemented a project coordination mechanism, such as a project management office (PMO), to align projects with the organization’s strategy, to ensure the success of projects, and to create value for the organization from projects. While organizations continue establishing PMOs, these PMOs are struggling to create sufficient value for organizations, and they seldom meet senior management’s expectations. Our results reveal a significant impact of the PMO environment and interaction of the roles on PMO’s value contribution. The findings confirm that PMOs have an essential function renewing organizations and creating a fit between organization capabilities and assets.

Keywords: Organizational Project Management; Project Management Office; PMO roles; Organization value contribution; Strategizing; System thinking
1. Introduction

A project management office (PMO) is a group or a department that supports project management within an organization (Darling & Whitty, 2016). The PMO may operate at a low level in the organization, or it may report to higher levels (Hobbs & Aubry, 2010). The tasks of a PMO may include defining and maintaining methods and tools for project management, optimizing project resource usage, providing training, supporting and guiding ongoing projects, controlling project progress by monitoring and reporting, and maintaining the repository of project documentation (Dai & Wells, 2004; Hobbs & Aubry, 2010). The mandate and the tasks of a PMO differ as widely as the industries and organizations that host them (Darling & Whitty, 2016). A PMO can offer a variety of services, and the literature proposes different models for PMOs (see e.g. Monteiro, A., Santos, V., & Varajão, J., 2016).

Despite senior management’s high expectations of the ability of PMOs to demonstrate value for the money invested and recognition of the importance of PMOs as an organization’s renewal function and value contributor (Artto, K. A., Kulvik, I., Poskela, J., & Turkulainen, V., 2011; Hurt & Thomas, 2009), PMOs face everyday challenges such as a short life expectancy – average two years (Hobbs & Aubry, 2007). One explanation for a PMOs’ short lifecycle is that PMOs are not sensitive enough to operational environment dynamics and are therefore not able to adapt to the requirements of the operational environment (Hobbs & Aubry, 2008; Müller, R., Glückler, J., & Aubry, M., 2013; Tsaturyan & Müller, 2015) resulting low PMO value contribution. Conversely, those PMOs that can renew their roles and processes in response to environmental changes will increase their likelihood of success (e.g., Aubry, M., Müller R., Hobbs, B., & Blomquist, T., 2010).

Previous studies of PMOs reveal wide variation between PMOs and the value that they contribute to their organizations (e.g., Aubry & Hobbs, 2011; Aubry, 2015; Dai & Wells, 2004; Liu & Yetton, 2007; Ward & Daniel, 2013). Recently, PMO research has emphasized an approach where a PMO contributes value to an organization as a system integrated into the organizational context
On the other hand, there is little empirical evidence for how PMO roles interact in relation to others and how this interaction affects in the roles’ value contribution. This constitutes a gap in the research that requires more studies of PMO roles in relation to an organization’s value contribution. In this study, we raise the following three research questions: 1) Which PMO roles are associated with an organization’s value contribution? 2) Which PMO roles interact together and how? 3) How does the rate of change in the organization’s environment affect the PMO’s value contribution?

In this study, we engage the existing concepts of the PMO roles and knowledge of the PMO expects in a process of creating new scientific and practical knowledge about the phenomena using a multi-method research strategy (e.g., Van de Ven, 2007). Furthermore, we utilize two theoretical “lenses” to investigate the PMO value contribution phenomena: first, the lens of the contingency theory configuration perspective (Miles, R. E., Snow, C. C., Meyer, A. D., & Coleman, H. J., 1978; Mintzberg, 1979), and a dynamic concept of organization configuration with context (e.g., Drazin & Van de Ven, 1985; Milgrom & Roberts, 1985; Siggelkow, 2001); and secondly, the dynamic capability view (Teece 2007; Teece 2014) that shed light organization capability evolution and in organization strategic renewal processes (Zahra, S. A., Sapienza, H. J., & Davidsson, P., 2006; Zollo & Winter, 2002). Based on these theories, we focus on improving understanding of how a PMO can support strategy-making and the benefits that practitioners get from a PMO as a strategy tool use (Jarzabkowski & Kaplan, 2015) in the pluralistic project oriented organization context, where power is diffuse and work is knowledge-based guided by multiple objectives (Denis, J. L., Langley, A., & Rouleau, L., 2007). More precisely, our study contributes to the organization project management and PMO studies in the two ways: First, our study offers an insight into how a PMO and its roles add value as an organizational function creating value for the organization. Second, this work demonstrates the significant and context specific interaction effects between the roles. This article proceeds as follows: The next section discusses the principles of contingency theory and the dynamic
capability view from the organization fit and value contribution perspectives. Then, we define a PMO as an organizational strategizing tool. Finally, we introduce a method to adjust coherence between the PMO roles and fit between organization contexts to maximize value creation. The study concludes by discussing the key findings, implications for practice, limitations, and future research.

2. Theoretical basis

2.1. Strategic fit, a process of aligning the organization with the environment

A fit is a central concept in strategy management (Venkatraman & Camillus, 1984). Strategic fit defines an optimal interaction between organization structures, resources, capabilities with an environment resulting high value contribution (e.g., Child, 1972; Donaldson, 1987; Doty, D. H., Glick, W. H., & Huber, G. P., 1993; Doty et al., 1993; Drazing & Van De Ven, 1985; Miles et al., 1978; Mintzberg, 1979). For example, Miles et al. (1978) define three efficient organization strategies: analyzer, prospector, and defender. These are strategies for an organization to respond to its environment in order maintain high value contribution and competitiveness under different environmental conditions. Defenders focus on organization internal operations, prospectors organization external operations and market opportunities, analyzer have a capability effectively shift focus between internal and external operations. In the long run, these three proactive strategies outperform the organizations’ reactive strategy that opposes external changes and organization adaptation. Furthermore, Mintzberg identified the five effective configurations of the organization internal coordination mechanisms: simple structure, machine bureaucracy, professional bureaucracy, divisionalized form, and adhocracy. Both examples of fits reflect the patterns of interactions, i.e., gestalt (Hrebniak, 1981; Lawrence & Dyer, 1980; Van de Ven, 1979) between strategic organizational functions in a context. The definitions are relatively generic and suffer to define the micro level activities of arriving at a fit. For example, Siggekow and Rivking (2005) showed how environment rate of change impact organization processes and activities. More precisely, the
efficient organization configurations and activity patterns should be both connected to the external
environment and internally consistent, i.e., balancing and reinforcing system (Siggelkow &
Levinthal, 2003). The paper describes the critical interactions between organization assets in the
process of evolution toward a fit, i.e., high-value contribution, however, a study has a limited
capability to identify the internal processes that create and maintain fit in response to environmental
changes. According to the dynamic capability view (DCV), organization dynamic capability is high
level of routines (collection of routines) that, together with its implementing input flows, confers
upon an organization's management a set of decision options for producing significant outputs of a
particular type (Winter, 2000, p. 983). The dynamic capability view bridges the organization’s
internal renewal practices and value creation together in a process of creating organization internal
coherence between the organization assets such as routine processes. Organization’s dynamic
capability can be defined as managerial processes and routines that build, integrate, and reconfigure
its low level operational assets (e.g., Eisenhardt & Martin, 2000; Teece 2007, 2014). The dynamic
capabilities enable organizations to develop a high-value contribution processes and maintain them
when in the turbulent environment (Helfat & Peteraf, 2003). The dynamic capabilities "orchestrate"
the organization's operational capabilities and activities, such as production processes, and create
new capabilities that support the organization’s high performance and competitiveness.

