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Integrated Project Delivery: Communication Architecture in Practice

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Abstract

Integrated Project Delivery (IPD) is a team-based project delivery process that improves project performance by merging the people, processes, and project goals and by fostering open communication throughout the project process. This paper covers the basics, principles, contractual structures, communications and digital technologies that underpin IPD. It also reviews recent literature to identify the recent trends in the research, barriers in implementation, and future opportunities. The results revealed that while the development of BIM and collaborative contracting has facilitated the further development of IPD, communication architecture is still not well researched. New technologies like cloud computing, artificial intelligence, blockchain and the Internet of Things have great promise of improving communication, coordination and decision making. This review aims to give a brief overview of the communication architecture in IPD and suggests avenues for future research and industry use.

Keywords; Integrated project delivery, Building Information Modeling (BIM), Communication Architecture, Digital Technologies

1 INTRODUCTION*

Standard delivery methods such as design-build, design-bid-build, and construction management are traditionally employed in the construction industry and although these methods

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are used for decades, a wide range of professionals are dissatisfied with the outcomes. These dissatisfactions could be addressed as the projects often suffer from low quality, time and cost overruns, among others. In this regard, currently, the construction complexity is increasing rapidly, and the delivery methods being applied are considered inappropriate due to the inability to follow the modern trends, causing as a direct effect the dissatisfactions mentioned. In this sense, nowadays the proper delivery approach is considered crucial and significant for a project overall success. To overcome and improve the current delivery methods, IPD immerges as a new construction approach that increases the project performance through a highly collaborative process. In this regard, IPD seeks to improve the triple constraint (cost, time and quality) outcomes by aligning the project team incentives and goals as well as applying a shared risk and reward, early involvement and a multiparty contract agreement. The IPD delivery method possesses main study categories, being them the contract, process, information & modelling, team and communication, where at the same time are the most distinguishing characteristics from the traditional methods.

The purpose of this review is to explore the basics of IPD, focusing on information architecture and communication, collaborative working, implementation difficulties, and digital tools that enable the exchange of information. The paper also reviews the state of the art and points out future prospects to enhance communication and collaboration in IPD construction projects.

2 FUNDAMENTALS OF INTEGRATED PROJECT DELIVERY

Integrated Project Delivery (IPD) is an important pillar of the Lean Construction Institute. The construction industry has seen a sharp decline in productivity and project outcomes since the late 1960s. A large reason for this decline is that a vast majority of projects are delivered late and over-budget.

The aim of IPD is to create a better system of collaboration and communication between the various parties involved in a construction project, from the owner to the designer to the builder and any trades and suppliers involved. This method stands in contrast to the traditional design-bid-build project delivery model in which the owner of the project has separate contracts with each party and serves as a go-between for the design and build teams. [1]

IPD Methods

The IPD method is often consummated through a single physical contract between the involved parties of the construction project. The contract outlines expectations for each group and clearly states the shared goals for the project. Below we explore several types of IPD contracts and agreements which fuel LCI’s mission of integrating project delivery.

a. Multi-Party Agreements

A multi-party agreement is a type of agreement in which the key parties of the project team join together in a shared contract. In some cases, only three parties (owner, designer, construction manager) will sign the main agreement, making it a tri-party agreement. Any contract that contains more than three main signers becomes a multi-party agreement. The agreement promises continual involvement for all parties throughout the project.

Unlike design-bid-build or design-build contracts, multi-party agreements consist of a single document signed by each involved party in the project. Sometimes multi-party agreements can contain more than a dozen main signatories including mechanical contractors, framing contractors, and the like. There may also be sub-signatories signed underneath the main parties, allowing the contract to branch out depending on the needs of the main signatories.

b. Relational Contracting

A relational contract is an agreement that governs a long-term relational commitment between two or more parties. In the design and construction industry, relational contract defines the ongoing terms of a working relationship. As the relationship strengthens between those involved, the contract becomes more efficient as the parties involved in the pact trust one another.

Relational contracts are the types of agreements that parties involved in an IPD team sign into. This is because there is inherent trust that the other teams on the contract will complete their work as efficiently as possible in order to maximize profit for all.

