Production Planning & Control
The Management of Operations

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/tppc20

Customising Hybrid project management methodologies

M. Mirzaei, V. J. Mabin & O. Zwikael

To cite this article: M. Mirzaei, V. J. Mabin & O. Zwikael (07 May 2024): Customising Hybrid project management methodologies, Production Planning & Control, DOI: 10.1080/09537287.2024.2349231

To link to this article: https://doi.org/10.1080/09537287.2024.2349231

Published online: 07 May 2024.

PRODUCTION PLANNING & CONTROL
https://doi.org/10.1080/09537287.2024.2349231

Customising Hybrid project management methodologies

M. Mirzaei[a], V. J. Mabin[b] and O. Zwikael[c]

[a]Business Information Systems, Auckland University of Technology, Auckland, New Zealand; [b]School of Management, Victoria University of Wellington, Wellington, New Zealand; [c]Research School of Management, The Australian National University, Canberra, Australia

ABSTRACT

Despite the growing popularity of Hybrid project management methodologies (combining Plan-driven and Agile methodologies), research guiding project managers on integrating various methodologies into their project management approach is limited. This gap in understanding managers' choices and their implications is important as mismatches between the project and its methodology can adversely affect project success. This paper examines how project managers customize Hybrid project management methodologies by selecting aspects of both Agile and Plan-driven approaches. An abductive approach grounded in both theory and practice was used, drawing on Contingency and Coordination Theories together with empirical data including interviews, document analysis and observations from 10 case studies. Results suggest two key characteristics of projects that impact project managers' decisions when customizing project management methodologies: Team type and project goal. The paper advances our knowledge on how practices from various project management methodologies can be integrated by method or by phase into a Hybrid model.

ARTICLE HISTORY
Received 7 March 2023
Accepted 25 April 2024

KEYWORDS
HYBRID; agile; project management methodology; project manager; project success; project team

Introduction

The choice of an effective project management methodology is critical for a project's success (Joslin and Müller 2015). Amidst the ever-evolving landscape of project management, Hybrid approaches are surging in popularity (Azenha, Reis, and Fleury 2021; Papadakis and Tsironis 2018; Vinekar and Huntley 2010). This is mainly due to their unique ability to blend adaptability and predictability by merging Plan-driven and Agile project management techniques. International large-scale cross-industry surveys demonstrate the high acceptance of Hybrid methodologies. For example, Serrador and Pinto (2015) and Gemino, Horner Reich, and Serrador (2021) show 62% and 52% respectively of projects use Hybrid methodologies. Scholars predict that this trend will continue to rise (Conboy and Carroll 2019; Gemino, Horner Reich, and Serrador 2021; Paasivaara 2017). This trend in practice can be attributed to the superior performance of Hybrid models over both Agile and Plan-driven methodologies, as evidenced by recent research (e.g. Agbejule and Lehtineva 2022; Azenha, Reis, and Fleury 2021; Bianchi et al. 2022; Reiff and Schlegel 2022; Sithambaram, Nasir, and Ahmad 2021).

However, in order to fully reap the benefits of Hybrid methodologies, managers face several challenges in selection, design and implementation. Hybrid project management models strive to integrate two opposing worldviews from Agile and Plan-driven approaches with contradictory recommendations regarding planning, team structure, management style, and coordination. For example, Agile approaches emphasize flexibility and iterative development, while Plan-driven approaches prioritize detailed planning and structured phases (Zwikael et al. 2022). Choosing one type of methodology over the other will impact the trajectory of the project in many ways. Hence, the importance of comprehensive research into nuances in combining Agile flexibility with Plan-driven structure in Hybrid methodologies cannot be overstated.

In the face of the seemingly paradoxical integration of Plan-driven and Agile approaches in project management, it is imperative to investigate how project managers navigate this challenging landscape and reconcile the conflicting principles and logics inherent in each approach. The existing literature provides classification models for project management methodology selection based on project characteristics. However, these models primarily focus on either Agile or Plan-driven methodologies, overlooking the increasing prevalence of Hybrid approaches. Huemann (2022) argues that with the increasing use of Hybrid methodologies, project managers are becoming designers of project management methodologies for their own projects as they pick and choose various aspects of different project management methodologies to achieve their project goals. Several scholars (Fortune and White 2006; Shenhar et al. 2002) argue that project managers' ability to customize project management methodologies to their context

CONTACT M. Mirzaei Maryam.mirzaei@aut.ac.nz Business Information Systems, Auckland University of Technology, Auckland, New Zealand

supersedes the role of any individual methodology in achieving project success.

This evolving dynamic calls for a more thorough exploration of the role and perspective of project managers in Hybrid methodologies' customization. Inspired by Locke and Golden-Biddle's (1997) approach to identifying research gaps through 'problematizing', this study seeks to explore the intricate balance required in Hybrid project management methodologies. To enhance our comprehension and provide project managers with essential insights for navigating these intricacies effectively, it is crucial to address this significant research gap. Accordingly, we focus on the following research question: *How do project managers customize their Hybrid project management methodology by selecting aspects of Plan-driven and Agile to fit the needs of different types of projects?*

Embracing a qualitative approach is vital when answering the above research question to unveil subtle nuances and patterns that might remain hidden with quantitative methods, ultimately yielding more valuable and actionable findings. We adopted an abductive approach that iterates between both theory and empirical evidence to understand a phenomenon (Dubois and Gadde 2002). For the theoretical lenses, we employ Contingency Theory to understand how different contexts demand tailored management approaches, recognizing that there is no one-size-fits-all solution. Further, we use Coordination Theory, to gain insights into the operational aspects, detailing how various elements within a project can be effectively synchronized and managed to achieve desired outcomes. This dual-theoretical approach provides a comprehensive framework for project managers to navigate and optimize diverse project environments. Our empirical evidence is drawn from 31 in-depth interviews, document analysis, and observations that cover ten case studies.

The research identified team and goal types as the two most significant characteristics of projects that influence project managers' decisions when customizing Hybrid project management methodology. We develop a model based on how these two project characteristics impact the choice and composition of Hybrid project management methodology. This paper contributes to the Operations Management literature by presenting a modular approach to customizing Hybrid project management methodologies. The paper advances our knowledge on how aspects from various project management methodologies can be integrated into an effective Hybrid methodology based on the goal and team type of the project at hand. The remainder of the paper is organized as follows—literature review, methodology, discussion of findings, practical and theoretical implications of this research, and future research directions.

Literature review

The literature review begins with an exploration of Hybrid project management methodologies, setting the stage for understanding their contemporary relevance and application. Central to our discussion, we differentiate between 'approach', 'methodology', and 'method': 'approach' as the guiding philosophy, 'methodology' as the framework implementing this philosophy (e.g. Scrum or Waterfall), and 'method' as the specific techniques within these frameworks (e.g. daily stand-ups in Scrum). We then delve into the context of the key project management methodologies. Central to this review is the dichotomy of 'what' and 'how' in project management. The 'what' aspect, which involves defining and measuring project goals, is where contingency theory plays a crucial role. It emphasizes the importance of adopting adaptive methods tailored to the specific contexts of individual projects. Subsequently, the discourse on *project coordination* helps examine the 'how', the mechanics of reaching these goals.

Hybrid project management methodologies

Common project management methodologies include Plan-driven (e.g. PMBOK and PRINCE2) and Agile (e.g. Scrum and Kanban), both offer a range of effective methods and techniques. For example, Plan-driven methodologies follow a linear and structured process, often through project phases such as initiation, planning, execution and benefits realization (Zwikael and Meredith 2018). Alternatively, Agile methodologies such as Scrum (Takeuchi and Nonaka 1986) introduce a synchronic time perception, contrasting the sequential view prevalent in Western 'linear-active' cultures as described by Lewis (2006). This methodology, influenced by the 'reactive' approach of Oriental cultures, prioritizes people-orientation over job-orientation, face-to-face communication over written documentation, and flow and rhythm over fixed results. Unlike Plan-driven methodologies that focus on step-by-step planning, Agile methodologies are guided by principles (such as a manifesto) rather than detailed plans. Scrum incorporates regular ceremonies like daily stand-ups, sprint reviews, and retrospectives, acknowledging multiple paths to a goal rather than a single 'Critical Path'.

Building upon these foundational methodologies, Hybrid project management emerges as a versatile methodology, integrating the structured aspects of Plan-driven methods with the flexibility and adaptability of Agile practices to cater to diverse project needs. With increasing trends in the adoption of Hybrid project management methodologies, a large number of such methodologies are discussed in the literature, which includes a range of combinations of Agile and Plan-driven methodologies. Proposed models differ in terms of where and how the two methodologies are positioned. Several scholars identified and compared a list of Hybrid models in the literature (e.g. Bianchi and Amaral 2020; Silva, Bianchi, and Amaral 2019). Most discussions on Hybrid models focus on using Agile and Plan-driven for specific phases (e.g. Bianchi and Amaral 2020; Reiff and Schlegel 2022; Silva, Bianchi, and Amaral 2019). Reiff and Schlegel (2022) go further and group those identified models into four types: The Water-Scrum-Fall model, the Hybrid V-model, the Plan-driven-Agile model, and the Agile-Stage-Gate model. Imani, Nakano, and Anantatmula (2017) label all those types of

models that apply different methodologies (Plan-driven and Agile) depending on the project phase as '*Hybrid-by-Phases*' while also identifying another group of Hybrid models, where specific methods are integrated and used in the proposed Hybrid model (e.g. Bianchi and Amaral 2020; Fitzgerald, Hartnett, and Conboy 2006; Shenhar and Dvir 2007). Imani, Nakano, and Anantatmula (2017) label that latter group as '*Hybrid-by-Methods*' which entails the integration and simultaneous use of specific methods from both Agile and Plan-driven approaches within the same project phase.

What all these models have in common is that they are devised to gain the benefit of both methodologies whilst avoiding or mitigating the weaknesses of each. For example, some researchers point to Hybrid models being more responsive to change while also ensuring rigorous documentation and project control is in place (Conforto and Amaral 2016; Cooper and Sommer 2018; Lehnen, Schmidt, and Herstatt 2016; Schmitz, Mahapatra, and Nerur 2019; Tanveer 2015). A Hybrid methodology can be more scalable than Agile while also being less costly than Plan-driven methodologies (Imani, Nakano, and Anantatmula 2017). Gemino, Horner Reich, and Serrador (2021) survey also demonstrates that a Hybrid methodology achieves similar stakeholder success to Agile, superseding the Plan-driven methodology, whilst achieving project management success (budget, time and scope and quality outcomes) at the same level as the Plan-driven methodology. Others posit that a Hybrid methodology provides a range of options that can be tailored to the range of distinct organizational processes and cultures, project specifications and contractual requirements (Bianchi et al. 2022; Conforto and Amaral 2016; Kuhrmann et al. 2019).

