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STRATEGIES TO OVERCOME INTEGRATED PROJECT DELIVERY IMPLEMENTATION BARRIERS: A PERUVIAN CASE STUDY

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ABSTRACT

The construction industry continues to struggle with the persistent gap between design and construction. Integrated Project Delivery (IPD) has been introduced as a collaborative approach to improve integration and project outcomes. However, its use remains limited, mainly because of barriers identified in previous studies. This research seeks to highlight the most relevant obstacles to IPD and to examine strategies and practices that help overcome them, drawing on the experience of a real project. The study combines a systematic review of the literature with an in-depth case analysis of a complex building developed under a collaborative scheme in Peru. Barriers reported in the literature were organized, validated with expert input, and then compared with the strategies applied in the case study. Results show that cultural and mindset related issues are the most significant, representing about 28% of the barriers. The case demonstrates that these challenges can be reduced when stakeholders are involved early, supported by practices such as collaborative mockups, team co-location, and the use of digital tools, including artificial intelligence, to monitor progress. In summary, the findings suggest that consistent application of collaborative strategies can lower barriers to IPD and provide useful lessons for similar project contexts.

KEYWORDS

IPD, Integrated Project Delivery, construction, barriers, strategies.

INTRODUCTION

The construction industry has long faced performance challenges, reflected in its slow labor productivity growth. Over the past two decades, this growth has averaged only about 1% per year, while the global economy has grown at roughly 2.8% (McKinsey & Company, 2017). One of the main reasons for this gap is the persistent fragmentation between design and construction (KPMG, 2023).

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This divide is reinforced by the contractual separation of key stakeholders, owners, contractors, designers, and subcontractors and by the limited collaboration during the early stages of projects (Rousakis & Roberts, 2021).

These conditions are closely linked to recurring problems such as cost overruns, schedule delays, rework, and contractual disputes (Khanna et al., 2021). In the end, they undermine project performance and reduce the value delivered to clients (Durdyev et al., 2020; Melendez et al., 2025). A similar situation can be observed in the Peruvian context. According to recent reports on public investment from the Contraloría (2025), 2,416 public works projects were paralyzed nationwide as of December 2025. Among the causes are some related to deficiencies in initial coordination, design maturity, interdisciplinary collaboration, and contractual alignment among project stakeholders.

In response to these challenges, different project delivery approaches have been proposed to improve integration and alignment among participants (Attouri et al., 2023). Among them, Integrated Project Delivery (IPD) has attracted particular attention (Othman & Sayed, 2025). According to the American Institute of Architects (AIA, 2007), IPD is defined as a project delivery method that integrates people, systems, business structures, and practices into a collaborative process that leverages the knowledge and experience of all participants. One of its distinctive characteristics is the early involvement of all key stakeholders from the initial phases of the project, enabling the integration of interdisciplinary knowledge, the alignment of objectives, and the reduction of uncertainty from the design stage. Likewise, this approach is based on the sharing of risks and rewards, as well as on joint decision-making aimed at optimizing project outcomes. Previous studies have highlighted several benefits of adopting IPD. For example, it can enhance coordination, reduce conflicts, and increase predictability in both cost and schedule performance (Ghassemi & Becerik-Gerber, 2011). In practice, it has also been linked to higher levels of client satisfaction (Zadeh et al., 2025).

Despite the advantages reported in the literature, the practical use of IPD is still limited, especially in contexts where traditional contractual arrangements prevail (Rodrigues & Lindhard, 2023). Research has pointed to several barriers that hinder its implementation (Melendez et al., 2025). These include contractual rigidities, resistance to organizational change, limited experience with collaborative delivery models, and the insufficient early involvement of owners (Bin et al., 2023; Gil & Soler, 2024; Sherif et al., 2022). Although these barriers have been described in detail, there remains a lack of empirical evidence on how they can be effectively addressed in real project settings. In practice, concrete strategies and collaborative practices are still underexplored, leaving an important gap for future studies (Muianga et al., 2023).

