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# Overcoming the principal-agent problem: The need for alignment of tools and methods in collaborative project delivery

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## ABSTRACT

Despite the focus on collaborative project delivery models (CPDMs) in the construction industry, it remains unclear how it promises bases for delivering better value for money than many traditional models. In view of the importance of knowledge about CPDM delivery, this study aims to explore governance mechanisms that underline the relationship between principal and agent and how this relationship is impacted by the alignment of organisational tools and methods. We argue that there is an interrelationship between agency theory and stewardship theory that provides an important theoretical foundation for CPDMs; additionally, alignment of organisational tools and methods can contribute to overcoming the principal-agent problem in projects if aligned with the functions in CDPMs. An empirical analysis of an exploratory case study supports these assumptions and highlights how CPDM's success can occur through removing and reducing the fundamental principal-agent problem and illustrates the performance and dangers of CPDM tools. Our findings deepen the theoretical understanding of CPDM delivery and provide new insights into the strategic fit in CPDMs alignment in projects.

## 1. Introduction

A project delivery model (PDM) is defined as an arrangement of “how the multiple parties involved in a project are organized and managed” (Davies, MacAulay & Brady, 2019 p. 123). In contrast, a collaborative project delivery model (CPDM) takes on a more collaborative arrangement (Bygballé & Swärd, 2019; Walker & Lloyd-Walker, 2015) by utilising a number of different strategies: “Early involvement of key parties, transparent financials, shared risk and reward, joint decision making, and a collaborative multi-party agreement are some of the features incorporated in all the arrangements to a varying degree” (Lahdenperä, 2012, p. 57).

Over the past decade, there has been an increasing interest in CDPMs in construction, such as Project Partnering (PP), Project Alliancing (PA), Integrated Project Delivery (IPD), and Lean Project Delivery (LPD). These models have all evolved as a response to experienced problems and underperformance in capital construction projects (Egan, 1998; Latham, 1994),<sup>1</sup> as they deliver greater continuity in workflow hence more predictable results and improved project performance (Egan,

1998). As such, CPDM is important for organisational performance in enabling closer collaboration, encouraging relational integration, and promoting teamwork between project participants (Lahdenperä, 2012; Nwajei, 2021). Examples of these models are predominantly seen in construction and infrastructure industry projects (hospitals, road and rail), despite variations of the model being introduced in the oil and gas industry (Lahdenperä, 2012; Walker & Lloyd-Walker, 2015). Although there are differences between the models (Lahdenperä, 2012; Mesa, Molenaar & Alarcon, 2019), they have fundamental features in common. Namely, they are all based on relational contracting (Nwajei, 2021), striving to align the team's goals with the goals of the project and to utilise collaborative and integrated approaches to reduce waste and maximise efficiency so as to increase the value to the owner (AIA, 2007). Therefore, we use Collaborative Project Delivery Model (CDPM) as a general term covering all these more specific arrangements.

The development of CPDMs has been mainly practitioner- and authority-driven (AIA, 2007; Lahdenperä, 2012). The literature on CDPMs has largely focused on how principles of integration and collaboration are sought for through a set of functions (defining the core

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<sup>1</sup> The collaborative project delivery models were essential in overcoming the main problems in the construction industry (fragmentation, low-cost tendering, overruns and traditional adversarial behaviour) through collaboration and integration of the project team.

purpose of a strategy) such as team formation, commitment to common goals, and intensified planning (Lahdenperä, 2012; Walker & Lloyd-Walker, 2015), operationalized through numerous tools and methods (hereinafter referred to as “tools”) which help in the structuring of work (i.e., the planning, designing and analysis) in a project (Klakegg, 2017) such as BIM and various lean tools (Mesa et al., 2019). We consider functions as the purpose of a strategy, (what we want to achieve, the ‘end’ result) and tools are the ‘means’ of achieving the end result. Essentially, functions are the link between and the tools and strategy in CPDMs. We adhere to a view that a projects strategy is underpinned through the choice of delivery model and the principals used. However, far less thought has been devoted to the theoretical foundations of CPDM and to what degree the tools used actually function as intended and thereby support the underlying project strategy. Engebø et al. (2020) who conducted a scoping review of CPDM argue that despite the increasing attention it has received amongst researchers, there is no unified theoretical framework for CPDMs. They also found that there is no unified terminology, either. Further analysis shows that there are few studies on how the project delivery model impacts project performance. The authors further argue that the knowledge on the characteristic that sets the different project delivery methods apart and their performance implications is scarce. Undoubtedly there are several knowledge gaps in the current body of literature and “there is a need for more research on the cause-effect relationship regarding the topic of PDMs elements [...] to promote collaboration in construction projects” (Engebø et al., 2020, p. 296). Hence the implication is that tools can be an effective element in understanding its effect on project delivery.

We propose agency and related theories be an appropriate theoretical basis for CPDM as they are frequently used to analyse relationships in the project-based industry (see, e.g., Ahola, Ståhle & Martinsuo, 2021; Snippert, Witteveen, Boes & Voordijk, 2015; Solheim-Kile, Lædre & Lohne, 2019). Therefore, the purpose of this paper is to develop a coherent theoretical framework (encompassing function and tools) based on overcoming and removing the fundamental principal-agent problem in construction projects. For this purpose, we pose the following research questions: What is the theoretical foundation for CPDMs? What conceptual framework could we use to understand different project delivery models (PDMs)? Which functions are essential in CPDMs? To what degree do CPDM tools perform as intended? And, as a part of the last question, why do they not always do so?

The rest of the paper is structured as follows: In Section 2, we present the conceptual and theoretical background of CPDMs and how those may be understood in the light of agency and related theories. Based on this, we present what we see as the theoretical foundation of CPDMs and propose a conceptual framework for describing and understanding different PDMs. A case study on the use of CPDM tools is presented in Sections 3 and 4. Then, in Section 5, we discuss the case findings based on the conceptual framework presented and the theoretical foundation. Finally, the paper ends in Section 6 with a conclusion, including practical implications and suggestions for further research.

## 2. Literature review

### 2.1. Agency and stewardship theories

Agency theory, with its wide application area, is one of the grand organisation theories. An agency relationship can resemble a contract between two cooperating parties under which the principal delegates work and some decision-making authority to the agent (Jensen & Meckling, 1976). Agency theory was originally concerned with the differences in the parties’ attitude towards risk (i.e., the risk-sharing problem), which tends to lead to the preference for different courses of action. It was later broadened to the principal-agent problem, which arises when there is a goal conflict between the two parties and when it is difficult or expensive (due to so-called agency costs) for the principal to monitor the agent’s actions (Eisenhardt, 1989).

The focus of agency theory is on determining optimal governance mechanisms for the relationship, such as the use of hierarchical controls or incentives. The principal-agent problem can further be divided into the risk of adverse selection (i.e., the risk of selecting the wrong agent for the job) before the parties formalise the contract and the risk of moral hazard (i.e., the risk that the agent acts in self-interest and opportunism<sup>2</sup>) that occurs when the relationship is governed by the contract. In both cases, conflicting goals and information asymmetry are seen as key sources to the problem (Akerlof, 1970). However, Wagner (2019) points out that it also can rest on power asymmetry (e.g., where the principal has an unequal distribution of power to coerce the agent into obeying their commands).

