EVALUATING A NEW PROJECT MANAGEMENT METHODOLOGY: RESULTS FROM A MULTIPLE EMBEDDED COMPARATIVE CASE STUDY

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ABSTRACT

Project management as a field of practice and research is characterized by impressive amounts of normative literature and extensive collections of best practices on the one hand and a very limited amount of proof of the efficiency of the proposed tools and techniques on the other hand. Among the limited empirical evaluations of project management guidelines, the majority obey the dominant positivist paradigm within this stream of research. The results within and across the limited studies are inconsistent, conflicting and contradicting. This paper takes point of departure in a new and hybrid project management methodology (PMM) labeled HD and aims to contribute to the general debate on PMM evaluation by answering the research question: To what extent is the new and hybrid PMM successful in increasing project performance? A comparative and multiple case study is conducted of 62 projects in 16 organizations. Out of 19 pilot projects applying the specific PMM, seven indicate that the PMM is successful in achieving its objective of increasing project performance. However, five pilot projects indicate that the specific PMM is not successful in achieving its objective, but decreases project performance. Three pilot projects are unclear, and four pilot projects are lacking data. Overall results are mixed and point to the complexity of PMM evaluation – both ontologically and epistemologically. Contributions are threefold and include 1) a fit between PMM and project type and industry that can nuance contingency theory around PMM, 2) a conceptual model and operationalization of evaluating a PMM that can expand the limited variety of methods behind PMM evaluation, and 3) practical implications for reflective project managers that can supplement their understanding and increase project performance.

1. INTRODUCTION

The field of project studies is characterized by comprehensive collections of best practices such as the PMBOK (PMI, 2017) and APMBOK (APM, 2019) with the explicit aim of disseminating the project management body of knowledge that is generally recognized as good practice and guide practitioners toward specific practices which are applicable to most projects most of the time based on the premise that "*there is consensus about their value and usefulness*" and *"general agreement that the application of the knowledge, skills, tools, and techniques can enhance the chances of success"* (PMI, 2017, p. 2). However, the comprehensive books are scant when it comes to proof of this agreement and consensus. Neither the PMBOK nor APMBOK explicitly show evidence of the effect of the proposed practices. In general, there are only a few empirical tests that validate a little proportion of the many tools and techniques flourishing in the field of project management (Joslin & Müller, 2015, 2016b). PMM evaluation is important to assess the many project management practices which have weak empirical validation and are subject to fad and oblivion cycles. The objective of this paper is to outline an empirical evaluation of a new and hybrid project management methodology (PMM) labeled Half Double (HD) which consists of three principles, nine methods and nine tools designed to increase impact in projects (see appendix A for further details).

Examining extant literature on PMM evaluation, we see three problems.

First, there is an imbalance between conceptual PMM recommendations and empirical PMM evaluations. From the very beginning of the establishment of project management as an academic field, proposals of techniques on how to manage projects have been a dominant research subject (Betts & Lansley, 1995). In the first literature review within the field of project management research, Betts and Lansley (1995) reveal that among the most researched topics are development of new project models and presentation of new project techniques. In a later review, Zobel and Wearne (2000) find a consistent pattern and show that the first three topics

given mo.st attention in early conference papers within this field of study are “project management”, followed by “information management” and “personnel management”. In a recent theoretical review of PMM, the large and continuing interest in PMMs is confirmed and the various research, theories, models, ideas, opinions, and methods behind the basic principles of PMM are outlined (Karina, 2020). Surprisingly, the reviews find that tests of the many PMM proposals receive remarkably little attention (Betts & Lansley, 1995; Zobel & Wearne, 2000). At the very bottom of the aforementioned list of dominant topics is project evaluation review with a total score of 0.00. Thus, since the foundation of project management as a scientific discipline, there has been an imbalance in proposals of project management tools and techniques and empirical evidence showing if and how they work and deliver on their promise: to improve projects and their success rate (Karina, 2020). Still today, there is a skewed balance toward an extensive and impressive amount of normative and directive project management tools and techniques and a limited amount of literature that examines these tools and techniques (Betts & Lansley, 1995; Joslin & Müller, 2015, 2016b; Wells, 2012; Zobel & Wearne, 2000).

Second, among the limited empirical studies that have been done within this area, the methodological design is uniform and conform. A majority of the empirical studies are based on quantitative self-reporting survey data and statistical analyses looking for significant correlations between PMM and some kind of success indicator. Such studies adhere to the general paradigmatic discourse of positivism within the project management field of study in general (Clegg, 2013; Joslin & Müller, 2016a; Müller, Sankaran, & Drouin, 2013; Müller & Söderlund, 2015), and within the areas of project related evaluations more specifically (Haass & Guzman, 2019). Hence, the few empirical PMM evaluations comply with the dominant way of thinking within the field. Such confirmatory evaluation approaches of PMM fall short when it comes to expanding contemporary thinking and understandings around PMMs. To better understand if and how PMMs work, we need additional empirical investigations that do not

replicate old methods but use novel approaches that can generate new knowledge. Future work should focus on understanding the relationships by means of different research methodologies – such as action research or case studies (Golini, Kalchschmidt, & Landoni, 2015).

Third, among the limited empirical studies that have been done in this area, the evidence is contested (Joslin & Müller, 2016b). For instance, researchers find positive correlations between PM practices and project success (Cooke Davies, 2002) and suggest PMMs work as an important success factor (P. Lehtonen & M. Martinsuo, 2006). On the other hand, there are still high failure rates for projects that do use PMMs (Joslin & Müller, 2016b), and recent research only finds a weak correlation between PMM and project success (Pace, 2019). In between these two poles are several studies with mixed answers. For instance, Wells (2012) finds that PMMs are expected to help support managers, but at the same time an alarming rate of almost half of the asked project practitioners experience that there is no benefit associated with the usage of PMMs (Wells, 2012, p. 55). Another study finds that a specific project method led to the deterioration of cost and schedule performance, but improved quality (Suetin, Vikhodtseva, Nikitin, Lyalin, & Brikoshina, 2016). In general, recent research finds results that do not align with previous studies, illustrating a need to continue the study of methods impacting success (Pace, 2019). Thus, there is no clear response to the general query regarding if and how PMMs work in practice, but rather contested and contradicting findings.

These matters are in line with the gaps identified in recent literature and calls for further research. For instance, Lehtonen and Martinsuo state that *"Current research does not properly address the position of PM methodologies in the successes and failures of project management."* (M. Lehtonen & M. Martinsuo, 2006, p. 7). Wells (2012, p. 45) finds a further need for understanding about how PMMs support performance. Finally, Joslin and Müller argue*"Research on project methodologies is limited and the results are somewhat*

contradictory. …More research is required to better understand how project methodologies impact success" (Joslin & Müller, 2016b, p. 365 and 368).