2.2. A Project Management Office

"PMOs are organizations' responses to their needs and environments – unique structural arrangements
designed to fulfil a specific purpose" (Pellegrinelli & Garagna, 2009, p.651). Many organizations, and
especially those that regularly run large projects, use a project management office (PMO) to assist in
all aspects of the management of project work (Maylor, 2003). The PMO is commonly constituted as
a function alongside other functions within the organization (Darling & Whitty, 2016) and may operate
at various organization levels. Not every PMO has the same mandate and responsibilities, so the PMO's
role in the management of projects varies between organizations. The responsibilities of PMOs may range from developing project methodology to supporting ongoing projects and managing the organization's project portfolio (Monteiro et al., 2016). On the other hand, Aubry et al. (2007) found considerable diversity and a lack of consensus regarding the roles and responsibilities that should be included in a PMO, which is confirmed by Monteiro et al. (2016). Moreover, there is great variety in the terms used to name the function. Monteiro and colleagues (2016), for example, identified 25 unique names, finding that project office, project management office, project support office, project management centre of excellence, project portfolio office and program office were the most widely used in the literature.

The selected PMO roles, processes and activities should comply with the organization’s strategy and hierarchy, as well as the other actors in the network. The PMO roles set expectations for how an actor such as the PMO function acts, and how it is expected to act towards the project organization in collaboration with the other organization actors in the network. Although the names and categorization schemes vary, several researchers have proposed that a PMO may take on several simultaneous roles (Müller et al., 2013; Unger, N.B., Gemünden, H.G., & Aubry, M., 2012). The roles can be categorized according to a nature of the role as the administrator role and the supporter role (Desouza & Evaristo, 2006); the controlling role, coordination role and supporting role (e.g., Unger et al., 2012); and the controlling role, serving role and partnering role (Müller et al., 2013).

2.3. Roles and processes of the PMO as integration mechanisms to create a fit

One way to see a PMO is through the lens of organization project management (OPM), as an organizational function and mechanism to "integrate all project management activities through organization hierarchy or network" (Sankaran et al., 2017, p.24). Aubry et al. (2007, p. 332) defined organisational project management as “a new sphere of management where dynamic structures in the firm are articulated as means to implement corporate objectives through projects in order to maximize
value.” These organizational activities that are associated with organizing, especially when the activities lead to a consistent pattern of actions refer to a process of strategizing (Tsoukas & Knudsen, 2002). Organizing is a part of a strategizing process (Johnson, G., Melin, L., & Whittington, R., 2003; Whittington & Melin, 2003) which actively involve both organizational strategy adaptation and social practices (Balogun, J., Jacobs, C., Jarzabkowski, P., Mantere, S., & Vaara, E., 2014; Golsorkhi, D., Rouleau, L., Seidl, D., & Vaara, E.; Seidl & Whittington 2014; Vaara & Whittington 2012). The strategizing processes engage with organizational (at least partly) emergent strategy process (e.g., Mintzberg, 1979; Pettigrew, 1985) and the context-specific processes of matching organization assets with environment, creating and maintaining high organization value contribution (e.g., Helfat & Peteraf, 2003; Zahra, S. A., Sapienza, H. J., & Davidsson, P, 2006; Zollo & Winter, 2002).

Analogically, a PMO can be seen as an organization strategizing function and an orchestrator of the project oriented organization’s assets. The roles and processes of the PMO serve as a way of integrating the organization’s assets or creating new assets i.e. the processes act means to maximize organization value contribution. Gulati, R., Wohlgezogen, F., & Zhelyazkov, P. (2012) define two types of collaborative processes and activities – coordinative and cooperative – which coexist, but are grounded on different premises of organization and team interaction. The coordinating processes are grounded on hierarchies and authority and are driven by an administrative type of collaboration (e.g., Desouza & Evaristo, 2006) and effective communication (Morris, P. W., Pinto, J. K., & Söderlund, J., 2012). Conversely, the cooperative processes are driven by social interactions and relational attachments, and integration methods are driven by a voluntary type of collaboration (Desouza & Evaristo, 2006; Julian, 2008) and beneficial relationship (Morris et al., 2012). Furthermore, the role types and related processes have different impacts on organization value creation. The outcome of successful coordination is more efficiency, effectiveness and flexibility within the organization, and fruitful cooperation creates stability and equality, as well as shared vision toward the strategic goals (Gulati et al., 2012).
2.4. Fit and PMO value contribution

From a contingency theory perspective, organization performance is a fit between an organization's assets and environment resulting high performance (e.g., Donaldson, 1987). The fit can be described as confirmation of the organization assets, where the assets are coherent to produce synergy and also, connected to operational environment (e.g., Miller & Friesen, 1984; Siggelkow, 2002). The phenomena can be defined with three arrays: 1) coordination as a "pattern of roles to support commonly agreed goals"; 2) cohesion as connectedness between the assets; and 3) synergy in which the interactions reinforce each other (Sankaran, S., Müller, R., & Drouin, N, 2017, p. 25).

Performance in the project context can be measured as a process efficiency and measured by the ratio of outputs divided by inputs of a production process (e.g., McLaughlin & Coffey, 1990). In such a case, efficiency-related performance measures, such as process time, cost and output quality, provide an accurate quantification of performance. On the other hand, if the organization and its functions operate as an open system in a pluralistic context, then the production process inputs result in several outputs that can be further refined as inputs as a cyclic process. The system adjusts itself by using feedback loops during the production process, and it is necessary to quantify performance from a holistic value creation perspective (e.g., Winter & Szczepanek, 2008). In an open system, teams continually search for new value creation and co-creation possibilities with stakeholders, which increases flexibility in the process and improves the ability to deliver more value when the process is focused toward the strategic goals. To shift a PMO performance focus from efficiency to value creation measurement, Desouza and Evaristo (2006) suggest that PMO value contribution can be captured using project-, PMO- or business value-centric dimensions and metrics. In a similar vein, Aubry et al. (2011) propose that a PMO's performance is a balance between several aspects that align with organization strategy i.e. contribute organizational value: 1) rational goal accomplishment such as productivity; 2)
benefits and growth; 3) human relations and learning; and 4) the organization’s internal control such as project management processes stability (Quinn & Rohrbaugh, 1983 in Aubry et al., 2011).