Agency theory can undoubtedly help us theorise about contracting situations (e.g., in construction), but as is the case with all theories, it abstracts away parts of the real world, and its propositions may not apply to all situations. An important limitation of agency theory is its assumption that people act in self-interest and in accordance with the model of the economic man (Davis, Schoorman & Donaldson, 1997). In this regard, a stewardship theory, based on sociological and psychological approaches to governance, has been proposed as an alternative (or a contrast) to agency theory (Donaldson & Davis, 1991). Such relationships tend to occur when certain psychological (motivation by higher needs and intrinsic factors, identification with the organisation, value commitment, use of personal power) and situational processes (involvement-orientated management philosophy, and collectivist and low power distance cultures) prevail (Davis et al., 1997). Agency and stewardship theory can be seen as conflicting but also as mainly complementary. It is foremost the control focus in agency theory that conflicts with the involvement-orientation in stewardship theory. Agency theory argues the principal ought to control the agent to ensure that the agent acts in the principal’s interest. Hence, agency theory separates work from controlling the work. In contrast, stewardship theory does not separate doing the work from controlling the work but rests on the ideas of self-control and self-management.

Agency theory has been frequently used to model project relationships and contracting situations where a project owner assigns a contractor and/or an engineering consultant to deliver the project on its behalf. In a recent review, Ahola et al. (2021) identified four types of agency relationships depending on the parties’ goal congruence and temporal orientation. While goal congruence is a key issue in general agency theory, the temporal orientation is unique for project-based firms and projects. Hence, a relationship where an agent is repeatedly employed by a principal tends to be characterised by trust and mutual expectations of continuity (Ahola et al., 2021). Goal congruence and trust have also been sought for when using alternative purchasing approaches and delivery models that combine elements of agency and stewardship theory (Snippert et al., 2015).

The dominating approach in agency theory is to see the principal-agent problem from the principal’s perspective. This approach focuses on risk represented by the agent as opposed to the principal (Eisenhardt, 1989; Jensen & Meckling, 1976). However, the problem can also be seen from the agent’s perspective: The agent has a risk of choosing (to work for) the wrong principal and the risk of the principal being opportunistic (Wagner, 2019). Examples of principal opportunism can be non-cooperative behaviour and the setting of unrealistic goals. While agent opportunism largely rests on information asymmetry, principal opportunism largely rests on power asymmetries, although opportunism from both parties can rest on both types of asymmetries. Wagner (2019) describes how mutual opportunism creates “opportunism games” between principal and agent, leading to prisoner’s dilemma situations and vicious self-reinforcing circles where actual or expected opportunism from one party is countered by opportunism from the other. These are

<sup>2</sup> Opportunism here means trying to exploit a situation to your own advantage (Wagner 2019).

situations we recognise from transactional contracting in construction.

Turning our attention to PDMs and taking the considerations above, both agency and stewardship theory have been reflected upon differently in the literature. In traditional PDM literature, we find, according to agency theory, that the principal is often described as tasked with monitoring the actions of the agent (checking). In contrast, stewardship theory focuses more on the steward’s motivation (intrinsic) to act in the principals’ best interests. However, in CPDM literature the theoretical perspective, while interwoven with the traditional, is positioned more towards alignment of goals in the relationship between the principal and agent.

A summary of these theories with their application in PDM and CPDM is provided in Table 1.

### 2.2. Project strategy and collaborative project delivery models

A project typically has a strategy that gives it direction towards success in its specific environment (Arto, Kujala, Dietrich & Martinsuo, 2008). Direction includes both the project objectives and the overall route to follow to achieve these objectives. The project strategy can be more or less explicit; it can be formulated at several levels of detail and can be described in a magnitude of ways, including the formulation of the fundamental principles (Skaar, Bølviken, Koskela & Kalsaas, 2020) the project will follow. The project literature highlights that selecting an appropriate PDM is one of the most important strategic decisions impacting project success (Klakegg, Pollack & Crawford, 2021).

Klakegg (2017) argues that a project’s delivery strategy is operationalised through its PDM by capturing the organisation and financial mechanisms (i.e., contractual) in project delivery, depicting how construction industry owners should create a PDM. The ability of project-based organisations to balance between organising the project (the structuring of work and contracts and the level of specifications), finding the right participants (the procurement route) and the commercial arrangements between the parties (the agreement formats), to achieve a dynamic relationship with contextual conditions, is vital for project success (Klakegg, 2017). In construction projects, a project strategy will, in practice, be based on a combination of a specific judgement of the case in question and more general views or guidelines on how projects could and should be organised and function. When such guidelines are established, they form the framework for establishing the project strategy and are sometimes referred to as the client organisation’s project model (Klakegg, 2017).

CPDMs in construction management research and practice have gained prominence due to the shift in focus away from transactional and

adversarial contracting (see Colledge, 2005; Harper, Molenaar & Cannon, 2016; Strahorn, Brewer & Gajendran, 2017; Yeung, Chan & Chan, 2012b). The main underpinning behind the practice is the reports documenting the failings of construction projects (Egan, 1998; Latham, 1994) and explaining the benefits of relational contracting models in effectively delivering better value for money (Hall & Scott, 2019; Lichtig, 2005). As a result, over the last two decades, the construction industry has experienced an emerging transformation towards the use of more integrated and collaborative delivery models (Walker & Rowlinson, 2020a). According to Walker and Lloyd-Walker (2015) and Walker and Rowlinson (2020a), CPDMs worldwide differ with varying degrees of integration and collaboration aimed at fostering less opportunistic behaviour. These models are all built on relationship-based project delivery (see Fischer, Khanzode, Reed & Ashcraft, 2017; Galvin, Tywoniak & Sutherland, 2021; Lahdenperä, 2012; Mesa et al., 2019), which have been publicised as improving construction performance (see Alves & Lichtig, 2020; Gil, 2009; Walker & Lloyd-Walker, 2015). It is argued that CPDM arrangements have far more flexibility and better mechanisms to cope with uncertainty than other PDMs, (see Walker & Lloyd-Walker, 2015).

In essence, CPDMs are key instruments in aligning organisations in a project. Organisational alignment is generally defined as aligning the goals of participants (individuals and parties) with organisational goals, in our case, the goal of the project. Organisational alignment is vital in achieving organisational performance (Moore, 2006). As Moore observed, alignment requires the organisation to “have a clear strategy and set of goals” because the strategy embodies the overall objectives (p. 26). CPDM arrangements are important in aligning the organisation to avoid divergent strategies. Traditionally in construction projects, the relationships between the parties have been more competitive and adversarial than cooperative (Lahdenperä, 2012; Toolanen, 2008). A key challenge has been that parties have partially overlapping interests and goals (Eisenhardt, 1989). As CPDM has taken root, it has become increasingly common to hear practitioners talk about the choice of delivery strategy or model “to create and capture value throughout the life cycle of the project from execution to operational handover” (Davies et al., 2019, p. 122). The basis is to seek to align all participants to project goals, aligned through the project’s delivery model (Hall & Scott, 2019).

CPDM is often presented in CPDM literature in terms of a set of specific traits (characteristics) for achieving goal alignment and collaboration. We examine these traits, to try to understand CPDM delivery. While somewhat different sets of such traits have been presented, they all revolve around the same themes. Table 2 presents a list and a comparison of traits found through our study of literature on CPDMs. Broad grouping of themes finds functions, tools and leadership the most common themed traits from CPDM literature. While these traits are relevant and have positively impacted successful project delivery, their development has been markedly practitioner- and authorities-driven.