The aim of this paper is to address the shortcomings and calls for more research on PMMs and their effect by answering the research question: *To what extent is a new and hybrid PMM successful in increasing project performance?*

To address this question, we examine 62 projects in 16 organizations being part of a multiple and comparative case study (Yin, 1989) which is a part of a larger action research initiative (Reason & Bradbury, 2008, p.4 in Christ, 2010) running from 2015 to 2022. We analyze collected data from 19 pilot projects implementing the PMM as well as 43 reference projects not implementing the PMM but representing business as usual. We choose this method as it allows both an in-depth examination of each case and an identification of elements that distinguish cases from each other (Eisenhardt & Graebner, 2007). Based on a systematic comparison (Rihoux & Ragin, 2009) of the 62 projects we evaluate the new PMM and establish evidence for its success in increasing project performance.

The rest of the paper is structured as follows. The next section reviews extant literature to provide a definition of a PMM and a conceptual framework for evaluating PMM. The third section outlines the data generation and analysis methods of the multiple and comparative case study. The fourth section presents the results and the data behind them. Finally, the fifth section discusses the findings in terms of theoretical, methodological and practical contributions as well as the limitations of the study.

2. THEORY

This section defines PMM and reviews extant literature on PMM evaluation to develop a conceptual model for evaluating PMM.

2.1 Defining project management methodologies

The first formal PMMs were set up by government agencies with the aim of controlling budget, plans, and quality (Packendorff, 1995). Since then, positive and high - even unrealistic - expectations to PMMs' effect have arisen (Lehtonen and Martinsuo 2005 in Joslin and Muller 2016, p. 365). In line with the increasing expectations to PMMs, attention has shifted from individual tools and methods to methodologies that encompass multiple methods and tools (P. Lehtonen & M. Martinsuo, 2006) and the related understanding of them (Joslin & Müller, 2016b, p. 367). In this study, we draw on Joslin and Müller (2016b, p. 365) who *"define the building blocks of a methodology as methodology elements that can include processes, tools, techniques, methods, capability profiles, and knowledge areas".* Specifically, we define PMM as a collection of good practices (M. Lehtonen & M. Martinsuo, 2006, p. 7) where practice can be defined as *"a set of socially defined ways of doing things in a specific domain: a set of common approaches and shared standards that create a basis for action, problem solving, performance and accountability"* (Wenger, McDermott, & Snyder, 2002, p. 38).

Examples of typical PMMs are PRINCE2 (Axelos, 2017) representing a classical waterfall approach from the UK, SCRUM (Schwaber & Sutherland, 2020) representing a contemporary agile approach from the US (Beck et al., 2001), and ISO 21500 (ISO, 2012) providing a high-level description of project management concepts and processes (Takagi & Varajão, 2021). The new PMM evaluated in this paper is a hybrid methodology labeled HD. The HD PMM originates in Denmark and consists of a set of abstract principles, generic methods and concrete tools summing up to a total of nine PMM practices (presented in detail in Appendix A).

2.2 Evaluating project management methodologies

When reviewing extant literature on PMM evaluation, it becomes clear that there is a limited amount of empirical investigations that test proposed tools and techniques. Available PMM evaluation publications is listed in table 1.

Reference	Methodology	Findings	Limitations
Gemino, Reich, and Serrador (2020)	survey - 296 responses on 447 projects	Analyses of project methodologies and practices show that hybrid and agile project management approaches significantly increase stakeholder success over traditional approaches while achieving the same budget, time, scope, and quality outcomes.	Results are based on survey data with questions probing for the existence of different approaches, but not discerning project managers' why and how considerations. The questions focus on the project, not on the surrounding organization or industry. Project success is limited to self-reported perceptions.
Pace (2019)	survey - 367 responses	Results indicate that PMM has a weak correlation with reported project success - not moderated by industry or project manager experience.	Project success is limited to self-reported perceptions.
Joslin and Müller (2016b)	interviews - 19 managers	A validation of a theoretically derived research model shows a positive relationship between project methodology elements and project success - moderated by project governance.	The study is based on interviews of a small sample size and the results cannot be generalized.
Golini et al. (2015)	survey - 496 responses	Adoption of project management tools is an important project success factor – although it is not necessary to adopt all the tools as a whole: every organization should find the right balance and correct adoption of the tools.	Results are based on survey data with a low response rate from international development projects in non-governmental organizations and cannot be generalized. Project success is limited to self-reported perceptions.
Joslin and Müller (2015)	survey - 254 responses	22.3% of the variation in project success can be explained by applying the relevant PMM elements.	Answers are limited to professional (PMI+IPMA) project managers and the time to latest project experience is unknown: therefore results cannot be generalized. Project success is limited to self-reported perceptions.
Serrador and Pinto (2015)	survey – 859 responses on 1386 projects	Agile methods have a positive impact on project success in terms of project efficiency and stakeholder satisfaction.	Project success is limited to self-reported perceptions.
Wells (2012)	interviews - 48 practitioners (4 organizations)	47.9% of project managers view PMMs as non-beneficial to themselves and their projects and claim that using PMMs hinders their project delivery. Practitioners' expertise, accountability, and attitudes have a direct influence on the extent to which PMMs contribute and benefit PM.	Results are limited to qualitative data based on subjective perceptions from interviews.
Fortune, White, Jugdev, and Walker (2011)	survey - 150 responses	PM roles have become much more professional and the amount of PM tools used has risen but fewer projects are regarded a complete success. The three most critical success factors to projects' outcomes are clear goals/objectives, support from senior management and realistic schedule.	Project success is limited to self-reported perceptions.
P. Lehtonen and M. Martinsuo (2006)	survey - 288 companies	Organizations succeeding in project management also use systematic PMMs in terms of setting goals for projects and making systematic decisions: consequently, PMMs are considered a success factor.	The study is limited to two practices: goal setting and decision making.

Cooke Davies (2002)	survey - 136 projects (23 organizations)	There are significant correlations between PM practices and project success in terms of cost and time.	Project success is limited to time and cost. The relationship between project success and PMM is limited to statistical correlation - not causality.

TABLE 1: LITERATURE ON PMM EVALUATION

Table 1 shows the methodological design behind each of the articles as well as their main findings and limitations – partly motivating this study.

Across but also within these publications, findings are contested and even conflicting in terms of indicating the success of the evaluated PMMs.

For instance, researchers find positive correlations between PM practices and project success in terms of cost and time (Cooke Davies, 2002) and proof of positive effects of specific methods on project success in terms of project efficiency and stakeholder satisfaction (Serrador & Pinto, 2015). Other scholars find that organizations succeeding in project management use systematic PMMs and suggest that PMM is an important success factor (P. Lehtonen & M. Martinsuo, 2006).