In this context, the aim of the study is to provide empirical evidence by presenting strategies and good practices drawn from a real case carried out in an emerging market. The goal is to show how these approaches can help overcome the barriers to IPD implementation discussed in the academic literature. To this end, the study addresses the following research questions: (1) What are the main barriers to IPD implementation identified in the academic literature?; (2) What strategies were used to overcome these barriers in the University of Lima Library Project (PBUL)?; and (3) What good practices were identified in the PBUL?

CASE STUDY

The case study was carried out at the PBUL, a university building located in Lima, Peru. The project is promoted by a private university and executed by the construction company COSAPI S.A. under a reimbursable cost scheme, with a contractual term of 16.5 months and an approximate budget of 180 million soles. The project has a built area of approximately 19,000 m² and comprises eight floors above ground and a basement, incorporating highly complex architecture that includes a Glass Reinforced Concrete (GRC) facade system. The complexity of the project is not only associated with its architectural design and the involvement of multiple technical specialties, but mainly with its execution in the center of the university campus, while the university maintained

its regular academic operations, serving approximately 30,000 students. This condition involved the implementation of strict security controls, access and circulation restrictions, and time limitations for high-impact activities (such as maneuvers, emptying, or noisy work). It was also challenging because the project was carried out within a fully operational university campus, which further constrained logistics and the supply chain.

RESEARCH METHODOLOGY

The study methodology is presented in Figure 1 and follows four sequential stages: (1) identifying barriers to IPD implementation through a systematic literature review; (2) validating the barrier categories with expert judgment; (3) analyzing the strategies applied to overcome these barriers in a case study; and (4) recognizing good practices derived from the IPD implementation in the project examined.