In comparing various CPDMs, three of the reviewed articles contained ambitions to formulate a framework for CPDMs. Lahdenperä (2012) uses a set of “key integration features” geared towards a core feature of cooperative culture. He groups the other features into team formation, administrative consistency, commercial unity, planning emphasis, teamwork premises and operational procedures. Whereas Walker and Lloyd-Walker (2015) and Walker and Rowlinson (2020) both propose the same “collaboration framework” that distinguishes between the following form of traits: “platform facilities,” “behaviours,” and “process, routines and means.” There have also been studies presenting other specific aspects of CPDMs, such as opportunity and uncertainty management (Hietajarvi, Aaltonen & Haapasalo, 2017; Johansen, 2015).

From Table 2, we observe that some traits are what we in this paper refer to as functions (“ends”), whereas others are obviously tools (“means”), e.g., technology, co-location, workshops, and team-building activities (and in some regard also the contract). For example,

**Table 1**  
The focus of agency and stewardship theory in the PDM literature.

Theory	General Focus in the Theory (traditional PDM)	Theory’s position towards CPDM
Agency theory	Discusses the relationship between the principal and agent having different desires and goals and that the principal tries to monitor and verify what the agent is actually doing (Eisenhardt, 1989; Jensen & Meckling, 1976).	Focuses on discussing goal congruency between the principal and agent (agency relationship) and its influence on project performance with emphasis on trust, through increased commitment (Ahola et al., 2021).
Stewardship theory	Expresses that stewardship occurs when the agent is motivated to serve others and act in the best interests of the principal, understanding that pursuing their her own objectives (utility) generates higher costs than benefits (Davis, Schoorman, & Donaldson, 1997; Donaldson & Davis, 1991).	Discussing how stewardship occurs when the agent’s goals are perfectly aligned with those of the principal, more emphasis on the idea of self-control, self-management and self-empowerment (Davis, Schoorman, & Donaldson, 1997; Donaldson & Davis, 1991).

**Table 2**  
Common CPDM traits found in literature.

	Trait	<i>This paper</i>	American Institute of Architects (2007)	Lahdenperä (2012)	American Institute of Architects (2014)	Walker & Lloyd-Walker (2015)	Department of Infrastructure and Transport (2015)	Mesa et al. (2019)	Alves & Lichtig (2020)	Tillmann & Miron (2020)
Functions	Team selection	<i>Selection of a competent and complementary team</i>		Team formation						Selection of a competent and complimentary team
	Culture	<i>Creation of a collaborative best for the project culture</i>	Mutual respect and trust	Mutual respect and good faith	Trust / Respect / Safe environment	Common best-for-project mindset and culture / No blame culture / Trust-control balance / Mutual dependence and accountability	Work together in good faith, acting with integrity / Making best-for-project decisions	Networks of commitments / Trust	Reliable promising	Building of trust and a collaborative culture
	Goals	<i>Commitment to common goals</i>	Early goal definition	Jointly developed project goals	Early and clear goal definition / Joint ownership			Define value from the perspective of the customer	Value / Increase output value by considering client's requirements	Commitment to common goals
	Early involvement	<i>Early involvement of key participants</i>	Early involvement of key participants	Early involvement of key participants				Early involvement of key participants		
	Common understanding	<i>Integration of perspectives through intensified dialogue</i>	Open communication	Open and active communication			Work collaboratively with private sector parties	Integrated project team		Integration of perspectives
	Decision making	<i>Joint decision making</i>	Collaborative decision making	Joint decision making		Consensus decision making	Joint management of risk		Group consensus-based decision-making / Choosing by advantages	Joint decision making
	Improvement	<i>Collaborative innovation</i>	Collaborative innovation	Commitment to improvement	Optimize the whole, not the parts	Commitment to innovate / Focus on learning and continuous improvement / Pragmatic learning-in-action		Tightly couple action and learning / Optimize the project, not pieces / Manage continuous improvement / Map the value stream	Continuous improvement / Tightly couple learning and action / Reduce the share of non value-adding activities / Waste elimination	
	Planning	<i>Intensified and collaborative planning</i>	Intensified planning	Planning emphasis / Intensified early planning				Last planner system / Allow customer demand to pace and pull production / Create flow	Pull planning / Pull / Flow / Last planner system	Coordination through collaborative planning
	Risk and reward	<i>Sharing risk and reward</i>	Mutual benefit and reward	Shared financial risk and reward / Mutual liability waivers	Shared risk and reward	Incentive arrangements / Integrated risk mitigation structure	Share the outcomes		Commercial unity / Share and collectively manage risk and rewards / Risk pool	Sharing of risk and reward
	Resolution of conflicts	<i>Collaborative resolution of conflicts</i>		Pre-agreed conflict resolution methods						Resolution of conflicts
	Organisation and governance	<i>Integrated organisation with</i>	Organization	Administrational consistency /	Integration (people and systems)	Joint governance structure		Integrated governance / Lean operational system /	Collaborative governance / Flat organisation / Cross-	

(continued on next page)

Table 2 (continued)

Trait	This paper	American Institute of Architects (2007)	Lahdenperä (2012)	American Institute of Architects (2014)	Walker & Lloyd-Walker (2015)	Department of Infrastructure and Transport (2015)	Mesa et al. (2019)	Alves & Lichtig (2020)	Tillmann & Miron (2020)
Tools	Co-location	<i>collaborative governance</i>	Equality of key participants Co-location of team			Substantial co-location	Increased relatedness	functional teams / Increase relatedness Colocation / Big room	
	Teambuilding		Teambuilding activities / External teambuilding expertise						
	Transparency		Transparent financials	Transparency	Transparency and open book			Increase transparency / open book / Value stream mapping	
	Collaboration			Continuous workshopping	Collaboration		Collaboration		
	Contract			Collaborative multiparty agreement			Relational contract	Multiparty agreement	
	Design						Target value design / Set-based design	Set-based design / Design to targets / Target value design BIM	
	Technology		Appropriate technology	Advanced information and communication tools	Good technology				
Leadership	Communication	Leadership			Joint communication strategy Authentic leadership / Motivation and context - defining the collaboration circumstances		Andon / Visual displays / A3		
Style of leadership and management	Advanced management principles				Promise-based management				

**Functions:** purpose of a strategy in what we want to achieve, the ‘end’ result.

**Tools:** things that help you do your job or to achieve something, it is a ‘means’ of achieving the end result.

**Leadership:** meant to establish meaning and direction, aligning people, motivating, inspiring.



Lahdenperä's (2012) framework despite being the most comprehensive, combines functions and tools in a way that does not support our analysis. Moreover, certain traits in the table refer to leadership and tools which we consider categories of their own. For our purposes, we use the list of traits and combine it together with agency and stewardship theory as a basis for developing a framework for CPDMs.

### 2.3. Tools as the operationalisation of project strategy

As contended above, CPDM seeks for integration, collaboration and alignment through certain functions, which are typically operationalised through a set of tools. From the perspective of project management, we see tools as “a thing that helps you do your job or to achieve something” (Oxford English Dictionary, 2005) and what we use to structure our work (Klakegg, 2017). Although tools play a significant part in sustaining a project's strategy, little research has exemplified the owner's role in aligning the project's strategic aims (goals) to the correct tools. Establishing the correct fit (cf. Porter, 1996) between the project strategy and the purpose of the tools (the way they are intended to function) not only acts as a contributing factor to successful delivery but to overall organisational results. In essence, the importance of how the project strategy is operationalised through the functions of the tools can be understood and seen in the aftereffects when they are implemented in practice. Instead, scholars have focused on identifying the individual key benefits from the use of specific tools in project delivery as an opportunity to reduce costs for a company, sharing of information across departments, sharing of knowledge, etc. (Babu & Babu, 2018; Koseoglu & Nurtan-Gunes, 2018; Zimina, Ballard & Pasquire, 2012). Moreover, the tools are often discussed in isolation, the claim being that a specific tool will work in a specific way and contribute to project success in a given (unambiguous) and substantial way (Alhava, Laine & Kiviniemi, 2015; Tang, Chong & Zhang, 2019).