On the other hand, there are still high failure rates for projects that do use PMMs (Joslin & Müller, 2016b), and recent research only finds a weak correlation between PMM and project success (Pace, 2019).

In between these two poles are several studies with mixed answers. For instance, Wells (2012) finds that that PMMs help support 1) control and monitoring, 2) standardization and unified language and 3) guiding and directing managers with uncertainty and fear of the unknown, but at the same time: "…*significantly, 47.9% of all practitioners rated the benefits of PMMs as low and considered PMMs as nonbeneficial to themselves and their projects."* (Wells, 2012, p. 53). Another study finds that a specific project method led to the deterioration of cost and schedule performance, but improved quality (Suetin et al., 2016).

Finally, researchers nuance the relationship between PMM and success which they suggest is moderated (Joslin & Müller, 2016b) or quasi moderated (Joslin & Müller, 2015) by project governance depicted as an environmental circumstance. Thus, answers to the important but

overlooked question of whether the various PMM suggestions work are contested and contradicting.

Moreover, the review highlights the limited methodological variety of the empirical investigations. The methodological design is rather uniform and conform. Out of the ten reviewed publications, eight are based on quantitative self-reporting survey data and statistical analyses looking for significant correlations between PMM and some kind of project success indicator. Such studies adhere to functionalist or positivist ontologies and objective epistemologies (Burrell & Morgan, 1979) which is the general paradigmatic discourse within the PM field (Clegg, 2013; Joslin & Müller, 2016a; Müller et al., 2013; Müller & Söderlund, 2015) and within project evaluation (Haass & Guzman, 2019). Hence, the few empirical studies evaluating PMMs are compliant to the dominant way of thinking within this field. Explanations behind the limited variety in research approaches may lie in the operational challenges associated with evaluating PMMs for instance the problem of specifically measuring the impact of the adoption of techniques in terms of controlling for their correct use (Golini et al., 2015) which is necessary according to previous research finding that managers' work is decoupled from the PMMs provided, advising further research on project success to be observant of the application of PMM and not its mere presence (Joslin & Müller, 2015). Notwithstanding the reasons for the conformity, previous studies contribute and advance the debate on PMM evaluation. However, the conventional design falls short when it comes to addressing the repeating limitations of the surveys and expanding our knowledge base around PMM evaluation. To better understand if and how PMMs work, we need additional empirical investigations that do not replicate old methods but use novel approaches that can generate new knowledge. Future work should focus on understanding the relationship by means of different research methodologies - such as multiple case studies (Gemino et al., 2020) as the limited approach of small samples in single settings or single cases in the majority of research on this

matter (Serrador & Pinto, 2015) is not enough to examine project management approaches in more depth. To better understand if and how a new and hybrid PMM works and address the limitations of current PPM evaluation, we utilize a comprehensive and comparative case study of multiple projects and organizations representing various settings. The empirical PMM evaluation is guided by the conceptual framework presented in the next sub-section.

2.3 Conceptualizing project management methodology evaluation

One of the few conceptual models that can guide empirical PMM evaluation is Joslin and Müller's (2016) research model shown in figure 1.

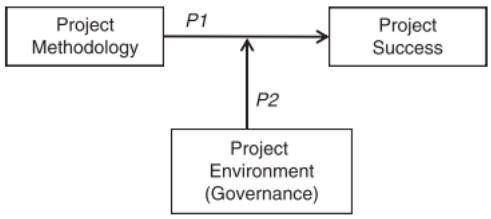


FIGURE 1: RESEARCH MODEL (Joslin & Müller 2016)

In Joslin and Müllers research model, PMM is the independent variable that makes the dependent variable of "project success" more likely and "project environment" is the moderating variable that mediates the relationship between these two variables. We find Joslin and Müller's (2016) research model beneficial but insufficient for evaluating the new PMM for a number of reasons which are outlined in the following sub-sections. Following these lines, we develop the advanced model shown in figure 2. The model is explained along with the arguments in the sub-sections below.

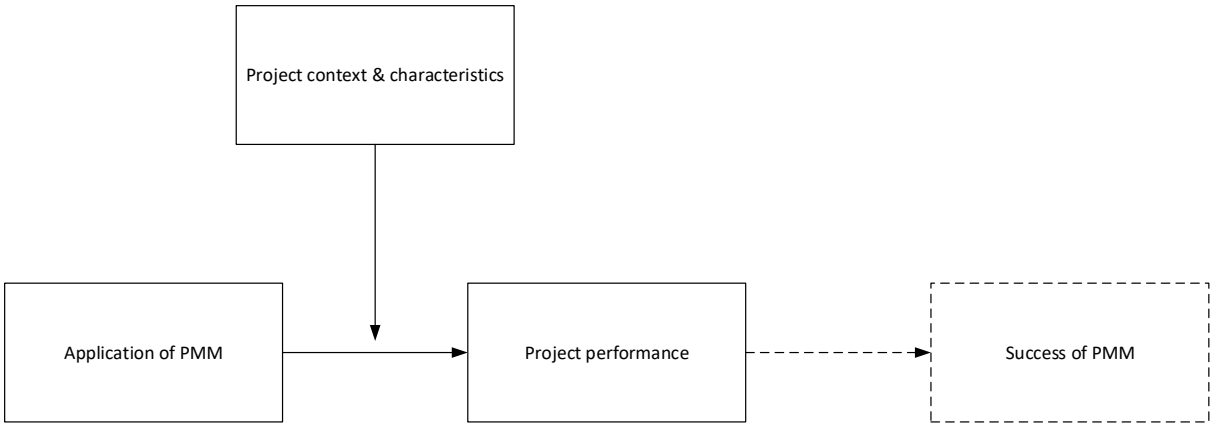


FIGURE 2: PMM EVALUATION MODEL

2.3.1 Application of PMM

The central point in both models is of course the project (management) methodology. In a related study, the same authors find it is important to be attentive to the application of PMM and not just its mere presence (Joslin & Müller, 2015) and therefore "project methodology" is changed to "Application of PMM" in our model.

2.3.2 Project context and characteristics

Joslin and Müller (2016) use the concept "project environment" as a mediating viable and insert "governance" in brackets to signify that this is what they consider in terms of the environment. We agree on the importance of project governance but contend that it can be addressed in a PMM - and in this study it is embedded in the PMM as the practice of having a committed and engaged steering committee or project owner. This is one practice out of the nine concrete practices that are the building blocks of the examined PMM (for further details see appendix A).

Instead, of "project environment" we insert "project context and characteristics" to signify two decisive aspects. First, we have an open view of a project as embedded in its context which is both enabling and constraining (Takagi & Varajão, 2021) both the project, its management and its performance. We acknowledge that contexts form projects – meaning that projects are

located and managed in drifting environments (Kreiner, 1995) in terms of time and place (Lundin & Söderholm, 1995; Rämö, 2002) being for instance a project's host organization as well as the industry and sector it operates within. Second, project characteristics are decisive in terms of project performance. Like contexts, project characteristics are also enabling and constraining the project as well as its management and performance. Project characteristics are for instance project novelty, pace, technology and complexity (Shenhar, Levy, & Dvir, 1997) as well as management complexity (Fangel, 2005).