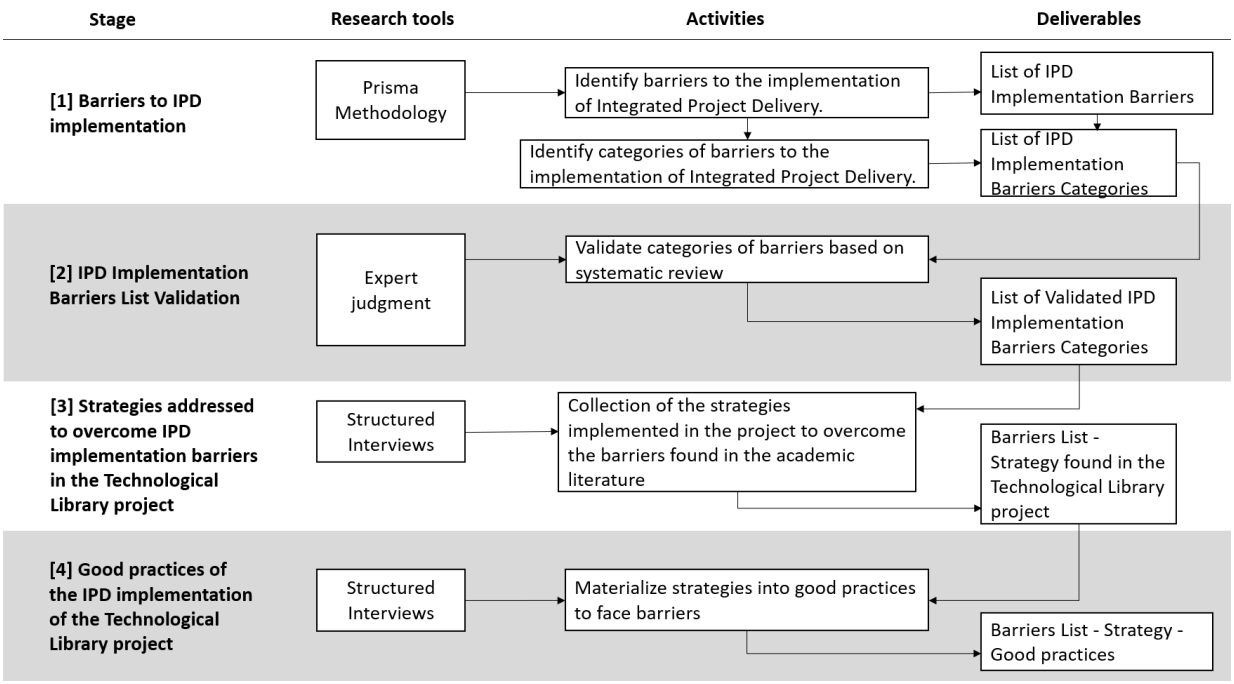


Figure 1: Methodology flow diagram

STAGE 1: IDENTIFICATION OF BARRIERS TO IPD IMPLEMENTATION THROUGH SYSTEMATIC REVIEW OF THE LITERATURE

At this stage, a systematic literature review was carried out using the PRISMA approach (Page et al, 2021). The goal was to identify the main barriers to IPD implementation that have been highlighted in academic studies.

The PRISMA methodology has been widely applied in construction research and studies on collaborative approaches. For instance, Karasu (2023) used PRISMA to systematically examine the relationship between IPD and Building Information Modeling (BIM) in construction projects. His work highlights how these two concepts can be integrated to achieve stronger collaborative results.

The literature search was conducted using three databases: IGLC, Web of Science, and Scopus. Keyword combinations related to IPD and its implementation obstacles guided the process. In total, 286 items were retrieved. During the eligibility stage, eight duplicates were removed. Screening by title and abstract excluded 187 publications that did not specifically address barriers to IPD,

leaving 99 articles for detailed review. A thorough content analysis followed, during which 59 publications were excluded for not meeting the predetermined inclusion criteria. This final selection resulted in 40 articles forming the basis of the study. Each of these was analyzed in depth, and the obstacles identified were compiled into a preliminary list. These impediments were then organized into thematic groups. To ensure accuracy, the initial categorization was validated through expert judgment, a process explained in the next step.

STAGE 2: VALIDATION OF BARRIER CATEGORIES THROUGH EXPERT JUDGMENT

A validation process was carried out using expert opinion, based on the preliminary list of barriers identified in Stage 1. The aim was to ensure consistency, completeness, and practical relevance in the categories defined. Six professionals from the construction industry participated, each meeting two requirements: (a) more than 20 years of professional experience, and (b) at least 10 years working in collaborative projects or IPD-like schemes. During structured meetings, the experts reviewed the list of barriers and their categories. They proposed changes, mergers, reformulations, and even added barriers not explicitly mentioned in the literature. All agreed suggestions were incorporated into the final list, strengthening the original framework with real-world expertise from collaborative practice.

STAGE 3: ANALYSIS OF STRATEGIES TO OVERCOME BARRIERS IN THE TECHNOLOGY LIBRARY PROJECT

After validating the final set of barrier categories, a case study of the PBUL was conducted to analyze how the barriers identified in the literature were addressed in practice. Data were collected through structured interviews with members of the project's technical team, including the project manager, production and planning leaders, site supervision staff, the IPD leader, and the project control manager, as well as other relevant stakeholders.

The interviews were conducted in a structured manner, organized into two blocks: (i) Explanation of the validated list of barriers and (ii) Collection of strategies used in the PBUL project to address the barriers on the list from the interviewee's point of view. These interviews made it possible to identify the specific strategies applied throughout the project to respond to the different categories of barriers. The identified strategies were then systematically compared with the validated categories, allowing an assessment of how effectively the project addressed the barriers reported in previous studies.

In addition, the implemented strategies were further validated through surveys administered to industry experts, who evaluated their perceived effectiveness in mitigating each barrier category.

STAGE 4: IDENTIFICATION OF GOOD PRACTICES DERIVED FROM THE IMPLEMENTATION OF THE IPD

Finally, based on the strategies identified and validated in Stage 3, appropriate IPD implementation of good practices that can be replicated in other building projects were developed. This stage was conducted through additional structured interviews aimed at identifying the underlying principles of the strategies applied in the project, which made it possible to formulate an integrated list of barriers, strategies, and good practices.