At the heart of this perspective lies a deterministic view on the relationship between tool and effect. We argue that this, in many cases, represents an over-simplifying, naïve, and highly questionable perspective. Jarzabkowski and Kaplan (2015) discuss the use of strategy tools and find that there is no 1:1 or deterministic relationship between the intended use and outcome of tools and the actual use and outcome. We expect the same to be the case within the construction domain. Another aspect of this simplistic view is using deterministic planning by copying the pre-set prescription of tools used in past projects to emulate similar successes (Bicheno & Holweg, 2000) or adding more tools to improve performance even further. In his book on selecting the right improvement tools, Moore (2011) finds that the effect of tools is highly contextual. Of course, “some tools may not be as good as others for a given situation” (p. xvii), but “if you have good leadership, alignment, teamwork, and innovation throughout the organisation, it doesn't matter too much what tools you use...If you don't have that, ... you will not be successful in using the tool selected (p. 146).”

This underscores that tools do not work on their own, but as part of the project totality (Bicheno & Holweg, 2000). In a PDM, the project strategy is operationalised through the tools used. Just as there is a fit between the dimensions in the PDM there will also be a fit between the tools used. How a tool works, will not only be influenced by the tool regarded as a stand-alone but by the totality of the tools used. This totality consists of the number of tools, the fit (relationship) between the tools, and the total context.

As analysed by Lahdenperä (2012) and Mesa et al. (2019), differences in the choices of tools constitute important parts between different CPDMs (see Section 2.1). They do, however, not discuss if and how the differences in tool use influence how the different CPDMs function in practice.

### 2.4. Towards a conceptual framework for CPDMs

A strategy works through its ability to direct individual and

collective action when implementing the project (Artto et al., 2008). The crucial point is the ability of the project strategy to influence how the project functions. To make the project function as intended, we first need to establish appropriate structures. The structures are what is referred to as the PDM. According to Klakegg (2017), the PDM consists of the organisation form, how the project is structured regarding work breakdown and division of contracts, the level of specification, the procurement route, and finally, the agreement format, including conflict resolution, risk-sharing, and payment. Next, one must establish expedient work processes. This is the question of which tools the project will use. Finally, we have the question of leadership. This is the question of how to develop the wanted project culture and how to secure direction and alignment (e.g., Kotter, 1990; Långstedt, Wikström & Hellström, 2017). Neither the PDM (structure), the tools (work processes), nor the project culture and alignment (leadership) will work in isolation but will influence each other mutually.

Based on the reviewed literature and the reasoning above, we put forward the framework illustrated in Fig. 1, where a PDM is understood as part of a total construct for achieving project objectives in accordance with a project strategy (Fig. 1). For a client organisation, the project strategy will usually be founded in a (general) project model (Klakegg, 2017). The project strategy includes both the project objectives and the overall route to follow to achieve these objectives. The project strategy is concretised through a set of functions (cf. “key integration features” in Lahdenperä, 2012, p. 63). The functions are again operationalised through a project structure (the PDM), the work processes (the tools) and the executed project leadership. There will be a degree of overlap between these three elements (structure, tools, and leadership), e.g., contractual mechanisms that are traditionally seen as parts of the PDM can also be seen as tools. They constitute a whole, making it crucial to understand the interplay between them. This limits the degree to which their effects can be analysed in isolation.

This proposed model has some resemblance with how the Last Planner System (LPS) (Ballard, 2000) is composed. LPS is a production planning and control system for project-based production (mainly construction and shipbuilding). LPS consists of a set of higher-level principles that guide thinking and action, certain functions that it enables (e.g., collaborative planning), a structure in the form of a hierarchy of plans, and a set of tools in the form of work processes (Ballard & Tommelein, 2016; Ballard, Hammond & Nickerson, 2009).

By using the term leadership in the model, we make a firm distinction between leadership and management. While management is about planning, budgeting, organising, staffing, controlling, problem-solving, etc., leadership is about establishing meaning and direction, aligning people, motivating, inspiring, etc. (Kotter, 1990; Zaleznik, 1997). As we see it, both structure, in the form of a PDM, and work processes, in the form of the use of different tools, are within the domain of management, while culture and direction are within the domain of leadership.

The model highlights two important ways in which the elements in the model will influence each-other: Vertically, there will either be fit and compliance or a lack of it, between goals, strategy, functions, and tools. Horizontally there will also be fit and compliance (or lack of it) between the different structural elements, tools and leadership.

The proposed model is a generic model suitable for analysing any PDM. However, the topic of this paper is CPDMs, which is a specific group of PDMs. Hence, we must distinguish between generic functions and operationalisations of functions (through structures, tools, and leadership) relevant for any project and functions and operationalisations specific to the PDM in question.<sup>3</sup> Accordingly, the discussion on tools in the sections to follow will concentrate on the tools specific to CPDMs.

<sup>3</sup> The recommendations in the PMBOK Guide and the Standard for Project Management from the Project Management Institute (2021) is an example of a generic approach.

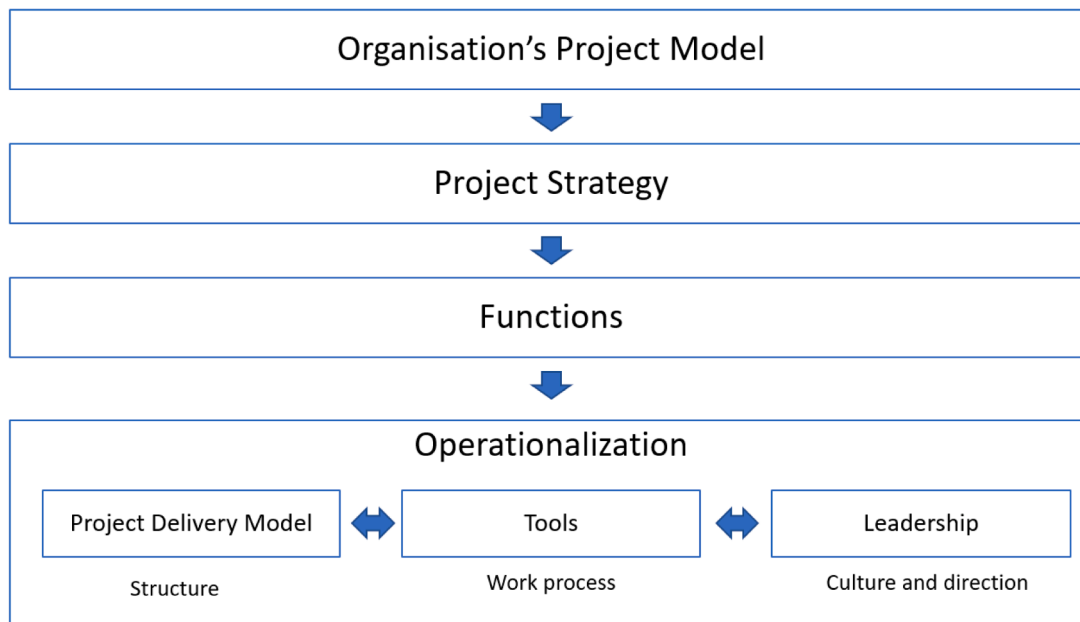


Fig. 1. The application of the conceptual framework to the topic of this paper.