2.5. PMO environment rate of change

A PMO operates in a pluralistic (i.e., complex and diversified) context that affects the selection of coordination methods and the outcomes of those methods (e.g., Baccarini, 1996). According to Geraldi, J., Maylor, H., & Williams, T. (2011), the complexity of the environment has five dimensions: structural, environmental, dynamic, spatial, and socio-political. The structural complexity dimension is associated with the size of the project size and the variety of project components, as well as the extent of integration between the components. Integration between the elements increases complexity. The environmental complexity dimension is associated with how novel the project is, experience and capability a project requires, and the availability of information. The dimension of dynamic complexity is associated with the changes that the environment causes during the project. The spatial complexity dimension is associated with external pressures to accomplish project goals, and the social-political complexity dimension is related to conflicts of political interest involving multiple projects, i.e., the nature of the changes.

Taken together, the dimensions of structural and dynamic complexity are the commonly used mediators that are associated with project performance and organizational success in the project literature (Brady & Davies, 2014). Also, unpredictable changes in the environment will likely negatively impact performance, especially when the projects include complex, tightly integrated, customer-specific components, i.e., when the impact of change has a chain reaction in the delivery process. In this study, we consider the rate of change in the PMO environment to be low when organizations focus on delivering internal projects. Conversely, we consider the rate of change in the PMO environment to be high when organizations focus on delivering external projects such as customer solutions.
3. The hypotheses

The following sections introduced five PMO roles as PMO processes and means of creating an organization fit and value: 1) the performance coordinator role; 2) the strategic coordinator role; 3) the multi-project administrator role; 4) the project developer role; and 5) the knowledge manager role.

We divided these five PMO roles into two categories – coordinative roles and cooperative roles – according to their dominant characteristics and impact on an organization. The role types, roles, and related tasks are presented in Table 1.

<table>
<thead>
<tr>
<th>Role type</th>
<th>The PMO’s roles</th>
<th>The PMO’s tasks</th>
</tr>
</thead>
</table>
| Coordinative | 1. Performance coordinator | ➢ Report project status to business executives  
               ➢ Monitor and control project performance  
               ➢ Develop and maintain project scoreboard  
               ➢ Develop key performance indicators |
| Coordinative | 2. Strategic coordinator | ➢ Provide advice to business executives  
               ➢ Participate in strategic planning  
               ➢ Support strategic management  
               ➢ Forecasting  
               ➢ Benefits management  
               ➢ Network and provide environmental scanning |
| Coordinative | 3. Multi-project administrator | ➢ Coordinate between projects  
               ➢ Identify, select, and prioritize new projects  
               ➢ Manage one or more portfolios  
               ➢ Manage one or more programs  
               ➢ Allocate resources between projects  
               ➢ General administrative project tasks  
               ➢ Provide common project tools |
| Cooperative | 4. Project developer | ➢ Develop and implement a standard methodology  
               ➢ Promote project management within the organization  
               ➢ Develop personnel competency, including training  
               ➢ Provide mentoring for project managers  
               ➢ Provide a set of tools without trying to standardize |
| Cooperative | 5. Knowledge manager | ➢ Manage project documentation archives  
               ➢ Conduct post-mortem reviews for projects  
               ➢ Conduct project audits |
Table 1. The PMO’s roles and related tasks (Adapted from Aubry et al., 2011). The three PMO roles as 6) the client interface manager; 7) the recruiter; and 8) the specialized tasks operator were discarded during the pre-screening process (see Table 2).

3.1. The PMO’s coordinative roles and organizational value contribution when the rate of change in the environment is low

The PMO’s coordinator roles, such as being a strategic coordinator, multi-project administrator, and performance coordinator, are associated with integrating project activities, such as implementing organizational strategy through a PMO, centralizing project decision-making, coordinating between projects, and sharing information to support decision-making processes (e.g., Aubry et al., 2011). According to Desouza and Evaristo (2006), these roles can be characterized as administrative. In the administrative roles, authority and coordination mechanisms are grounded on organizational hierarchies, the communication roles are established, and channels are created. For instance, the strategic coordinator role ensures that the projects align with the organization’s strategy, including activities such as strategic planning and providing information about how the strategic goals will be achieved (Desouza & Evaristo, 2006). Similarly, the multi-project administrator role ensures that projects operate coherently with each other and that project resources are allocated efficiently according to the organization’s priorities (Aubry et al., 2011), which is positively associated with project organization capability to operate project-wise (Cooke-Davies & Arzymanow, 2003) and increased performance. Further, Martinsuo and Lehtonen (2005) showed empirical evidence of a positive association between multi-project and single-project management and project performance. From a project team perspective, formalizing project processes supports information-sharing and the availability of relevant, on-time information, which has been associated with improving a team’s ability to deliver on time and according to customer requirements (e.g., Hoegl and Parboteah, 2007).
On the other hand, delivering customer solutions in an environment that has a high rate of change requires delegation of the decision making authority close to the operations and flexibility to operate effectively (e.g., Jerbrant & Karrbom Gustavsson, 2013). For example, organizations delivering complex products and systems (Davies, A., & Brady, T. 2000; Hobday, 1998, 2000) are required to promptly respond to customer needs and changes. These unplanned changes are likely to decrease performance when the organization structures and processes are rigid. In a similar vein, professional organizations and knowledge-intensive project work require relevant information sharing and active collaboration to operate effectively (Kratzer et al., 2008). Integration to centralized decision-making and formalized project processes are likely to create slack in the decision-making processes, hinder lateral information flow and reduce creativity. Furthermore, rigid processes may also lose relevant project-specific information and decrease performance, especially in an environment with a high rate of change. Therefore, we posit three hypotheses:

Hypothesis 1: A PMO's performance coordinator role is positively associated with high-value contribution when the rate of change in the environment is low.

Hypothesis 2: A PMO's strategic coordinator role is positively associated with high-value contribution when the rate of change in the environment is low.

Hypothesis 3: A PMO's multi-project administrator role is positively associated with high-value contribution when the rate of change in the environment is low.

3.2. The PMO’s cooperative roles and organizational value contribution when the rate of change in the environment is high

The knowledge-intensive and cooperative PMO roles, such as the development manager role and knowledge manager role, are associated with activities such as developing project processes,
supporting project learning, sharing information, and creating project capabilities (e.g., Aubry et al., 2011). PMOs that support cooperative organization processes close to the operations are effective when environment rate of change is high (Desouza & Evaristo, 2006).

In the cooperative methods and processes, such as learning and process feedback loops, the relationships between partners are informal, authority is determined between the partners, and there exist many levels of information-sharing (e.g., Argyris, 1976). In a process level, open-minded and semi-structured cooperative processes are efficient in creating organization capabilities and supporting organization processes in complex environments, such as finding new creative and effective ways to operate, and having the ability to adapt when the environment changes in order to maintain high value contribution (Davies & Brady, 2000; Sense, 2007). Furthermore, project managers’ ability to adapt to the project requirements and lead teams is associated with project success (e.g., Pinto & Prescott, 1988). In a similar vein, knowledge-intensive and complex environments require project teams to have the independence to self-organize, cooperate and ability utilize organization capabilities and project knowledge in order to operate effectively (e.g., Cohen & Levinthal, 1990; Garrety et al., 2004; Kratzer, J., Gemünden, H.G., & Lettl, C. (2008); Perkins, D., Jugdev, K., & Mathur, G., 2018) and to produce value in an efficient manner (e.g., Kujala, J., Ahola, T., & Huikuri, S., 2013). Therefore, we posit two more hypotheses:

Hypothesis 4: A PMO's project developer role is positively associated with high-value contribution when the rate of change in the environment is high.