The terms of the contract list out the expectations of the various groups and how their involvement will intersect with one another over time. For instance, if the construction team is needed in the design stage of the process, their responsibilities during that time would be listed out in the contract.

c. Integrated Forms of Agreement (IFOAs)

An Integrated Form of Agreement – also sometimes called an IPD Contract – is a common type of relational contract used in Integrated Project Delivery. This legal document mandates that the parties must truly collaborate on the project rather than just having orders come from the top-down.

d. IFOA Contract

An IFOA is the physical joint contract signed by the various groups of a construction project. The deal forces the groups to work together as it legally binds them to share risks and financial rewards from the project.

3 PRINCIPLES OF INTEGRATED PROJECT DELIVERY

The construction sector is no exception when it comes to the importance of principles in business implementation. To make IPD more effective, nine basic principles are needed. If all are adopted and used effectively, greater collaboration is achieved, resulting in improved project outcomes in both design and construction. The American Institute of Architects & AIA California Council (2007) adopted the nine IPD principles which are:

1. Mutual trust and respect
2. Sharing of risks & rewards
3. Collaborative decision-making and Innovation
4. Involvement of key participants at an early stage
5. Establishing goals earlier
6. Extensive planning
7. Open lines of communication
8. Leadership and Organization
9. Multi-party agreement.

Although the list is not in any particular sequence, these nine principles are critical when attempting to apply IPD as a design process. [2] [3]

4 COMMUNICATION ARCHITECTURE IN INTEGRATED PROJECT DELIVERY (IPD)

Communication architecture is the prearranged structure in which information is created, distributed, saved and used by project participants, from initial through closing of an Integrated Project Delivery (IPD) project. In contrast to traditional delivery models, which typically have a hierarchical and fragmented communication chain, IPD creates a collaborative communication environment for real-time, multidirectional and transparent communication among the owner, the architect, the engineer, the contractor, subcontractors and the supplier.[4]

The communication system in IPD is based on openness, trust, shared responsibility and integrated decision making. This enables project participants to access the project information at all times and helps to minimise misunderstandings, information loss and work duplication. It

enables the design issues, constructability concerns and cost implications to be discussed together before the project work begins; whereby key stakeholders are involved at an early stage.

A good communications design also facilitates knowledge sharing, conflict resolution and problem solving in a group. Digital collaboration platforms, Building Information Modelling (BIM), Common Data Environments (CDEs) and cloud communications systems allow stakeholders to coordinate activities effectively, while ensuring that everyone has access to the same source of project information. Thus, communication architecture plays a vital role in IPD because it fosters transparency, accountability, innovation and ongoing collaboration along the project lifecycle.

Components of Communication Architecture

- Stakeholder communication network
- Information management system
- Decision-making framework
- Collaboration protocols
- Digital communication platforms
- Feedback and reporting mechanisms

Table 10: Challenges to effective communication architecture [6]

Challenge	Description	Mitigation Strategy
Stakeholder diversity	Cultural and professional differences	Training, communication protocols
Technological barriers	Difficulty adopting BIM/cloud	Capacity building
Information overload	Excessive data	Central dashboards
Geographical dispersion	Distant project teams	Virtual collaboration tools
Resistance to change	Preference for old methods	Incentives, leadership support

5 COMMUNICATION NETWORKS AND COLLABORATIVE PRACTICES IN INTEGRATED PROJECT DELIVERY (IPD)

Communication is the key to an Integrated Project Delivery (IPD) in which the abilities of architects, engineers, contractors, and clients, and other stakeholders are coordinated. IPD is a different approach to project delivery than traditional project delivery methods in that it encourages open communication, collaborative problem solving and shared decision making. A good communication network facilitates information exchange, fosters trust and facilitates project delivery effectively.[5]

a. Collaborative Communication

In IPD, communication is not about the mere transfer of information but is continuous. Stakeholders are engaged in a continuous dialogue about the project, eliminating ambiguities and creating a common understanding to enhance coordination and minimize conflicts.