The outcome of this stage represents a practical contribution of the study, as it provides empirical evidence on how IPD barriers can be successfully addressed in real projects. This contribution is further strengthened by the participation of the project manager and IPD specialists in the development of the paper, helping to reduce the gap identified in the existing literature.

RESULTS AND DISCUSSIONS

BARRIERS TO IPD IMPLEMENTATION IDENTIFIED IN THE LITERATURE

The barriers were organized into six main categories, each of which was further divided into specific groups (A1–A3, B1–B3, C1–C3, D1–D3, E1–E2, F1–F2, and G1–G2), as detailed in Table 1. This classification was developed based on the review and analysis of 40 academic articles, with each group indicating the corresponding supporting studies.

Table 1. IPD barriers from the academic literature

Category	Code	Group	Reference
Cultural and Mindset Barriers	A1	Adversarial Culture and Distrust	1, 2, 6, 7, 9, 10, 11, 12, 13, 16, 18, 20, 22, 24, 26, 28, 32, 34
	A2	Resistance to Change	2, 4, 5, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 22, 23, 24, 26, 28, 30, 31, 33, 35, 36, 38, 39, 40
	A3	Lack of Collaborative Alignment	7, 10, 11, 12, 17, 20, 24, 29, 32, 33, 36
Contractual and Legal Barriers	B1	Incompatibility with existing legal frameworks	1, 2, 4, 6, 8, 9, 10, 14, 15, 16, 17, 19, 28, 30, 31, 33, 34, 35, 38
	B2	Inappropriate contracts for IPD	9, 10, 12, 13, 20, 21, 22, 28, 29, 32, 33, 36, 37, 40
	B3	Risks, insurance, and liabilities	11, 13, 14, 15, 20, 21, 27, 37, 40
Financial and Incentive Barriers	C1	Incentive design	2, 4, 9, 12, 15, 18, 22, 24, 25, 26, 31, 37
	C2	Allocation of risks and costs	2, 7, 11, 17, 18, 26, 28
	C3	Return on investment	1, 17, 16, 19, 20, 28, 30, 33, 35, 36, 38
Organizational and Leadership Barriers	D1	Rigid organizational structures	5, 6, 7, 9, 18, 20, 21, 22, 23, 31, 33, 34, 38
	D2	Limited organizational capabilities	18, 21, 22, 23, 24, 26, 36
	D3	Project governance	9, 12, 18, 20, 22, 26, 27, 32, 37
Knowledge and Training Barriers	E1	Lack of knowledge about IPD	3, 4, 5, 8, 9, 12, 13, 14, 16, 21, 22, 26, 30, 31, 36, 38
	E2	Insufficient training	3, 9, 12, 33, 38
Technological Barriers	F1	Technological limitations	1, 2, 5, 6, 14, 15, 19, 28, 30, 31, 32, 33, 34, 35, 38, 40
	F2	Technology skills gaps	2, 12, 13, 18, 28

*1. (Suttie, 2013), 2. (Rached et al., 2014), 3. (Forero etal.,2015), 4. (Kim et al.,2015), 5. (Korb et al., 2016), 6. (Li & Ma, 2017), 7. (Assaf et al., 2023), 8. (Attouri et al., 2023), 9. (Meléndez et al., 2025), 10. (Zadeh et al., 2025), 11. (Gil Sebastián & Soler Severino, 2024), 12. (Refahy et al., 2024), 13. (Rodrigues & Lindhard, 2023), 14. (Asad et al., 2023), 15. (Aderibigbe & Umeokafor, 2023), 16. (Atália et al., 2023), 17. (Sherif et al., 2022), 18. (Kahvandi et al., 2019), 19. (Roy et al., 2018), 20. (Leicht & Harty, 2017), 21. (Bilbo et al., 2015), 22. (Medina, 2014), 23. (Seed, 2014), 24. (Aapaoja et al., 2013), 25. (Pishdad-Bozorgi & Bowen, 2013), 26. (Aapaoja et al., 2012), 27. (S Buk'hail & Al-Sabah, 2024), 28. (Mei et al., 2023), 29. (Kahvandi et al., 2023), 30. (Alqahtani et al., 2022), 31. (Durdyev et al., 2020), 32. (Piroozfar et al., 2019), 33. (Kahvandi et al., 2019), 34. (Guo & Guo, 2016), 35. (Ghassemi & Becerik-Gerber, 2011), 36. (Khanna et al., 2024), 37. (Khanna & Keen, 2012), 38. (Othman & Sayed, 2025), 39. (Gil Sebastián & Soler, 2024), 40. (Mei et al., 2023).