Hypothesis 5: A PMO's knowledge manager role is positively associated with high-value contribution when the rate of change in the environment is high.
3.3. Coherence between the coordinative and cooperative roles of PMOs and organizational value contribution

PMOs seldom execute one role at a time (e.g., Müller et al., 2013; Tsaturyan & Müller, 2015). The roles, processes and procedures in the PMO need to be adjusted according to the environmental requirements, creating a coherent set of rules and consistency of action. The roles are likely to interact as a system supporting or cannibalizing each other's value contribution over time. Coordination within organization is likely to require some degree of cooperation, and vice versa (e.g., Leufkens & Noorderhaven, 2011). For example, an independent PMO that relies on cooperation requires cross-departmental coordination and established communication processes to work efficiently (Desouza & Evaristo, 2006). We postulate that a PMO's performance coordinator role benefits from knowledge-sharing. Similarly, a PMO's strategy coordination role benefits from the project developer role. Therefore, we posit two more hypotheses:

Hypothesis 6: The performance coordinator is positively associated with the knowledge manager role and high-value contribution.

Hypothesis 7: The strategic coordinator role is positively associated with the project developer role and high-value contribution.

The conceptual model is illustrated in Figure 1.
3.4. Operationalization of variables

We define the PMO roles, using the five key roles from Aubry et al. (2011), as: 1) performance coordinator, 2) strategic coordinator, 3) multi-project administrator, 4) project developer, and 5) knowledge manager. We coded the roles as dichotomy variables as either active (coded as 1) or passive (coded as 0).

We defined the rate of change in a PMO’s environment with two dimensions of complexity: structural complexity and dynamic complexity (e.g., Brady & Davies, 2014; Geraldi et al., 2011). The former refers to how complex the project is, such as interdependencies between the product components or system architecture, the project and the project environment. The latter refers to the rate of change that projects will experience during the delivery phases. We assume that external projects will face more unpredictable changes than internal projects. Further, the greater the number and interdependency of the system components in projects (such as in integrated customer solutions),
the greater the impact of each change is on a project. By testing the constructs (rate of change dimensions) we were able to reduce the two dimensions into the following sub-set of the dimensions. PMOs that support internal projects delivering simple products with low structural and dynamic complexity are operationalized as a PMO operating in an environment where the rate of change is low (coded as 0). PMOs supporting external projects and complex deliveries (such as integrated customer solutions) with both high structural and dynamic complexity are operationalized as a PMO operating in an environment where the rate of change is high (coded as 1).

We define a PMO’s performance as the value contributed by the PMO in the organization environment (e.g., Aubry et al. 2011). As a reminder, PMO performance is defined with four value dimensions: 1) rational goal accomplishment, for example economic value, such as profit, project management efficiency, and return on investment; 2) project benefits and growth; 3) human relations and learning, internal cohesion in the organization and morale; and 4) internal organization project management processes, such as the quality and stability of programme and portfolio processes, information and knowledge sharing (Quinn & Rohrbaugh, 1983 in Aubry et al., 2011). The total value contribution was measured using a scale from 5 to 1 (with 5 as a high-performance contribution, and 1 as a low-performance contribution).

4. Methodology

The research process was divided into two sequential phases. In the first phase of the empirical data collection, we applied a focus group method including one facilitator and ten project experts (e.g., Kruegert, 1994). The objective of the first phase was to screen the PMO roles that contribute most value for further evaluation in the second phase. This qualitative research method has three main characteristics, which is similar to the Delphi method, such as group assessment, iteration rounds, and several feedback loops (Rowe & Write, 1999). The two main phases are presented in Table 2.
Table 2. Description of the research process.

In the second phase, we utilized the design of experiments (DOE) method with the twelve PMO experts. The objective of the second phase is to identify the value contributed by the PMO roles under different organization conditions and evaluate the interaction effect between the roles.

4.1. The DOE method

The DOE method was developed to support manufacturing and process improvements; however, the method is also known outside traditional manufacturing environments, such as in sales and marketing research (Bell, G. H., Ledolter, J., & Swersey, A. J., 2006). DOE is a structured tool that can lead to new results by investigating the causal interactions of the PMO roles. We chose the DOE method for three reasons. First, DOE as a statistical method is a useful tool for creating new knowledge from an unknown abstract phenomenon (Fisher, 1935), such as the performance of PMOs. Second, the method enables the complex relationships between PMO roles to be analysed, something which cannot be detected with a linear approach. Third, using DOE as a supporting tool, we were able to cover a significant number of PMO configurations (144) with a small number of experts (12) with a high explanatory power in context (54%).

In DOE, the inputs of the process are called factors, and the one or more process outputs are called response variables. Each row in the design represents the predetermined input levels (see Appendix 1). The output of each row, a PMO configuration, is evaluated by a single PMO expert. The applied Plackett–Burman design and the other fractional factorial models are orthogonal designs,
which means that effects are estimated independently with minimum variance (Bell et al., 2006). The selected design determines how many runs are needed to conduct an experiment based on the factorial design resolution, number of factors and their levels. PB designs have typically two or three factor levels each, with the number (N) of runs given. These factor levels are changed simultaneously according to the predetermined design – see Appendix 1.

4.2. Sample

This study aims to investigate the value contribution of various PMO roles. Our review requires highly qualified experts with a thorough understanding and knowledge of the topic in question. The selection of experts was inspired by the procedure presented by Okoli and Pawlowski (2004), and the main selection criterion was a long-established career in project management, including a career as PMO staff. The selected experts were recommended by a PMO or project management function and personally contacted by email before the experiment. The email explained the research area of interest, the objective of the research, and the research method to be used. One organization’s security policies were so strict that the interviews could not be conducted, three experts chose not to participate, and two experts were changed during the process because of lack of experience.

The experts were categorized into two groups. The first group included ten project management experts with an average of eight years of project experience. The second group consisted of twelve PMO experts averaging over ten years of project experience and a minimum of five years of PMO experience. The experts represented organizations operating mainly in Finland, and they operated in the ICT (3), finance (3), manufacturing (2), energy (2), and construction (2) sectors. The answers were anonymous. Detailed information is presented in

<table>
<thead>
<tr>
<th>Role of expert(s)</th>
<th>Expertise in years</th>
<th>Industry sector</th>
<th>Organization size</th>
<th>PMO age in years</th>
<th>Amount of work time</th>
</tr>
</thead>
</table>


The survey included both for-profit and non-profit organizations. The organizations delivered mainly either internal or external projects, and the number of project managers in the organization varied from 11 to 100. All of the organizations have a working project governance model. The PMOs' ages ranged from one year to ten years, and the age of a PMO is associated with the maturity level of the PMO.