While research shows Hybrid project management methodologies are more successful than Agile and Plan-driven methodologies (e.g. Agbejule and Lehtineva 2022; Azenha, Reis, and Fleury 2021; Bianchi et al. 2022; Reiff and Schlegel 2022; Sithambaram, Nasir, and Ahmad 2021), their complexity and the need for contextual customization highlight the critical role of project managers in their successful adoption and implementation. Zasa, Patrucco, and Pellizzoni (2020) stress the importance of aligning Hybrid methodologies with organizational goals and team dynamics, while taking into account a wide range of Hybrid methodologies. Bianchi and Amaral (2020) highlight the complexity of selecting from a variety of context-specific Hybrid methodologies. This diversity of options, while beneficial, also adds complexity to the selection process, underscoring the pivotal role of project managers in tailoring methodologies to their specific project contexts. Consequently, scholars like Bianchi et al. (2022), Niederman, Lechler, and Petit (2018), and Tanveer (2015) call for further research into customization of Hybrid methodologies for different project contexts. Moreover, despite widespread acceptance adoption of Hybrid methodologies in practice, the process of customizing Hybrid methodologies is underdeveloped in the literature (Bianchi et al. 2022; Reiff and Schlegel 2022). This paper focuses on the customization of Hybrid project management methodologies.

The evolution of project management methodologies

The context of project management methodologies reveals a landscape marked by evolution and diversification. Iterative methods and techniques embedded in Agile methodology demonstrate a fundamentally different worldview from traditional Western project management, known as Plan-driven methodologies. A significant attempt to propose an alternative to the Plan-driven methodology was the development of the Agile manifesto (Fowler and Highsmith 2001) which encapsulates this distinct perspective.

Given the fundamental differences in Agile practice, numerous studies have compared and contrasted Agile and Plan-driven methodologies. Such studies often focused on the application and applicability of either methodology to different projects in achieving project success (e.g. Pearson 1990; Shenhar and Dvir 2007; Thesing, Feldmann, and Burchardt 2021; Wysocki 2011). This exploration led to discussions on explicit distinction between Project success and Project management success (e.g. Cooke-Davies 2002; DeLone and McLean 2003; Markus and Mao 2004). For example, De Wit (1988) highlighted the need to differentiate between achieving project objectives, not just successful project management focused on cost, time and quality/scope. Lechler, Edington, and Gao (2012) argue that decisions during implementation (such as scope) need to take account of the business context. More recently, Zwikael and Meredith (2021) conceptualized three project success dimensions to differentiate the performance of key project individuals from the overall performance of the project: (1) Project management success—evaluates the performance of the project manager in achieving the project plan; (2) Project ownership success—evaluates the performance of the project owner in realizing the business case, and (3) Project investment success—evaluates the overall performance of the project for its funder.

The evolution in understanding project success has also led to the understanding that projects with different characteristics require different managerial approaches. Dvir et al. (1998) and Dvir, Sadeh, and Malach-Pines (2006) argue that projects have fewer characteristics in common than previously considered. Understanding the nuanced dimensions of project success leads us to consider how the adaptation and application of project management methodologies in various settings may inadvertently embed assumptions that impact the overall success of a project. Morris (2013) argues that numerous reports on project failure started after the bureaucratic selection of a project management methodology that overlooks its underpinning concepts. Similarly, Fernandez and Fernandez (2008) argue that blind adherence to Agile methodologies led to growing dissatisfaction with Agile project management. This 'bureaucratization' overlooks the fact that the underpinning concepts that made Agile projects successful are: '*adaptive, problem solving, a temporary system of diverse specialists, linked together by coordinating*

executives' (Webb 1969, 23). While some scholars call for rethinking existing project management concepts and assumptions (Ahlemann et al. 2012; Geraldi, Söderlund, and Marrewijk 2020; Winter et al. 2006), such research is rare (Hällgren 2012). Thus, methodologies have often been selected and applied to different types of projects without recognizing their foundational assumptions and functions, leading to misapplication and transformation of innovative techniques into rigid rules applied in a less appropriate context.

Contingency theory in project management

Reflecting on the notion that diverse projects require different management approaches, it behoves us to explore the implications of contingency theory to project management. This organizational theory proposes there is no single optimal approach to management (Burns and Stalker 1961; Lawrence and Lorsch 1967; Woodward 1958, 1965), a concept also applicable to projects as temporary organizations (Lundin and Söderholm 1995). Researchers have argued that projects with different characteristics require different managerial approaches, including project management methodologies, as a misfit between the project and the methodology being used will impede project performance (Joslin and Müller 2015). Research in this domain has attempted to bridge this knowledge gap through the development of contingency models that suggest the most effective methodology according to key project characteristics (e.g. Crawford, Hobbs, and Turner 2006; Hansen, Svejvig, and Hansen 2022; Niknazar and Bourgault 2017). Several project classification models have been proposed, such as Pearson's (1990) ends-means matrix and Shenhar and Dvir (2007) four-dimensional framework—technology, complexity, novelty, and pace—to guide best practices for managing projects.

Key characteristics of projects discussed in this literature include uncertainty levels, product type, complexity, and pace. For example, Chipulu and Vahidi (2020) demonstrates that technological uncertainty influences the effectiveness of managerial critical success factors. Several scholars argue that increased uncertainty requires *Agile* methodologies (e.g. Howell, Windahl, and Seidel 2010; Wysocki 2011). Shenhar and Dvir (2007) also used their classification model to recommend using different managerial styles for different projects. Burgan and Burgan (2014) suggest using industry and product type to choose the project management methodology. Mafakheri, Nasiri, and Mousavi (2008) developed a decision-support model. More recently, Thesing, Feldmann, and Burchardt (2021) developed a more comprehensive list of characteristics, including various aspects of scope, time, cost, organization context, and project team, to develop a decision model for choosing Agile versus Plan-driven methodology.

While Agile and Plan-driven methodologies have dominated discussions, recent research suggests the choice is far from being straightforward. In a study with a sample size of 367, Pace (2019) found a weak correlation between project success and Agile or Plan-driven methodologies, highlighting that choosing the right methodology for various projects is a 'wicked problem'. Furthermore, given the diverse range of interrelated factors and the uniqueness of each project, it is rare that a project fits completely with either of these management methodologies – Agile or Plan-driven (Bianchi et al. 2022). More recently, Gemino, Horner Reich, and Serrador (2021) conducted a comprehensive literature review to identify project characteristics that fit best with either Agile or Plan-driven. They concluded that many projects need a combination of both sets of methodologies (i.e. Hybrid) and that there is a need for further research to identify how various aspects of each methodology fit project characteristics.

Coordination theory in project management

When projects combine diverse methodologies, communication and coordination between the different functions and activities becomes even more critical than with a single 'pure' methodology. Recognizing this essential role of effective collaboration in such projects, coordination theory add a valuable perspective. It addresses the alignment of multiple actors' efforts to *'pursue goals together'*, as described by Malone (1987). In organizational research, coordination mode is closely related to workflow and interdependencies. Thompson (1967) classifies processes as independent, parallel, or sequential, and suggests that each requires a different coordination mode and that interdependency increases from 'independent' to 'sequential' and to 'reciprocal'. He argues that as interdependency increases, the demand for coordination changes. Low levels of interdependency can be managed by planning and scheduling, while higher levels of interdependency require various mutual adjustment mechanisms (i.e. face to face meetings). Similarly, for projects, Bashir et al. (2022) argue that project management scheduling methods such as Critical Path Method ('CPM') and Program Evaluation and Review Technique ('PERT') can coordinate parallel and sequential activities while lacking the coordination capability required for interdependent activities. Meanwhile, Baxter and Turner (2021) demonstrated that Scrum practices such as daily and review meetings improve communication and increase shared understanding. These practices can also reduce the structural complexity that arises from interdependencies (Zwikael and Gilchrist 2024).

The literature on team dynamics reveals team type influences the nature of required explicit and implicit coordination, thereby influencing the effectiveness of project management methodologies. Rico et al. (2008) highlight that in contrast to the structured approach of explicit coordination, implicit coordination is driven by 'shared cognition' which is supported by entirely different practices. Hollenbeck, Beersma, and Schouten (2012) provide a taxonomy of teams, listing 42 types of teams discussed in the wider organization literature and providing a framework for differentiating teams based on temporal stability, authority and skill differentiation. The question remains how these differences impact required coordination mechanisms in projects and how it may impact the choice and effectiveness of a project management methodology.

Research methodology

Research design

This paper employs an exploratory research approach that seeks to understand project managers' strategies and choices as they select aspects of Plan-driven and Agile to customize Hybrid project management methodologies for different types of projects. The research followed an abductive approach [as demonstrated in Figure 1] that aims to find a theoretical explanation for observed empirical phenomena using an interactive learning loop between theory and empirical studies (Dubois and Gadde 2002). This process also facilitates rigour and relevance: '*the two ends of the same bridge that spans the gulf between academics and practitioners*' as advocated by Pinto (2022, 8). Understanding how project managers select and adapt various mechanisms embedded in each methodology to coordinate the project in achieving project success, requires an in-depth analysis of projects in a real-life context. Therefore, we conducted case study research (Eisenhardt 1989; Yin 2003) to obtain empirical data for the abductive process. Dubois and Gadde (2002) argue that the in-depth insight that is commonly associated with a case study is closely related to an abductive process which advocates non-linear logic. The unit of analysis (the case) is a temporally-bounded event: a project. The projects were small projects (duration: 2 months – 1 year; team size: 8 – 42), each being one of innumerable projects conducted in large and mature organizations (more than 2000 employees) in New Zealand and Australia.

Following an abductive approach, our research progresses through two vital phases essential to our exploratory study. This double-stage case selection facilitates a systematic evolution of our research framework and reflects the '*flexibility that is inherent in exploratory research… the focus is initially broad and becomes progressively narrower*' (Cavana, Delahaye, and Sekaran 2001, 108). The first stage attempted to refine

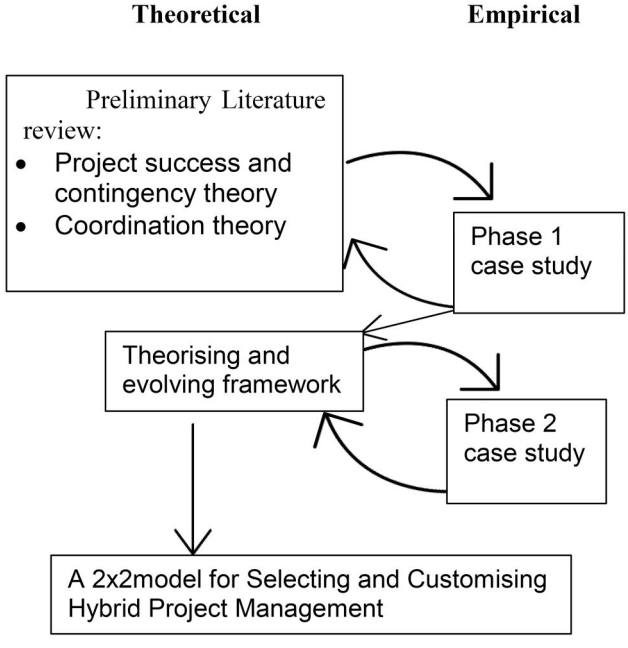

Figure 1. Illustration of the abductive approach used in the research design.

the conceptual model based on project managers' perspective of 'what' and 'how' project success is judged, across different project types. In the subsequent phase, we used this framework to understand project managers' journey as they customized Hybrid project management methodology for their specific projects. The initial phase serves as the bedrock for framework development, providing the necessary structure for our comprehensive investigation in the second phase. In the first phase, we employed Patton's (2005) purposeful sampling to select a diverse array of projects from different sectors (service, construction, film, software, policy) and organization types (government, commercial, education, not-for-profit), reflecting the multidisciplinary nature of project management and its application in different industries. After analysing 10 projects in the first phase, we achieved saturation: No new features or dimensions emerged from adding more projects.