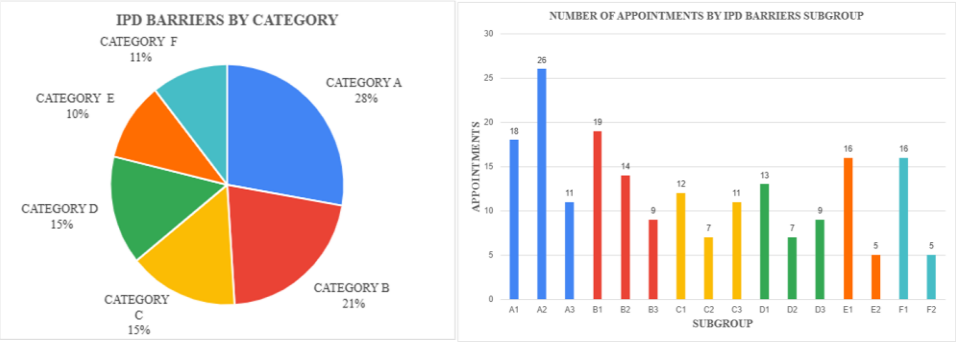


Figure 2: IPD barrier groups based on their frequency per category and frequency

CONCEPTUAL FRAMEWORK AND CLASSIFICATION CRITERIA

The identified barriers were classified into six categories based on their operational nature and sphere of influence within the project lifecycle, distinguishing between human behaviors and institutional structures:

Cultural and Mindset: "Soft factors" rooted in collective psychology, such as adversarial attitudes, lack of trust, and resistance to transitioning from fragmented silos to an integrated mindset.

Contractual and Legal: Focuses on the regulatory framework, highlighting the incompatibility between traditional procurement laws and the multiparty agreements and shared liability models essential for IPD.

Financial and Incentives: Addresses the economic alignment of interests, including the difficulty of establishing Target Value Design and shared risk/reward contingency pools.

Organizational and Leadership: Structural and procedural barriers, such as rigid hierarchies, centralized decision-making, and a lack of facilitative leadership to manage multidisciplinary teams.

Knowledge and Training: Refers to the stakeholders' intellectual readiness and the gap in technical/methodological skills required to operate under IPD principles.

Technological: Limited to digital and physical infrastructure, specifically BIM interoperability, lack of Common Data Environments (CDE), and real-time collaboration tools.

STRATEGIES AND GOOD PRACTICES USED TO OVERCOME IPD BARRIERS

A. Cultural and Mindset Barriers

Cultural and mindset barriers are the most significant category (28%). Resistance to change predominates, alongside mistrust and adversarial cultures that hinder joint decision-making (Asad et al., 2023). This ranking stems from IPD requiring a profound shift from traditional management; without cultural alignment, contractual or technological mechanisms remain insufficient (Mei et al., 2023). Such resistance is evident in international cases like the Saxum project in Israel, where professionals initially viewed IPD as theoretical but inapplicable to their adversarial business

culture (Korb et al., 2016). Thus, cultural barriers directly condition the willingness to adopt collaborative practices (Aderibigbe et al., 2023).

