

INTEGRATED PROJECT DELIVERY (IPD): PROJECTING A COMMON GOOD TO KEY PARTICIPANTS AND THE PROJECT

Peter D K Agbaxode¹, Ehsan Saghatforoush and Sitsabo Dlamini

*School of Construction Economics and Management, University of the Witwatersrand, Braamfontein,
Johannesburg, South Africa*

Construction project efficiency is enhanced when the success of key participants is related to the project. This depends on the project delivery method chosen. However, Integrated Project Delivery (IPD) often results in improved project efficiency. There is however an extensive literature on IPD but there is a dearth of research that seeks to provide evidence on its potentials in projecting a common good. Therefore, the aim of this study is to identify the potentials in IPD towards projecting a common good to key participants and the project. The study employed quantitative research approach and used structured questionnaires for data collection. A total of 127 respondents representing 56% response rate out of a sample of 229 participated in this study. This includes construction site supervisors, engineers, quantity surveyors, architects, project managers and managing directors in the construction industry. A pilot study was conducted to determine the validity and reliability of the survey instrument. Assessment of factors in the questionnaire was based on a five-point Likert scale. The scores were transformed to importance indices using Relative Importance Index (RII) to establish the significance of both contractual and behavioral principles of IPD including the significance of early involvement and collaboration of key participants in a project delivery towards projecting a common good. The study provides empirical evidence and significant insight into how IPD has the potential to project a common good to key participants and the project. It is the first of its kind to explore the common good that is inherent in the implementation of IPD in construction project delivery. However, a further research is recommended to build on the current study by considering a case study to further establish the extent of a common good of key participants in implementing an IPD project in the construction industry.

Keywords: common good, IPD, key participants, project delivery

INTRODUCTION

The project delivery method chosen significantly influences the efficiency of the project (Hamzeh *et al.*, 2019). It also determines the success of the project. There are many project delivery methods in use in the construction industry. However, the Traditional Project Delivery (TPD) methods which includes Design Bid Build (DBB), Design and Build (D&B) and Construction Manager at Risk (CM@R) are the widely used methods across the world (Harper *et al.*, 2016; Mesa *et al.*, 2016; Nawi *et al.*,

¹ agbapieroo@gmail.com

2014). These methods have proven not to project the common good of key participants (owner, designers and constructors) due to lack of collaboration or integration throughout the project particularly at the design stage which often leads to project inefficiency (Harper *et al.*, 2016; Mesa *et al.*, 2016; Nawi *et al.*, 2014).

Common good as used in the context of this study refers to the satisfaction of all key participants (owner, designers and constructors) in relation to the success of the project. This is based on the principles of integration and collaboration in IPD. However, Argandoña (1998, p. 1095), defined common good as “everything that is good to more than one person, that perfects more than one person, that is common to all”. Garay (2015, 46-47) also defined the term as “the attainment of material conditions for the development of a joint activity or the coordination of actions so that the result of the joint activity is achieved including each member's own personal development” based on an earlier definition by Finnis (2011).

Integrated Project Delivery (IPD) on the other hand has the potential of reducing the weaknesses in the TPD methods, leads to improved project performance (Mesa *et al.*, 2016), and ensures better collaboration and integration between participants (Hamzeh *et al.*, 2019; Fish, 2011; Raisbeck, Millie and Maher, 2010). A good collaboration has the potential of projecting a common good of key participants and ensuring project success. It is on this premise that IPD was born into the construction industry (El-Asmar, Hanna and Loh, 2013; AIA and AIACC, 2007).

However, despite the broad range of literature on IPD, there is a dearth of research that seeks to provide evidence on the potentials of IPD in projecting a common good. Therefore, this study sought to provide empirical evidence and significant insight into the potentials of IPD towards projecting a common good to key participants and the project. The relevant literature review is presented in the next section.

LITERATURE REVIEW

The widely used project delivery method in the construction sector is the TPD methods, which have been widely criticized in the industry for lack of integration or collaboration to project delivery (Harper *et al.*, 2016; Mesa *et al.*, 2016; Nawi *et al.*, 2014). In defining these TPD methods Mesa *et al.*, (2016) and Fish (2011) indicated that with “DBB”; the owner enters into separate contracts with the designer and the contractor while with the “DB”; a single contract is signed by the client with the design-builder who is a single firm that performs design and construction. With the “CM@R”; the construction manager is hired early in the process to deliver an early cost commitment and to manage issues of schedule, cost, construction and building technology (AIA and AIACC, 2007). This is similar to IPD but lacks the extent of collaboration and integration (Mesa, *et al.*, 2016; Fish, 2011).