Echoing Pace (2019), we emphasize the value of qualitative data, for example from interviews, as being crucial in unravelling the intricate complexities involved in customizing the appropriate methodology. Therefore, in Phase 1, we conducted 13 interviews with one or more representatives of each case at their early stages. Interview questions included general questions related to the size of the project and its complexity, the relevant industry, the type of contract, duration. Further questions were driven by variables suggested by the classification studies within the success literature, and project contingency theory discussed earlier. These included questions related to the strategic goal of the project, market uncertainty, technological uncertainty, system scope and pace of the project. In addition, questions related to the project team and its formation and task allocation were informed by Coordination theory in project management and project team literature. Since projects do not happen in isolation, some questions on the organization's strategy, related programmes and project portfolio were also included (see questions in Appendix A). Findings of this phase led to the development of a framework and, following repeated iterations between empirical observations and theoretical analyses, the framework evolved into its final shape, as presented in this paper.

In Phase 2, a subset of four cases was then selected, one for each of the four quadrants of the classification model developed in Phase 1, to explore how each project's goal and team type impacted the customization of project management methodology and what challenges were faced throughout the project. The cases had similar work contexts and types, except for their differences on the framework dimensions. This made it easier to highlight the differences relevant to our research. For these cases, a further 18 interviews were conducted at various stages until project completion, with interview questions in this phase eliciting more details on obstacles and problems, root causes of those problems and actions taken.

In these subsequent interviews, project managers elaborated on their key activities, challenges and obstacles, and strategies they select to deal with those challenges and their justifications for those actions. The objective was to

understand the project managers' perceptions of the 'how' to achieve the project goal in different projects and the role of project management methodologies.

Data collection and analysis

We collected longitudinal data from 17 participants across a total of 31 interviews in two phases. Table 1 summarizes the two research phases, while Table 2 provides information on ten cases, including their type, sector, and sources of information.

Dubois and Gadde (2002, 555) explain the role of an evolving framework that starts with 'articulated preconceptions' and '*is developed according to what is discovered through the empirical fieldwork, as well as through analysis and interpretation*'. In the case of this research, a 2×2 framework was developed based on the findings of the literature review. The initial framework broadly suggested that the 'what' and the 'how' of managing projects impact the choice and applicability of project management methodology. These dimensions were guided by relevant theories: project success and coordination theory, until the final framework was developed.

Interviews in both phases were conducted mainly with project managers or someone in a similar role (e.g. Scrum master), because they are the primary users of project management methodologies and prescriptive concepts, and because their perceptions and reasoning directly impact decisions at the project level. In some cases, we interviewed more than one person, either because project management decisions were split between different roles (e.g. Scrum Master, Associate Director, and product owner) or because the project manager changed during the project (e.g. PM1 and PM2). Additionally, the lead researcher visited interviewees in the workplace and attended some project planning sessions and project-related workshops. These allowed observations of the project context, which helped make better sense of the data collected through interviews and

Table 1. The research design.

Phase	Case selection method	Outcomes
Phase 1 – Model development	Purposeful sampling based on maximum variation – 10 cases from a diverse range of industries and 13 interviews.	A theoretical project management methodology selection model.
Phase 2 – In-depth analysis of key characteristics	A purposeful sampling of four cases based on the theoretical model developed in Phase 1 and 18 further interviews.	An in-depth analysis of the impact of team type and goal type on the customization of project management methodology.

Table 2. Cases and sources of information.

Code Name	Project Type / Sector	Number of interviews	Role of interviewee and codes	Additional sources of information
Case 1	Service platform enhancement and customer engagement initiative / Government	2	Project manager (PM)	Three organization-level meetings with the project manager and two of his upper-level managers prior to the official case study, the firm's website
Case 2	IT implementation and technology integration initiative / Education	2	Project manager (PM)	One organization-level meeting with two upper managers prior to the official case study, the firm's website, project documents
Case 3	Mid-rise apartment building, alliance contracting / Construction	1	General manager (GM)	Online material suggested by the interviewee
Case 4	Service payment optimization project / Government	1	Project manager (PM)	The firm's website
Case 5	Documentary film / Not-for-profit	2	Director and producer (DP)	Materials suggested and provided by the interviewee.
Case 6	High-security identity system enhancement / Commercial software	5	Project managers (PM1 and PM 2) Scrum Master (SM)	The firm's website
Case 7	Export value enhancement policy development / Government	3	Project manager (PM)	Two meetings with the project consultant and project manager, two workshops conducted as part of the project, the firm's website, the project manager's website, online material suggested by the interviewee
Case 8	Freight forwarding business intelligence tool development / Commercial Software	5	Project manager (PM), Lead consultant (LC)	Observation (of the software used), the firm's website
Case 9	Library website user experience enhancement / Education Software	6	Scrum Master (SM) Associate Director (AD) Product Owners (PO1 and PO2)	Project documents, the firm's website, observation of an entire day planning session and one *daily stand-up* and some materials used in the project
Case 10	Seismic resilience enhancement for multi-level structure/ Construction	4	Project manager (PM), Site Manager (SM)	The firm's website, project documents

documents. We aimed to collect as much information as possible from each case project and conduct multiple interviews throughout until no new themes emerged and we reached a saturation point. The projects which were analysed further in phase two required more information to achieve saturation, as the scope of investigation increased.

A total of 31 interviews were recorded and transcribed. Eisenhardt (1989) suggests initially describing each case in detail for researcher familiarity. A framework was created for this, aiming to acquaint the researcher with case details and to organize events coherently. This also ensured evidence was gathered for later cross-case comparison. Individual case reports were structured around eight central themes: project outputs and outcomes, perception of change, goal and success criteria, the process of achieving the goal, the project team, choice of project management methodology, workflow, and project obstacles. Initially, these themes were informed by a literature review that explored the 'what' and 'how' of managing projects and their influence on the selection and suitability of project management methodologies. This structured description was used to gain insights into the logical relationships between a project's characteristics, the methodologies used and the challenges managers faced, while also aiding in the organization of evidence for comparative analysis. As the research progressed, the themes were refined based on the data, leading to their final form as described above. Structured recording and classification of case information and records of detailed causal relationships discussed by interviewees attempted to ensure internal validity as discussed by Yin (2003). To ensure external validity, detailed case descriptions are provided to allow readers to assess their potential applicability to other settings (Miles and Huberman 1994). Moreover, to ensure reliability, structured and semi-structured interviews, secondary data document analysis and observations were used to enable the triangulation of evidence (Riege 2003; Yin 2003).

Findings

We explored the perception of project managers about 'what' the goal of the project is and 'how' they should achieve it, and then examined how aspects of project management methodologies are customized accordingly to facilitate this process.

The findings are therefore presented in three sections: the first two sections present the findings of Phase 1, and the last section deals with Phase 2. The first section deals with the 'what' question and explores project managers' perception of the goal of their projects. The second section looks at the 'how' and explores the process of achieving the goal for their projects. This first phase revealed two distinct characteristics of projects, *Project goal* and *Team type,* that impacted the choice of project management methodologies and subsequent decisions. These characteristics were then used to develop the 2×2 classification model based on project type. The final section presents the results of Phase 2, which provides an in-depth analysis of four cases, one for each of the four quadrants of the classification model.

Project managers' perceptions of their project's goal and its measures

When asked to define their project goal, the interviewed project managers chose to focus on different aspects of their project, which revealed two distinct types of response: those focused on managing the project successfully to deliver the project's pre-defined specifications, '*project management success*', as opposed to those concerned with delivering a successful end result, '*project success*'. For cases in the first group, time, cost and scope were set, and any deviations from these pre-defined specifications were viewed as a problem. The following statement is an example of such a view:

> *I suppose from the project perspective, coming up on time and on the budget is a project manager's success, and then delivering the system as what we said we are going to deliver… I can only evaluate what I delivered against what I promised. (PM, 'Case 2')*

In this group, specifications were decided outside the project, and in a few cases, they were also approved by government entities or the customer, and any shortfall was considered a failure: the goal was to deliver the product specified faster and cheaper. In these cases, project managers' definitions of project goals were project management-oriented, with the project outcome being a necessity that the project should deliver on. A suitable metaphor for such projects is where a 'road map' represents all necessary tasks (as implied by necessity-based logic) to complete the project with its implied *minimum viable* product as something to be achieved only at the end of the project. They often used a 'risk register' and 'change control' procedure. Changes to specifications during such projects were viewed negatively, seen as issues that required management. '*If the project takes longer, we can't charge it … Because we are a vendor… we have a very firm idea of cost and time*' (PM, 'Case 6'). It should be noted that this does not preclude the existence of uncertainty in those projects. Uncertainty is inherent in every project and was observed in varying degrees in all projects in this study. What this group of projects had in common was the nature of uncertainty and the attitude towards change. Interestingly, changes and delayed decisions were limited to options with the same financial value of the project, in other words, minor variations but the same outcome.

The second group's response to the same question was more about the specifications, functions and benefits of the final product, rather than how they got there. In contrast to the first group, this group encouraged enhancements occurring during the execution process and saw them as adding value. Accordingly, project managers in this group defined success differently from the first group. In other words, the outcome determined whether the project was deemed to be a success. Some of these project managers decided on some specifications of their project during the execution phase. This group of project managers took responsibility for 'project success' – in contrast to the other group of project managers who saw themselves as only responsible for 'project management success'. In these cases, project managers embraced change during the project as something that may have a positive impact: '*At the end of three weeks… they*

can give us feedback … maybe something is a good idea, or maybe we need to change direction' (AD, 'Case 9').

Some project managers suggested that while there was a date and a budget in their business plan, time and cost were not success criteria; instead, they were '*just mechanics of the project*'. They even argued that time and budget were irrelevant measures for their project. '*We don't have a hard date at this stage … I am definitely more concerned about the usability and that it is ready to go up*' (PO, 'Case 9'). These project managers were expressing more concern about '*what*' to do rather than '*how*' and '*when*' to do it. Their definitions of the goal were outcome-oriented, and success criteria were defined with no upper limit (e.g. '*maximize customer satisfaction*', '*Increase the usefulness of the website*'). In other words, their goal was to maximize value. Some of these project managers were working with predefined resources including a budget. Their concern was to deliver the best possible outcome with these resources. An important attribute of such projects was that these projects were not declared successful when completed cheaper or faster. Some project managers in this group believe they can have a '*minimum viable*' product very early in the project, and the majority of project deliverables thereafter would add value incrementally: '*We could go live with it … we could launch today*' (SM, 'Case 9').