In the PBUL project, these barriers were addressed through early alignment, trust-building, and team co-location. These practices fostered shared responsibility, framing challenges as collective rather than individual problems. This aligns with literature identifying facilitative leadership and change management as essential to overcoming resistance (Ghassemi & Becerik-Gerber, 2011). Consequently, the project established transferable good practices in transparency and joint decision validation.

B. Contractual and Legal Barriers

Contractual and legal barriers represent 21% of the identified obstacles. The primary difficulty is the limited compatibility between IPD and traditional legal frameworks (Asad et al., 2023). This includes a lack of standardized contracts, limited use of multiparty agreements, and insufficient insurance for shared-risk arrangements. International evidence shows that semi-collaborative models like Construction Manager at Risk (CMAR) underperform compared to IPD; although CMAR involves contractors early, it lacks the multiparty agreement needed to align financial interests, resulting in more change orders and RFIs (Bilbo et al., 2015). These issues maintain fragmented structures and foster adversarial relationships (Bilbo et al., 2015; Aderibigbe et al., 2023). Their lower ranking compared to cultural barriers suggests that their influence depends on stakeholders' willingness to adopt hybrid contractual approaches (Attouri et al., 2023).

In the PBUL project, these barriers were addressed by adapting traditional contracts and implementing collaborative mechanisms within the conventional regulatory framework. Notably, 1:1 scale structural and architectural mockups were used to validate the production system and product with the active participation of all key actors. These strategies align with literature highlighting the use of relational clauses and collaborative governance in restrictive legal contexts (Muianga et al., 2023). Consequently, the project consolidated transferable practices, such as using collaborative annexes in flexible contracts and joint decision-making protocols, facilitating integrated delivery even without fully compatible legal frameworks.

C. Financial and Incentive Barriers

Financial and incentive barriers account for 15% of all identified barriers, ranking as the third most significant category, on a par with organizational and leadership barriers. The main barrier is the inadequate design of incentives, followed by the difficulty in defining a fair target price and the limited evidence of the return on investment of the IPD. These limitations generate compensation schemes that are poorly aligned with the overall performance of the project, increasing uncertainty in the distribution of risks and benefits and reducing the commitment of actors to the collaborative approach (Durdyev et al., 2020). This is exemplified in the Chilean context, where traditional subcontracts often fail to encourage collaboration; a study on a road mitigation project (Meléndez et al., 2025) suggests that while IPD could optimize profit margins to 40%-50% through shared efficiency, current dynamics hinder the adoption of such incentive-based compensation for subcontractors. Their position below cultural and contractual barriers is explained by the fact that the effectiveness of financial incentives depends on the prior existence of a collaborative culture and contractual frameworks that allow for their implementation (Asad et al., 2023).

In the PBUL, these barriers were addressed through practices aimed at economic transparency, reducing uncertainty, and progressively aligning interests, even without the implementation of formal IPD incentive schemes. The early involvement of the main project participants, along with the use of mock-ups to pre-check technical solutions, helped reduce risks and build greater confidence in budgets. According to the literature on IPD, these practices demonstrate that transparency in financial aspects and the early evaluation of decisions help reduce the constraints

associated with incentives and promote collaborative work, even under traditional contractual schemes (Rodrigues and Lindhard, 2021).

D. Organizational and Leadership Barriers

Organizational and leadership barriers represent 15% of the total, ranking fourth. The core issue is the presence of rigid structures and governance models misaligned with IPD principles. This is evident in international contexts such as Malaysia, where Durdyev et al. (2019) identified through a quantified model that traditional hierarchical structures and the lack of project managers prepared for collaboration act as critical bottlenecks preventing decentralized decision-making. These constraints reduce team autonomy and adaptability. While they do not formally block IPD like legal barriers, they strongly influence practical performance and long-term sustainability.

In the PBUL project, these barriers were addressed through facilitative leadership and flexible organizational structures. A key factor was the contractor's project manager's active role as a link between stakeholders, promoting the early integration of designers and subcontractors into multidisciplinary teams. Additionally, goal alignment sessions enabled more decentralized decision-making. These actions align with Walker (2025), who emphasizes the importance of collaborative structures in overcoming traditional fragmented behaviors. Consequently, the project consolidated transferable practices, including early stakeholder involvement and governance based on trust, transparency, and shared responsibility.

