

EXPLORING IPD AS AN ANTIDOTE TO FRAGMENTATION WITHIN THE UK CONSTRUCTION SECTOR

Sa'id Ahmed¹, Abba Mahmud², Sani Akoh³ and Umar Tariq⁴

¹ *Department of Civil Engineering, Surveying and Construction Management, Kingston University, Kingston upon Thames, London, KT1 2EE, UK*

² *University of Portsmouth, School of Civil Engineering and Surveying, Portsmouth, United Kingdom, PO1 2UP, UK*

³ *University of Salford, School of Science, Engineering and Environment, Manchester, United Kingdom, M5 4WT, UK*

⁴ *University of the West of England, Department of Architecture and the Built Environment, Bristol, United Kingdom BS16 1QY, UK*

The Construction Industry has for long been criticised for poor performance and lack of collaborative culture. Studies over the years have linked these to fragmentation amongst project teams - which still leads to cost overruns and project delays. Collaborative Strategies like IPD, BIM have been developed to address these concerns. Despite the benefits they offer, their implementation is still not prevalence within the UK construction industry. This paper explores IPD as an antidote to fragmentation, in a bit to reveal factors inhibiting its uptake within the UK. The research utilises multiple case study and gathers data from interviews and documentary analysis. Overall, 16 interviews were conducted with construction stakeholders. The study found that although there are glimpses of IPD adoption - mostly within the multidisciplinary settings, yet wider implementation is hindered by commercial practices and cultural norms. The study accentuates the need for both public and private sector clients to embrace IPD in their portfolios and for “commercial actors” to align with the construction business model - as an effort to sustain industry transformation and wider collaborative working.

Keywords: Integrated Project Delivery (IPD); Collaborative Working (CW); Target Value Design (TVD); commercial practices; construction procurement

INTRODUCTION

The importance of the construction industry cannot be overemphasized. The sector plays a significant role in the global economy with a total annual revenue of about USD 15.2 trillion in 2020, which accounted for 13% of the global gross domestic product (GDP), with potential to reach to 13.5% GDP by 2030 (Oxford Economics, 2021). In the UK, the sector is broad and diverse: from design, construction, and infrastructural development, through to the maintenance of buildings and their disposal (NCC Strategy, 2018). However, the sector has long been criticised for its

¹ s.ahmed@kingston.ac.uk

lack of efficiency (Koskela *et al.*, 2002; Farmer, 2018). These challenges have held back the sector's productivity potential. Part of this is linked to fragmentation (HM Government, 2013) which has been a prevalent feature of the industry, resulting in devastating effects on cost performance and client satisfaction (Latham, 1994; Koskela *et al.*, 2018; Arcadis, 2021).

After the economic recession periods, Construction 2025 Report (2013) called for partnership at all levels amongst stakeholders to reduce costs by 33% and speed up time by 50%. This was followed by the Farmer Report (2016), which advocated for the adoption of manufacturing advances e.g., Integrated Project Delivery (IPD), Building Information Modelling (BIM), and off-site production strategies to address fragmentation and improve performance. It seems like galvanising these concepts to achieve the necessary improvement would require comprehensive integrated working practices. Yet, studies have shown that integration within the UK construction industry is fading, largely because of commercial behaviours (Challender, *et al.*; 2016; Ahmed *et al.*, 2022); these behaviours are reinforced by the prevailing procurement protocols and 'institutionalised' factors that surround the usual project delivery model (Sarhan *et al.*, 2018). With this lack of integration in construction practices, commercial misalignment has been reported as hinderance to (CW) in the UK construction industry (Namadi *et al.*, 2018; Sarhan *et al.*, 2018). Conversely, Piroozfar *et al.* (2019) argued that the advancement of IPD and BIM suggest, in theory, that potential improvements can be introduced in this regard. Despite progresses made in introduction, there is very little evidence to suggest that a proportionate adoption of IPD (in relation to BIM) has taken place in the UK construction industry (Dalui *et al.*, 2021). Furthermore, there is less evidence to indicate a sensible change in the existing profile of the procurement model in the UK. As the construction environment becomes more competitive, fragmentation around the project delivery model is now more evident (Bertoni, *et al.*, 2015), and opportunistic practices continued to prevail over partnering (Challender *et al.*, 2014). This has left clients embracing safeguarding approaches as a mechanism to 'bully' contractors, largely through contractual interpretations to maximise their own profits (Pasquire *et al.*, 2015).