The above discussion indicates two distinct types of project goals: (1) Project management success-oriented goals that deliver a final product faster and cheaper ('Project management success'), and (2) Project success-oriented goals that attempt to maximize long-term value.

The impact of team type on the process of achieving project goals

Interviewees were also asked about the project management processes, workflow and task allocation. While sequential workflow underpins all network scheduling models, some interviewees discussed non-linear and/or non-sequential workflows. Project managers also exhibited different levels of flexibility in decisions about task allocation. They also addressed their team differently, some by name, others by roles.

> *So you have piling crews, steel and … crews, and wiring crews. (GM, 'Case 3')*
>
> *Developer and the testers, the designers … These are very generic. (PM, 'Case 8')*
>
> vs
>
> *I can't replace them … they can't be replaced. (DP, 'Case 5')*
>
> *T– has got three people working for her, … and myself. (PM, 'Case 2')*

In some projects, members with different skills move in and out of the project as needed, whereas in other projects, the workforce is made up of a stable set of members: '*There is always waiting in IT, … sometimes there is a week delay between this person finishing and the next person starting*' (PM, '*Case 6*') vs '*The daily stand-ups allow very quick response to those sorts of things … [in case some work is delayed another team member would say] Ok, I will help you in such and such' (PM, 'Case 6')*.

After mapping the workflow for each project, we analysed how each of the above elements influences the workflow and the type of challenges each project confronted. Our data suggest (see next paragraphs) that the team type provided the greatest explanatory power among all the elements: we observed a clear distinction between projects with a team whose members were continuously involved in the same project until its completion, which we call '*stable teams*' in this paper, and projects with members who moved in and out of the project as needed, which we call '*transient teams*'.

In projects with *transient teams*, most interactions between team members occurred when one resource finished their work and the next person/or group of people began. When team members left the project and attended to other projects, their involvement in the project was coordinated primarily via a schedule. However, the time of their return was uncertain, and their involvement in other projects increased this uncertainty and variability. Project managers with Transient teams were found to put more effort into estimation and planning and needed to be more effective in coordinating personnel from different departments. Their challenges were often related to synchronization.

Cases with a *stable team* did not employ sequential workflow. While some of these projects also used a schedule, the schedule did not play a coordination role for them. Instead, they used different coordination mechanisms, many of which were *ad hoc*. Team members were constantly informed about progress in the project via other means, such as daily stand-ups. Project managers seemed to perceive the management of stable teams to be less complex than that of transient teams. However, it was also observed that teamwork in non-sequential processes required more frequent and longer meetings in order to achieve the required level of coordination. These mechanisms also seemed to be less effective when the team required responding to or coordinating with external entities.

Figure 2 provides examples and quotes of each extreme, summarizing the above discussion in a 2-by-2 classification model based on goal type (Project management success vs Project success) and team type (stable vs transient).

Customization of project management methodologies

The findings discussed in the above two sections explain how the project managers' perception of their project's goal and how it is achieved influences their decisions and the nature of challenges in their projects. This third section further discusses four projects, each representing one quadrant of the proposed model (Figure 2). The cases have been deliberately selected in a way that they have some similarities in terms of the context and nature of work, to highlight the differences most related to this research: *team type*, and the *goal type*.

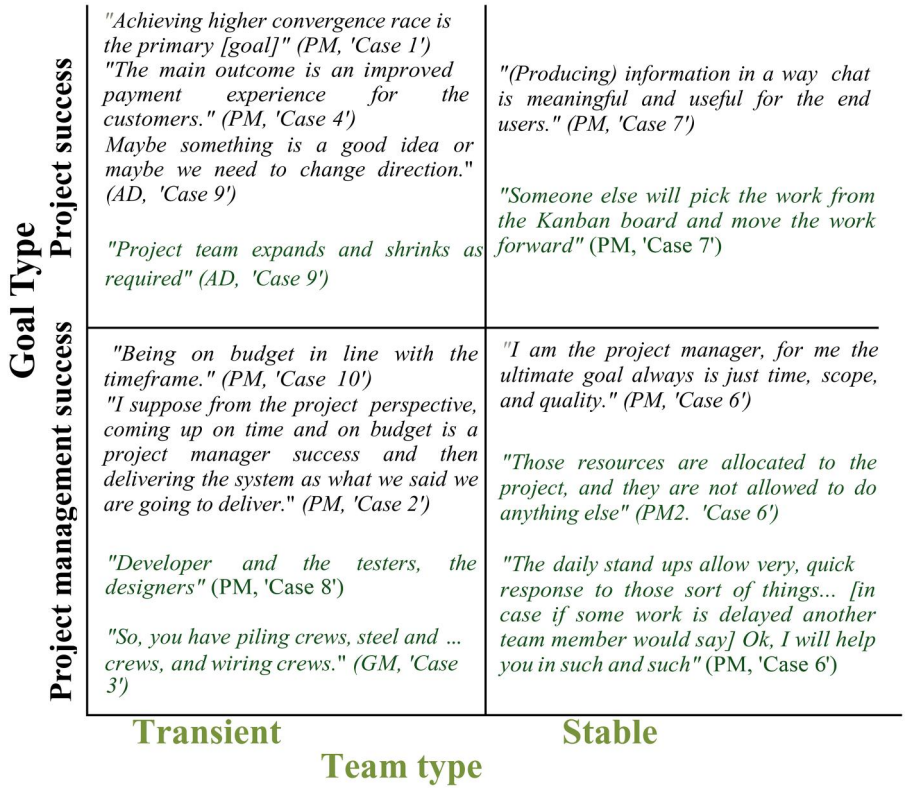

Figure 2. Proposed classification model.
Black text – Quotes relating to Goal type. Green text – Quotes relating to Team type.

Quadrant 1 (transient team and project management success-oriented goal)

The project chosen to represent this quadrant, 'Case 8', was part of a larger program that developed software for a global business application. This program was broken into multiple projects, each of which took a maximum of 60 days to complete. Case 8 was one of these 60-day projects. The criteria for success as described by the project manager were time, budget, and prescribed scope – the output for each project was fixed at the outset. Iterations were allowed at the program level. The workflow was sequential, and the team involved was shared across projects, so they came and went as needed for this project. They also did a variety of non-project tasks. They used Critical Chain Project Management (CCPM) which is a Plan-driven methodology.

It is worth noting that the company had deliberately divided the development into 60-day chunks and set the scope for each project firmly so that CCPM would work. '*We do put a lot of emphasis on getting the requirements locked in upfront*' (PM, 'Case 8'). In the company where the case occurred, only *urgent* undertakings that required *cross-team* collaboration were considered projects. The project manager argued that urgency means that timely delivery is a key performance indicator (KPI) for a project, while velocity should be regarded as the KPI for other operations. The execution process was governed by centralized priorities, which aligned individual efforts with the priorities of the entire organization. A software program that produced and updated information across the organization facilitated such alignment. Practices such as relay race, countdown, visual presentation of buffer penetration, buffer management meetings, monthly reviews of backlogs, and internally-established heuristic rules facilitated the decision-making in the execution process. The planning process used necessity-based logic (Mabin and Davies 2010). Estimates were based on required touch time and performed for a single activity with a single 'marker'(term used to refer to unit of work in the case organization). The number of possible iterations and the duration of each task were calculated separately. Hence there were no iterations on a project level. Iterations were allowed within the task only. This separation allowed visibility of the sources of uncertainty and transparency in estimates. Visibility and transparency were also observed in execution, where the centralized decision-support system (mentioned earlier) aligned individual efforts with the priorities of the entire organization.

We also observed that planning played an important role in this project. Working across different teams was a source of network complexity. In fact, the project was found to be vulnerable to mistakes relating to the estimates used in planning. Indeed, at the end of the project, the project manager admitted that despite the very successful completion of the project, they were aware that such efficient scheduling of work had created a system-wide overload which could lead to worker burnout, which was needed to be managed carefully at a company level.

Quadrant 2 (stable team and project management success-oriented goal)

The project chosen for Quadrant 2 was 'Case 6', a contracted software project for a client, in which the project scope was well defined at the outset, and the criteria for success as

described by project manager were focused on project management success. The project started with a transient team and then changed to a stable team when it moved from a *Plan-driven* methodology to *Scrum*. Initially, under Plan-driven, the workflow was sequential. However, they reduced task sizes to enable early engagement for all members. For example, for the tester to be able to start work early in the project, the whole team worked in smaller batches. Due to small batch sizes, an increasing dependency was observed; this was because, ideally, all team members worked on the same piece of work (a user story). As a result, developers worked on items that were still being analysed, and testers were developing tests for the product that was still under development. This work pattern is closer to a 'concurrent engineering' concept where the team carries the work together rather than passing it on sequentially to each other (Morris 2013, 68). Accordingly, workflow changed from purely sequential to reciprocal.

Scrum is perceived to facilitate better understanding between vendor and customer, and it requires constant prioritization of backlog tasks from the customer. However, in this case, the customer was not interested in such regular engagement. Furthermore, the project had detailed upfront planning with contractual obligations. Hence, all customer-related activities, such as development of backlog, User Acceptance Testing (UAT) which tests codes in the actual environment, customer's customers (end user) testing, and finally, launching the product to the final users, were kept outside the sprint. Thus we deduced that the team used a Hybrid model that coordinated the internal team using Scrum, while external engagement and planning used a Plan-driven methodology.

Scrum was perceived to produce a better product and increase customer satisfaction while also increasing the efficiency of the contractor's team. *Scrum* was also perceived to improve efficiency and result in faster and less costly delivery by reducing idle time and non-value-adding activities. Parallel movement and a multifunctional team in *Scrum* eliminated the waiting time that is common in sequential processes. Non-value-adding activities included processes that did not contribute to the final product, analysis of items that were not going to be coded later, and analysis and coding that was no longer needed. Moreover, *Scrum* was perceived to be less complex, thereby requiring less managerial effort.

We observed that despite Scrum enabling the completed project to be deemed a success, there were some downsides. *Scrum* seems to impose an overestimation of resources because the number of resources required should always be rounded up to the nearest integer. It may also have imposed an overestimation of time since the number of user stories that can be done in a sprint should round down to the nearest integer. In addition, we observed that *Scrum* appears to make it harder to coordinate outside the team when it was necessary.

Quadrant 3 (transient team and project success-oriented goal)

An example of this combination was 'Case 9', a library website redevelopment. It is classed as 'project success-oriented' because the criteria for success as described by the project manager related to realizing a project outcome, i.e. increased usability and usefulness. The final website's design and functionality were developed progressively through user consultations (consultation was part of the project). The project manager reasoned that for users to be able to comment, there needed to be something for them to '*see and play with*' and hence there were multiple iterations in the design and development phases.