2.3.3 Project performance

Another central concept is "project success" which we label "project performance" to limit confusion with "success of PMM" which is the focus of this paper. The most central relationship in both models is the one indicating that "application of PMM" can led to "project success" or superior "project performance". To theorize this relationship we draw on previous research suggesting PMM is a critical success factor leading to project success (Golini et al., 2015; M. Lehtonen & M. Martinsuo, 2006).

2.3.4 Success of PMM

We keep the central relationship but split up Joslin and Müller's (2016) "project success" concept into two separate concepts: "project performance" and "success of PMM". The splitting highlights the distinction between projects' performance and the inference that positive performance is due to the application of a specific PMM. The last line from "project performance" to "success of PMM" is dotted to mark the philosophical difference between this last epistemological inference and the other earlier arrows illustrating ontological relationships.

3. METHOD

This section outlines the methodological considerations behind the study – running from 2015 to 2022.

3.1 Evaluation research design

The overall research approach is design and evaluation research where the purpose is to evaluate a new PMM designed to increase project performance, and the perspective is rather extensional (Van de Ven, 2007, p. 9) in terms of the implementation of the new PMM and the performance of the projects. The research examines the new PMM as a model for solving practical problems of project management as a profession and assesses the success of the new PMM in terms of achieving the predetermined objective which is to increase projects' performance. Hence, the evaluation is based on achievement of objectives (Dahler-Larsen, 2013) which is different from typical PMM evaluations focusing on classical success criteria such as the triple constraints of the iron triangle (Haass & Guzman, 2019) but beneficial because it allows for a tailored evaluation that acknowledges that success is unique (Takagi & Varajão, 2021) and ensures that the PMM is only judged on its promise. Design and evaluation research is beneficial because it goes beyond describing or explaining a social problem to generating knowledge of the relative success of an alternative solution to a practical problem (Van de Ven, 2007, pp. 27-28). "*These kinds of design studies focus on pragmatic research questions, such as 'Will it work?' and 'Does it perform better or worse than the status quo solution to a problem?'* (Van de Ven, 2007, p. 278). Such evaluations typically require natural field experiments and case studies in which multiple cases are compared.

3.2 Case study design

Following these lines, the overall research design is a case study which is an empirical inquiry that investigates a contemporary phenomenon within its real life context based on multiple sources of evidence (Yin, 1989, p. 23). More specifically, the design is embedded and multiple case design (Yin, 1989, p. 46) where the multiple cases are 16 organizations and the multiple units of analysis are 62 projects embedded within these organizational cases. The design follows the variance based strategy of effect evaluation (Dahler-Larsen, 2013) in which at least one

pilot project and preferably three reference projects are selected within each of the 16 case organizations. The pilot project implements the new PMM and the reference projects do not implement the PMM. In all other aspects, the reference projects are as similar as possible to the pilot project. Hence, the logic behind the design is to examine to what extent it is reasonable to infer a variance in project performance due to a variance in PMM. It is important to note that focus is on the variance (Dahler-Larsen, 2013, pp. 97-98) between the pilot and reference projects within each organization. The ideal evaluation would examine the difference in performance between the same project with and without using the PMM. As this is impossible, the pool of reference projects works as a kid of quasi-control group in a field experiment (Dahler-Larsen, 2013; Yin, 1989). Following these lines, all projects are compared within and across organizations, and pattern matching is applied as a technique to further analyse results (Yin, 1989).

3.3 Operationalization

The PMM evaluation is based on a comparative case study which is primarily deductive in nature as it relies on the concepts and their relationships illustrated in the conceptual model presented in the theoretical section.

Table 2 serves as an overview of the operationalization of the model's four concepts. Project context and characteristics are based on seven dimensions which are further outlined in appendix A.

APPLICATION OF PMM	PROJECT CONTEXT AND CHARACTERISTICS	PROJECT PERFORMANCE	SUCCESS OF PMM
MORE	SIMILAR	HIGHER	YES
pilot project manager applies PMM more than all reference projects (pilot project total PMM practice score is higher than all reference projects)	most of the context and characteristics comparability dimensions are green (2/3)	pilot project impact is higher than all reference projects	all cells in the row are green
MEDIUM	MEDIUM	MEDIUM	UNCLEAR
pilot project manager applies PMM more and less than reference projects (pilot project total PMM practice score is both higher and lower than reference projects)	half of the context and characteristics comparability dimensions are green (1/2)	pilot project impact is higher and lower than reference projects	one or several elements are unclear
LESS	DIFFERENT	LOWER	NO
pilot project manager applies PMM less than all reference projects (total pilot project PMM practice score is lower than all reference projects)	few of the context and characteristics comparability dimensions are green (1/3)	pilot project impact is lower than all reference projects	comparability and PMM cells are green but impact cell is red OR comparability and impact cells are green but PMM cell is red

TABLE 2: PMM EVALUATION – OPERATIONALIZATION

3.3.1 Application of PMM

The examined PMM (outlined in Appendix A) consists of three abstract principles as well as three methods for each principle and one concrete tool for each method - summing up to nine practices. As it is important to be attentive to the application of PMM and not just its mere presence (Joslin & Müller, 2015), all projects are assessed in terms of the practices used to manage them. Project managers map their behavior against each of the nine PMM practices and score them on a scale from 1 to 4 where 1 is limited application and 4 is extensive application. The sum of these practice scores are considered and compared across projects to establish if the pilot projects are more aligned with the PMM than the reference projects.

3.3.2 Project context and characteristics

We examine projects' contexts in order to assess the degree to which they are comparable – and thereby establish the degree to which it is reasonable to compare the projects. In this study we

operationalize project context in three ways: 1) the organization hosting the project as well as 2) the industry and 3) sector in which it operates.

We also examine projects' characteristics in order to assess the degree to which they are comparable – and thereby establish the degree to which it is reasonable to compare the projects. To examine project characteristics, we use Shenhar and Dvir's (1997) radar chart and map projects in terms of their novelty, pace, technology and complexity. Each characteristic is operationalized on a scale from 1 to 3 or 4. To further investigate complexity, we use Fangel's (2005) characterization of management complexity, which is operationalized into three areas with subsequent questions and scored on a scale from 1 to 4. We summarize these scorings in one dimension labeled scale. Moreover, we consider the nature of the project and categorize projects in terms of eight inductively derived project types. Finally, we contend that the resources invested in a project also play a role in projects' performance and examine project cost and hours in order to assess the degree to which they are comparable – and thereby establish the degree to which it is reasonable to compare the projects. Hence, we operationalize project characteristics in four ways: 1) hours, 2) costs, 3) type and 4) scale.