With this brief introduction, a few questions arise such as: what are the barriers inhibiting IPD uptake in the UK construction industry? Will IPD help eliminate fragmentation and commercial challenges within the UK construction landscape? The aim of this study is to explore IPD as an antidote to fragmentation and thus reveal factors inhibiting its uptake within the UK construction sector.

METHOD

This research adopted an exploratory qualitative approach using a multiple case study technique - which provides an opportunity to investigate real-life context (Pratt 2009; Yin 2009), addressing the 'what and how' questions. The study chooses this approach given its ability to deeply probe and provide nuanced insights - which aligns with the study's intent that seeks to explore IPD as an antidote to fragmentation issue, and in turn reveal factors inhibiting its uptake within the UK construction industry. The primary research gathered data from interviews, open-ended questions, which provide insights from the views of participants and allowed the authors to understand factors that influence IPD uptake as well as the deterring factors. The study adopts a purposive sampling method in selecting the cases. Bryman (2012) maintain that this allows researchers to choose case(s) that can answer question(s). For example, some

criteria for the case study selection were: (a) the companies that adopts IPD principles (e.g., multi-party agreement, collaborative decision making etc) (b) Integrated practices that cut across project teams and supply-chain groups and (c) domiciled in the UK. Thus, 16 participants participated in the interviews that lasted for 60 minutes comprising of: client, directors (alliance and procurement), designers, contractors, cost consultants, lean practitioners, and suppliers. The participants, possess between 18 to over 20 years of experience, with knowledge around project delivery and commercial practices. The authors focused on early integration during costing/design interactions from the three cases to monitor IPD development in the projects.

Table 1: Illustrates the characteristics of the cases studied

Project Attributes	Case study project 1	Case study project 2	Case study project 3
Nature of the project	Infrastructure	Constriction	Infrastructure
Project location	UK	UK	UK
Nature of works	Design & Construction of water recycling treatment plant	Construction of water recycling treatment plant & sewage works.	Upgrade of highway smart motorway btw 16
Type of Client	Public	Public	Public
Mode of partner selection	Alliance, framework	JV, framework	JV, framework
Procurement arrangement	Centralised procurement system	Design & Build	Design & Build
Contract Sum	£1.2 billion	£200 million	£120 million
Participants information	Client/Contractors/Consultants	Contractors/Project managers/Client	Client/Contractors/Consultants

LITERATURE REVIEW

IPD for Project Delivery System: Antidote to Address Fragmentation

Project delivery systems in the traditional construction model are often used to determine contractual relationships, as seen in the design-bid-build (DBB) systems. So, ‘delivery’ in this arrangement is understood to be a type of transaction. For instance, the DB as seen in the UK setting: is an arrangement that provides clients with the opportunity to interact with a single contracting entity, as opposed to holding contracts with multiple players which would transfer risks (Koskela *et al.*, 2002). Despite the range of options with DBB, DB and Construction Management (CM), owners remain dissatisfied with the litany of overruns, project delays and lower quality (Lichtig, 2006), more precisely in the UK, commercial actors continued to struggle, when responsibilities for design are so far removed from the production process (Mossman *et al.*, 2010), hence, the level of fragmentation. With this growing trend, scholars have maintained that a move towards a system that has better coordination of participants for an integrated delivery of the project is imminent (Egan, 1998 2002; Alarcón and Mesa, 2012).



Figure 1: Three Basic Domains of Project Delivery (Adapted from Alarcon, et al., 2013).