2. Formal and Informal Communication

IPD is the integration of formal communication (meetings, reports, and design documents) with informal communication, which fosters knowledge sharing, quicker problem solving, and better working and professional relationships.

3. Trust and Relationship Building

There are high mutual trust, transparency and respect that helps to facilitate stakeholders to communicate openly and collaborate on achieving shared project objectives. Good relationships foster team working, reduce misunderstandings and assist group decision making.

4. Self-Organising Communication Networks

Communication evolves naturally based on the needs of the project, not particularly from the hierarchy of the organisation. Team members directly communicate with the people with the necessary expertise, giving flexibility and responsiveness to the team's work.

5. Balanced Information Sharing

Good communication within the IPD enables the flow of information to and from everyone involved in the project, to be accurate, timely and transparent. Access to information is a part of the equal rights that improves coordination, minimize errors and helps in the informed decision making.

6. Team Diversity and Collaboration

IPD teams consist of people from different disciplines and organisations. The promotion of communication between various areas of expertise fosters innovation, integrates different knowledge and enhances the overall project performance.

Communication networks are vital to the effective running of IPD projects. To enhance teamwork, project coordination and the successful delivery of an architectural and construction project, a balance of formal communication, informal interaction, trust, transparent information sharing and inter-disciplinary collaboration is essential.

Technical tools and social actions are the principal ways to improve communication (Marshall-Ponting & Aouad, 2004). Combining technology and human management approaches lead to effective and strategic methods. Effective communication is measured by looking at how well the functions of communication were applied and if the message was fully communicated. There are several important traits that are exhibited by successful architects in terms of how they communicate information to their clients. In terms of administrating communication-related design project, Thomas, Tucker, & Kelly (1998) and Breu et al. (2008a) established the factors listed below: (a) Management characteristics, (b) Message or information characteristics and (c) relationship characteristic. Each of these factors will be explained below: x Tools characteristic: Building design information is affected by collaboration between stakeholders. When information can be fully coordinated and organized, it enables better communication between the client and the architect. The role of management can be seen in the Information technology used for the project including computer software and hardware and the communications media infrastructure that will be used as a framework

for project-related communications. The communication infrastructure includes email systems, a project specific intranet system, and the processes for holding meetings (Breu et al., 2008a). It is crucial all the design documents needed to complete a building project are visually defined and represented in the design approach. x Message characteristics: Messages can have many characteristic including credibility, accuracy, and timeliness. Credibility and accuracy can work together because if the receiver regards the message to contain accurate information, then they will deem it to be credible. In the field of architecture, accuracy describes how close the client's requirements are represented by the building design or other relevant documents. Timeliness is also important, as a message must be received as soon as possible so that it can be used. Timeliness is especially important at all design and construction stage where the information contained in the message may contain changes to the design (Thomas et al., 1998); (Breu et al., 2008a). x Relationship characteristics: The relationship between

the building design documents and the information provided by the client can improve communication between the architect and the client. Responsiveness refers to the architect's willingness to meet project requirements and answer client inquiries. It is important because it strengthens the client-architect relationship. As discussed earlier, successful relationships are based on mutual trust. Other characteristics of a successful relationship include similarities between parties and mutual knowledge. Conversely, unsuccessful relationships exhibit mistrust, differences between parties, conflicts, and misunderstandings (Ziegler, Ylitalo, & Mäki, 2004)

6 APPROACHES FOR IMPROVING COMMUNICATION PERFORMANCE IN ARCHITECTURAL DESIGN PRACTICE

Technical tools and social actions are the principal ways to improve communication. Combining technology and human management approaches lead to effective and strategic methods. Effective communication is measured by looking at how well the functions of communication were applied and if the message was fully communicated. Digital communication tools enable project information to be created, stored and shared efficiently, and social and organisational practices help to build collaboration, trust and understanding amongst project players. These methods work together to ensure that project goals are understood and interpreted correctly and stakeholder expectations are managed. There are several key strategies for enhancing communication competency in practice as an architect, discussed below: [7]