These delivery methods do not project the common good of key participants therefore has consequences of projects being completed behind schedule, to poor quality and over cost (Mesa *et al.*, 2016). Others include project reworks, lack of communication and coordination, wastages, conflicts and misunderstanding between project participants (Nawi *et al.*, 2014; Nawi *et al.*, 2012; Kamar and Anuar, 2011; Nawi, Lee and Nor, 2011). Therefore, efforts towards improving the processes involved in the project cycle to enhance efficiency are very paramount in project delivery. There is the need for process and team integration throughout the project since these are key drivers of change necessary for the industry to become more successful (Nawi *et al.*, (2014).

There are numerous definitions for IPD however, American institute of Architects (AIA) and American Institute of Architects California Council (AIACC) define it as a “project delivery approach that integrates people, systems, business structures, and practices into a process that collaboratively harnesses the talents and insights of all participants to optimize project results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction” (AIA and AIACC, 2007, p.1). El-Asmar, Hanna and Loh (2013) also defined it as a project delivery method distinguished by a multi-party agreement with an early involvement of key project participants. IPD offers improvements over existing TPD methods since it promotes a more collaborative or integrated approach between project participants (Hamzeh *et al.*, 2019; Fish, 2011; Raisbeck, Millie and Maher, 2010). It contributes significantly to the success of a project and enhances integration (Nawi *et al.*, 2014). It has the potential to provide better performance to meet owners’ expectations (Mesa *et al.*, 2016). A key reason for which IPD was introduced into the construction industry is because the TPD methods suffer because participant success and project success are not necessarily related (AIA and AIACC, 2007).

In IPD, project participants have an interest in the success of the project and will do what is in the interest of the project (Fish, 2011) thereby projecting a common good. IPD comprise a multidisciplinary team of professionals bound together by alternative forms of agreement that require team members to share risk and reward, contribute equally, and employ alternative processes and technologies, aimed at improving project efficiency (Ilozor and Kelly, 2012). This concept generally begun from the US in which the project participants collaborate to develop a project from the initial concept to the handing over (Nawi *et al.*, 2014). The “Big Room” concept which is a core aspect of IPD allows key participants to collaboratively work in the same room to discuss, define and plan the sustainability and cost goals for the project (Jones, 2014).

An IPD project allows key participants to all sign one contract (multi-party contract) with the aim of eliminating separate motives and contracts that exist within the TPD methods (Becerik-Gerber and Kensek, 2010; AIA and AIACC, 2007). This principle drives the key participants to work towards a set of common goals (Nawi *et al.*, 2014) by tying their success to project success (Jayasena and Senevirathna, 2012; AIA and AIACC, 2007) thereby achieving a common good. The level or degree of collaboration in an IPD project renders it as a philosophy or as a delivery method (Jayasena and Senevirathna, 2012; NASFA, COAA, APPA, AGC and AIA, 2010). IPD as a philosophy is when integrated practices are applied to TPD approaches without a multi-party contract. On the other hand, IPD as a delivery method is when a multi-party contract is signed and employing the full structure of IPD (Jayasena and Senevirathna, 2012; NASFA, COAA, APPA, AGC and AIA, 2010).

Embodied in IPD is contractual and behavioral principles; Contractual principles include key participants bound together as equals; shared financial risk and reward based on project outcome; liability waivers between key participants; fiscal transparency between key participants; early involvement of key participants; jointly developed project target criteria; collaborative decision making. Behavioral principles include mutual respect and trust; willingness to collaborate; and open communication (Jayasena and Senevirathna, 2012; NASFA, COAA, APPA, AGC and AIA, 2010). These principles are the driving force of an IPD project. Critical decision making is improved due to the knowledge and expertise of all key participants (Thomsen *et al.*, 2010) at an earliest practical stage (Jayasena and Senevirathna, 2012). This results in enhancing project efficiency. The common good is ensured by using economic

incentives, encouraging collaborative behavior and creation of an environment that reinforces teamwork through moral and social incentives (O'Connor, 2009). There is also an emphasis on the bonds developed between key participants and their conduct (El-Adaway, 2010).