Focusing on CPDMs, we assert that agency and stewardship theory together constitute an adequate theoretical foundation for them. We see CPDMs as attempts to solve the principal-agent problem, partly by eliminating it (e.g., by removing self-interest by aligning goals), partly by modifying it (e.g., by hindering “opportunism games” through enhanced togetherness, transparency and trust between the parties, cf. Snippert et al. (2005). In doing so, CPDMs embrace some of the core elements of stewardship theory (Davis et al., 1997).

We further assert that this theoretical foundation can establish a more solid ground for understanding how CPDMs work, what their strengths and limitations are, and what their potential for further improvement is. The conceptual framework can also be used for comparative conceptual and empirical analyses of different PDM’s. In this paper, we will use the conceptual framework to identify the fundamental functions of CPDMs and how they are operationalised through the use of different tools. Based on agency and stewardship theory, we find that CPDM functions must meet the following fundamental criteria, as shown in Table 3.

The functions in Fig. 1 act as a bridge between the strategy and its operationalisation in practice. It is important to note that an owner has a

design challenge when creating a CPDM strategy, based on the vast number of factors that exist, to allow for agency and stewardship to coexist (i.e., designed to be supportive and not conflicting). For example, an issue arises when utilising financial mechanisms (i.e., designed-in the contract form) to align individual behaviours and actions (i.e., help shape collaborative behaviours) to team-based performance (Ross, Dingwall & Dinh, 2014; Walker & Lloyd-Walker, 2020, p. 20). "Guidance for owners in setting out a CPDM strategy see (Department of infrastructure & regional development, 2015; Ross et al., 2014).

Referring to Fig. 1, the functions take the project strategy as a point of departure, making them actionable through the PDM, tools and leadership that is chosen. Thus, in the formulation of functions, one consideration needs to be taken into account: what functions are essential in CPDMs? The construction project management literature entails many accounts of functions (AIA, 2007, 2014; Alves & Lichtig, 2020; Lahdenperä, 2012; Mesa, Molenaar, & Alarcon, 2019; Tillmann & Miron, 2020; Walker & Lloyd-Walker, 2015). For the functions in our framework, we turn to the CPDM traits highlighted in Table 2. We remove tools and leadership from the list of traits as discussed in Section 2.1, and propose the list of functions presented in Table 3 as essential for CPDMs.

Functions 1 and 2 meet the criteria of selecting the ‘right’ team, the functions 3 and 7 – 9 the criteria of eliminating the divide between principal and agents, and the functions 2 and 4 – 9 contribute to reduced opportunism and the turning of agents into stewards, while function 10 is a ‘safety valve’ if things go wrong. Function 1 also includes the possibility to deselect parties that don’t contribute at an acceptable level and serves as such, also partly as a ‘safety valve’.

### 3. Method

#### 3.1. Approach and case selection

Our first two research questions were addressed in the literature review and resulted in a proposed conceptual framework for PDMs and CPDMs. Our third research question deals with the performance of tools (or the lack of it). To answer this question, we draw on an exploratory case study of a large-scale IPD hospital project in Norway. A central part of the answer will be to examine if and how the tools (an operationalisation of project strategy and CPDM functions) contribute to overcoming

Table 3  
Fundamental criteria and proposed functions fundamental to CPDMs.

Fundamental Criteria	List of essential functions
a. The selection of the “right” team, meaning a team with the attitude, knowledge, and skills needed.	1. Selection of a competent and complementary team
b. The elimination of the divide between principal and agents, thereby avoiding opportunistic behaviour (from both).	2. Early involvement of key participants
c. The turning of agents into stewards caring for the principal and working with a ‘best for the project’-mindset. This is based on the acknowledgement that the principal-agent divide cannot be totally eliminated.	3. Commitment to common goals, sharing risk and reward
	4. Joint decision making
	5. Intensified and collaborative planning
	6. Collaborative innovation
	7. Integration of perspectives through intensified dialogue
	8. Creation of a collaborative best for the project culture
	9. Integrated organisation with collaborative governance
	10. Collaborative resolution of conflicts



the principal-agent problem.

Given that objective of the study is theory building (and elaboration), a single case study approach is an appropriate choice, especially as it allows for reaching adequate depth to illustrate the alignment (or misalignment) between tools and functions on the one hand and the extent to which these contribute to overcoming the principal-agent problem. In the case study, we are looking to understand and discover the “underlining causal relationships,” i.e., the generative mechanisms (Johnston & Smith, 2010, p.29), and “illuminate a decision or a set of decisions, why they were taken, how they were implemented, and with what result” (Yin, 2018, p. 14). Moreover, the case study is also used in an illustrative sense as it shows how our conceptual framework works in an empirical setting (Sigglekow, 2007).

### 3.2. The case project

We have chosen to study a hospital project in Norway that was implemented using IPD as the delivery model. Hence, it is an appropriate case to use for theorising CPDMs.

The case project was going through a renewal process starting in 2015 and finishing in 2021. The project included new construction and refurbishment of a total area of 44,000 m<sup>2</sup> and had a budget of 2.7 billion NOK (270 million EUR). Two new buildings were constructed, a psychiatric building (phase 1, construction between 2015 and 2019) and a somatic building (phase 2, construction between 2018 and 2021). The same design teams parallelised the two overlapping phases.

The hospital is owned by the public regional health authorities, who in 2015 established a temporary client organisation for the project. The original strategy was to use a Design-Build (DB) PDM, but during the design phase, this changed to an IPD. A general contractor and group of consultants were procured and signed a memorandum of understanding with joint intention to be the first construction project in Norway to use IPD. In 2017 the preliminary planning team entered a multiparty IPD agreement between the owner, the consultancy group, and the general contractor. The parties agreed to share risk and reward, negotiate common project goals, have joint project control, provide financial transparency, and use collaborative tools. Specialised technical contractors make substantial contributions in hospital construction (with involvement in 65–70% of the scope), had similar IPD agreements (called subcontract agreements) were aligned with the first-mentioned multiparty agreement. To reduce the budget by 300 million NOK (30 million EUR), a replanning process of the original DB designs was conducted (termed “Sprint 300”).

The general contractor was from the Norwegian branch of an international contractor and staffed the project with a mix of Norwegians without IPD experience and UK personnel with IPD experience. The owner and consultants had previous experience only from Design-Build (DB) and Design-Bid-Build (DBB) projects. Hence, the general contractor played an important part in providing knowledge and focus for the IPD initiative. In addition, the project facilitated some knowledge transfer in the form of advice from experts, workshops, and visits to other IPD projects.

The project had two dimensions of project goals: Project objectives and project ambitions. The project objectives were, compared to comparative builds, to deliver the project, 10% cheaper, 50% quicker, and at the same time providing improved quality. The project ambitions were to be a trendsetter and drive the development of the Norwegian construction industry by means of:

- being the first to use IPD in Norway,
- acquire higher productivity rates,
- strive for a high degree of innovation,
- increase the reputation of the hospital,
- digitalise all two-dimensional (2D) drawings, thereby becoming a paperless project,

- strive for a high degree of industrialisation and prefabrication outside the construction site.

The narrative was to gain a competitive advantage by acquiring the reputation as a first mover in the Norwegian health sector. The plan for the following phase 2, was to deliver the somatic building with a well-seasoned and integrated project team that could better coordinate the project, based on experience and lessons learnt.