1. **Tools characteristic:** Building design information is affected by collaboration between stakeholders. When information can be fully coordinated and organized, it enables better communication between the client and the architect. The role of management can be seen in the Information technology used for the project including computer software and hardware and the communications media infrastructure that will be used as a framework for project-related communications. The communication infrastructure includes email systems, a project specific intranet system, and the processes for holding meetings. It is crucial all the design documents needed to complete a building project are visually defined and represented in the design approach.
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7 DIGITAL TECHNOLOGIES ENABLING COMMUNICATION IN IPD

Emerging digital technology is offering a broad palette of industrial change enablers. Here again there is broadly consistent scoping internationally of which emerging digital technologies will most impact the construction industry. Indeed, there is broadly consistent scoping of which emerging digital technologies will most impact industry and society in general. The significant technologies include: [8]

1. **Cloud Computing:** this is a general term for anything that involves delivering hosted services over the Internet. Cloud computing is accelerating the uptake of digital innovation in construction by delivering improved software services and enhanced mobility.
2. **Building Information Modelling (Bim**): where the digital representation of a building geometry is supplemented with an integrated database of related construction and operational information, such as material type, manufacturer, cost, maintenance regime, etc. In particular, BIM promises to integrate the design, construction and operational phases of a project, aiming to reduce the incidence of rework and better enable production efficiencies.
3. **Augmented And Virtual Reality**: is able to immerse the user in a highly realistic rendition of a proposed building, and/or superimpose elements of a digital model onto the real world. The technologies are being used to improve design communication and support technical work activities on site.
4. **Scanning And Automated Data Capture:** creating digital representations of the as-built project (whether existing, in progress or completed) is critical to the design, construction and operation of a built facility. The rapid development of LiDAR (laser scanning) and photogrammetry, twinned with the availability of low-cost drones

(unmanned aerial vehicles) has allowed for safe, efficient, timely and accurate digitisation to drive significant gains in the overall project management.

5. **Internet Of Things (IOT):** describes the system of connected electronic sensors and actuators attached to objects in the real world. Electronic sensors now come in a multitude of forms and can be used to monitor operating conditions, performance levels and/or the physical state of any entity at any given time. This capacity to create a digital twin of the real world is driving an explosion in new applications and services where live data and data captured over time can be used to better inform decision-making. What is especially exciting about this live data and data collection over time is that it can also include user behaviour data. That means the circular dependency between building performance and user behaviour can finally begin to be closed.
6. **Data Analytics:** few corners of the economy, and life in general, are not being or have the prospect of being impacted by digitalisation and the massive data sets that this process of digitalisation will produce. Data analytics refers to the growing range of techniques and algorithms used to interrogate and make sense of these super-large data sets (so-called, big data). For the construction industry this offers a transformative opportunity to shed the traditional find-and-fix approach to problem solving, and to adopt instead a predict-and prevent approach. The impact of data analytics on the structure and very nature of the construction industry can be expected to be rapid and ubiquitous.
7. **Blockchain:** due in part perhaps to its initial association with bitcoin and the dark net, blockchain is often considered something of a sinister technology. In operation it could have quite the opposite implication on the construction industry, as it offers the potential to make any transaction (whether financial, contractual, communicative or any other form of exchange) secure and transparent. That is to say, blockchain technology moves any transaction record into a distributed representation that is permanent, virtually impossible to hack, and lodged in a sequence of related past and future transactions. Given construction activity generates masses and masses of complex and critical transactions as a matter of course, the potential for blockchain technology to provide improved transaction management is hugely significant.
8. **Machine Learning and Artificial Intelligence**: the promise of machine learning and artificial intelligence seems in hindsight to have been long coming, but is now very definitely upon us. Machine learning is a particular branch of artificial intelligence that employs increasingly sophisticated algorithms to identify patterns from data records and utilise these to automate model building and make decisions with minimal human intervention. How completely artificial intelligence will replace human decision making

is a subject for ongoing debate, but it will certainly have significant capacity in that regard. The accelerating computational power available and increasing digitalisation of processes is advancing the capabilities and applications of artificial intelligence substantially.

