STAKEHOLDER READINESS FOR INTEGRATED PROJECT DELIVERY IN PUBLIC SECTOR CONSTRUCTION: THE ROLE OF MATURITY MODELS

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Integrated Project Delivery (IPD) is a collaborative method that enhances project outcomes in public construction. The transition to IPD in public projects introduces unique challenges, including strict regulatory compliance, transparent management of public funds, and balancing diverse community expectations. Additionally, public projects struggle with implementing IPD's shared risk-reward model and fostering interdisciplinary collaboration. Recognising these challenges for stakeholders such as government bodies, consultants, and contractors, this study emphasizes the need to assess and improve stakeholder readiness for IPD in the public sector. The study proposes using Maturity models, known for their effectiveness in various sectors, to evaluate and elevate readiness across dimensions like knowledge, attitudes, and actions. The core of this study is a literature review that examines existing Maturity models and their potential adaptation for public sector stakeholders. The study proposes preliminary principles for a conceptual framework to evaluate stakeholder readiness for IPD, outlining key elements that need to be considered in this context. This approach offers a structured pathway for enhancing stakeholder readiness for IPD, aiming to contribute to more successful public construction outcomes.

Keywords: collaboration; Integrated Project Delivery; maturity models; public construction projects; stakeholder readiness

INTRODUCTION

The Construction Users Roundtable (CURT) (2004) and the World Economic Forum (2016) highlight that widespread dissatisfaction persists as numerous projects fail to meet budgetary, timeline, and functional objectives. The construction sector also suffers from poor productivity and significant waste, with non-value-adding activities accounting for over 30% of the workload (Ashcraft 2022). These inefficiencies, estimated by the McKinsey Global Institute to cause financial losses of around $1.6 trillion US dollars, are particularly concerning. The potential savings from mitigating these inefficiencies could cover half of the global infrastructure expenditure, thereby facilitating more sustainable development. Efforts to address these challenges have focused on enhancing collaboration and contractual innovation, which could potentially increase productivity by 8-9% and result in cost savings of 6-7% (McKinsey Global Institute 2017). These solutions align with strategic

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recommendations from CURT, the American Institute of Architects (AIA), and the World Economic Forum to improve construction project outcomes by setting up project teams that share risks and rewards based on results. Integrated Project Delivery (IPD) is one method to enhance collaboration and contracting. Organisations aiming to implement IPD, along with necessary tools and concepts, face challenges in recognising and prioritising requirements. Collaboration among contracting parties within IPD requires a specific initial level of engagement for effective functioning (Pishdad-Bozorgi 2017). This raises questions about the extent of this threshold and the methods to measure it. The factual justification of success and benefits within an organisation can be established when standard assessment tools, such as Maturity models (MMs), are employed (Rashidian *et al.,* 2023a).

IPD to Enhance Value of Public Construction Projects

Public construction projects, particularly in developing nations, are hindered by limited fiscal capacities and inefficiencies, leading to disproportionately high capital costs without corresponding improvements in infrastructure quality (World Bank 2020). The project lifecycle, as detailed by The Royal Institute of British Architects (2020), underscores the significance of each development stage in ensuring value for money, a crucial metric for assessing project outcomes (Olatunji *et al.,* 2017). Selecting an appropriate project delivery method is pivotal in enhancing the overall value for money in public construction projects (Moradi *et al.,* 2022).

A transition to collaborative project delivery methods promotes beneficial relationships among stakeholders, including governments, engineers, and contractors, significantly boosting project value (MacDonald *et al.,* 2013). This approach (See Figure 1), by integrating the expertise of key disciplines throughout the project process, ensures that design strategies and decisions reflect the values of both upstream users and stakeholders, alongside downstream concerns for construction, operations, and sustainability (Ling *et al.,* 2020).

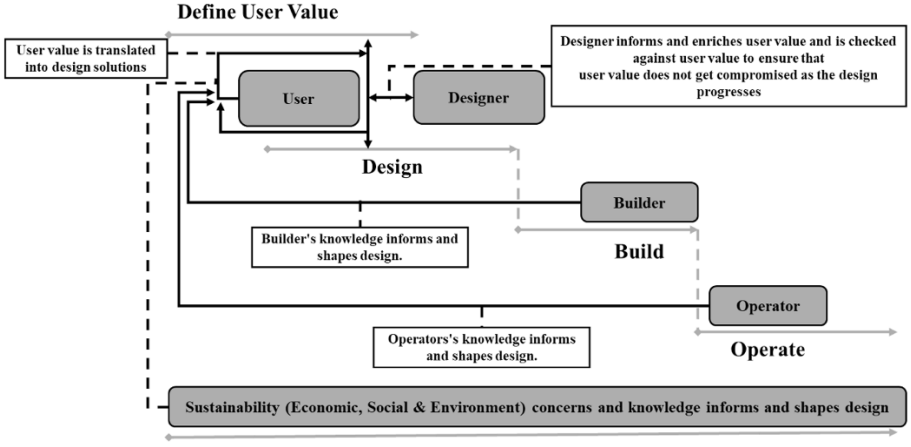

Figure 1: Integrating Process to Enhance Value (modified from Fischer et al., 2017)