3.3.3 Project performance

Pilot project performance is operationalized as one or several key performance indicators that are relevant for all projects within one organization – such as sales numbers, quality measures, waste reductions or supplier relationships. The key performance indicators are similar for projects in the same organization but different across organizations.

3.3.4 Success of PMM

The underlying logic behind the PMM evaluation model is that we can infer that the new PMM contributes to increased project performance if projects applying it have a higher performance compared to projects not applying the PMM everything else equal - which is never the case:

everything else is never equal - but a broad spectrum of perspectives including the 14 quantitative measures mentioned above as well as several qualitative descriptions and discussions are considered in order to establish the degree to which everything else is more or less equal. If everything besides the PMM application is rather equal and we see a superior pilot project performance compared to the reference projects, it seems reasonable to infer that the reason possibly lies in the project practices – and hence, we consider such cases indicative of PMM success.

3.4 Data collection and analysis methods

The evaluation relies on mixed methods based on qualitative and quantitative data. The primary data collection methods are interviews and documents, and the primary data analysis methods are objective and variance based effect evaluation. A complete overview of the data collection and analysis methods can be seen in table 3 which lists the informants and the nature behind the data.

DATA COLLECTION AND ANALYSIS METHODS	
INFORMANTS	• Project managers • Project owners • Project participants • Internal consultants • External consultants
DATA COLLECTION METHODS	• Interviews: structured and semi structured - open and closed questions • Documents: emails and reports - Word, Excel, PowerPoint
DATA ANALYSIS METHODS	• Objective based evaluation • Variance based strategy for effect analysis • Comparative case studies – within and across case analyses • Pattern matching – within and between extreme cases
NATURE OF DATA	• Qualitative descriptions • Quantitative scorings • Subjective accounts • Objective measures

TABLE 3: DATA COLLECTION AND ANALYSIS METHODS

The specific details of the data for each of the 16 organizations and the 62 projects is outlined in table 4. The table shows that the complete dataset consists of 138 project evaluation interactions and 1.047 files summarized in 280 report pages excluding appendixes.

Organization	Number of pilot projects evaluated	Number of reference projects evaluated	Number of total projects evaluated	Number of project evaluation interactions	Number of project evaluation files	Number of project evaluation report pages
#1	1	3	4	16	89	24
#2	1	3	4	9	111	24
#3	1	3	4	14	53	20
#4	1	3	4	10	45	24
#5	1	3	4	13	58	20
#6	1	3	4	7	75	19
#7	2	4	6	8	80	24
#8	2	3	5	11	78	15
#9	1	3	4	8	94	14
#10	1	3	4	7	80	14
#11	1	3	4	7	59	15
#12	1	3	4	9	75	17
#13	2	2	4	9	51	14
#14	1	1	2	3	44	12
#15	1	0	1	2	21	10
#16	1	3	4	5	34	14
Total	**19**	**43**	**62**	**138**	**1047**	**280**

TABLE 4: DATA OVERVIEW

4. RESULT

The results of the data collection and analysis are outlined in the following two sections – explicating and explaining the results.

4.1 PART ONE: EXPLICATING RESULTS

This first part of the analysis outlines the overall results shown in table 5.

PILOT PROJECT NUMBER	PROJECT CONTEXT AND CHARACTERISTICS	APPLICATION OF PMM	PROJECT PERFORMANCE	SUCCESS OF PMM
PP1	100%	medium	lower	unclear
PP2	86%	more	lower	no
PP3	80%	more	higher	yes
PP4	71%	more	higher	yes
PP5	83%	more	lower	no
PP6	100%	more	higher	yes
PP7[1]	100%	more	higher	yes
PP8	86%	more	lack of data	lack of data
PP9[2]	100%	more	lower	no
PP10[2]	100%	more	lower	no
PP11	100%	more	lower	no
PP12[3]	100%	more	medium	unclear
PP13	86%	more	higher	yes
PP14[4]	57%	more	medium	unclear
PP15[1]	100%	more	lack of data	lack of data
PP16[1]	100%	more	higher	yes
PP17[1]	100%	more	higher	yes
PP18[5]	lack of data	lack of data	lack of data	lack of data
PP19	83%	less	lack of data	lack of data

CONCLUSION

To what extent is a new and hybrid PMM successful in increasing project performance?			
	Succesful (yes)	7	47%
	Unclear	3	20%
	Unsuccesful (no)	5	33%
	lack of data	4	
	all cases	19	
	all cases - with data	15	100%

[1] As there is only one reference project, the comparability cannot be similar.
[2] As there is only data on one reference project, the comparability cannot be similar.
[3] Insignificant performance difference.
[4] Pilot project performance is medium on two parameters and lowest on one parameter.
[5] As there are no reference projects, the analysis cannot be conducted.

TABLE 5: PMM EVALUATION - ANALYSIS AND RESULTS

The first column lists the pilot projects. The second column shows the degree to which the pilot and reference projects are similar in terms of their context and characteristics. The results (percentages) are based on a detailed analysis of the seven comparability dimensions shown in appendix A. The data behind the results is shown in appendix B. The third column shows the degree to which the pilot and reference projects are dissimilar in terms of PMM application. The results (more or less or medium) are based on an analysis of the pilot projects' relative use of the nine PMM practices compared to the reference projects (explained in the operationalization table 2 in the methods section). The fourth column shows the degree to which the pilot projects outperform the reference projects. The results (higher or lower or medium) are based on an analysis of the pilot projects' relative key performance indicators compared to the reference projects (explained in the operationalization table 2 in the methods section). These three columns in the middle form the basis for the results shown in the last column to the right. The column shows the answer to the overarching question regarding the success of the PMM in terms of achieving the overall objective of increasing project performance.

The results of the analysis of the 19 pilot projects fall into four groups:

1. confirming (green - yes) projects
2. disconfirming (red - no) projects
3. unclear (yellow) projects
4. insufficient data (grey) projects

Each of the first three groups are outlined below.

Confirming projects. As table 5 shows, almost half (47%) of the 15 projects with sufficient data are green in the first three columns - meaning: 1) the pilot and reference projects are comparable, 2) the pilot project follows the new PMM more than the reference projects, 3) the pilot project has a higher performance than the reference projects. In these seven cases, the

fourth column is also green – meaning: the analysis indicates that the new PMM possibly increases project performance and the PMM is considered a success.

Disconfirming projects. As table 5 shows, one third (33%) of the 15 projects with sufficient data are green in the first three columns but red in the third column - meaning: 1) the pilot and reference projects are comparable, 2) the pilot project follows the new PMM more than the reference projects, 3) the pilot project has a lower performance than the reference projects. In these five cases, the fourth column is also red – meaning: the analysis indicates that the new PMM possibly decreases project performance and the PMM is not considered a success.