8 LIMITATIONS AND FUTURE DIRECTIONS FOR COMMUNICATION ARCHITECTURE IN IPD

Communication architecture has greatly improved collaboration in Integrated Project Delivery (IPD), but there are some challenges to the broad application of IPD. The present research is largely conceptual in nature, qualitative in methodology and mostly case specific in scope, and there are relatively few large-scale empirical and/or longitudinal studies. Therefore, current results are limited in terms of their generalisability to a range of project types, organisational contexts, and geographical locations. Furthermore, there are no generally accepted frameworks and validated metrics available to measure the effectiveness of communication, transparency of information, knowledge sharing, collaborative decision-making and engaging stakeholders. The integration of emerging technologies like Artificial Intelligence (AI), Digital Twins, blockchain, and sophisticated data analytics is still in its early phases, although digital tools such as Building Information Modelling (BIM) and Common Data Environments (CDEs) have already improved collaboration to a great degree. Future research should focus on the development of comprehensive and standardised communication architecture frameworks, establishing robust evaluation metrics, improving interoperability among digital platforms and strengthening the governance mechanisms for secure and more transparent information exchange. There should also be further exploration of cross-cultural collaboration, cyber security, communication strategies for the entire lifecycle of a project, and multidisciplinary and longitudinal research to apply the intelligent digital technologies to improve communication practices and support the wider implementation of IPD in the global construction industry.[9]

9 LITERATURE REVIEW

(Kahvandi et al. 2020) [10] identify and to classify IPD implementation enablers. In this study, a comprehensive list of IPD implementation enablers has been developed using an in-depth literature review. Besides, IPD project managers, employers, consultants, contractors, and engineers participated in a survey. The obtained results were analysed using Exploratory Factor Analysis method. Thus, the study findings illustrated that organizational enablers are considered essential enablers, followed by environmental, contractual, and technical enablers. The significance of this research is the identification and classification of IPD implementation enablers, which will provide valuable information to develop IPD implementation strategies.

Additionally, the results of this study can be a proper roadmap to support developing countries to adopt the IPD delivery approach for project developments.

(Viana et al., 2020a)[11] examines the suite of tools and methods to support a smooth flow of information, coordination, and real-time collaboration including digital platforms, information management systems, and standardized communication protocols. The study also outlines typical communicative barriers that are inherent in IPD projects such as ideological differences, information flood, conflicting stakeholder interests and technological integration issues. It provides pragmatic resolutions which are meant to reduce these challenges. In addition, the analysis highlights the necessity of the systematic communication-management plan to create transparency, accountability, and effective discussion. Overall, this study sheds some light on the strategic inelasticity of communication in IPD projects and provides practical advice to the practitioners, stakeholders, and institutions that want to achieve the best project delivery through collaboration.

(Kaufman et al., 2025b)[12] examine the development of an applied framework for analysing, influencing, and improving communications to enhance productivity through collaborative information exchange on a fast-track integrated project delivery construction megaproject. Using an interdisciplinary approach, project communications are reconsidered as an independent, value producing system to be used to improve the relational dynamics of an enterprise. Acknowledging the critical impact of communications on project planning and execution, the framework leans heavily on prospect theory within the field of behavioural economics, which explains how people make decisions when faced with risk. The results show the efficacy of developing a model that focuses on conditions of satisfaction, rather than the traditional hierarchical systems of project information flow for decision making. As with any substantial, independent commercial organization, a dedicated communications team is instrumental to achieving previously unrealized productivity gains otherwise hampered by the pervasive nature of miscommunication in large, complex-design engineering and construction projects.

(Iwankovitsch and Jarrah 2025b) [13] Integrated project delivery (IPD) is a unique delivery method that involves a collaborative approach among the primary stakeholders. Unlike traditional methods, where parties tend to prioritize their individual interests, IPD aligns everyone's goals for the collective benefit of the project. This approach encourages open communication, shared risk and a collective commitment to success. This study will provide a comprehensive review of the literature, an overview of the IPD delivery structure and a review of case studies comparing and contrasting IPD with traditional methods. Key findings indicate

that IPD is still a relatively niche project delivery method but has had great success when applied to suitable projects.