### 3.3. Data collection and analysis

At the time of data collection (2018), phase 1 of the project (a psychiatric building) was under construction, while phase 2 (a somatic building) was being planned. We, therefore, do not have observation-based data on the initial selection of the team, the start-up phase and phase 2; however, this case project has also been the subject to pre-project reports and these publications (Aslesen, Nordheim, Varegg & Lædre, 2018; Nwajei & Bydall, 2018; Nwajei, Kalsaas & Bydall, 2020; Rodrigues & Lindhard, 2021; Simonsen, Skoglund, Engebø, Varegg & Lædre, 2019). Data was gathered from owner representatives, designers and main and technical contractors through a total of 13 interviews (lasting on average 60 min), two observations (big room and design meeting) and 14 answered questionnaires. The interviews were focused on certain thematic areas such as - the tendering process, contract agreements, the design process, project and design management tools and methods, project roles and responsibilities. On the other hand, the surveys were more focused on specific thematic areas such as - communication, cooperation and collaboration, relationships and culture, flow and efficiency, decision making and organisation. All data was analysed using the framework analysis method<sup>4</sup> to organise data by theme and then overlapping comments were compared to understand the different perspectives.

## 4. Findings

In Table 4, the tools observed in the case project are grouped according to our proposed list of functions. The table thereby documents to what degree the functions were backed by tools.

The table also gives a short description of how the tools contributed to supporting the overall objective of the CPDM in question (IPD), which is to eliminate or reduce the principal-agent problem. In addition to the main findings in the table, some criticism about the tools were also observed.

### 4.1. “Conflicting desires”

After the memorandum of understanding was initiated, the IPD project team was tasked with replanning the DB design and cutting costs since the cost of the initial design was 300 million NOK (30 million EUR) over budget. Tough negotiation and mutual adjustment challenges were experienced in this replanning phase, underpinned by the conflicting desires to revert back to old ways, utilising DB approaches. The Target Value Design (TVD) process was successful in finding optimised solutions that offered value for money without affecting the overall quality to the customer; however, this was marred with attitudes from project participants such as a representative for the owner:

“We were late in putting in place a good enough description of Target Value Design. If you ask the contractors about Target Value Design, all they think about is Target Cost Design because they are trying to reduce the cost, which is quite natural and then the customer sits on the other

<sup>4</sup> Framework analysis method is a method for analysing qualitative research, used since the 1980's on large scale social policy research and is popular in medical and health research (see Gale, Heath, Cameron, Rashid, & Redwood, 2013).

**Table 4**  
Findings from the case project.

Proposed Functions	Tools	Observed connection between function and tool	Observed Implications for Principal-Agent problem
1. Selection of a competent and complementary team	N/A	N/A	N/A
2. Early involvement of key participants	Integrated Project Delivery contract <sup>5</sup>	Actors involved early	Facilitate communication in the early phases & Reduce information asymmetry
3. Commitment to common goals, sharing risk and reward	Open book Target Value Design (TVD)	Allowed transparency Targeted value but lapsed into target cost design	Enhances togetherness Reduced value commitment
4. Joint decision making	Choosing by Advantage (CBA)	Allowed comparative decision making	Increased trust between the parties
5. Intensified and collaborative planning	Last Planner System (LPS) Big room Integrated Concurrent Engineering (ICE) Project Hotel <sup>2</sup>	Failed halfway Useful for visualisation Provided collaboration Too many opinions lack leadership. Reverted back to traditional ways, Portal that supported project but difficult for non-users.	Inability to employ collaborative aspects Aligned priorities Lack cohesion and difficult to collaborate Barrier in communication
6. Collaborative innovation	Swapping <sup>3</sup> Idea submission form	Instrumental in cutting costs Lacked follow-up	Reciprocity by aligning goals (stewardship behaviour) Limit potential solutions
7. Integration of perspectives through intensified dialogue	Building Information Modelling (BIM) See also ICE and LPS Co-location	Good but hampered by too many changes to the model Inconvenient travel, constantly interrupted & concentration problems	Bad for morale of agents Conflict in priorities
8. Creation of a collaborative best for the project culture	5S, Visualisation, Continuous Improvement, Built-in-Quality (BiQ))	Process improvement	Improved trust and cooperation
9. Integrated organisation with collaborative governance	Project's decision-making body <sup>1</sup> Integrated Project Delivery contract	Decided conflict-filled cases by decision making. Integration of Actors	Lack of governance and trust Reduces information asymmetry
10. Collaborative resolution of conflicts	Project's decision-making body <sup>1</sup>	Decided conflict-filled cases by decision making	Lack of governance and trust Turning agents into principals

**1. Project's decision-making body:**

CCC (Core, Cluster and Consultant) - groups that conduct detailed engineering. The composition of the groups depends on which tasks are to be solved, but interdisciplinary characterizes CCC.

IPD-P (IPD Principles) - Board with three members: the client, consultant and contractor who are responsible for daily project operations.

PSC (Project Steering Committee) - Superior body that decides conflict-filled cases by majority decision. Here, too, three members from the client,

consultant and contractor.

2. **Project Hotel** - "myMetier Projects" Storing of everything about the project & common portal for management and follow-up of projects.

3. **Swapping** - Method of swapping work task.

4. **Integrated project delivery** contract is both, a "contractual document" that encapsulates what everyone has agreed upon which we call "a tool" in this paper, while the contents of the contract are the detailed provisions of what is agreed upon.

side of the table and thinks about how to get the most value, wanting beyond what is in the contract, and there ends up being two conflicting desires."

A representative for the general contractor describes the reason for the problems:

"The goals in the project, cheaper construction etc., it is no secret that there are many challenges, particularly decision-making. We've gone through over and over, and I feel that Target Value Design has not been understood; we do not apply it, but why did it go wrong was because we did not actually establish where our starting point was, which is where you set all your strategies of what your goals are for any particular aspect, and we've done it differently, and inherited drawings."

While the representative for the owner substantiates these assertions:

"If there is conflict to be resolved, then it occurs in these IPD-P groups<sup>5</sup> who make decisions. What we see is that those who sit in the Champion and risk-reward team (CCC (Core, Cluster and Consultant)) and those in the working groups or clusters and do not have a leader, one who says that we must actually make a decision on this. This can have a detrimental effect on decision-making processes. Once, we had someone at the top take a leader's role in making decisions, and it did not go down well in relation to how decisions were made. The problem is that the CCC has not been able to define the mandate of all the working groups, so that all groups and every cluster do not have full control over what is within the mandate, we should have a much shorter decision time. This means that it is easy to send decisions up to IPD-P."

**4.2. "Time squeeze"**

Several parallel processes and tools were in progress during this time, such as design and construction using Integrated Concurrent Engineering (ICE), Virtual Design and Construction (VDC), Building Information Modelling (BIM), and the Last Planner System (LPS) utilising the big room. During this process, the consensus from the designers using VDC and BIM was that there was "Time squeeze as there are many parallel processes." The general contractors' representatives described the client's ambition of not having 2-dimensional (2D) paper drawings in the project as "a problem." First, there were some technical limitations, for example.

"how much detail and how much information can you put into a 3D model?" Then "when we update the model and input a huge amount of information and format it in the right way, but then we don't have the right system which affects the architects because the model takes too long to open." Second, "after we have worked on inputting data into the model, we then revert to 2D paper drawings anyway. This creates conflict because it costs a lot". Thirdly, "the 3D models keep changing, and nobody will agree on the correct version. The builders just want 2D paper drawings because they understand them and can construct using them". Fourthly, "we have these BIM kiosks here on-site, and when you are working with people who are not digitally competent, it is difficult for them."