Unclear projects. As table 5 shows, there are three pilot projects in which one or two of the first three columns are yellow - meaning: 1) the pilot and reference projects' comparability is medium, 2) the pilot project follows the new PMM more and less than the reference projects, 3) the pilot project has a medium performance compared to the reference projects. In these cases, the fourth column is yellow – meaning: the PMMs ability to increase project performance is unclear and the PMM evaluation is unclear.

All cases. The distribution of results across all cases is summarized in the bottom of table 5. The majority of the projects are confirmatory indicating that the PMM seems to work and deliver on its promise to increase project performance. However, the disconfirming group of projects is also substantial and cannot be neglected. It needs to be taken into account and its presence means that we cannot conclude that the new PMM works in general – at all times and in all places. Hence, the results confirm the old paraphrase: there is no one fits all. The results manifest that it is not possible to develop a PMM that works across all project contexts and characteristics. Projects are unique and should be managed according to their particularities. The next part of the analysis focuses on some of these particularities in order to explain the variance between the results.

4.2 PART TWO: EXPLAINING RESULTS

This second and last part of the analysis takes point of departure in the overall results and goes into detail with two groups: the seven confirming projects in which the new PMM seems to work and 2) the five disconfirming projects in which the new PMM seems not to work. These two groups of projects from various organizations are considered extreme cases in the sense that they are the most contradicting projects. The rest of the analysis compares these two groups of projects in an attempt to elicit what, besides their results, sets them apart. Hence, the analysis elicits internal similarities within these two groups and external differences across these two groups. The analysis takes point of departure in the comparability data on project context and characteristics shown in appendix B. Table 6 and 7 list the comparability dimensions and data of the two confirming and disconfirming groups of projects.

Project context - industry. A cross case analysis of the two extreme groups shows that there are no explanatory patterns in two of the three context dimensions: sector and organization. In the following, we outline the explanatory patterns of the third dimension: organizational industry. The two tables indicate that the PMM might have better odds in two of the examined industries – namely electronics and components. Two out of the three projects in the electronics industry are confirming (green) projects and none are disconfirming (red) projects. Two out of the four projects in the components industry are confirming (green) projects and none are disconfirming (red) projects. On the contrary, the two tables indicate that the PMM might have difficult odds in one of the examined industries – namely biotechnology. Two out of the two projects in the biotechnology industry are disconfirming (red) projects and none are confirming (green) projects.

PILOT PROJECT NUMBER	PROJECT COMPARABILITY DIMENSIONS						
	CONTEXT			CHARACTERISTICS			
	SECTOR	INDUSTRY	ORGANIZATION	HOURS	COSTS	TYPE	SCALE
PP3	private	Food	Gamma	lack of data	lack of data	business development	Easy
PP4	private	Health care	Delta	Many	Medium	supply chain	Easy
PP6	private	Electronics	Zeta	Medium	Medium	information technology	Medium
PP7	private	Manufacturing	Eta	Few[1]	Small[1]	organizational change	Easy[1]
PP13	private	Components	Lambda	Few	Medium	process optimization	Medium
PP16	private	Electronics	Ny	Few[1]	Small[1]	supply chain	Easy[1]
PP17	private	Components	Xi	Many[1]	Small[1]	process optimization	Difficult[1]
[1] As there is only one reference project, the comparability cannot be similar.							

TABLE 6: PMM EVALUATION - SEVEN CONFIRMING CASES

PILOT PROJECT NUMBER	PROJECT COMPARABILITY DIMENSIONS						
	CONTEXT			CHARACTERISTICS			
	SECTOR	INDUSTRY	ORGANIZATION	HOURS	COSTS	TYPE	SCALE
PP2	private	Engineering	Beta	Medium	Medium	product development	Easy
PP5	private	Health care	Epsilon	lack of data	Small	information technology	Medium
PP9	private	Biotechnology	Theta	Few[2]	lack of data	product development	Medium
PP10	private	Biotechnology	Theta	Few[2]	lack of data	product development	Medium
PP11	private	Logistics	Jota	Medium	lack of data	supply chain	Medium
[2] As there is only data on one reference project, the comparability cannot be similar.							

TABLE 7: PMM EVALUATION: FIVE DISCONFIRMING CASES

Project characteristic - type. A cross case analysis of the two extreme groups shows that there are no explanatory patterns in three of the four characteristic dimensions: hours, costs, and scale. In the following, we outline the explanatory patterns of the fourth dimension: project type. The two tables indicate that the PMM might have better odds in one of the examined project types – namely process optimization. Two out of the four process optimization projects are confirming (green) projects and none are disconfirming (red) projects. On the contrary, the two tables indicate that the PMM might have difficult odds in one of the examined project types – namely product development. Three out of the four product development projects are disconfirming (red) projects and none are confirming (green) projects.

5. DISCUSSION

The distribution of the results of the study manifests the complexity of this subject matter. An overall conclusion is that there is no "best" PMM solution to the project management problem. Projects as well as their environments are unique and should be managed accordingly.

From a contingency perspective, two considerations are worthy of attention. First, in terms of project context, the analysis indicates that there seems to be a fit between the PMM and the electronics and components industries and a lack of fit with the biotechnology industry. Second, in terms of project characteristics, the analysis indicates that there seems to be a fit between the PMM and process optimization projects and a lack of fit with product development projects. However, these considerations should be taken with caution as evidence is limited.

The three unclear cases and the four cases with insufficient data highlight the difficulty of performing this kind of PMM evaluation. This emphasizes the complexity of the evaluation task, the difficulty of the operationalization, the ambiguity of the data and its interpretation and the challenge of generating enough data on enough projects and parameters. The data generation is done in close collaboration with the participating project practitioners and puts great demands

not only on researchers but on all contributing parties. It requires a deep and engaged commitment from project practitioners who are willing to generate the required data. This is often the case in this action research study. Albeit, results are still unclear and data is lacking.

5.1 Contributions

The contributions of the study are threefold – covering theoretical, methodological and practical contributions.