(Viana et al. 2020b) [14] Review the IPD principles and their main categories, such as contract, process, information & modeling (I&M), team and communication as well as perform a qualitative analysis to illustrate the current research trends. In terms of the results, the contract category illustrated a strong trend, where the studies are focus on collaborations and frameworks to enhance high efficiency in construction. In the I&M category, demonstrated an increasing trend applying the Building Information & Modeling (BIM) subject as well as team category, where showed the importance of a well-structured team and their impact on the project., The process and communication categories illustrated a weak trend, allowing opportunities in the field. Finally, the current study reviewed and analysed the IPD and its main categories allowing a solid basis for future research.

(Surya & Kranti Kumar, 2022) [15] study the concepts of IPD and the barriers to adopt the IPD in the Indian construction industry. Through literature review, data about the IPD, barriers for the adoption of IPD, and its comparison with other traditional project delivery processes is collected. The current practices and barriers in India are known from various stakeholders through a questionnaire survey. Data analysis is done using the data collected from the literature review and the questionnaire survey. This study highlights the issues in the implementation of IPD in the Indian construction industry. This study concluded that a cultural & behavioural shift is required in the Indian construction industry and also government should make a strong policy push for the successful implementation of IPD in India.

(Memon et al., 2026) [16] examines the expectation–reality gap in IPD through a systematic literature review of 56 studies published between 2018 and 2025. The findings identify 11 expectation clusters and nine reality clusters. The expectation patterns are classified into three broader areas of collaborative practice, commercial and risk management, and governance and delivery, whereas the reality patterns relate to strategic and organisational issues, procedural and relational issues and, lastly, implementation and contractual issues. The discussion shows that IPD should be understood not only as a contractual arrangement but also as a socio-technical and institutional system that requires digital interoperability, trust, aligned objectives, legal readiness, and early stakeholder integration. The paper contributes a pattern–output matrix that links expectation clusters to reality barriers and translates the findings into future research directions for stakeholders.

Khanna et al. 2021 [17] revealed that adopting integrated project delivery while leveraging the BIM process in conjunction with ICT has the potential to effectively deliver mega infrastructure

projects in developing countries. The resistance to change, lack of experience and skills, and lack of awareness among project owners are recognized as the primary obstacles to IPD adoption. The main benefits for practice following adoption could include enhanced project delivery, more effective coordination among stakeholders, and greater transparency with cost and time savings through all stages of the project. It is recommended that the regulatory bodies establish governing standards and frameworks, amend regulations to accept IPD concepts, and upskill the workforce through training and knowledge transfer for its successful adoption. One novel aspect of this study may be recognized since most previous research has focused on limitations, benefits, and adoption frameworks for IPD whereas there has been no definitive study on the practicality of IPD combined with BIM and the use of ICT for successful infrastructure project delivery in developing countries. This study contributes to the body of knowledge by serving as an exemplary paper for future studies on the adoption of BIM and ICT approaches such as cloud computing, blockchain, IoT, and mixed realities to deliver projects with integrated project delivery.

10 CONCLUSION

Integrated Project Delivery (IPD) is a proven project delivery method that can improve construction performance by fostering collaboration, engaging stakeholders early in the process and assigning shared responsibility and clear communication among all stakeholders throughout the project lifecycle. The literature reviewed shows that IPD has many benefits over traditional delivery methods, including increased coordination, decreased inefficiencies, informed decision making, increased project quality, control of project costs, and timely delivery. Communication architecture is considered one of the core elements of IPD that facilitates effective information sharing, improves coordination among stakeholders and fosters integrated project management. Additionally, new digital technologies like Building Information Modelling (BIM), cloud computing, artificial intelligence, blockchain, and Internet of Things (IoT) have enhanced communication and project integration even more. But there are obstacles to wider rollout that include those of organisational culture, contractual arrangements, technology uptake and uniform communications. Improving communication architecture with collaborative approaches and digital solutions is still vital to IID's successful integration and future growth in the construction industry.

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