The team was not working permanently on this project – they were working on several other projects concurrently and hence are categorized as transient. While they did maintain a *cohesive team,* some members were not needed regularly for the project. Team members' interactions were a combination of sequential and reciprocal processes. This posed complexity in defining the process and what makes it most efficient.

They had chosen to use Scrum, with interviewees arguing that the use of *Scrum* would facilitate understanding and attainment of scope, which was highly reliant on user opinions and feedback. Some assumptions and measures needed modification as more information was obtained. Some information required further clarification after the project started. This was because users' feedback was focused on what they had already seen in the past, rather than what new technologies could provide them. Hence, many options needed to be introduced before any useful feedback was possible. After each release, group negotiation reduced the gap between the group's collective perception and the individual's perception of the goal, as well as the gap between perception and reality. In a way, Scrum facilitated collective thinking and working to achieve consensus in this case. Interviewees also reasoned that short development durations could produce a short piece of code, which makes it easy to trace, thus reducing errors and poor functionality and allowing change and modification more easily.

However, transient team members in this project found daily Scrum meetings to be non-productive activities. During the Sprint planning session, which lasted the whole day, we observed that some participants were impatient and often disengaged, and some invited team stakeholders were not present. While Scrum encourages multi-functional teams, in this case, each team member was responsible for a specific type of task. Because of their intermittent contributions, they felt Scrum meetings wasted their time.

It was apparent that some Scrum features such as '*User stories', 'working software'* and '*iterative process'* facilitated uncovering the scope in this case. However, Scrum did not function well as a coordination mechanism to engage and manage people effectively. Because the team members were in and out of the project, they decided to use a Hybrid model that integrated Plan-driven coordination methods and replaced regular face-to-face meetings (e.g. daily stand-up, sprint planning sessions) with specific and scheduled meetings that involved only required resources. In addition, a buffer was added to accommodate a better communication schedule. The case suggests that network scheduling and time buffers could be a valuable mechanism to coordinate

any transient teams with a sequential process, irrespective of the nature of their scope.

Quadrant 4 (stable team and project success-oriented goal)

Lastly 'Case 7' was a policy project in a government department to develop new policy guidelines in a new area requiring data collection and in-depth analysis. The success criteria as described by the project manager were related to project output and outcome, i.e., 'producing relevant and useful information' and 'ensuring that information is used by intended users'. The project had a cross-functional team who worked permanently on this project. While not full-time on this project, they are classed as a stable team because all team members were engaged in the project, throughout the duration of the project, and this was their main project alongside other 'business as usual' tasks. Unlike a transient team, they did not move in and out of the project or engage in other projects. While such policy development work had not previously been managed as a project, this was a good example of the recent phenomenon whereby project management is increasingly being applied to many undertakings that have not been previously considered projects, with Agile in particular being advocated. The project management methodology transitioned over time from non-project to Scrum and then to a Hybrid model that combined Scrum and PRINCE2. Despite adopting Scrum, the project did not have a Scrum Master; instead, it had a project manager who planned and managed it. '*I will do my planning and bring it into daily stands-up*' (PM, 'Case 7'). He was also involved in managing the execution, in other words controlling the project. Reflecting on his role, he did acknowledge that his role was more of a project manager than a Scrum Master.

The analysis of the workflow depicted a reciprocal/team workflow. Work entered and progressed within the team while all members were engaged in dealing with the work. This, in turn, reduced the importance of coordination via a schedule—a strength of network schedule models. Scrum advocates delivering incremental value at the end of each sprint and adopting short sprints with a fixed duration. *Scrum* assumes that deliverables are divisible into small pieces, but the smallest deliverable in this project was 45 to 75 days long due to the nature of the project. At first, the use of short sprints with fixed duration was compromised to achieve incremental value, moving instead to sprints with longer iterations of varying duration. However, they decided that this approach did not make a difference in how they were receiving feedback, and in fact, a workable product was quite meaningless in this context. Hence, Incremental delivery, as described by Agile, was not possible for this project, as per the definition of minimum viable product, so it was governed by a Plan-driven methodology.

Moreover, the concept of '*user stories*' did not make sense to the team and other people involved. These challenges questioned the whole point of using user stories as a replacement for tasks, and later, the team returned to using tasks (for more deterministic activities, both short term and long term) and objectives (for less deterministic activities to be undertaken in the long term), as units of planning. They also used Kanban with a list of tasks instead of a backlog that is ideally a list of deliverables. Nevertheless, they continued using features of Scrum, such as short-fixed duration Sprint, which the project manager argued created cadence and reflection opportunities, those reflective sessions providing opportunity for internal feedback and discovery. Hence, the project used Agile methods for team coordination and Plan-driven methods for planning and control.

Discussion

Despite the increased popularity of Hybrid project management methodologies in practice (e.g. Gemino, Horner Reich, and Serrador 2021; Rode, Jensby, and Svejvig 2023; Serrador and Pinto 2015), there is a lack of understanding in the literature on the effective customization of Hybrid methodologies. This study contributes to literature and practice on the integration of seemingly contradictory practices from various project management methodologies into an effective Hybrid model. This research particularly identified significant conceptual differences between Plan-driven and Agile project management methodologies related to two key dimensions: *Project goal* and the *team type*. A summary of the four in-depth studied cases, including observations on how best to manage these projects, is presented in Table 3. The subsequent sections will discuss each of the dimensions in light of the broader literature.

Project goal

This research highlights the predictive power of project managers' perception of their role on the choice of project management methodology. Whereas a project has various dimensions of success (e.g. Zwikael and Meredith 2021), we observed that project managers make their own selection of what project goal to focus on, whether as project success or project management success. This selection reveals their role and sphere of control, which is the key to the success of any methodology they select. This can explain why project managers' ability to customize project management methodologies impacts achieving project success as evidenced in the literature (e.g. Fortune and White 2006; Shenhar et al. 2002). Indeed, mismatch between their definition of the project goal and the assumptions underpinning their chosen methodology obstructs the intended mechanism those methodologies are designed to deliver.

For example, decision-support systems in Plan-driven methodologies focus on completing a major deliverable composed of components that cannot function independently. Hence, all tasks are deemed necessary to achieve the deliverable and they are prioritized based on their impact on project completion (e.g. critical task vs non-critical), focusing on project management success (Mirzaei 2016). Plan-driven methodologies discourage activities that seek to redefine the scope and focus on rapid and cost-effective project output delivery assuming there is no value-related hierarchy of tasks

Table 3. Overview of the cases and recommended approach.

		Team Type	
		Transient team	Stable team
Goal Type	Project success-oriented goals	'Case 9'– Website development Workflow: A combination of sequential with a loop, team, and reciprocal. Success criteria: 'Positively contribute to the goal of the institution', 'Increase the usefulness of the website' and 'Increase the usability of the website'. Recommended approach: Iterative mechanisms from Agile methodology at the project level, with network scheduling and coordination for task management. Note: Network scheduling and Plan-driven coordination methods were required because Agile coordination mechanisms were found to be inefficient here due to team type.	'Case 7'- Policy advisory Workflow: A combination of sequential with a loop, team, and reciprocal. Success criteria: 'producing relevant and useful information, and second 'ensuring that information is used by intended users', 'effective use of resources. Recommended approach: At the project level, task-oriented planning as used in Plan-driven methodology. Agile coordination mechanisms such as Kanban and features of scrum such as short-fixed duration Sprints and stand-ups was used for task management. Note: Network scheduling does not play the role of coordination within the stable team.
	Project management-oriented goals	'Case 8'– Software new product development Workflow: Sequential. Iteration was accommodated both at the task level and at the program level. No iteration at the project level. Success criteria: 'Meet quality standards and scope specification', 'successful handover and coexistence with other projects' and 'On time completion.' Recommended approach: Plan-driven methodologies such as CCPM for Project-level coordination and delivery and Program-level Agile methodology to facilitate iteration. Note: Goal setting and the size of the project can be customized to keep iterations outside the defined project.	'Case 6' – Software development Workflow: Sequential. Success criteria: 'ensure sustainable operation' (on time, on budget, maximize resource capital) and 'maximize customer satisfaction. Recommended approach: Agile methodologies such as Scrum facilitate coordination and task management. Plan-driven upfront planning and delivery to manage time, budget and customer expectations. Note: To gain efficiency from Agile coordination, a stable team should be set.

to be prioritized, except for their impact on output delivery. Accordingly, the scope buffer or backlog (as used in Agile methodologies such as Scrum) seems irrelevant because no part of the scope is expected to be left out (e.g. as in network models Critical Path and CCPM). The minimum viable deliverable is the solution to the problem at hand, and any addition to this *minimum viable deliverable* may be considered *scope creep*.

In contrast, in Agile methodologies such as Scrum, the '*minimum viable*' deliverable is assumed to be a much smaller unit—several of which can be delivered in a sprint. These deliverables are assumed to have individual realizable values, driving Agile methodologies to focus on delivering highest value in earlier iterations. Iteration and incremental delivery in Agile methodologies direct the focus towards 'project success' and facilitate continuous re-evaluation of the project outcome. Furthermore, incremental delivery reduces the risk of major misalignment between project output and project success. However, incremental delivery is only possible if the output is divisible into small pieces. Nevertheless, iteration alone creates opportunity for frequent reflection and cadence, while former can allow re-evaluation of success to some extent, the latter can improve efficiency by reducing planning complexity.

Our findings reveal that project stakeholders, particularly project managers, might adjust the project's characteristics to align with a chosen methodology. This finding extends the discussion on the application of contingency theory in project management. Current literature focuses on the importance of tailoring the methodology to align with the project's characteristics (e.g. Gemino, Horner Reich, and Serrador 2021; Shenhar and Dvir 2007; Thesing, Feldmann, and Burchardt 2021; Wysocki 2011). However, our findings extend beyond the conventional view of characteristics as an inherent phenomenon, introducing a bidirectional approach. For example, in 'case 8' where the project manager was responsible for part of a massive project, the company divided the overarching project into chunks of work taking less than two months, each constituting a distinct project within the overarching endeavour. In this way, by breaking every project into smaller easily-managed projects and pushing the iteration outside their defined project, they adopt a Hybrid-by-Phases approach for the overall undertaking. This approach helped the organisation to use coordination mechanisms and efficiency measures provided in the Plan-driven methodology, CCPM, while reaping benefits of multiple small deliverables, as with Agile.

Team type

This research identifies an important effect of project team type on project coordination based on two distinct types of

teams: Stable, where members collaborate throughout a project's lifespan, and transient teams, where members engage in multiple projects simultaneously. These team types have a significant impact on the choice of project management methodologies. We also identified distinct coordination mechanisms that are effectively enabled by Agile and Plan-driven methodologies. For example, two significant features of Agile methodologies—*cadence* and *incremental value*—are distinct practices that can be used independently. The findings also shed light on the *role of the schedule as a means of coordination and communication* and how this is tied to team type. It was found that practices such as *daily stand-up*, *cadence,* and *backlog,* when used together in a stable team can enhance coordination as effectively as a schedule.