E. Knowledge and Training Barriers

The results of the systematic literature review show that knowledge and training barriers account for 10% of the identified barriers, making them less significant than cultural, contractual, and organizational barriers. These barriers are mainly related to a limited understanding of IPD principles, little prior experience with collaborative approaches, and gaps in the technical and methodological skills needed for effective implementation. In developing construction markets, Rached et al. (2014) identify a critical gap between theoretical knowledge of Lean-IPD and its practical application, noting that a lack of specialized training for subcontractors often leads to a misperception of risk and a tendency to revert to traditional design-bid-build logic.

In the PBUL project, knowledge and training barriers were addressed through a learning-by-doing strategy based on the early involvement of key stakeholders and formal and informal spaces for continuous interaction. The formation of multidisciplinary teams, the use of collaborative mockups, and the early application of Project Production Management principles enabled designers, subcontractors, and contractors to develop a shared understanding of the production system and project objectives. Likewise, the facilitative leadership of the contractor's project manager was key to promoting alignment, clarifying roles and responsibilities, and supporting the progressive adoption of collaborative practices. This strategy made it possible to consolidate transferable best practices, such as training integrated into the production process, the use of collaborative tools such as collective learning, the early definition of roles to reduce ambiguities, and the promotion of leadership that facilitates knowledge transfer among project stakeholders.

F. Technological Barriers

Technological barriers represent only 11% of the total, making them less significant than cultural or contractual factors. While IPD is associated with BIM, these tools are often used for technical tasks rather than strengthening integration (Li and Ma, 2017). This is exemplified by the Saxum project in Israel, where designers' lack of 3D expertise forced external 2D-to-BIM conversion, causing inefficiencies and hindering real-time collaborative decision-making (Korb et al., 2016). Thus, technology serves as a support whose effectiveness depends on organizational and leadership factors (Rached et al., 2014).

In the PBUL project, these barriers were addressed by treating technology as a means rather than an end. Tools providing clear coordination and transparency benefits were prioritized. Notably, an AI-based monitoring system allowed real-time objective information sharing,

reducing gaps and supporting joint decision-making. Additionally, collaborative platforms and early technological infrastructure facilitated integration between design and execution. Consequently, the project identified transferable practices, such as prioritizing collaboration-oriented technology and adopting tools progressively based on team maturity.

CONCLUSIONS

The findings of the systematic literature review indicate that the main barrier to the adoption of IPD is cultural and dominant mindsets (28%), followed by contractual and legal limitations derived from traditional procurement system (21%). These barriers were addressed through strategies provided by the PBUL case study, which demonstrates that even without a formal IPD contract, many of these barriers can be partially overcome through the deliberate use of collaborative practices at the project level.

Improved coordination between design, planning, and construction was achieved through early stakeholder engagement, co-location of teams, collaborative mock-ups, and the use of tools such as PPM. These strategies were key to overcoming the previously identified barriers and improved construction feasibility, facilitated value engineering, and reduced rework. Overall, the results suggest that IPD should be understood primarily as a cultural and organizational transformation, and not just as a technical solution or contractual model.

From an academic standpoint, this study contributes by connecting previously identified barriers with evidence from a real project, offering practical insights into how these obstacles can be gradually overcome through adaptable strategies and best practices. From a professional perspective, the results indicate that owners, contractors, and designers can begin transitioning toward IPD by prioritizing early collaboration, cultural development, and collective decision-making. These actions help establish a solid foundation for a more effective and sustainable implementation of IPD in complex construction projects.

The article presents limitations as it is based on a single case; therefore, future studies could test which early collaborative practices and tools reduce rework, improve decision-making, and decrease cost and schedule deviations. In Peru, it is recommended to promote policies that support project development and strengthen training in tools to facilitate a more efficient implementation.

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