IPD has high potential of becoming an international standard in the industry due to its substantial benefits and characteristics (Jayasena and Senevirathna, 2012). However, despite its numerous benefits, there are significant barriers to its implementation in the construction industry. A study by Kahvandi *et al.*, (2019) on analysis of the barriers to the implementation of IPD and an earlier research by Becerik-Gerber and Kensek (2010) all identified capital; organizational; and environmental factors as barriers to IPD implementation. Others are legal issues (appropriate contract structures); financial (shared risk and reward); cultural (trust and teamwork); and technological (interoperability between participants).

Notwithstanding the significant barriers to IPD implementation, it has the potential of improving the efficiency of a project delivery. It emphasizes collaboration and integration of key participants from an earliest practical stage of a project and encourages the use of economic incentives. However, there is a dearth of research that seeks to provide evidence on the potentials of IPD in projecting a common good despite the broad range of literature that exist. Therefore, this study sought to provide empirical evidence on the potentials of IPD towards projecting a common good to key participants and the project. The next section presents the research methods.

RESEARCH METHODS

The study employed quantitative research approach due to its positivist nature especially in the use of predetermined and highly structured questionnaire (Saunders *et al.*, 2016). The focus of the questionnaire is to collect factual data in order to critically assess the potentials in IPD towards projecting a common good (Creswell and Creswell, 2017; Saunders *et al.*, 2016). It identified the significance of contractual and behavioral principles in IPD. It provided an effective means of data collection and gave each respondent the opportunity to respond to the same set of questions (Saunders *et al.*, 2016). A five-point Likert scale was used to assess factors in the questionnaire and respondents were asked to score each factor on a scale of 1 to 5 where Not Significant was rated as 1, and Highly Significant rated as 5.

Data analysis was based on the Relative Importance Index (RII) of the factors. According to Holt (2014, p. 6), the most frequently used RII formula in construction management literature is; $RII = \sum W/A \times N$

RII is significant in understanding the importance of different factors in construction management. It was used by Zeng, Tian and Tam (2005, p. 684) in identifying factors affecting design quality and by Ribeiro and Fernandes (2010, p. 170) in exploring agile methods in construction. Therefore the scores from the questionnaire in this study were transformed to importance indices using this formula where RII = Relative Importance Index; W = weight given to each factor by respondents on a scale of 1 to 5 with 1 implying the least and 5 the highest; A = highest weight (5 in this case); and N = total number of respondents. Five important levels were transformed for RII which are; High (H) ($0.8 \leq RII \leq 1$); High-Medium (H-M) ($0.6 \leq RII \leq 0.8$); Medium (M) ($0.4 \leq RII \leq 0.6$); Medium-Low (M-L) ($0.2 \leq RII \leq 0.4$); and Low (L) ($0 \leq RII \leq 0.2$). RII value has a range from 0 to 1 and the higher the value, the more important the factor.

The questionnaire was in five (5) sections; Section A contains demographic information; Section B and C contains contractual and behavioral principles of IPD in improving the efficiency of project delivery respectively; Section D contains factors on early involvement and collaboration of key participants in a project delivery; and Section E makes provision for comments and additional factors from respondents. This study was carried out with professionals in the Ghanaian construction industry and identification of respondents was purposefully carried out through contacts, and LinkedIn. Data collection was done online through emails, LinkedIn and what-sup with a sample size of 229 composed of site supervisors, engineers, quantity surveyors, architects, project managers and managing directors. According to Saunders *et al.*, (2016), a minimum sample size of 30 or more for statistical analyses is acceptable for a study. A purposive sampling technique was used to identify the selection of professionals only as respondents in order to achieve the research aim (Saunders *et al.*, 2016). A total of 127 participants responded representing 56% response rate.

The privacy, anonymity and confidentiality of all respondents were duly assured in their voluntary participation in the research. In ensuring validity and reliability of the questionnaire, a pilot study was conducted with professionals in the industry to test the variables; detect ambiguities and to provide opportunity for additional comments. The next section contains results and appropriate discussions.

RESULT

The results of the questionnaire survey including appropriate discussions are presented in this section based on a total of 127 responses. The role and years of experience of respondents in the construction sector are presented in table 1 and 2 respectively with corresponding frequencies and percentages of participants.