Recently, there has been a shift towards integrated procurement in the UK construction, but it has been piecemeal, partial, and is still far from the norm,

particularly in public sector (Mossman *et al.*, 2010). Whilst in the lean world, this approach continues to offer numerous improvements over the existing models of procurement, consolidating collaboration amongst stakeholders (Attouri *et al.*, 2023). In addition, ‘delivery’ in this domain is understood in terms of the actual work process used for moving the facility from concept to customer (Ballard, 2000), which are accomplished via the three principles in the lean construction triangle, as illustrated in figure 1. These principles typify the project organisation, operating system, and the commercial terms, all integrating stakeholders, and their interests in projects (Thomsen *et al.*, 2009), hence, within these domains, the IPD system was developed, (Attouri *et al.*, 2023). Although the use of collaborative contracting to improve the performance of construction type projects came to prominence in the 1990s in the UK. It developed the previous ideas of partnering which were incorporated into a contractual agreement (Attouri *et al.*, 2023), known as project alliancing. The term IPD emerged in the US in the early 2000s during initiatives to address poor project outcomes of normal construction methods - they fail to deliver projects to cost, schedule, and quality (Ashcraft, 2022). To overcome these limitations, Will Lichtig created a multiparty agreement, the Integrated Form of Agreement (IFoA) (Lichtig, 2006). This requires key delivery partners to pool their proposed profit at risk, jointly manage the project through consensus, and use lean processes during design and construction. IPD was developed in the US within the Lean Construction community as a holistic approach to both contracting and to delivering projects. It is now seen as a method with the potential to revolutionise project delivery. While normal delivery methods are based on transactional contracts, IPD is generally based on a single relational contract. “Relational” because consideration is given to the quality of relationships and processes, not just to the end-product (Roy *et al.*, 2018).

The Innovation behind IPD development revealed a contractual arrangement between principal actors (e.g., owners, architects, builders, consultants, and contractors) who are involved early on, making collaborative decisions; who jointly offer innovation and control as well as respect, trust, and transparency; and who share risks and rewards (Cohen 2010). The method also integrates BIM technology into contracts, which increases value for money (VfM) for building owners (Raisbeck *et al.*, 2010). Figure 2 illustrates an example of IPD and with the traditional DBB delivery models. As shown, the DBB is designed with organisational boundaries working in favor of firms (marked with a clear line), contributing to a hierarchical relational structure. In contrast, stakeholders working in IPD have joint organisational boundaries, where the traditional boundaries of the firms become less significant (stippled lines). Thus, according to Cohen (2010), relations in IPD are dynamic.

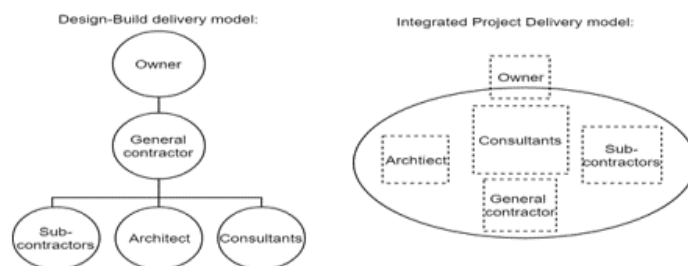


Figure 2: Differences in the structure of D&B and IPD Model (El Asmar *et al.*, 2013)

IPD has been described as an answer to the need for collaboration and the room for innovation in the construction industry (Lahdenperä 2012), as it deals with interdependence through alliances (Scott 2006). Thus, it requires actors to work

outside the boundaries of their traditional roles as constructed in the DBB delivery model. However, when examined closely, IPD seems to relate to the alliancing model, which was developed in the UK. Nonetheless, Howell notes that IPD was not inspired by alliancing, although it has much in common with it, asserting that alliancing ‘is a form of contract and organisational governance’ and Lean Construction is the operating system. So, from a philosophical standpoint, IPD is developed to engage all stakeholders in an intensified collaboration for better project delivery (Lahdenperä, 2012), as well as to continuously improve team relationships in construction (Alarcon *et al.*, 2013; Cohen, 2013). Kent and Becerik-Gerber (2010) argued that the principle of early involvement in IPD could be the cure for the fragmentation problems that industry is faced with and prevent inefficient practices that occur late in construction phases. But they assert that despite the growing interest and benefits, it is still not widely adhered in the UK construction industry. This is even though it updates the alliance model with advances in information technology and provides a fair consideration of risk sharing (Raisbeck *et al.*, 2010).