In our studied projects, stable teams displayed lower authority levels and higher autonomy, largely facilitated by Scrum processes. In contrast, transient teams did require higher authority and hierarchical decision-making, enabling them to coordinate their team members as they enter and leave the project. While Hollenbeck, Beersma, and Schouten (2012) categorizations for an organizational context do not adequately capture these differences for project teams, some parallels can be drawn, particularly concerning authority. The two types of teams did demonstrate elements of the two sides of the authority spectrum. The key differentiator, however, was members' continuous or intermittent participation in the project. This team type differentiation underscores the need for tailored coordination mechanisms and methodology choices, aligning with our findings on the distinct coordination needs of stable and transient teams in project management.

Stable teams demonstrate reciprocal processes, while transient teams exhibit sequential processes. Network scheduling, as per Thompson's (1967) classification, assumes a sequential workflow, while stable teams tend to engage in non-sequential processes requiring different coordination mechanisms. Network scheduling methods, as highlighted by Bashir et al. (2022), are effective in coordinating parallel and sequential activities, particularly in the context of transient teams. However, stable teams deviate from network scheduling assumptions about uncertainty, variability, and the nature of task allocations (Mirzaei and Mabin 2015). While stable teams were equally specialized and skilled, they often performed other tasks after completing their own, because they did not leave the project. This reduced the variability of time estimates and the uncertainty due to external factors imposed when members engage in other projects. Furthermore, a well-functioning stable team can self-organize without the need for a schedule as a coordination mechanism. Our study further aligns with the research of Baxter and Turner (2021), who demonstrated the positive impact of Scrum practices on communication, shared understanding, and reducing structural complexity caused by interdependencies. Implicit coordination facilitated by shared cognition, as discussed by Rico et al. (2008), is also relevant to our findings, as shared understanding plays a crucial role within stable teams managing interdependencies. In contrast, this research found that with a transient team, since members enter and exit the project as they engage in external activities, variability and uncertainty increases, which reinforces the need for a schedule as a coordination mechanism.

While stable teams can reduce the effect of variability in the project schedule and the need for explicit coordination mechanisms, this only refers to planning. Hence, the perceived reduced complexity in managing a stable team is limited to planning effort and may not mean a reduction in the effort required overall. Our findings show that stable teams require higher levels of other types of coordination and control efforts. This is in line with Miller and Rice (2013) findings, which suggest that sequential processes require less coordination and control effort. We contend that since coordination and control are the strength of the Plan-driven methodology, transient teams gain the most benefit from the mechanisms used in the Plan-driven methodology.

Customizing project management methodologies – theoretical and practical implications

In this study, we observed two examples of 'Hybrid-by-Phases' (in quadrants 1 and 2) used by project managers in charge of project management success: firstly, for a stable team to benefit from Agile coordination mechanisms while working on a Plan-driven project (PRINCE2); secondly, for a transient team that required iteration, to coordinate the team using the schedule and still benefit from Agile iterative and incremental delivery. The Hybrid-by-Phases approach offers the project manager the ability to customize the project management approach according to the distinct requirements of each phase. By applying different methodologies in each phase, the approach becomes more focused and efficient. This structured approach allows the project manager to optimize various aspects of project management, such as processes, resource allocation, and risk mitigation strategies, based on the specific challenges and objectives of each phase. It enables the project manager to navigate different methodologies effectively while collaborating with a diverse range of stakeholders and addressing specific challenges throughout the project.

We also identified two examples of 'Hybrid-by-Methods' used by project managers in charge of project success (in quadrants 3 and 4). The Hybrid-by-Methods approach provides greater flexibility, which is especially beneficial when the project manager has the complex responsibility of achieving project success. In this approach, feedback and iteration mechanisms, inspired by Agile methodology, are integrated throughout the project's life rather than being limited to specific phases. By combining and integrating various project management methodologies and practices simultaneously, the Hybrid-by-Methods approach creates a unified framework that spans the entire project lifecycle. This approach allows the project manager to leverage the strengths of different methodologies in a synergistic manner, enhancing adaptability and increasing the likelihood of

Table 4. Hybrid customization models.

		Team Type	
		Transient Team	Stable Team
Goal Type	Project success-oriented goals 'Hybrid-by-Methods'	Incremental and iterative delivery and Plan-driven coordination methods (e.g. Network scheduling) throughout the project.	Agile coordination methods are used internally, and Plan-driven coordination methods are used for external engagements throughout the project.
	Project management success-oriented goals 'Hybrid-by-Phases'	Program-level Agile methodology to facilitate iteration outside defined project. Project-level Plan-driven coordination methods (e.g. Network scheduling) and Delivery at project level.	Agile coordination at the sub-project level for tasks and team management and Plan-driven for upfront planning, and deadline-driven delivery.

project success. However, it also means that the project manager bears a greater level of autonomy and responsibility when it comes to tailoring and adjusting methodologies to suit the specific requirements and circumstances of the project. It is important to note that in cases where the project manager's main objective is solely focused on project management success, this level of autonomy may not be granted.

Table 4 summarizes the customization choices settled on by the project managers in our research. As presented in the table, Cases 8 and 6 use Agile and Plan-driven at distinct phases (i.e sub-project, project, program), while Cases 9 and 7 use aspects of each methodology throughout the project in respond to specific project requirements and constraints. Cases 9 and 8 with a transient team used Plan-driven methods to coordinate its transient team while Cases 7 and 6 with a stable team used Agile for task coordination internally.

Based on these manager's experiences, Table 4 provides a guide for practitioners with key areas for consideration when customizing a Hybrid Project Management Methodology for their project. If a project manager defines project success mostly in terms of the project's outcomes (e.g. business success), the Hybrid-by-Methods grants them greater control and decision-making power across the project lifecycle, which are necessary for attaining those outcomes. Conversely, if a project manager's criteria for success are focused on project management success (e.g. scope, schedule, budget, and quality), the Hybrid-by-Phases approach might be more suitable. This method facilitates decision-making with the involvement of other stakeholders at the beginning of each phase, allowing the project manager to concentrate on specific constraints within each phase.

Another key area for consideration is the composition of the project team which influences the ideal coordination method. For stable teams, Agile methodologies foster close collaboration and communication. In Hybrid-by-Methods projects, Agile methodologies can be used throughout, while Plan-driven methodologies are more suited for managing interactions outside the team. For Hybrid-by-Phases projects, Agile methodologies shine at the sub-project level, while Plan-driven methodologies manage overarching planning and deadlines. Conversely, for transient teams, Plan-driven methodologies are essential for smooth coordination. In Hybrid-by-Methods projects, incremental and iterative delivery can be at the project level coupled with Plan-driven coordination at each iteration. This approach helps in effectively coordinating the team. In projects adopting Hybrid-by-phases, while iterations might occur at the program level, Plan-driven methodologies at the project level are critical for both team coordination and managing project constraints.

Our study, grounded in pluralistic perspectives drawn from contingency theory, challenge the notion of universally applicable *prescriptive methods*, advocating instead for a more nuanced understanding of how project management methodologies are selected and adapted. Consistent with Geraldi, Söderlund, and Marrewijk (2020) recommendation, our paper reflects a contextually-aware approach to project management research. We extend the conversation to encompass not just the methodologies themselves, but also the fundamental aspects of a project, such as its definition, goal, and team formation. Our research suggests that project characteristics, often depicted as static in previous studies, can be selected, or modified by project managers to suit their preferred methodology (as was done in Cases 7 and 8). This finding further highlights the pivotal role of project managers in choosing, contextualizing and customizing methodologies, and underscores the significance of their perception as the key users of project management methodologies. Building on Imani, Nakano, and Anantatmula (2017), our model operationalizes their theoretical insights into practical application by providing a tool for customizing Hybrid project management methodologies. It fills the identified gaps and addresses the skill level challenges for agile teams with empirical guidance, thus advancing the practices of Hybrid project management.

Conclusions

This research makes a significant contribution to the emerging literature on customizing Hybrid project management methodologies, as called for by Agbejule and Lehtineva (2022), Azenha, Reis, and Fleury (2021) and Reiff and Schlegel (2022). To answer the research question, '*How do project managers customize their Hybrid project management methodology by selecting aspects of Plan-driven and Agile to fit the needs of different types of projects?*', we present a

model that elucidates how practitioners customize their own project management methodologies by blending aspects of Agile and Plan-driven methodologies, tailoring them to specific contexts. Leveraging off contingency theory, our approach suggests moving away from black-box solutions, opting instead to dissect methodologies to tailor and combine their core elements. This modular strategy allows mass customization of Hybrid methodologies led by project managers.

Our case studies further revealed two key project aspects that influence Hybrid model customization: goal type and team type. One of the novel aspects of this paper is that we differentiate between two types of Hybrid models: *Hybrid-by-Methods* and *Hybrid-by-Phases*. We have found that these two types of Hybrid approaches have different implications for the customization process, as well as for the project outcomes. *Hybrid-by-Methods* are more conducive to *project success*, empowering project managers with greater control throughout the lifecycle. In contrast, a *Hybrid-by-Phases* approach is better suited for *project management success*, where the project manager's control and responsibility are confined to specific constraints within each phase.

Additionally, we delved into how Agile and Plan-driven methodologies shape coordination tools, exploring decision-making processes for choosing and adapting them to diverse contexts. The paper reveals the implications of these choices on challenges faced during the project. Whereas this paper is limited in identifying the two key factors that impact this choice, future research could explore additional influential factors that impact when and how to implement Hybrid approaches and explore a more modular and comprehensive understanding of project management methodologies. Furthermore, whilst this research focused on the perceptions of project managers as the primary users of project management methodologies, future research could also integrate the important views of other stakeholders, including project owners and team members.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Notes on contributors

Dr. Maryam Mirzaei, is an early career researcher and lecturer at Auckland University of Technology (AUT), specializes in Supply Chain Management and project management. Before her academic tenure, she led a significant portfolio of post-tsunami reconstruction projects. This role not only honed her skills in managing large-scale projects but also laid the groundwork for her research interests in practical, industry-based applications of project and supply chain management. Dr. Mirzaei's work is characterized by its industry relevance and applicability, addressing real-world challenges faced by contemporary businesses. Through extensive industry collaborations, she has developed courses that are both modern and directly linked to real-world practices. She has been leading numerous operation and supply chain management consultancy projects involving students, focused on problem-solving, enhancing operational efficiency, introducing sustainability practices, and technology adoption and automation.