<sup>5</sup> IPD-P group is a project's decision-making body. IPD-P contains three board members, the client, consultant and contractor, who are responsible for making decisions about daily project operations.

#### 4.3. “Idealisms around new methods” - the threat of overflow

Other problems were experienced using ICE and LPS, which the designers describe as “lacking people who have a background and competence to execute the ICE meetings.” The general contractor adds that “when ideas are given, we don’t have the resources to follow up.” Whereas the technical contractors admit that “the use of LPS has not been successful and is no longer in use for stage 1 of the project. New people were arriving all the time, and the LPS wall has only been used to clarify milestones and decisions”. Simultaneously, the project employs Lean tools, such as co-location, which the general contractor remarked as:

“...been applied with partial success in creating a collaborative culture as the designers are forced to travel to the construction site to physically locate and constantly have too much to do to answer questions.”

At the same time, the subcontractor remarked on the overflow of tools, asserting:

“There has been a lot of pain. There came in addition to the IPD contract, a bunch of idealisms around new methods, which have been of disturbance. Here there must be LEAN, Last Planner, Pull-planning, Co-locate, and be a paperless construction project with no drawings where everyone should use BIM and iPads out there. In addition to the contract, we are burdened with the owner’s array of ideal methods. So, we have almost set a Norwegian record in applying many new methods at once. We have had a number of attempts with great success in parts of the project, but by and large, when you put 8 electricians to work, they must have something there to work with, and until you can take the iPad and nail it to the wall, they will revert back to paper drawings. Then there are those who do not have time and cannot afford to lose their agreed piece-rate payment, and they contact the trade union and demand paper drawings. Then you lose motivation as a team. So, most of these methods did not give us the success we wanted.”

Further difficulties arose in the use of an idea submission form, which had no resources attached to developing the ideas that were submitted. The challenges were primarily attributed to a lack of time: from conducting parallel processes despite unfinished drawings to the deadline never changing even though a switch occurred from DB to IPD, and the ambitions in utilising tools and methods. As a result, the project in 2018, had a lack of industrialisation as well as innovation and was delayed and over budget; however, a recapturing of these challenges described above was sought in phase 2 (the somatic building).

## 5. Discussion

### 5.1. A theoretical foundation for CPDMs

This article sets out to study the theoretical foundations of CPDM and to what degree the tools used actually function as intended and thereby supporting the underlying project strategy. The basic theoretical premise is that CPDMs attempt to solve the principal agency problem utilising both agency and stewardship theory. While both theories show behaviour and governance systems in striking contrast - known opposites (Donaldson & Davis, 1991), they reflect the same phenomenon, as described: the connection of employment between a principal and an agent and the resulting outcome in performance. In the literature, CPDMs are being advocated by both owners (principals) and contractors (agents) (e.g., Alves & Lichtig, 2020; Lichtig, 2005). This confirms that the expansion of agent theory (presented in Section 2.2) to include both principal and agent opportunism is highly relevant. The case demonstrates a willingness from both the owner and contractor to see opportunism from the other party’s viewpoint as a problem they hope to overcome or reduce by aligning their interests in the project through the use of CPDM.

The relationship in CPDMs between principal and agent is not only economic but also psychological as the agent turned steward is

empowered to set goals and act with a best for project mentality (Donaldson & Davis, 1991). However, our case findings remind us that agents are also driven by their own ambitions, strategies and needs to work for their own self-interest (Eisenhardt, 1989), in this case to win a market position as an IPD specialist or to influence the owner to engage them in future projects. Turning to stewardship theory, this raises the question of what degree in CPDMs can the owner be a steward for contractors and not only contractors to be stewards for owners. Supporting Donaldson and Davis (1991) arguments, that contractors as stewards will achieve the same performance to which owners aspire, if they are given the power to act like an owner.

The findings from the case project further partly illustrates how CPDMs can be used to overcome the principal-agent problem. Hence, we argue agency and stewardship theory together constitute an appropriate theoretical frame of reference for CPDMs.

### 5.2. Forming a conceptual framework for understanding different PDMS

Our second research question asks what conceptual framework could be used for understanding different PDMS? The conceptual framework proposed in Section 2.4 provides further insights into understanding PDMS and their inner workings. Fig. 1 captures the process by which a project’s strategy through functions becomes operationalised. The fit and dynamic between the elements are what defines a strategy (Porter, 1996). Designing the right fit that achieves the strategy must suit and build the culture while applying the appropriate tools. We argue that the issue of fit focuses on the congruence amongst a larger set of elements. The case project gives empirical support for the conceptual framework.

As part of the conceptual framework, we have proposed a list of essential functions in Section 2.4 in response to our third research question. Our case illustrates various ways in which these functions contribute to solving the principal-agent problem. However, functions such as “Selection of a competent and complementary team,” not observed in the case study, is perhaps a key facet of agency theory in terms of avoiding adverse selection. Another essential function is having an “integrated organisation” as creating one organisational body unifies the project organisations. This function is vital as it helps overcome the principle and agent problem by removing principals and agents, thereby reducing information asymmetry. Similarly, “commitment to common goals, sharing risk and reward” unifies project organisations by working to reduce the problem of moral hazard. Although the case illustrates how the tools can unify project participants, conflicting priorities can work contrary to the best interests of the principal.

Essential CPDM functions are not just characterised by fit but by the dynamics and balance between the elements. For example, the findings show that while a competent and complementary team was procured by the project, many team members (without an IPD background) were untrained in the use of the tools in the project, causing overload. A lack of CPDM knowledge, experience and attitude might engender a reversion to past Design-Build (DB) or Design-Bid-Build (DBB) experience, which are common points of reference. A consequence of overload creates a ripple effect that affects other parts of the project. Evidently, the selection of a competent and complementary team can represent the difference between success or failure in a project. It is the balance between organising the project, finding the right participants and the commercial arrangements between the parties (the agreement formats) that establish the framework for project success (Klakegg, 2017). However, choosing team members can be difficult since teams are assembled with employees from different companies, and projects have frequent one-off contracts. In such a case, is having a diverse background of competencies as necessary as having the right competencies?

Our proposed conceptual framework, Fig. 1, is presented in a top-down approach where strategy, at the top, is concretised through horizontal layers. However, it can also be understood through CIMO-logic (Denyer, Tranfield & Van Aken, 2008), which explicates how a certain outcome (O), can be achieved through a context-dependant (C)

intervention (I), triggering a specific (generative) mechanism (M). Seen through CIMO-logic lenses, structure, tools and leadership are interventions, that trigger certain mechanisms, which we in the conceptual framework call functions, that is mechanisms that align the goals of the principal and the agent and/or turns agents into stewards.

### 5.3. The performance and dangers of CPDM tools

Our last research question relates to the performance of tools and reasons to their possible shortcomings. The findings (summarised in Table 4) support that tools work through a mutual relationship between project goals, project strategy and functions, where each element influences each other (vertically in the conceptual framework), as well as between the elements, tools and leadership, that is internally within the operational level (horizontally in the conceptual framework). However, it is important to note that the elements require monitoring (health check) from time to time to analyse the effectiveness of each element (see Walker & Lloyd-Walker, 2020). Moreover, there were some criticisms about the tools from project participants, which supports that tools alone are insufficient and require support through the environment - time, training, follow-up, and leadership (Moore, 2011). These findings are also relevant for the ongoing debate on a prescriptive versus adaptive approach to choosing tools in emulating successful project delivery, as discussed in Section 2.3 (Bicheno & Holweg, 2000).