Table 1: Role in the construction sector

Role in the Construction Sector	Frequency	Percent
Foreman	24	18.9
Engineer	36	28.3
Quantity Surveyor	27	21.3
Architect	13	10.2
Project Manager	19	15
Managing Director	8	6.3
Total	127	100

Table 2: Years of experience in construction

Years of Experience in the Construction Sector	Frequency	Percent
1yr - 5yrs	20	15.7
6yrs - 10yrs	36	28.3
11yrs - 20yrs	46	36.2
21yrs - 30yrs	17	13.4
31yrs - 40yrs	8	6.4
Above 40yrs	0	0
Total	127	100

The educational level of respondents was paramount in this study hence presented in figure 1. Majority of respondents were HND, 1st degree and Masters Graduates therefore had a sound knowledge in the field of the study.

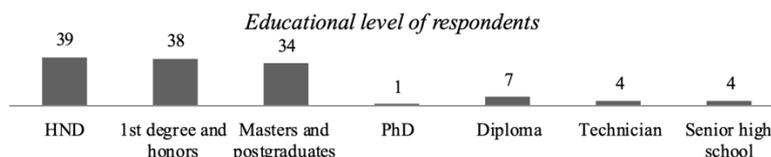


Figure 1: Educational level of respondents

The survey composed of 34 variables out of which 12 were contractual and 7 were behavioral principles of IPD in improving the efficiency of project delivery. A group

of 15 factors were on early involvement and collaboration of key participants in a project delivery.

Contractual Principles of IPD in Improving the Efficiency of Project Delivery

Table 3 presents the RII, ranking and Importance level (IL) of contractual principles of IPD. The RII of 9 contractual principles falls within $0.8 \leq RII \leq 1$ which indicates high importance level. Hence these principles are very significant in ensuring an efficient project delivery towards projecting a common good.

Table 3: RII of Contractual Principles of IPD

S/N	IPD Contractual Principles	RII	Ranking	IL
1	Early involvement of key participants in the project.	0.89	1	H
2	Early contributions of knowledge and expertise by participants.	0.88	2	H
3	Making Collaborative value-based decisions.	0.85	3	H
4	Key participants bound together as equals.	0.85	4	H
5	Jointly and early developed project target criteria.	0.84	5	H
6	When the success of key participants is tied to project success.	0.84	6	H
7	Key participants jointly accountable for any errors in design.	0.83	7	H
8	Sharing financial reward (compensation) based on project outcome.	0.80	8	H
9	Sharing financial risk among key participants.	0.80	9	H
10	Utilization of new technologies and approaches.	0.77	10	H-M
11	Waiving liabilities between key participants.	0.77	11	H-M
12	When there is fiscal transparency between key participants.	0.77	12	H-M

Early involvement of key participants is important in a successful project delivery (El-Asmar, Hanna and Loh, 2013). It enhances process and team integration which are key drivers for the success and common good of a project and participants (Nawi *et al.*, (2014). Early contributions of knowledge and expertise by participants is important to ensure pro-activeness (Jayasena and Senevirathna, 2012). It improves critical collaborative value-based decision making (Thomsen *et al.*, 2010) by enhancing jointly and early developed project target criteria that leads to project success (Fish, 2011). Key participants are bound together as equals by signing a multi-party contract before starting the project (Becerik-Gerber and Kensek, 2010; AIA and AIACC, 2007) hence enhances integration (Nawi *et al.*, 2014). The common good of the project and participants is enhanced when the success of key participants is tied to project success (Nawi *et al.*, 2014; Jayasena and Senevirathna, 2012; AIA and AIACC, 2007). This is also achieved when key participants are jointly accountable for any errors in design (Fish, 2011).

Sharing financial reward (compensation) based on project outcome and sharing financial risk among key participants was rated high. This is consistent with a study by Ilozor and Kelly (2012) with emphasis on risk and reward sharing including equal contribution of expertise. Jayasena and Senevirathna (2012) posited that motivation is very paramount for the success of IPD hence incentives are needed to enhance the process (Raisbeck, Millie and Maher, 2010; O’Connor, 2009).

Behavioral Principles of IPD in Improving the Efficiency of Project Delivery

Table 4 presents the RII, ranking and Importance level (IL) of behavioral principles of IPD. The RII of 6 behavioral principles falls within $0.8 \leq RII \leq 1$ which indicates high importance level hence these principles are very significant in ensuring an efficient project delivery towards projecting a common good.