Victoria Mabin is Emeritus Professor in Management and former Associate Dean at Victoria University of Wellington. Her specialty is problem solving/decision making using Theory of Constraints with other systems thinking and OR/MS methods, and she has undertaken many projects assisting organizations with strategic priority setting and operational problems. Publications include 'The World of the Theory of Constraints' (2000), the lead Thinking Processes chapter in the 'Theory of Constraints Handbook', and many journal articles. She has been ranked the top researcher in the Theory of Constraints Thinking processes. https://www.tandfonline.com/doi/full/10.1080/00207543.2018.1518602. Vicky was awarded the 2021 Lifetime Achievement Award by the Theory of Constraints International Certification Organization, the Griffiths Medal (Operational Research Society UK), the Hans Daellenbach Prize by the ORSNZ, and Fellow of the Operational Research Society (UK). She has served as president of ORSNZ, chair of NZPICS Wellington Chapter, on the board of TOCICO and editorial boards of ITOR and Decision Sciences Journal of Innovative Education.

Ofer Zwikael is a Professor of Project Management at the Australian National University. His five books and more than 250 scholarly peer-reviewed papers have been recognized through research awards from the Academy of Management, British Academy of Management, Project Management Institute, International Project Management Association, Emerald, and the Australian Institute of Project Management. Professor Zwikael was named by Stanford University and Elsevier to be among the top 2% of international scientists in Business and Management. His research on project benefits management has been funded by major organizations, including the Australian Department of Defence and the Project Management Institute (US). He has held leadership roles including Head of School and Associate Dean and is currently an Associate Editor for the *International Journal of Project Management*.

References

Ahlemann, F., F. El Arbi, M. G. Kaiser, and A. Heck. 2012. "A Process Framework for Theoretically Grounded Prescriptive Research in the Project Management Field." *International Journal of Project Management* 31 (1): 43–56. https://doi.org/10.1016/j.ijproman.2012.03.008.

Agbejule, A., and L. Lehtineva. 2022. "The Relationship between Traditional Project Management, Agile Project Management and Teamwork Quality on Project Success." *International Journal of Organizational Analysis* 30 (7): 124–136. https://doi.org/10.1108/IJOA-02-2022-3149.

Azenha, C. F., A. D. Reis, and L. A. Fleury. 2021. "The Role and Characteristics of Hybrid Approaches to Project Management in the Development of Technology-Based Products and Services." *Project Management Journal* 52 (1): 90–110.

Bashir, H., U. Ojiako, A. Marshall, M. Chipulu, and A. A. Yousif. 2022. "The Analysis of Information Flow Interdependencies within Projects." *Production Planning & Control* 33 (1): 20–36. https://doi.org/10.1080/09537287.2020.1821115.

Baxter, D., and N. Turner. 2021. "Why Scrum Works in New Product Development: The Role of Social Capital in Managing Complexity." *Production Planning & Control* 34 (13): 1248–1260. https://doi.org/10.1080/09537287.2021.1997291.

Bianchi, M. J., and D. C. Amaral. 2020. "A Systematic Review of Association Rules in Project Management: opportunities for Hybrid Models." *Product Management & Development* 18 (2): 136–144. https://doi.org/10.4322/pmd.2020.033.

Bianchi, M. J., E. C. Conforto, E. Rebentisch, C. D. Amaral, S. O. Rezende, and R. de Pádua. 2022. "Recommendation of Project Management Practices: A Contribution to Hybrid Models." *IEEE Transactions on Engineering Management* 69 (6): 3558–3571. https://doi.org/10.1109/TEM.2021.3101179.

Burgan, S. C., and D. S. Burgan. 2014. "One Size Does Not Fit All: Choosing the Right Project Approach." *Paper Presented at PMI® Global Congress 2014—North America, Phoenix, AZ*. Newtown Square, PA: Project Management Institute.

Burns, T., and G. M. Stalker. 1961. *The Management of Innovation*. London, England: Tavistock.

Cavana, R. Y., B. L. Delahaye, and U. Sekaran. 2001. *Applied Business Research: Qualitative and Quantitative Methods*. Brisbane: Wiley.

Chipulu, M., and R. Vahidi. 2020. "The Dependence upon Context of Project Critical Success Factors: test of the Contingency Hypothesis and Effects of Technological Uncertainty and Collectivism Culture." *Production Planning & Control* 31 (15): 1261–1275. https://doi.org/10.1080/09537287.2019.1702733.

Cooke-Davies, T. 2002. "The 'Real' Success Factors on Projects." *International Journal of Project Management* 20 (3): 185–190. https://doi.org/10.1016/S0263-7863(01)00067-9.

Cooper, R. G., and A. F. Sommer. 2018. "Agile–Stage-Gate for Manufacturers: Changing the Way New Products Are Developed." *Research-Technology Management* 61 (2): 17–26. https://doi.org/10.1080/08956308.2018.1421380.

Conboy, K., and N. Carroll. 2019. "Implementing Large-Scale Agile Frameworks: Challenges and Recommendations." *IEEE Software* 36 (2): 44–50. https://doi.org/10.1109/MS.2018.2884865.

Conforto, E. C., and D. C. Amaral. 2016. "Agile Project Management and Stage-Gate Model – a Hybrid Framework for Technology-Based Companies." *Journal of Engineering and Technology Management* 40: 1–14. https://doi.org/10.1016/j.jengtecman.2016.02.003.

Crawford, L., B. Hobbs, and J. R. Turner. 2006. "Aligning Capability with Strategy: Categorizing Projects to Do the Right Projects and to Do Them Right." *Project Management Journal* 37 (2): 38–50. https://doi.org/10.1177/875697280603700205.

De Wit, A. 1988. "Measurement of Project Success." *International Journal of Project Management* 6 (3): 164–170. https://doi.org/10.1016/0263-7863(88)90043-9.

DeLone, W. H., and E. R. McLean. 2003. "The DeLone and McLean Model of Information Systems Success: A Ten-Year Update." *Journal of Management Information Systems* 19 (4): 9–30.

Dubois, A., and L. E. Gadde. 2002. "Systematic Combining: An Abductive Approach to Case Research." *Journal of Business Research* 55 (7): 553–560. https://doi.org/10.1016/S0148-2963(00)00195-8.

Dvir, Dov., Arik Sadeh, and Ayala Malach-Pines. 2006. "Projects and Project Managers: The Relationship between Project Managers' Personality, Project Types, and Project Success." *Project Management Journal* 37 (5): 36–48. https://doi.org/10.1177/875697280603700505.

Dvir, D., S. Lipovetsky, A. Shenhar, and A. Tishler. 1998. "In Search of Project Classification: A Non-Universal Approach to Project Success Factors." *Research Policy* 27 (9): 915–935. https://doi.org/10.1016/S0048-7333(98)00085-7.

Eisenhardt, K. M. 1989. "Building Theories from Case Study Research." *The Academy of Management Review* 14 (4): 532–550. https://doi.org/10.2307/258557.

Fernandez, D. J., and J. D. Fernandez. 2008. "Agile Project Management – Agilism versus Traditional Approaches." *Journal of Computer Information Systems* 49 (2): 10–17.

Fitzgerald, B., G. Hartnett, and K. Conboy. 2006. "Customising Agile Methods to Software Practices at Intel Shannon." *European Journal of Information Systems* 15 (2): 200–213. https://doi.org/10.1057/palgrave.ejis.3000605.

Fortune, J., and D. White. 2006. "Framing of Project Critical Success Factors by a Systems Model." *International Journal of Project Management* 24 (1): 53–65. https://doi.org/10.1016/j.ijproman.2005.07.004.

Fowler, M., and J. Highsmith. 2001. "The Agile Manifesto." *Software Development* 9 (8): 28–35.

Gemino, A., B. Horner Reich, and P. M. Serrador. 2021. "Agile, Traditional, and Hybrid Approaches to Project Success: Is Hybrid a Poor Second Choice?" *Project Management Journal* 52 (2): 161–175. https://doi.org/10.1177/8756972820973082.

Geraldi, J., J. Söderlund, and A. van Marrewijk. 2020. "Advancing Theory and Debate in Project Studies." *Project Management Journal* 51 (4): 351–356. https://doi.org/10.1177/8756972820932002.

Hällgren, Markus. 2012. "The Construction of Research Questions in Project Management." *International Journal of Project Management* 30 (7): 804–816. https://doi.org/10.1016/j.ijproman.2012.01.005.

Hansen, A. S., P. Svejvig, and L. K. Hansen. 2022. "Revisiting Shenhar and Dvir's Diamond Model: Do We Need an Upgrade?" In *Research on Project, Programme and Portfolio Management. Lecture Notes in Management and Industrial Engineering*, edited by R. Ding, R. Wagner, and C. N. Bodea. Cham: Springer.

Hollenbeck, J. R., B. Beersma, and M. E. Schouten. 2012. "Beyond Team Types and Taxonomies: A Dimensional Scaling Conceptualization for Team Description." *Academy of Management Review* 37 (1): 82–106. https://doi.org/10.5465/armr.2010.0181.

Howell, D., C. Windahl, and R. Seidel. 2010. "A Project Contingency Framework Based on Uncertainty and Its Consequences." *International Journal of Project Management* 28 (3): 256–264. https://doi.org/10.1016/j.ijproman.2009.06.002.

Huemann, M. 2022. "Celebrating the Power of Projects and Their Management." *International Journal of Project Management* 40 (1): 1–3. https://doi.org/10.1016/j.ijproman.2022.02.001.

Imani, T., M. Nakano, and V. Anantatmula. 2017. "Does a Hybrid Approach of Agile and Plan-Driven Methods Work Better for IT System Development Projects." *International Journal of Engineering Research and Applications* 07 (03): 39–46. https://doi.org/10.9790/9622-0703043946.

Joslin, R. S., and R. Müller. 2015. "Relationships between a Project Management Methodology and Project Success in Different Project Governance Contexts." *International Journal of Project Management* 33 (6): 1377–1392. https://doi.org/10.1016/j.ijproman.2015.03.005.

Kuhrmann, M., P. Diebold, J. Munch, P. Tell, K. Trektere, F. McCaffery, V. Garousi, et al. 2019. "Hybrid Software Development Approaches in Practice: A European Perspective." *IEEE Software* 36 (4): 20–31. https://doi.org/10.1109/MS.2018.110161245.

Lawrence, P. R., and J. W. Lorsch. 1967. *Organization and Environment: Managing Differentiation and Integration*. Boston, MA: Harvard Business Press.

Lechler, T. G., B. H. Edington, and T. Gao. 2012. "Challenging Classic Project Management: Turning Project Uncertainties into Business Opportunities." *Project Management Journal* 43 (6): 59–69. https://doi.org/10.1002/pmj.21304.

Lehnen, Jens, Tobias Sebastian Schmidt, and Cornelius Herstatt. 2016. "Bringing Agile Project Management into Lead User Projects." *International Journal of Product Development* 21 (2/3): 212–232. https://doi.org/10.1504/IJPD.2016.078867.

Lewis, R. D. 2006. *When Cultures Collide: Leading across Cultures*. Boston, MA: Nicholas Brealey Publishing.

Locke, K., and K. Golden-Biddle. 1997. "Constructing Opportunities for Contribution: Structuring Intertextual Coherence and "Problematizing" in Organizational Studies." *Academy of Management Journal* 40 (5): 1023–1062. https://doi.org/10.2307/256926.