5. RESULTS

5.1. The main effects
The objective of the phase is to distinguish those PMO roles with the highest value contribution from those with low value contribution i.e., to establish a hierarchy of the roles’ effects according to their organization value contribution (see Table 4).

<table>
<thead>
<tr>
<th>PMO role value contribution</th>
<th>Effect</th>
<th>T-value</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance coordinator</td>
<td>0.940</td>
<td>3.39</td>
<td>0.00</td>
</tr>
<tr>
<td>Strategic coordinator</td>
<td>1.345</td>
<td>4.86</td>
<td>0.00</td>
</tr>
<tr>
<td>Multi-project administrator</td>
<td>0.799</td>
<td>2.89</td>
<td>0.01</td>
</tr>
<tr>
<td>Project developer</td>
<td>2.154</td>
<td>7.90</td>
<td>0.00</td>
</tr>
<tr>
<td>Knowledge manager</td>
<td>1.490</td>
<td>5.38</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Table 4, the effects, the significance of the effects and the explanatory power of the effects.

According to the result, the project developer, knowledge manager, and strategic coordinator roles contribute the most value (the effects were between 2.2 and 1.4). The performance coordinator and multi-project administrator roles provide the least value (the effects were between 0.9 and 0.8). The model explains 54% of the PMOs’ value contribution effect, which is a good value in context, and all the PMO roles were statistically significant ($p < 0.05$). The project developer role has the highest differences between the output answers, and the multi-project administrator role has the lowest differences between the given outputs. The $t$-values describe the distribution of the data of each variable.

The objective of the second phase is evaluating value contribution of the roles according to the environment rate of change (see Table 5).
Table 5. Effects and significance of the effects according to the rate of change in the environment.

<table>
<thead>
<tr>
<th>PMO role / Environment rate of change</th>
<th>Effect</th>
<th>T-value</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Performance coordinator</td>
<td>1.840</td>
<td>0.370</td>
<td>3.75</td>
</tr>
<tr>
<td>Strategic coordinator</td>
<td>1.241</td>
<td>1.585</td>
<td>2.62</td>
</tr>
<tr>
<td>Multi-project administrator</td>
<td>0.697 (0)</td>
<td>0.920</td>
<td>1.61 (0)</td>
</tr>
<tr>
<td>Project developer</td>
<td>2.090</td>
<td>2.301</td>
<td>4.00</td>
</tr>
<tr>
<td>Knowledge manager</td>
<td>1.207</td>
<td>1.235</td>
<td>4.13</td>
</tr>
</tbody>
</table>

Φ – variable is not significant

When the rate of change in the environment is low, the PMO’s project developer (effect 2.1), the knowledge manager (effect 1.8), and the PMO’s performance coordinator (effect 1.6) roles contribute the most value. The effect of the multi-project administrator role is insignificant, which does not support hypothesis 3, and the strategic coordinator role contributed little value (effect 1.2). When the rate of change in the environment increases, the project developer role, knowledge manager and the strategic coordinator roles maintain high-value contribution (the effects were between 1.2 and 2.3). On the other hand, the value contribution of the knowledge manager role declines (the effect falls from 1.8 to 1.2), which does not support hypothesis 5. Conversely, the value contribution of the project developer role increases when the rate of change in the environment increases (the effect rises from 2.1 to 2.3), which supports hypothesis 4. The PMO’s strategy coordinator role is the highest value contributor in both environments. Furthermore, the strategy coordinator role’s value contribution increases, when the rate of change in the environment increases (effect from 1.2 to 1.6), which does not support hypothesis 2. The effect of the performance coordinator role becomes insignificant, which supports hypothesis 1, and the effect of the multi-project administrator role becomes significant.
5.2. Interaction effects according to each environment

Next, we tested the interaction effects between the roles. The roles and their interactions are divided into two categories: interactions when the rate of change in the environment is low (Table 6), and interactions when the rate of change in the environment is high (Table 7). The interaction effects have three levels: 1) a reinforcing interaction (labelled “o”); 2) a parallel interaction (i.e., no interaction between the roles, labelled “•”); and 3) an antagonistic interaction (i.e., the roles interfere with each other, labelled “x”). Interactions with no statistical significance ($p > 0.05$) were labelled “Ø.”

<table>
<thead>
<tr>
<th>Environment rate of change is low</th>
<th>Strategic coordinator</th>
<th>Multi-project administrator</th>
<th>Project developer</th>
<th>Knowledge manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance coordinator</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>Strategic coordinator</td>
<td></td>
<td>x</td>
<td>x</td>
<td>0</td>
</tr>
<tr>
<td>Multi-project administrator</td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Project developer</td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

(o = reinforcing interaction, • = parallel interaction, x = antagonistic interaction, Ø = interaction is not significant ($p>0.05$))

Table 6. Interactions between the roles when the rate of change in the environment is low.

When the rate of change in the environment is low, the performance coordinator role reinforces the knowledge manager role, which supports hypothesis 6. Also, the performance coordinator role reinforces the strategic coordinator, project developer, and multi-project administrator roles, and the strategic coordinator role interferes with the multi-project administrator and project developer roles. The other interactions are insignificant.

When the rate of change in the environment is high, the strategic coordinator role reinforces the project developer role, which supports hypothesis 7. The strategic coordinator role also reinforces the multi-project administrator role, and the performance coordinator role interactions become parallel with the other roles (see Table 7).
Table 7. Interactions between the roles when the rate of change in the environment is high.

The other interactions are insignificant. The role type, hypotheses, and the results are presented in Table 8, and the detailed interaction effects between the roles are described in Appendices 2 and 3.

<table>
<thead>
<tr>
<th>Role type</th>
<th>The hypothesis</th>
<th>Accept/Reject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordinative</td>
<td>Hypothesis 1: A PMO’s performance coordinator role is positively associated with organization value contribution when the rate of change in the environment is low.</td>
<td>Accept</td>
</tr>
<tr>
<td>Coordinative</td>
<td>Hypothesis 2: A PMO’s strategic coordinator role is positively associated with organization value contribution when the rate of change in the environment is low.</td>
<td>Reject</td>
</tr>
<tr>
<td>Coordinative</td>
<td>Hypothesis 3: A PMO’s multi-project administrator role is positively associated with organization value contribution when the rate of change in the environment is low.</td>
<td>Reject</td>
</tr>
<tr>
<td>Cooperative</td>
<td>Hypothesis 4: A PMO’s project developer role is positively associated with organization value contribution when the rate of change in the environment is high.</td>
<td>Accept</td>
</tr>
<tr>
<td>Cooperative</td>
<td>Hypothesis 5: A PMO’s knowledge manager role is positively associated with organization value contribution when the rate of change in the environment is high.</td>
<td>Reject</td>
</tr>
<tr>
<td>Coordinative and</td>
<td>Hypothesis 6: The performance coordinator is positively associated with the knowledge manager role and organization value contribution.</td>
<td>Accept</td>
</tr>
<tr>
<td>Cooperative</td>
<td>Hypothesis 7: The strategic coordinator role is positively associated with the project developer role and organization value contribution.</td>
<td>Accept</td>
</tr>
</tbody>
</table>

Table 8. Summary of the results.