5.1.1 Theoretical contributions

The study partakes in the academic discussion of PMM evaluation and provides a set of answers that can further advance the debate. Overall, it shows evidence of PMM success and PMM failure and provides several answers to the research question: To what extent is the new PMM successful in increasing project performance? More specifically, it shows how the PMM seems to increase project performance in some cases and not in others while leaving the majority of the cases without a clear answer either because the results are unclear or because data is insufficient. One general answer based on these results is that the new PMM is not a general PMM that works well in all projects. Two specific answers are that the success of the PMM in terms of its ability to increase project performance depends on project type and industry. These results contribute to the contingency debate on PMM. Within this area, extant literature points to the importance of internal elements - such as project practitioners' expertise, accountability, and attitudes (Wells, 2012), the quality of the project's vision or goal (Serrador & Pinto, 2015) as well as project governance (Joslin & Müller, 2015, 2016b). This internal view is supplemented by the results of this study showing that also external environmental aspects such as the industry of the project's host organization matter. Hence, the findings nuance extant literature claiming that "*Regardless of the industrial sector or size of project, project management methodologies (PMM) can be applied to improve the probability of meeting the*

project goals." (Chin, Yap, & Spowage, 2012). Moreover, the study renders plausible that project type plays a role in terms of the contingency fit between projects and the PMM. Thereby, the study addresses a recent call for research that tests the moderation effect of project typologies on the relationship between tools adoption and project performance (Golini et al., 2015).

5.1.2 Methodological contributions

The study constitutes a supplement to the knowledge base on PMM evaluation also in terms of its alternative methodological design. Despite numerous calls for novel approaches to project research in general (Drouin, Müller, & Sankaran, 2013; Joslin & Müller, 2016a; Müller & Söderlund, 2015) and to project evaluation (Haass & Guzman, 2019) and PMM in specific (Golini et al., 2015), extant literature on PMM evaluation primarily relies on positivist survey data and statistical analysis. While this kind of methodology clearly advances the knowledge base in terms of quantitative indicators of project practitioners' individual and subjective perceptions of PMM and project performance, they fall short on a number of parameters. For instance, they cannot capture consensus among several practitioners, or more objective project success parameters independent of practitioners' individual and subjective perceptions - such as sales, quality and waste. These are some of the aspects covered in this study – which relies on mixed methods and a combination of qualitative and quantitative data with an objective and subjective nature. Based on this alternative methodological design, the researchers perform a substantial evaluation of a specific PMM that addresses some of the shortcomings within contemporary PMM evaluations. It is extremely time consuming and challenging to conduct this kind of longitudinal multiple and embedded case study research in close collaboration with practitioners. However, it is also rewarding. This study shows only some of the results that the rich dataset can generate.

5.1.3 Practical contributions

The study is relevant to project practitioners aiming to increase project performance. It directs attention to a PMM that works in some cases and can be a valuable asset in the toolbox of reflective project practitioners. Following the rethinking arguments for developing reflective practitioners instead of trained technicians (Berggren & Söderlund, 2008; Crawford, Morris, Thomas, & Winter, 2006; Winter, Smith, Morris, & Cicmil, 2006), the study also serves to warn against blindly following this PMM – or any other PMM for that matter.

5.2 Future research and limitations

The mixed results and the ambiguous answers mirror the complexity of the PMM evaluation task in two ways. First, the results illustrate the ontological complexity of projects as phenomena including project related aspects such as practices, and performance, context and characteristics as well as the relations between these aspects. Second, the results illustrate the epistemological complexity of generating knowledge of projects as phenomena including project related aspects and the relationships between them.

Several considerations are worth mentioning in terms of the methodology and operationalization behind the results generated in this study.

First, the results cannot be generalized to PMM application in general as the study is restricted to data on the HD PMM in specific and it is unknown to what degree the control group of reference projects follows any other PMM.

Second, the PMM application is measured based on data from interviews and not observations which is a preferred method for generating data on behavior like management practice. Hence, the validity of the study is at risk.

Third, a limitation of the objective based evaluation is the possibility of ignoring important side-benefits and dis-benefits which were not part of the original intend.

Last but not least, there are limits to the operationalization of project performance and PMM success. One could argue that a project can have a superior performance in many ways – for instance relating to project effectiveness like impact but also in terms of project management efficiency. Future research could examine project performance in terms of the classical parameters of the triple constraints of the iron triangle (time, cost and quality), but also in terms of lessons learned or more idiosyncratic success criteria. Likewise, one could argue that a PMM can be successful in many ways – for instance regarding the process and outcome of the project, but also in terms of spillover effects in other projects, other parts of the organization or other organizations. Future research could examine PMM success in terms of the learning generated by implementing and working with the PMM, the perceived usefulness of the PMM or diffusion and adaption of the PMM within and between organizations.

6. CONCLUSION

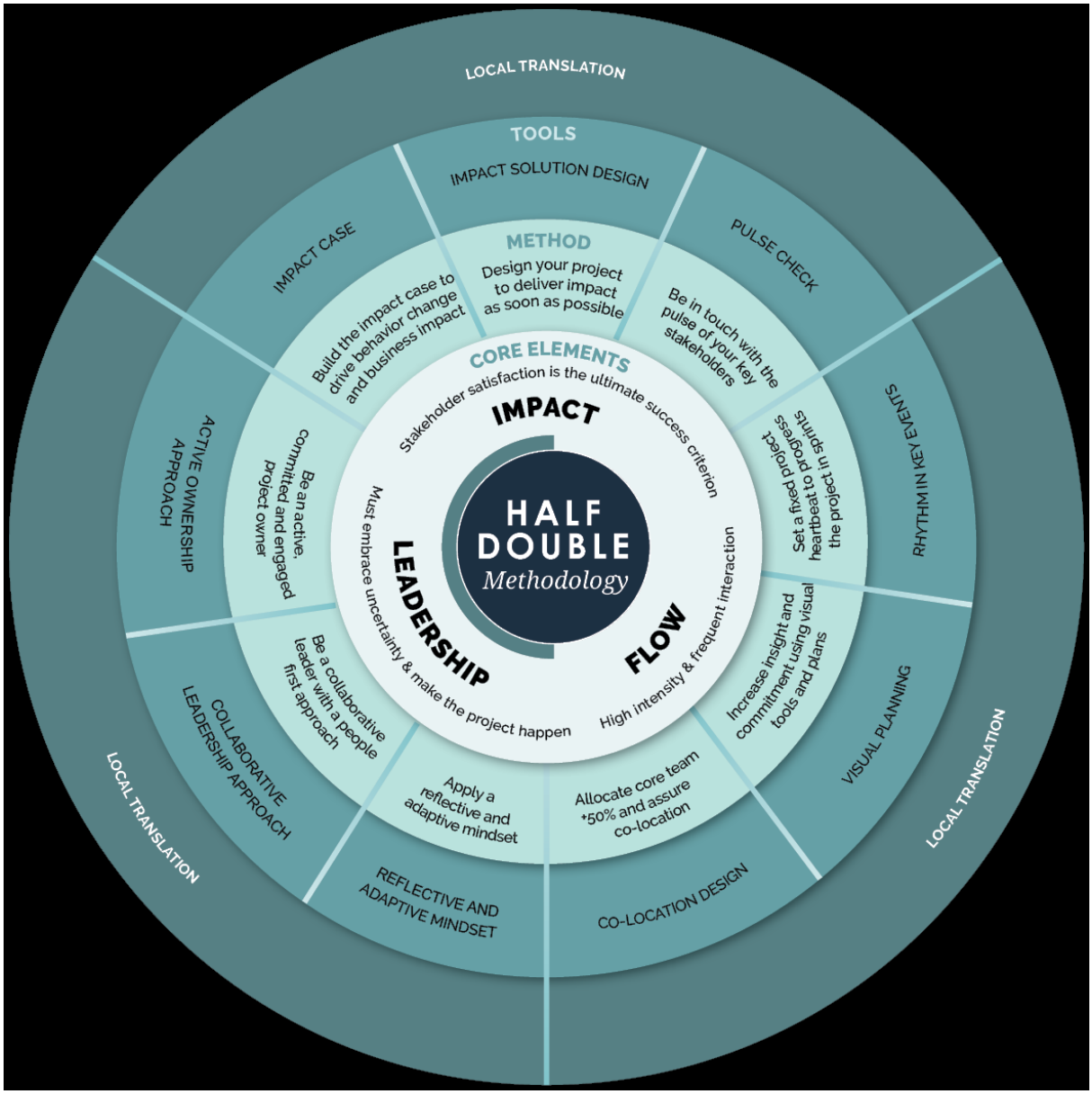
The study behind this paper was initiated to answer the research question: *To what extent is a new and hybrid PMM successful in increasing project performance?* Based on a multiple embedded case study relying on mixed methods, we developed a conceptual model for PMM evaluation. We collected and analyzed qualitative and quantitative data with a subjective and objective nature from 62 projects in 16 organizations. The results of the comparative case study analysis are varied and point towards a relative answer: *to some extent, is the new and hybrid PMM successful in increasing project performance.* Seven cases are confirming the underlying logic of the developed PMM evaluation model and serve as indicators of the success of the PMM. However, five cases are disconfirming the underlying logic and disprove the inference that the PMM is successful as it seems to decrease project performance. Three cases are unclear,