The common understanding from advocates of IPD is that the ultimate potential of IPD comes from applying all the elements, the idea being that they will reinforce each other and contribute to continuous improvement (AIA, 2014; Alves & Lichtig, 2020). However, the opposite can also be the case. Overambition can result in the introduction of more elements than the organisation can absorb and the tools might be misaligned (Moore, 2011). In this case, too many initiatives compete for attention and limited resources, resulting in overflow in the form of dilution, confusion, frustration, inefficiency (Bicheno & Holweg, 2000), and lack of alignment to an overall strategy. Our findings indicate that this was, in fact, a problem in the case project. Illustrating that potential overflow is a topic to be considered when the intent is to introduce a total package of tools, and refers to the age-old debates of quality versus quantity, and single- versus multi-tasking. These insights may help understand why tools don't always work as expected and contribute to understanding the goals-tools fit in CPDMs.

### 5.4. Towards an increased understanding of CPDMs

The asymmetry and conflicts presented in our findings also show that the role of the principal can be problematic from the perspective of the agent (Wagner, 2019, see Section 2.2). Our observations indicate that the over-ambitions of the principal resulted in misalignment between the project goals and the tools, creating overflow and problems for agents. These observations support the perspective of Wagner and challenge the dominating understanding of agency theory that problems are created by the agent as opposed to the principal (see Section 2.2). Our findings underpin the problems represented by the agent having limited information about the motivations and future behaviour of the principal. This underscores the relevance of the concept of the opportunistic principal and adds nuance to principals seeking self-interest (Wagner, 2019). Principals might overfocus on their own ambitions and thereby get carried away and driven into doing things that are not good for the project. A second example of this in our case findings is the decision not to delay the project when the PDM was changed from DB to IPD.

CPDMs are being advocated by both owners (principals) and contractors (agents) (e.g., Alves & Lichtig, 2020; Khazode, Fisher & Reed, 2007; Lichtig, 2005). Both owners and contractors see opportunism from the other party as a problem they hope to overcome or reduce by aligning their interests in the project through the use of CPDMs, see Fig. 2. Consequently, investing in mechanisms supportive of

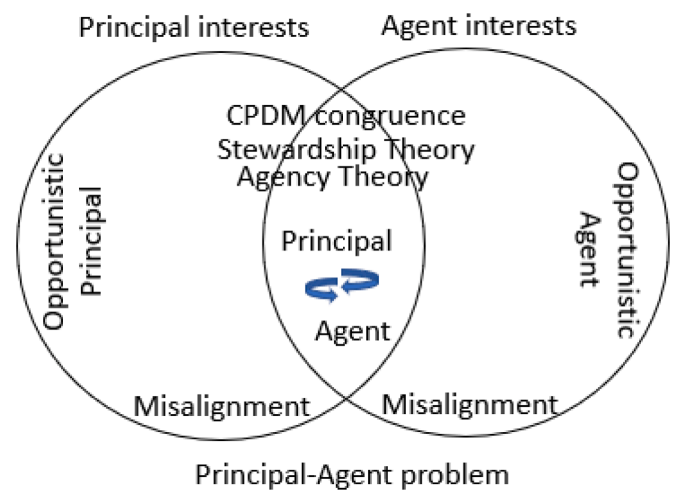


Fig. 2. The interrelation between Principal and Agent in a construction project.

governance, culture, and trust and providing a platform upon which firms may foster collaboration could limit self-interest-orientated behaviour (Galvin et al., 2021). In this regard, stewardship theory reminds us that the relationship between principal and agent is not only economic but also psychological as the agent is turned into a steward and is empowered to set goals and act with a best for project mentality (Donaldson & Davis, 1991). We earlier asked ourselves to what degree in CPDMs, can we or should we expect the owner to be a steward for the contractors and the contractors be stewards for the owner? However, our findings remind us of the fact that agents will also be driven by their own ambitions, strategies and needs, in essence working for their self-interest, for example to win a defined market position, such as IPD specialists which would influence owners to engage them in future projects. This confirms that the expansion of agency theory (presented in Section 2.2) to include both principal and agent opportunism is highly relevant.

## 6. Conclusion

### 6.1. Theoretical contribution

We make two contributions to the growing literature on CPDM conceptualisations (Ahola et al., 2021; Galvin et al., 2021; Lahdenperä, 2012; Mesa et al., 2019; Walker & Rowlinson, 2020). Firstly, while most conceptual work on CPDMs so far has relied on influential practitioner- and authority-driven frameworks (Alves & Lichtig, 2020; Lahdenperä, 2012; Walker & Rowlinson, 2020), we have proposed agency theory, supplemented by stewardship theory, provide an important theoretical foundation of CPDMs (Sections 2.2 and 2.4). In this regard, we have presented a conceptual framework for the understanding of PDMs and proposed a list of the essential functions of CPDMs (Section 2.4). Secondly, we illustrate how a variety of tools can contribute to overcoming the principal-agent problem in projects if aligned with the functions in CPDMs. Moreover, by examining the case study, we make a theoretical contribution to the body of literature concerning the principal-agent problem, highlighting that the behaviour of the principal rather than the agent can endanger the relationship through the number of initiatives competing for attention and limiting resources. More specifically, overambition can reduce the morale of the agents and therefore it is important for the principal to select a competent and complementary team with sufficient capability. It is important to note that context plays an important role in understanding, to what extent agency theory can be applied and used for developing a theory on CPDMs.



## 6.2. Managerial implications

The proposed theoretical foundation and theoretical framework may spur managers to think more broadly about the choice of delivery model. More specifically, it may help them clarify the purpose of various functions typically included in PDMs. Obviously, some functions work for a control-driven philosophy with the purpose to avoid opportunism by the other party, whereas other functions work towards goal alignment and involvement. As we have argued, here it is important to see that this constellation works both ways as certain asymmetries will always exist. Furthermore, we recommend that construction managers be careful in introducing new tools in CPDM projects. Undoubtedly, tools are very useful, but it is important that their number, use, and contribution is carefully aligned with the functions of the PDM and the targets of the project.

## 6.3. Limitations and further research

Our paper has some limitations that could be addressed in future studies. First, we do not utilise multiple case studies in examining the strategic fit in CPDMs. Analytic conclusions arising independently from contrasting cases, would be more “powerful toward theoretical replication” (Yin, 2018, p. 98), and would strengthen these findings. Second while we believe agency and stewardship theory constitutes an appropriate basis for developing a theoretical foundation and framework for CPDMs, it is by no means the only plausible theoretical basis. Therefore, we invite other scholars to complement or expand our thinking using a wide range of other theories. Third, we think the tools question, merits further investigation as our results stem from one single case. For example, we did not look at how the use of tools (and their purpose) change over time, which is known to be the case for strategy tools (Jarzabkowski & Kaplan, 2015). Fourth, we suggest that future research is directed at monitoring the behaviours, culture and levels of collaboration in CPDM projects (health check), based on pre-estimated limits. We also suggest that responsibility requirements and level of authority are used in the assessment of health checks. We think that while the large questionnaires required are time consuming, they are not nearly as time consuming as the reduced levels of collaboration and cultural instability that continue in projects.

## 6.4. Concluding remarks

At the point of writing this paper, the case project was in its first year of operation and the data collected gives just a snapshot of the planning in the project. Therefore, the use of the case study in this paper is for illustration purposes and should not be read as a story of success or failure. Subsequently, the case project was successful in fulfilling its main goals, delivering on time and below budget.<sup>6</sup>

## Declaration of Competing Interest

None.

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