6. Discussion
The results revealed that the PMO's project developer role is the role with the highest environment-independent value contribution. Also, the strategic coordinator and the knowledge manager roles are both environment-independent high-value contributors. On the other hand, the value contributions of the performance coordinator and multi-project administrator roles are environment-dependent. The performance coordinator role contributes the most value when the rate of change in the environment is low; however, the role is not a significant value contributor when the rate of change in the environment is high, which is expected. Surprisingly, the value contribution of the multi-project administrator role is high when the rate of change in the environment is high and insignificant when the rate of change is low. There are two dominant explanations for the effect: First, every project should align with the strategy; the high value contribution of multi-project management in a turbulent environment may be explained by the effect of strengthening this alignment between strategy and projects. Second, adopting a centralized project governance model is likely to increase performance when a PMO is operating in a pluralistic environment.

Furthermore, the effects of interactions between the roles indicate few significant interactions. The PMO's performance coordinator role has a reinforcing interaction with the strategic coordinator, multi-project administrator, project developer and knowledge manager roles when the rate of change in the environment is low. The strategic coordinator role has a reinforcing interaction with the multi-project administrator and project developer roles when the rate of change in the environment is high. The strategic coordinator role interferes with the multi-project administrator and project developer roles, which may indicate problems between senior management and the project team. The project teams may require some extent of autonomy to develop working methods, which might conflict with a straightforward process of strategy execution. When the rate of change in the environment increases, the strategic coordinator role reinforces the multi-project administrator role and the project developer role. However, the performance coordinator role interactions with the other roles become parallel.
The interaction effects show that the PMO's cooperative roles are likely to benefit from some degree of formal project procedures (e.g., Edström & Galbraith, 1977), such as to coordinate collective action (e.g., Cohen & Levinthal, 1990). In addition, the interaction effects show that some core PMO roles are environment-independent, facilitating roles with a value contribution that depends on the other roles and the context.

7. Conclusion

This paper contributes to strategy as practice research and a call for context-dependent studies that focus on the strategizing process, covering the organizational, social and individual levels. This study connects strategic management research with PMO practices and decision making as a part of organization strategic management. In our study, we conceptualized a PMO as an organizational strategizing tool. The type of role and the related processes describe the different mechanisms by which the PMO creates a project organization fit, i.e., maximizes the organization value contribution according to the environmental requirements through the coordinative and cooperative processes.

Our findings shed light on how PMO processes effect on organization value contribution and why the dynamic PMOs may have better value contribution, longer lifespans, and higher satisfaction among senior managers than others in similar environments. For example, a PMO's developer role is an environment-independent role that contributes value. However, the performance coordinator and multi-project administrator roles are environment-dependent. This distinction between environment-dependent and -independent roles and their interactions indicate that the configurations of the roles include trade-offs between the roles. These role configurations and the empirical findings of the roles’ interactions provide valuable information about how organizations create and maintain a fit in a pluralistic environment using a PMO as a tool and how to avoid reactive actions.
From a PMO manager’s perspective, we show that a PMO’s roles and underlying interactions between the roles and environment affect the PMO's value contribution. The result indicates that the project developer, knowledge manager, and strategic coordinator are the roles that are most environment-independent. The PMO manager should focus on what those core roles and related processes mean in their organizational context. On the other hand, the value contributions of the performance coordinator and multi-project administrator roles are environment-dependent. Environment dependency gives an opportunity for a PMO manager to optimize the performance of the PMO roles according to the strategic goals and environment characteristics. A PMO manager that has a deep understanding of the interactions between PMO roles in a specific context is likely to build a configuration of the roles that has a higher value contribution than a manager who randomly selects the roles. For example, the distinction between core and peripheral roles enables the PMO manager to select the role that contributes the most value in a specific context, to choose supporting roles to amplify the value contribution effect, and to reject antagonistic roles and avoid chaos of the roles. Also, a talented PMO manager might be able to evaluate and measure the impact of PMO roles on the organization value contribution and adjust the role over time which, is likely to provide better value for the money invested on a PMO.

Finally, the results indicate the importance of adjusting PMO roles and measuring value contribution as a context-specific dynamic system. *A priori* knowledge of effective role configurations will likely save a significant amount of money compared to "trial and error" process and *a posteriori* analysis of why several PMO roles, processes and environment characteristics did not fit together and the costly “PMO experiment” failed. This study shows that the DOE method can be used as an analysing and learning tool to collect PMO data from experts to identify effective PMO role configurations in a context. The method and results can also be used to identify underlying strategic processes facilitating organizational renewal, synchronize PMOs to increase their coherence and value contribution, and simulate the configurations of PMOs even before a PMO goes live.
As with any study, this one has limitations. This study does not, however, depend on a statistical sample that attempts to be representative of a specific population. While this study provides a deep understanding of a context-specific set of PMO roles associated with value contribution, the PMO’s objectives in a pluralistic context, the organization’s project management maturity level and culture, and the expert’s background are likely to have a significant moderating effect on value contribution. For future research, the method developed here may offer support in defining PMO strategies and seeking new context specific PMO role configurations.
References


Appendices

Appendix 1. 12-run Plackett–Burman design.

<table>
<thead>
<tr>
<th>Run Block</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
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<tr>
<td>5</td>
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<tr>
<td>6</td>
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<tr>
<td>10</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>12</td>
</tr>
</tbody>
</table>

Appendix 2. The interactions effects between roles when rate of change in the environment is low.

PMO performance interactions in a stable project environment

* The multi-project manager role was later renamed as the multi-project administrator role

Appendix 3. The interaction effects between roles when rate of change in the environment is high.
* The multi-project manager role was later renamed as the multi-project administrator role
Publication IV

Ville Otra-Aho, Jan Stoklasa, Pasi Luukka, Jukka Hallikas

A Role of a Project Management Office in an Organizational Renewal

Accepted
PMI Conference proceeding, APAC
A Role of a Project Management Office in an Organizational Renewal

Ville Otra-Aho Jan Stoklasa Pasi Luukka Jukka Hallikas
Lappeenranta University of Technology Finland

Organizations are increasingly searching for ways to create value and enhance competitiveness in a turbulent environment. One way to maximize both organizational value creation and probability to meet the strategic objectives is to establish a project management office (PMO). The PMO orchestrates the organization’s assets; however, selecting consistent PMO processes that match the operational context remains challenging. This paper utilizes an organizational theory and strategy management grounded perspective to the PMO’s purpose as an organization’s strategizing tool. Then, we introduce a novel method based on the fuzzy set theory to investigate the PMO roles, processes, contingency variables and the outcomes as a system of interactions. Finally, we test the method with empirical data. The result shows the three configurations associated with a high organizational value creation, as well as the three configurations associated with a low organizational value creation.