Table 2: IPD Characteristics Embodied

Case No	Early involvement (Y/N)	Shared risk/reward (Y/N)	Multi-party contract (Y/N)	Collaborative decision-making (Y/N)	Liability waivers (Y/N)	Jointly developed goals (Y/N)
1	Y	N	N	Y	N	N
2	Y	Y	Y	Y	N	Y
3	Y	Y	Y	Y	N	Y
4	Y	Y	Y	Y	Y	N
5	Y	N	N	Y	N	N
6	N	N	N	Y	N	N
7	Y	N	N	N	N	N
8	Y	Y	Y	N	N	Y
9	Y	Y	Y	Y	N	Y

Source: Adapted from Ghassemi and Becerik-Gerber Study (2011)

Although IPD is not entirely suitable for all construction projects. For example, most governmental entities regardless of jurisdiction may be unable to proceed with a true IPD project because governmental procurement codes, rules, statutes and/or regulations may mean that certain professional consultants (e.g., cost consultants) are engaged under a defined fee schedule with a prescribed contract form (Reaves, 2012). However, in the case where IPD may not be suitable, its characteristics may still be applied in negotiating construction contracts to achieve a smoother and more successful project (Kahvandi *et al.*, 2020). This premise was explored by the Ghassemi and Becerick-Gerber (2011) study (see Table 2), which examined nine industry cases with varying degrees of IPD characteristics embodied in the projects. The conducted study revealed that none of the projects utilising IPD characteristics suffered from the commonly observed issues within the industry. However, the authors discovered that IPD suffered from four main barriers, namely: cultural, financial, legal, and technological barriers (Ghassemi and Becerik-Gerber, 2011).

FINDINGS

In this section, empirical findings were gathered to understand the drivers and barriers of IPD uptake in the three cases studied within the UK construction industry. Table 3 presents the cross-case comparison of the three-case study projects examined around the IPD principles utilised. These are discussed under the following sub-themes: key

players involved, agreeing cost collaboratively, supply-chain approach and jointly developed goals, and factors inhibiting IPD uptake with the necessary support required. As revealed in table 3, these themes embodied IPD enactment around business model, contract structure and positive behaviours (AIA CC, 2014). One of the respondents from CSP1 lamented that “most of these principles occurred in our projects, but because most of the times participants are integrated at different periods, thus, affects how others buy into these initiatives”. This means that, engaging teams early is not just a platform for IPD structure, but a necessity that will increase CW, align different stakeholder’s interests, and encourage actions that add value to the project whilst minimising fragmentation.

Table 3: Cross-case study Comparison on IPD Principles

Factors	CSP1	CSP2	CSP3
Early Stakeholders Involvement	Clients’ rep; project manager, estimators, designer, contractor, and suppliers.	Clients’ rep, PM, designers, estimators, contractors, cost engineers, and SC.	Client rep, PM, designers, estimators, contractors, cost engineers, and SC.
Agreeing Cost Mechanism Collaboratively	Moderate - the alliance team managed early costing/design activities with supply-chain but sporadically.	Weak - the JV team and SC only converged to collaborate after the client team has established details.	Weak - there is no close collaboration btw the teams until after detail cost /design is established.
Supply Chain Approach and Jointly Developed Goals	ECI and SC engagement through a centralised system fostering collaboration and team relationships.	Procured through D&B, which revealed system mismatch with the JV and other costing issues.	Although JV was used, but competitive tendering is still applied on SC pricing strategy.
Utilising IPD in projects	Partially Utilised some elements	Not Utilised	Not utilised
Factors inhibiting IPD	Siloed teams within project delivery model	Custom and Practice issues	Fragmented arrangements.
Support required for IPD	Enterprise model	Relational Contracting	Aligning commercial team within the contract.

According to Ballard, (2012) most often owners are not aware of their alternatives at project definition stage, nor are they offered new ideas that would allow efficient planning and discussion on their conditions of requirement. Thus, developing target costs are prematurely set without integration nor the avenue for the team to establish an eloquent cost solution. This of course is slightly like the above cases studied, which revealed comparable limitations (particularly in Case 2&3) in their early integration and costing/design development processes. Also, as discovered from the above cases, the owners often set their project criteria without in-dept interactions or much input from the delivery teams or the SCGs. This indicates that the cross-functional team (including SCGs) are not fully integrated, thus missing the chance to cost the project collaboratively. The logic in this approach is that it incentivises the team, aligning the interests of the designers and constructors with those of the customer (to build a project that meets the requirements of the customer and end-users within their budget) (Cohen, 2012; Ballard, 2016).