Lundin, R. A., and A. Söderholm. 1995. "A Theory of the Temporary Organization." *Scandinavian Journal of Management* 11 (4): 437–455. https://doi.org/10.1016/0956-5221(95)00036-U.

Mabin, V. J., and J. Davies. 2010. "TOC Thinking Processes: Their Nature and Use – Reflection and Consolidation." In *Theory of Constraints Handbook*, edited by J. F. Cox and J. G. Schleier, 631–669. New York, NY: McGraw Hill.

Mafakheri, F., F. Nasiri, and M. Mousavi. 2008. "Project Agility Assessment: An Integrated Decision Analysis Approach." *Production*

Planning & Control 19 (6): 567–576. https://doi.org/10.1080/09537280802360884.
Malone, T. W. 1987. "Modeling Coordination in Organizations and Markets." *Management Science* 33 (10): 1317–1332. https://doi.org/10.1287/mnsc.33.10.1317.
Markus, M. L., and J. Y. Mao. 2004. "Participation in Development and Implementation-Updating an Old, Tired Concept for Today's is Contexts." *Journal of the Association for Information Systems* 5 (11): 514–544. https://doi.org/10.17705/1jais.00057.
Miles, M. B., and A. M. Huberman. 1994. *Qualitative Data Analysis: An Expanded Sourcebook*. Thousand Oaks, CA: Sage Publications.
Miller, E. J., and A. K. Rice. 2013. *Systems of Organization: The Control of Task and Sentient Boundaries*. London, UK: Routledge.
Mirzaei, M. 2016. "Exploring Applicability of Theory of Constraints to Projects: Critical Chain Project Management and beyond." Doctoral thesis, Victoria University of Wellington. Victoria University of Wellington.
Mirzaei, M., and V. J. Mabin. 2015. "Variability in Project Scheduling and the Impact of Team Type." In Proceedings of the Joint NZSA + ORSNZ Conference.
Morris, P. W. G. 2013. *Reconstructing Project Management*. Cambridge, MA: John Wiley and Sons Ltd.
Niederman, F., T. Lechler, and Y. Petit. 2018. "A Research Agenda for Extending Agile Practices in Software Development and Additional Task Domains." *Project Management Journal* 49 (6): 3–17. https://doi.org/10.1177/8756972818802713.
Niknazar, P., and M. Bourgault. 2017. "Theories for Classification vs. classification as Theory: Implications of Classification and Typology for the Development of Project Management Theories." *International Journal of Project Management* 35 (2): 191–203. https://doi.org/10.1016/j.ijproman.2016.11.002.
Paasivaara, M. 2017. "Adopting SAFe to Scale Agile in a Globally Distributed Organization." In 2017 IEEE 12th International Conference on Global Software Engineering (ICGSE), 36–40. IEEE. https://doi.org/10.1109/ICGSE.2017.15.
Pace, M. 2019. "A Correlational Study on Project Management Methodology and Project Success." *Journal of Engineering, Project, and Production Management* 9 (2): 56.
Papadakis, E., and L. Tsironis. 2018. "Hybrid Methods and Practices Associated with Agile Methods, Method Tailoring and Delivery of Projects in a Non-Software Context." *Procedia Computer Science* 138: 739–746. https://doi.org/10.1016/j.procs.2018.10.097.
Patton, M. Q. 2005. *Qualitative Research & Evaluation Methods*, 3rd ed., 6th print. Thousand Oaks: Sage Publications.
Pearson, A. W. 1990. "Innovation Strategy." *Technovation* 10 (3): 185–192. https://doi.org/10.1016/0166-4972(90)90023-D.
Pinto, J. K. 2022. "Avoiding the Inflection Point: Project Management Theory and Research after 40 Years." *International Journal of Project Management* 40 (1): 4–8. https://doi.org/10.1016/j.ijproman.2021.11.002.
Rico, Ramón, Miriam Sánchez-Manzanares, Francisco Gil, and Cristina Gibson. 2008. "Team Implicit Coordination Processes: A Team Knowledge-Based Approach." *Academy of Management Review* 33 (1): 163–184. https://doi.org/10.5465/amr.2008.27751276.
Reiff, J., and D. Schlegel. 2022. "Hybrid Project Management – A Systematic Literature Review." *International Journal of Information Systems and Project Management* 10 (2): 45–63. https://doi.org/10.12821/ijispm100203.
Riege, A. M. 2003. "Validity and Reliability Tests in Case Study Research: A Literature Review with "Hands-on" Applications for Each Research Phase." *Qualitative Market Research: An International Journal* 6 (2): 75–86. https://doi.org/10.1108/13522750310470055.
Rode, A. L. G., A. Jensby, and P. Svejvig. 2023. "A Multiple and Comparative Case Study Evaluation of a Hybrid Project Management Methodology." European Academy of Management (EURAM) Annual Conference, Ireland.
Schmitz, K., R. Mahapatra, and S. Nerur. 2019. "User Engagement in the Era of Hybrid Agile Methodology." *IEEE Software* 36 (4): 32–40. https://doi.org/10.1109/MS.2018.290100623.
Serrador, P., and J. K. Pinto. 2015. "Does Agile Work? – A Quantitative Analysis of Agile Project Success." *International Journal of Project Management* 33 (5): 1040–1051. https://doi.org/10.1016/j.ijproman.2015.01.006.
Shenhar, A. J., D. Dvir, T. Lechler, and M. Poli. 2002, July. "One Size Does Not Fit All – True for Projects, True for Frameworks." *Proceedings of PMI Research Conference*, 14–17. Newtown Square, PA: Project Management Institute.
Shenhar, A. J., and D. Dvir. 2007. "How Projects Differ and What to Do about It." In *The Wiley Guide to Project, Program and Portfolio Management*, edited by P. W. G. Morris, and J. K. Pinto, 1265–1286. John Wiley & Sons.
Silva, F. B., M. J. Bianchi, and D. C. Amaral. 2019. "Evaluating Combined Project Management Models: Strategies for Agile and Plan-Driven Integration." *Product Management & Development* 17 (1): 15–30. https://doi.org/10.4322/pmd.2019.003.
Sithambaram, J., M. H. N. B. M. Nasir, and R. Ahmad. 2021. "Issues and Challenges Impacting the Successful Management of Agile-Hybrid Projects: A Grounded Theory Approach." *International Journal of Project Management* 39 (5): 474–495. https://doi.org/10.1016/j.ijproman.2021.03.002.
Takeuchi, H., and I. Nonaka. 1986. "The New Product Development Game." *Harvard Business Review* 64 (1): 137.
Tanveer, M. 2015. "Agile for Large Scale Projects – a Hybrid Approach." In 2015 National Software Engineering Conference (NSEC), 14–18. IEEE. https://doi.org/10.1109/NSEC.2015.7396338.
Thesing, T., C. Feldmann, and M. Burchardt. 2021. "Agile versus Plan-Driven Project Management: decision Model for Selecting the Appropriate Approach to a Project." *Procedia Computer Science* 181: 746–756. https://doi.org/10.1016/j.procs.2021.01.227.
Thompson, J. D. 1967. *Organizations in Action; Social Science Bases of Administrative Theory*. New York, NY: McGraw-Hill.
Vinekar, V., and C. L. Huntley. 2010. "Agility versus Maturity: Is There Really a Trade-off?" *Computer Magazine*. 43 (5): 87–89. https://doi.org/10.1109/MC.2010.126.
Webb, J. E. 1969. *Space Age Management: The Large-Scale Approach*. New York, NY: McGraw-Hill.
Winter, M., C. Smith, P. Morris, and S. Cicmil. 2006. "Directions for Future Research in Project Management: The Main Findings of a UK Government-Funded Research Network." *International Journal of Project Management* 24 (8): 638–649. https://doi.org/10.1016/j.ijproman.2006.08.009.
Woodward, J. 1958. *Management and Technology*. London, England: Her Majesty's Stationary Office.
Woodward, J. 1965. *Industrial Organization: Theory and Practice*. New York, NY: Oxford University Press.
Wysocki, R. K. 2011. *Executive's Guide to Project Management: Organizational Processes and Practices for Supporting Complex Projects*. Hoboken, NJ: Wiley.
Yin, R. K. 2003. *Case Study Research: Design and Methods* (3rd ed.). Thousand Oaks, CA: Sage Publications.
Zasa, F. P., A. Patrucco, and E. Pellizzoni. 2020. "Managing the Hybrid Organization: How Can Agile and Traditional Project Management Coexist?" *Research-Technology Management* 64 (1): 54–63. https://doi.org/10.1080/08956308.2021.1843331.
Zwikael, O., and J. Meredith. 2021. "Evaluating the Success of a Project and the Performance of Its Leaders." *IEEE Transactions on Engineering Management* 68 (6): 1745–1757. https://doi.org/10.1109/TEM.2019.2925057.
Zwikael, O., and A. Gilchrist. 2024. "A Structured Process for the Fuzzy Front-End of Complex Projects." *Production Planning & Control* 2024: 1–10. https://doi.org/10.1080/09537287.2024.2320766.
Zwikael, O., R. D. Pathak, F. Ling, S. Titov, Z. Husain, L. Yang, B. Sharma, C. Y. Tay, and D. Samson. 2022. "Variation in Project Management Practices across Borders." *Production Planning & Control* 33 (13): 1270–1282. https://doi.org/10.1080/09537287.2020.1858362.
Zwikael, O., and J. Meredith. 2018. "Who's Who in the Project Zoo? The Ten Core Project Roles." *International Journal of Operations & Production Management* 38 (2): 474–492. https://doi.org/10.1108/IJOPM-05-2017-0274.

Appendix A. Interview questions

First Interview (questionnaire for structured interview)

1. Industry.
2. Number of project team (part time/full time).
3. Expected duration.
4. Location of team members, e.g. co-located, across office in the same city, across country, international.
5. Level of uncertainty in the product (technological uncertainty), e.g. no new technology, some new technology, technology is new for the firm but is an existing technology, key technologies do not exist at the start of the project.
6. Level of uncertainty in the process, e.g. improvement on existing system, new generation of an existing system, completely new system.
7. What resources does this project share with other projects in the same portfolio and in what basis?
8. What are the resource requirements for this project? (qualification, organisation policy in resources management)
9. Is there any decision-making process involved in selecting the resources? If yes, please explain.
10. Is there a project management office, if yes what is its role in this project?

Follow up interviews (Guideline for semi structured interview)

1. What is the major outcome for which this project is undertaken?
2. What are the high-level success criteria (2-3) that must be satisfied for the goal to be achieved?
3. What key activities or tasks are required to realise the above success criteria?
4. What obstacles have you encountered, or do you encounter that prevent you from accomplishment of any of the key activities?
5. Which problem do you see as the most serious in preventing you from achieving your goal?
6. What is the undesirable effect of this problem on the project goal?
7. Is there a specific action causing the problem?
8. Can you identify a root cause for the obstacles?