Keywords and Phases: Organization, Strategy as Processes and Practices, Fuzzy Set Qualitative Comparative Analysis

1. Introduction

Organizing is a part of a strategizing process (Johnson et al., 2003) and the organizational activities that are associated with organizing, especially when the activities lead to a consistent pattern of actions and refer to the process of strategizing (Tsoukas and Knudsen, 2002). Analogically, a project management office (PMO) is an organizing function that supports project management (Darling and Whitty, 2016) to meet the strategic objectives. A PMO can be characterized as organizations’ strategic practitioner and a strategizing tool (e.g., Jarzabowski and Kaplan, 2015).

The PMO may operate at a low level in the organization, or it may report to higher levels (e.g., Hobbs and Aubry, 2010). The tasks of a PMO may include defining and maintaining methods and tools for project management, optimizing project resource usage, prioritizing projects providing training, supporting and guiding ongoing projects, monitoring and reporting project progress (Dai and Wells, 2004; Hobbs and Aubry, 2010). As such, a PMO orchestrates project-oriented organizations’ operational assets and can act as an organizations’ dynamic capability creating, extending and modifying resource base.

All the PMOs activities are or should be tightly entangled with project organization strategizing processes (e.g., Aubry et al., 2009) creating a consistent pattern of organization behavior toward the strategic objectives, i.e. fit. More precisely, during the strategizing process, a PMO practices act as the “high level of routines (collection of routines) that, together with their implementing input flows, confer upon an organization’s management a set of decision options for producing significant outputs of a particular type” (Winter, 2000, p.983). Similarly, the practices act as a means to create cohesion, i.e. fit between the organizations’ operational assets and strategic objectives.

2. Theoretical basis: Organizations strategic renewal

Strategic organization renewal or strategizing is a process were organization manage environment changes to optimize its value creation, to maintain strategic direction. From a contingency theory perspective this means that organizations adapt to the environment changes such as changes in competitive and technology landscapes or customer preferences. This process of adaptation creates unique configurations of the organization assets that result high organization performance i.e. organizations fit to the context (e.g., Miller, 1986). The configurations between the organization assets in an organization competitive landscape are unique. Similarly, there is likely to exist few organization specific configurations that are equally effective however, organization may shift between the configurations when environment changes (Siggelkow, 2002). Furthermore, the dynamic capability view (Helfat et al., 2007; Teece et al., 2007) provides knowledge of processes how organization create, extent and modify its operational assets to maintain high strategic direction and high organizational value contribution.
From an organizational configurational perspective, there may be several equally effective organization configurations between organizational assets and context (Doty et al., 1993). Analogically, there may occur few equally effective configurations between PMO variables and contextual variables i.e. initial conditions that results high or low organizational value contribution. To investigate the conditions, we chose a combination of the set-theoretic approach and linguistic fuzzy modeling as an underlying methodology for our purpose of analyzing a fitness in a PMO context. Linguistic fuzzy rules are defined as representing the possible relationships between the variables under investigation. The use of linguistic variables introduces acceptable granularity for the variables, making the use of linguistic rules in place. To make the analysis more robust and less dependent on the definitions of thresholds, we introduced a fuzzy partitioning of the values of the relevant variables. This way, the interpretation of the results is also facilitated as the supposed knowledge/relationships are described in terms of everyday language and the meanings of the “high” and “low” values.

Using a real-life dataset, we found the support for the high value creation configurations i.e. rules in the data and also counterevidence to these rules and quantified the strength of both, with the amount of evidence in favor of a rule R present in the data set, and the amount of evidence against a rule present in the data set. If the amount of evidence in favor of the rule sufficiently exceeds the amount of counterevidence, i.e., the evidence-counterevidence ratio of the rule \( R \) is sufficiently above one, we consider the rule to be plausible in reality. The number of data instances that comply, at least partially, with the conditions specified in the antecedent part of the rule can be considered a measure of the generality of the rule for the given sample. Rules that many data instances exhibit the features described by the antecedent part of the rule, with no counterexamples and strong support in their favor in the data, are the best candidates for plausible general rules. When the relevance of such rules, measured by the proportion of data points that are “covered” by these rules, is above zero, we still investigated the rules of plausibility, but only as specialized rules - i.e. rules relevant only for the part of the sample under investigation. Rules for which there are significantly more counterexamples than
data-points supporting these rules are considered implausible. If there is both evidence and counter-evidence at the same time, the rule may describe a relationship that exists, but it might be formulated in an overly general manner.

the PMO variables, i.e. input variables and the value contribution measures, i.e. output variables.

5. Results

5.1 The three high-value contributing PMO configurations

First, we analyzed the configurations of the contingency variables and the PMO role and process variables as a system that has a positive association with a high organizational value creation. Each of the emerged configurations corresponds with two outputs that are investigated separately, but that have the same antecedent part of the rule and operationalization of the variables – see Table 2.

The following three PMO configurations are associated with both a high internal process value creation and a high economic value creation. In configuration 1, low organization’s environment and the project environment’s turbulence, and the organization’s project orientation, coupled with active multi-project management is associated with a high organizational value contribution. In configuration 2, low organization environment and project environment turbulence, low organization’s project management centralization, low PMO authority, and active multi-project management are associated with a high organizational value contribution.

In configuration 3, organization environment and project environment turbulence, low organization’s project orientation, and low project centralization, a high PMO authority, and active multi-project management are associated with a high organizational value contribution.

5.2 The three low-value contributing PMO configurations

We analyzed the configurations of each contingency variable and the PMO’s variables as a system that had a negative association with a PMO’s value creation – see Table 3.

### Table 1 Definitions of the “active” and “passive” i.e. not active values using linear fuzzy numbers.

<table>
<thead>
<tr>
<th>Variable name</th>
<th>Type [0,1]</th>
<th>Measurement method levels</th>
<th>Possible values</th>
<th>passive (low)</th>
<th>active (high)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contingency variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organization size</td>
<td>Input</td>
<td>Ordinal</td>
<td>(1.2, 6.7)</td>
<td>(1, 1.3, 3)</td>
<td>(1.3, 4, 7.7)</td>
</tr>
<tr>
<td>Organization environment</td>
<td>Input</td>
<td>Nominal</td>
<td>(1.2, 10.3)</td>
<td>(1.3, 10.1)</td>
<td>(2.7, 6)</td>
</tr>
<tr>
<td>Project environment</td>
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<td>Interval</td>
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<td>(1, 3.4, 6.8)</td>
</tr>
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<td>Project orientation</td>
<td>Input</td>
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<td>(0.5)</td>
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<td>(1, 3.4, 4.6)</td>
</tr>
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<td>PMO size</td>
<td>Input</td>
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<td>(0.5)</td>
<td>(1, 1.3, 4)</td>
<td>(1, 3.4, 4.6)</td>
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<td>PMO variables</td>
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<td></td>
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<td>(2, 3.4, 6)</td>
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<td>PMO authority</td>
<td>Input</td>
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<td>(3, 4.5, 5)</td>
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<td>Multi-project administrator</td>
<td>Input</td>
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<tr>
<td>Process developer</td>
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<td>Interval (reverse)</td>
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<td>(3.4, 5.1)</td>
<td>(1, 3, 4)</td>
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<td>Learning facilitator</td>
<td>Input</td>
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<td>Information manager</td>
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<td>Performance measures</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Internal process value</td>
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<td>(1, 1.3, 4)</td>
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<td>Human relations development value</td>
<td>Output</td>
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<td>(3, 4.5, 5)</td>
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<tr>
<td>Economic value</td>
<td>Output</td>
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<td>(0.5)</td>
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<td>(3, 4.5, 5)</td>
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<tr>
<td>Growth and benefits value</td>
<td>Output</td>
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<td>(3, 4.5, 5)</td>
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<tr>
<td>Average value contribution</td>
<td>Output</td>
<td>Interval</td>
<td>(0.5)</td>
<td>(1, 1.3, 4)</td>
<td>(3, 4.5, 5)</td>
</tr>
</tbody>
</table>