IPD is defined as "a project delivery method that integrates people, systems, business structures, and practices into a process to collaboratively harness the talents and insights of all participants, optimising project results, increasing value to the owner, reducing waste, and maximising energy efficiency through all phases of design, fabrication, and construction" (AIA California Council 2014:4). Early collaboration in IPD enables stakeholders to amalgamate knowledge, skills, and resources, which aids in the early detection and resolution of potential issues.

IPD has been shown to outperform other delivery methods—Design Bid Build, Construction Management at Risk, and Design Build—in metrics related to quality, communication, and adaptability to changes (Adamtey 2021; Ibrahim and Hanna 2019). Furthermore, when combined with tools such as Building Information Modelling (BIM) and Lean Construction (LC), IPD consistently enhances collaboration, streamlines processes, reduces costs, and delivers superior project performance. These benefits are particularly evident in communication, quality, schedule adherence, and stakeholder satisfaction across various project types and regions (Kent and Becerik-Gerber 2010; Lee *et al.,* 2013)

The Need for a Maturity Model for Adopting IPD

The adoption and implementation of IPD exhibit marked contrasts between developed and developing countries. In regions like Europe, Australia, the United Kingdom, and the United States, there has been significant advancement and integration of IPD into construction practices, with a focus on developing sophisticated contract models and guidelines that reflect a mature understanding of IPD principles (Aderibigbe *et al.,* 2023; Ashcraft 2022). Conversely, in developing countries such as China, India, the Middle East, and Southeast Asia, IPD is in the early stages of adoption, grappling with challenges like limited awareness, technological gaps, and inadequacies in legal and financial frameworks (Ma *et al.,* 2022; Osman *et al.,* 2017; Sari *et al.,* 2023). Cultural barriers and resistance to change further impede IPD adoption in these regions. While governmental support in countries like China and India is crucial, comprehensive efforts including training, policy development, and cultural transformation are required to promote IPD effectively (Khanna *et al.,* 2021; Ma *et al.,* 2022). Technological integration also varies, with advanced tools like BIM being utilised in developed countries, whereas basic technological infrastructure is still being established in the developing nations (Khanna *et al.,* 2021; Ling *et al.,* 2020).

The disparity in IPD adoption rates between developed and developing countries underscores the influence of organisational and national cultures, including policies and the construction sector's maturity level, on the implementation of IPD. The readiness of stakeholders to implement IPD has been questioned, particularly their ability to effectively utilise relevant tools, concepts, and contractual standards, and more fundamentally, their cultural capability to collaborate (Khanna *et al.,* 2021). Stakeholders are yet to achieve a level of maturity that enables transition from pilot projects to broader applications of IPD, as noted by Rashed and Mutis (2023).

The potential of the Maturity model approach in the development of IPD implementation is substantial. These models provide a systematic framework for assessing and enhancing current practices, facilitating an orderly progression from basic to advanced capabilities. By emphasising the dimensions of knowledge, attitudes, and actions, Maturity models help stakeholders not only enhance their competencies but also align their willingness and actual performance with IPD principles (Rashidian *et al.,* 2023a). As described by Mittal *et al.,* (2018: 199), these models are designed to elevate sophistication in people/culture, processes/structures, and technologies, addressing the multifaceted demands of projects. They provide a detailed assessment structure for gauging organisational readiness across critical areas such as leadership, culture, compliance, and technology. This adaptability is crucial, allowing Maturity models to be customised to the unique challenges and needs of various projects and organisations. Consequently, employing Maturity models can prove invaluable in supporting the structured and effective implementation of IPD

across diverse operational environments (Ebrahimi and Dowlatabadi 2019; Chapman 2019).

Development of a Conceptual Framework for a Maturity Model

The IPD Maturity model framework was developed through a literature review utilising an Integrative Review approach, which aims to evaluate, critique, and amalgamate research into new theoretical insights (Torraco 2005). While integrative reviews lack a uniform standard for data analysis, the primary goal is to thoroughly assess and dissect the literature, focusing on key concepts and their interrelations (Snyder 2019). This method facilitates a deeper understanding of the subject matter, allowing for the development of refined theoretical structures. Given the lack of studies specifically focusing on a maturity model for IPD, the method for developing the conceptual framework of such a model involves analysing existing maturity models, focusing on their structural components. The insights gained from this analysis will then serve as references in constructing the foundational structure of a maturity model tailored for IPD implementation.