This helps the customer have greater cost certainty while enabling the delivery team to increase their margins (Attouri *et al.*, 2023). This also means that often, the all-inclusive validation study is not fully deliberated by the teams, as identified from the cases. This is partly because most of the time the core teams are established after the business case, which signifies that some groups are fragmented, and that reduces team rapport, which is crucial for the team to establish early costs collaboratively (Afonso, 2012). Other key principle lacking from the cases were the utilisation of IPD as a

managerial tool. The absence of this continues to prevent potential cost-savings ideas that could be used during design reviews. Besides, as seen from the cases, these teams are established at different times, and the chances of eliminating design iterations (design-estimate-redesign) jointly, to optimise costs and the advantage trade-offs, is minimal (Grau *et al.*, 2021).

Interestingly, the principles of NEC option C contracting structure were utilised in all the three cases. However, the consistency to encourage SC and tier-2 groups, in the pain/gain share mechanism to consolidate team integration was inadequate. For instance, in all the three cases, relational contracts such as IPD or similar were found to be missing. This is because the contractual relationships within tier-1 are quite dissimilar from those in the tier-2; moreover, they are kept at arm's length and managed differently. Often, these behaviours in practice stifles collaboration, as clients repeatedly specify solutions to their problems without sharing their objectives, and this concealed information needed by the tier-2's to provide optimum value when required (Tillmann *et al.*, 2017).

Accordingly, table 3 revealed that members of the commercial teams, such as the cost consultants/estimators, are only involved with the team when the contract is in play, managing tier-2 and administering contracts. This of course has revealed some practical implications from each of the cases studied, where it has been reported to affect CW. In addition, all the three cases varied on the SC approach and jointly developed goals. CSP1, which was procured under alliancing, adopted a centralised system to manage their SCGs. This has allowed the commercial teams work more closely with the SC, thereby optimising their work processes. This means that, adopting a flexible approach can embed other collaborative advantages, as opposed to the rigid approach shown in CSP2 and CSP3 (Sarhan *et al.*, 2017). Likewise, the partial usage of IPD as spotted in CSP1, has lessened other technical issues that could have occurred on the project, considering the traditional nature of early costing and design activities. This is evident, as CSP1 adopted a strategy that utilised IPD elements in their project, which guided the team to reflect on the project goals and constraints. Hence, this transition further promotes collaboration and minimise the usual process waste during early costing and design activities (Grau *et al.*, 2021).

In terms of factors affecting IPD, the results also complement what was described in previous studies about "custom and practice" which originates from a fragmented system associated with commercial actors (Gottlieb and Kim Haugbølle, 2013; Pasquire *et al.*, 2015; Ahmed *et al.*, 2018). These activities continued to stifle integration in practice through behaviours around contracts, and persistence with due diligence to maintain client profitability at all costs (Sarhan *et al.*, 2017). The recurrence of this in a multidisciplinary setting shows that CW is still patchy, and these behaviours continue to hinder industry reforms. Regarding the nature of support required for IPD and commercial integration, some factors were identified: For example, the emphasis on cost consultants and SCGs to be placed on relational contracts and their roles in IPD process were mentioned. Furthermore, establishing an enterprise model that would create relational contracting for smooth transition between project, commercial teams and SCGs were mentioned (Alarcon *et al.*, 2013).

DISCUSSION

Exploring the concepts of IPD brought some insights and factors that are inhibiting its wider application. Most of the respondents felt that IPD ingredients offer significant benefits in practice. Although, not fully applying their attributes especially as seen in

the cases examined means maximum benefit of integration and minimising fragmentation would not be realised. This also relates to the nature of CW and how they are perceived. The exploration showed there is partial understanding and application on some of the IPD principles. Whilst implementing IPD seems essential in practice, the study discovered that the current project delivery model does not overtly integrate key players (commercial actors and SC groups) even within the multidisciplinary settings. Invariably, stakeholders' integration as practiced in (CSP3) seems to show one-way streak for clients to negotiate/request information when it suits them but lacks interaction. Unsurprisingly, these views are inspired by 'institutional' factors (Sarhan *et al.*, 2018), which seems to compound the issue of fragmentation and cultural resistance. As examined, the use of an IPD contract in the public sector will be difficult to reconcile with the competitive tendering procedures imposed by the Public Procurement Code. This constitutes a barrier to public sector IPD implementation.