Table 2 The PMO configurations leading to a high value contribution.
In configuration 4, organization turbulence is associated with a low economic, internal process, growth and benefit, and average value contribution. In configuration 5, a young PMO is associated with a low internal process and economic value contribution, and project performance. In configuration 6, a young PMO, an active PMO process developer role is associated with a low internal process and average value contribution.

Finally, we did not find evidence of information sharing and learning roles having an association with either high or low PMO value creation.

Table 3 The PMO configurations leading to a low value contribution.

<table>
<thead>
<tr>
<th>The low value contribution configurations</th>
<th>Configuration 4</th>
<th>Configuration 5</th>
<th>Configuration 6</th>
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<tbody>
<tr>
<td>IF</td>
<td>Organization environment turbulence</td>
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<td>1</td>
</tr>
<tr>
<td>Project environment turbulence</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Project internal process turbulence</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Project growth turbulence</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Project benefit turbulence</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Project economic value turbulence</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Project internal process turbulence</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Project economic value turbulence</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Project benefit turbulence</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Project economic value turbulence</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Range of the evidence-euclidean distance (EED) for the given set of rules</td>
<td>300–700</td>
<td>2.35–5.42</td>
<td>5.75–10.87</td>
</tr>
<tr>
<td>Number of PMOs covered by the antecedent of the rule</td>
<td>50</td>
<td>100</td>
<td>150</td>
</tr>
</tbody>
</table>

1 = high, 0 = low, -1 = negative

Table legend:

- 1 = high
- 0 = low
- -1 = negative

*The format used in "EED (ICF)" refers to the rule of at least partially out of the PMOs covered in the rule*
6. Conclusion

This paper extents knowledge of sociomateriality mainland and interactions between technology, organization, and work and a stream of strategy tools and practices mainland (Burgeman et al., 2017; Jarzabkowski and Kaplan, 2015). More precisely, the results shed light how PMOs transfer emergent strategy to mundane project activities (e.g., Jarzabkowski and Kaplan, 2015). As such a PMO can be defined as an organization dynamic capability that maintain organizational fitness i.e. internal cohesion between the assets and alignment of the asset with organizations’ strategic objectives.

As Rivkin and Siggelkow, (2005, p.119) point out, “The problem of finding appropriate organizational designs for different environmental conditions remains a steep challenge for practicing managers.” Our study shows that the organizational variables, the PMO variables, and environment variables interact creating high and low value contribution configurations i.e. holistic gestalts. In the study, we identified the three high-value creation configuration. PMO configurations, which we named “vertical integrators”, “organization administrators”, and “organization facilitators”. These configurations indicate configurations that the PMO managers and project organizations should aim for.

A simple “vertical integrator” configuration shows that the multi-project management is associated with a positive organizational value creation when the organization’s project orientation is low, and when both the project and organizational environments are turbulent. An “organization facilitator” configuration indicates that a multi-project manager role with a high PMO authority is associated with positive organizational value creation when the project management is decentralized, and when the both the project and organizational environments are turbulent. The “organization facilitator” configuration indicates that a multi-project administrator role is associated with a positive organizational value creation when the PMO has a high degree of authority and when the project management is decentralized, when the organization has a low degree of project orientation, and when the both the project and organizational environments are turbulent. The result complies with the previous organizational studies, which indicate that professional teams operate effectively in an autonomous way in a turbulent environment when work has a moderate level of organizational vertical coordination such as coordination of project resources.

Results indicate that in a turbulent environment the project organizations may benefit from the layered organizational control/coordination structures in which a PMO may have a significant organization role. Similarly, the multi-project administrator role exists in every high-value creation configuration, while the other PMO, organizational and environmental variables change between the configurations. Our findings suggest, that a multi-project administrator role can be characterized as a core PMO role and according to our results there is a clear tradeoff between the PMO’s roles, characteristics, the environmental variables in the configurations. The authors suggest the facilitation roles and other PMO characters should be adjusted to support the core role according the environment requirements. For example, in configuration 3, if the organization also has a low degree of project orientation and project management is centralized, i.e., the project experts may have limited support from each other and then the multi-project management value creation is high.

Then, we identified the configurations that have a significant low-value creation effects. In configuration four, an environment turbulence is associated with a negative internal process, economic value, growth and benefits, and average value creation. In configuration five, a young PMO is associated with a negative internal process and economic value creation, as well as low project performance. In configuration six, neglecting PMOs process development is associated with a negative internal process and economic value creation when a PMO is young. The result has probable causes, as a young PMO may require extra effort to establish the efficient processes necessary to be able to produce significant organizational value. The configuration six indicates that if a PMO is not able to renew its roles according to environmental requirements, its value creation may be hindered over its lifetime. Also, the results showed that environment turbulence is associated with a negative organizational value creation with several variables, such as internal process, economic value, growth and benefits, and average value-related variables. The authors propose that young PMO should create organization value through standardization.
Then minimize the external environments negative effects and adjust the roles to maximize value creation from projects.

Conflicting PMO roles and processes are likely to be a key reason for a PMO’s low-value creation (e.g., Aubry and Hobbs, 2011) and senior management dissatisfaction (e.g., Ward and Daniel, 2013), resulting in a short PMO lifetime. Our study supports these findings. Our data revealed that 80% of PMOs have a significant potential to improve their organizational value creation. The results indicate that the young age of a PMO is associated with low a low-value creation as well as old PMO age. One reason for this problem is that the PMO roles are too rigid or floating, i.e. not managed PMO process configurations become conflicting over time. The PMO experts may mimic the PMO role configurations using best practices, which causes a slippery slope toward the erosion of the organization value creation from projects.

High performing PMOs should create a capability to shift from one high-value creation configuration to another while maintaining the organization’s strategic direction and focus on the organizational strategic goals. This flexible role structure and unique role configuration provide an opportunity for PMO managers to create a strategy to differentiate the organization from its competitors and find circumstances that increase PMO value creation and organizations’ competitiveness.

In the following papers, the authors will clarify the concept of a PMO from a strategy perspective, deepen existing knowledge of PMO configurations, and develop methods to analyze organizational fitness.
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