Analysis of Existing Maturity Models Structure

Exploring the foundational elements of maturity models is crucial for advancing IPD implementation. Reference models were selected for their proven effectiveness in enhancing organisational maturity, particularly in fostering collaboration and integration. These models were recognised for their comprehensive assessment frameworks and their success in improving project outcomes through better collaboration. The selection criteria included their relevance to the construction industry and their focus on key dimensions such as leadership, culture, compliance, and technology.

Organisational Project Management Maturity Model (OPM3)
OPM3 serves as a benchmark for enhancing project management capabilities, incorporating continuous improvement principles within a framework of Standardisation, Measurement, and Control (Jayanetti *et al.,* 2022; Project Management Institute 2008). It provides a comprehensive structure that addresses organisational structure, culture, technology, and human resources through phases of knowledge, assessment, and improvement. This model supports effective management by offering insights, identifying strengths and areas for improvement, and guiding focused actions.

Capability Maturity Model Integration (CMMI)
CMMI boosts organisational processes and goal achievement by concentrating on essential business capabilities and practices (CMMI Product Team 2006). It offers two approaches: the staged representation outlines five maturity levels for a comprehensive assessment, suitable for broad process capability enhancements; and the continuous representation allows for the evaluation of specific process areas for targeted improvements.

Lean Construction Maturity Model (LCMM)
LCMM provides a structured approach for assessing and advancing LC maturity in organisations, focusing on leadership, customer focus, and culture (Jayanetti *et al.,* 2022; Nesensohn 2017). With five levels, eleven key attributes, and sixty behaviours, goals, and practices (BG&Ps), the LCMM enables organisations to identify their LC maturity and devise specific development plans. The attribute "Culture and Behaviour" underscores the importance of trust and collaboration, aligning with the

core principles of IPD. Recent studies recommend using LC principles as a foundation for developing maturity models, showing methodological consistency within the LC maturity framework (Jayanetti *et al.,* 2023).

BIM Maturity Model

Research by Rashidian *et al. (*2023b) has highlighted the significance of BIM Maturity models in assessing current BIM capabilities and guiding enhancements. The Multifunctional BIM Maturity model (MBMM) by Liang *et al. (*2016) is notable for its thorough examination of BIM, covering technological, process, and protocol aspects crucial for BIM integration. It defines BIM development stages with detailed assessment rubrics, facilitating the measurement of BIM maturity at both project and organisational levels (Lu *et al.,* 2021). Additionally, the BIM Maturity model by Siebelink *et al. (*2018) introduces a dimension that considers technical and organisational factors along with the importance of collaborative interactions, aiming for transparent and comparable BIM maturity assessments across the construction industry.

Linking Identified Models to the IPD Maturity Model

The development of the IPD maturity model was directly informed by the strengths and features of the reviewed maturity models:

- OPM3: The structured approach and comprehensive focus on organisational aspects from OPM3 have been utilised in developing the IPD Maturity model. Integrating continuous improvement principles and a phased methodology has allowed for a model that is tailored to the unique needs and dynamics of various stakeholders within IPD environments, thereby facilitating targeted improvements and effective management.
- CMMI: The continuous representation of CMMI, which focuses on evaluating specific process areas for targeted improvements, has been adopted in the IPD Maturity model. This adaptability is crucial for addressing the diverse needs of stakeholders in IPD.
- LCMM: The LCMM's structured methodology, which concentrates on key attributes and behaviours, has been utilised in the IPD Maturity model. By incorporating IPD's unique principles to outline essential attributes, it ensures methodological consistency and aligns with core IPD values.
- MBMM: The structured approach of the MBMM, focusing on technological, process, and protocol aspects, has facilitated the crafting of a framework that allows for the assessment of IPD maturity at both project and organisational levels. This ensures a thorough and multi-dimensional evaluation, aligning with the principles of IPD.

Conceptual Framework Development

Creating a Maturity model to assess Stakeholder Readiness in IPD is rooted in IPD's essential principles. The IPD Working Definition by the AIA California Council (2014) underscores that optimal outcomes are derived from early value definition and collaboration. Achieving these objectives entails nurturing key dimensions such as trust, respect, joint ownership, and integration.