Arguably, the law is influenced by the normal way of doing things - the Design-Bid-Build, DBB way. Thus, the principles required to support IPD are either missing or ignored in some of the cases studied. The most apparent is the lack of early team interaction. According to Simonson (2016), the essence of early team interaction is to determine the degree of certainty on the overall costs for owners to make sure sufficient funds are available to finish the project and assist in making informed cost-benefit analysis before construction commence. Apparently, these dialogic conversations do not often take place thus, the chances of attaining cost certainty at conceptual stage remain slender, given that the default approach is to refer to the contingency savings. As, majority of the respondents felt that IPD offer significant benefits in construction. Yet, many also believed that most of its challenges were "institutional" and commercially driven (Elghaish, *et al.*, 2020; Ahmed *et al.*, 2022). Some of the main factors mentioned were "custom and practice" that still exist within the prevailing system, linked with commercial activities, which continue to stifle CW through transactional behaviours and contracts, over persistence with due diligence to maintain client profitability at all costs. As such, the recurrence of this in a multidisciplinary setting shows that IPD is a system change in construction procurement - and this new system requires new thinking habits, new concepts, and new language (e.g., delivery partner or trade partner instead of sub-contractor, tier 1 etc.). Indeed, IPD is more likely to be the most economically advantageous procurement route for any public-sector client provided they can be sufficiently involved in the management of their projects - and its implementation needs strategy that best aligns the interest of all involved, including commercial actors and SCG to mitigate fragmentation and inspire productivity, innovation, and value addition. (Zimina *et al.*, 2012; Seed, 2022).

CONCLUSION

The UK construction Industry is faced with projects that finish over budget, over time, with unexpectedly low quality that leaves the stakeholders unsatisfied. These shortcomings mainly originate in the inherent fragmentation of the industry. The fragmented nature of the industry has resulted in correlated deficiencies such as inappropriate decision making, late or no involvement of the key stakeholders in the design stage, and lack of appropriate collaboration, communication, and trust between stakeholders. These characteristics and its deficiencies have generated barriers to IPD update and collaboration in the practice. The study showed that IPD is faced with barriers such as 'custom and practice', lack of cross-functional integration,

safeguarding and hierarchical roles, and cost driven environment. The study also found that cultural resistance and opportunistic behaviours by project professionals, is playing a significant role in preventing IPD thriving.

IPD's most important factors have been identified in this study as aligning "commercial actors" in a relational contract, creating enterprise construction model as well as trust and collaboration. Lack of these principles have been identified in this study as the key barriers to IPD uptake which could help improve the UK construction industry by defragmenting parties through early team integration - including supply-chain groups and agreeing costing mechanism collaboratively. Hence the industry should address this inherent fragmentation as well as eliminating the barriers mentioned. Accordingly, creating an 'all-inclusive' relational contract that aligns "commercial actors" within the project delivery model could provide the most (economically) advantageous project outcomes for all stakeholders. These factors as explored in the cases indicate that IPD approach is required within the UK context to improve the prevailing practices. This is because the depth for all-inclusive CW with relevant parties is still weak/lacking, and risk and reward sharing mechanisms are not properly understood, especially among the tier-2 groups. For example, Case 2&3 showed a high degree of isolation from the project teams. Although Case 1 seems to be steps ahead in this regard, they could also improve on their IPD development. Indeed, there are barriers to IPD adoption by organisations across the construction sector — it seems clear that they are unlikely to be legal - but mostly based on prevailing practices, habits, and assumptions. Consequently, this implies that without properly embedding IPD principles and aligning commercial actors within the construction delivery model, most of the barriers found will continue to hinder collaboration and efforts for transformational change in the industry.

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