and four cases lack data. Together, these cases signify the difficulty of performing this kind of project and PMM evaluation. Upon further analysis, two explanations to the varied results are found in pattern matching within and across the confirming and disconfirming groups of projects. In terms of project contexts, industry seems to matter: it is plausible that the PMM fits well within the electronics and components industries and does not fit the biotechnology industry. In terms of project characteristics, project type seems to matter: it is plausible that the PMM fits well within process optimization projects, while it does not fit product development projects. Practical implications for project management, ownership and governance is that a new PMM exists and that it is worthy of consideration for the reflective practitioner aiming to increase project performance. Contributions for project researchers are that it is possible to perform an alternative PMM evaluation that addresses some of the shortcomings within contemporary PMM evaluations, but that it is a challenging and demanding task. This multiple and embedded comparative case study is one of the first of its kind within PMM evaluation, and in that way, it provides a rare but substantial illustration of an alternative methodological design of a PMM evaluation.

APPENDIX A: THE HD PROJECT MANAGEMENT METHODOLOGY

The evaluated PMM labeled HD (an abbreviation for Half Double) consists of three abstract principles and three methods for each principle as well as one concrete tool for each method - summing up to nine practices that are the building blocks of the methodology. The HD PMM is illustrated in figure A1 and described in details elsewhere (Rode & Svejvig, 2021).

FIGURE A1: THE HALF DOUBLE PROJECT MANAGEMENT METHODOLOGY



APPENDIX B: RESEARCH METHODOLOGY - CONTEXT AND CHARACTERISTICS OPERATIONALIZATION

The operationalization is based on internal comparison between pilot and reference projects within the same organization.

COMPARABILITY	DIMENSION	SIMILAR	MEDIUM	DIFFERENT
CONTEXT	SECTOR	PP and RPs are situated within the same sector	PP and RPs sectors are similar and different	PP and RPs are situated within different sectors
	INDUSTRY	PP and RPs are situated within the same industry	PP and RPs industries are similar and different	PP and RPs are situated within different industries
	ORGANIZATION	PP and RPs are situated within the same organization	PP and RPs organizations are similar and different	PP and RPs are situated within different organizations
CHARACTERISTICS	HOURS	total PP hours are medium compared to RPs	total PP hours are medium and extreme compared to RPs	total PP hours are extreme (highest or lowest) compared to RPs
	COSTS	total PP costs are medium compared to RPs	total PP costs are medium and extreme compared to RPs	total PP costs are extreme (highest or lowest) compared to RPs
	TYPE	PP and RPs type is similar	PP and RPs typologies are similar and different	PP and RPs type is different
	SCALE	total PP scale is medium	total PP scale is medium and extreme	total PP scale is extreme (highest or lowest)

TABLE B1: PILOT AND REFERENCE PROJECT COMPARABILITY - OPERATIONALIZATION

APPENDIX C: RESEARCH RESULTS - CONTEXT AND CHARACTERISTICS DATA

The analysis is based on internal comparison between pilot and reference projects within the same organization.

PILOT PROJECT NUMBER	PROJECT COMPARABILITY DIMENSIONS							COMPARA-BILITY RATE
	CONTEXT			CHARACTERISTICS				
	SECTOR	INDUSTRY	ORGANIZATION	HOURS	COSTS	TYPE	SCALE	
PP1	private	engineering	alpha	lack of data	lack of data	product development	medium	100%
PP2	private	engineering	beta	medium	medium	product development	easy	86%
PP3	private	food	gamma	lack of data	lack of data	business development	easy	80%
PP4	private	health care	delta	many	medium	Supply chain	easy	71%
PP5	private	health care	epsilon	lack of data	small	information technology	medium	83%
PP6	private	electronics	zeta	medium	medium	information technology	medium	100%
PP7	private	manufacturing	eta	few[1]	small[1]	organizational change	easy[1]	100%
PP8	private	manufacturing	eta	similar	large	information technology	medium	86%
PP9	private	biotechnology	theta	few[2]	lack of data	product development	medium	100%
PP10	private	biotechnology	theta	few[2]	lack of data	product development	medium	100%
PP11	private	logistics	jota	medium	lack of data	supply chain	medium	100%
PP12	private	food	kappa	lack of data	medium	supply chain	medium	100%
PP13	private	components	lambda	few	medium	process optimization	medium	86%
PP14	private	components	my	many	large	process optimization	difficult	57%
PP15	private	electronics	ny	few[1]	small[1]	supply chain	easy[1]	100%
PP16	private	electronics	ny	few[1]	small[1]	supply chain	easy[1]	100%
PP17	private	components	xi	many[1]	small[1]	process optimization	difficult[1]	100%
PP18	private	components	omikron	lack of data	lack of data	production transfer	lack of data	lack of data[5]
PP19	private	manufacturing	pi	medium	lack of data	process optimization	easy	83%

TABLE C1: PILOT AND REFERENCE PROJECT COMPARABILITY - ANALYSIS

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