Integration in construction enhances the coordination of diverse project teams, aligning varied skills and experiences towards shared objectives. It relies on clear information sharing, timely and accessible communication, and a comprehensive understanding of design interactions to facilitate smooth operations, significantly

impacting owner satisfaction through improved teamwork, communication, and relationship quality (Manata *et al.,* 2022; Choi *et al.,* 2019).

Joint ownership in IPD represents collective control and financial stake, rooted in shared goals and responsibilities. This concept is crucial for incorporating joint risk management to address challenges such as design issues and profit variability, with risk and reward sharing mechanisms tailored to collective project outcomes. The foundation of joint ownership is established through clear contracts and multi-party agreements among all stakeholders, enhancing collaboration and commitment to the project (Lahdenperä 2012; Ma *et al.,* 2022, 2023).

Respect in the construction process is shown by recognising the qualities, skills, and expertise that individuals or organisations bring. Effective communication on task status, taking responsibility, and managing successes and failures are vital behaviours that foster team dedication, emphasising integrated approaches and mutual respect (Evans and Farrell 2023; Manata *et al.,* 2022; Moradi *et al.,* 2022).

Trust is fundamental for confidence in each party's reliability, integrity, and effectiveness, embodying the willingness to take risks by merging goodwill with competence. Advances in technology, such as BIM and Information and Communication Technology (ICT), alongside financial transparency, are crucial in promoting partnership capability by enabling clear information exchange and showcasing financial dealings, thus strengthening trust among stakeholders (Wong *et al.,* 2008; Zhang 2020; Pishdad-Bozorgi 2017; Ebrahimi and Dowlatabadi 2019; Ahmad *et al.,* 2019; Elghaish *et al.,* 2020).

To foster growth in the dimensions essential for successful IPD in public construction projects, it is crucial to focus on several factors as seen in Figure 2.

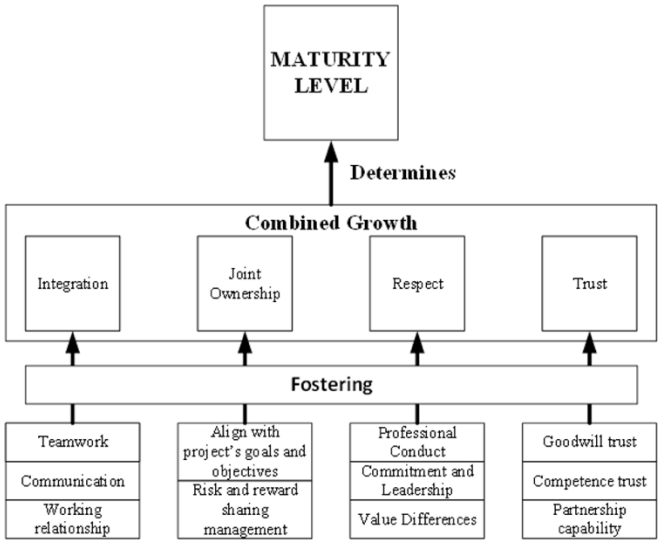

Figure 2: Framework of Maturity model for IPD Implementation

Frameworks and maturity models play crucial but distinct roles in construction project management. A developed framework, as illustrated in Figure 2, represents a typical framework used to shape the structure of the maturity model itself (Wang *et al.,* 2020). This framework facilitates the enhancement of an organisation's readiness for implementing IPD, which includes fostering a collaborative work culture (Rankohi *et al.,* 2023), streamlining integration processes and managing risks (Ma *et al.,* 2023), and optimising technology utilisation (Khanna *et al.,* 2021). The layered structure

provided by the framework also helps in identifying stakeholders' current positions on the readiness spectrum and determining necessary subsequent actions (Linhart *et al.,* 2017).

CONCLUSIONS

IPD emerges as a collaborative, stakeholder-based approach that significantly enhances project outcomes in public construction. This study emphasizes the critical importance of assessing and improving stakeholder readiness for IPD, given the unique challenges faced in public sector projects, such as strict regulatory compliance, transparent management of public funds, and balancing diverse community expectations. The proposed maturity model framework, developed by synthesising key elements from established models like OPM3, CMMI, LCMM, and BIM maturity models, provides a structured pathway for enhancing stakeholder readiness. By focusing on essential dimensions such as integration, joint ownership, respect, and trust, this model aims to foster a collaborative culture necessary for successful IPD implementation. The framework contributes to the ongoing discourse on improving project delivery methods in the construction industry and aligns with strategic recommendations from various industry bodies. By offering practical guidance and a detailed assessment tool, the IPD maturity model supports the effective adoption of IPD, promoting more successful public construction outcomes and contributing to sustainable development and public value creation.

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