Behavioral principles are very important in projecting a common good in IPD projects. Key participants having mutual respect and trust for each other enhances good relationship and conduct (El-Adaway, 2010) and promotes working towards a set of common goals (Nawi *et al.*, 2014). Another important principle is willingness to collaborate and effective collaboration as key participants. This is consistent with studies by Hamzeh *et al.*, (2019), Nawi *et al.*, (2014) and Raisbeck *et al.*, (2010).

Table 4: RII of Behavioral Principles of IPD

S/N	IPD Behavioral Principles	RII	Ranking	IL
1	Key participants having mutual respect for each other.	0.88	1	H
2	Willingness to collaborate as key participants.	0.88	2	H
3	Effective collaboration as key participants.	0.86	3	H
4	Having mutual trust for each other.	0.85	4	H
5	Open communication among key participants.	0.85	5	H
6	Open information sharing among key participants.	0.81	6	H
7	Ensuring transparent processes throughout the project.	0.78	12	H-M

Early Involvement and Collaboration of Key Participants in a Project Delivery

Table 5 presents the top 12 factors on early involvement and collaboration of key participants out of 15 variables used. These factors fall within $0.8 \leq RII \leq 1$ indicating high importance level. Therefore, they are very significant in ensuring an efficient project delivery towards projecting a common good.

Table 5: RII of Early involvement and collaboration of key participants

S/N	Early Involvement and Collaboration of Key Participants	RII	Ranking	IL
1	Key participants understanding of the owner’s desired outcomes is enhanced and strengthened.	0.87	1	H
2	Effective collaboration by all participants improves the quality of design documentation.	0.83	2	H
3	There is a more timely and informed understanding of the design.	0.83	3	H
4	Improvement in cost control, budget management and financial performance.	0.83	4	H
5	Providing an opportunity for adequate pre-design and design planning.	0.82	5	H
6	Providing an opportunity for strong pre-construction planning.	0.82	6	H
7	An improvement in the quality of the project.	0.82	7	H
8	Provides early and pre-construction anticipation and resolution of design-related issues.	0.81	8	H
9	Improvement in financial performance during the construction phase.	0.81	9	H
10	Early visualization of construction sequencing prior to commencing project.	0.81	10	H
11	There is the provision of adequate budget estimates to inform design decisions.	0.81	11	H
12	An increase in the level of effort by key participants during design phases results in reduced documentation time.	0.80	12	H

The study confirms that key participants understanding of the owner’s desired outcomes is enhanced and strengthened in an IPD. However, the “Big Room” concept facilitates the process (Jones, 2014) and drives key participants to work toward a set of common goals (Nawi *et al.*, 2014). Early involvement and collaboration enable a more timely and informed understanding of the design. It enhances critical decision making (Thomsen *et al.*, 2010) and improves cost control, budget management and financial performance. It provides an opportunity for adequate pre-design, design and pre-construction planning (AIA and AIACC, 2007). This is consistent with a study by Mesa *et al.*, (2016) that IPD has the potential to reduce the weaknesses in the TPD methods and can provide improved performance. However, the study identifies that effective collaboration by key participants improves project quality and ensures integration (Hamzeh *et al.*, 2019; Fish, 2011; Raisbeck, Millie and Maher, 2010).

The ranking of contractual and behavioral principles of IPD including variables on early involvement and collaboration of key participants presents the significance of these factors in ensuring an efficient project delivery. These however emphasize the potential of IPD towards projecting a common good to both the project and key participants. The next section presents conclusion and appropriate recommendation for future research.

CONCLUSION

When the success of key participants is not related to the success of the project, both suffers. Therefore, in ensuring an effective project delivery, the success of the two must be related (AIA and AIACC, 2007). This is the basis of IPD hence the potential of projecting a common good in a project delivery. There is an enhanced collaboration and integration (Hamzeh *et al.*, 2019; Nawi *et al.*, 2014; Fish, 2011; Raisbeck *et al.*, 2010) with better performance that meets participants expectations in IPD (Mesa *et al.*, 2016) when key participants success is tied to project success. IPD projects a common good to key participants and the project by improving construction productivity (AIA and Construction, 2007) particularly when a multi-party agreement is signed thereby eliminating separate motives that exist within the TPD methods (Becerik-Gerber and Kensek, 2010). These principles drive the key participants to work toward a set of common goals (Nawi *et al.*, 2014).

A total of 34 variables on IPD were synthesized for the study. This consists of 12 contractual and 7 behavioral principles respectively including 15 variables on early involvement and collaboration of key participants in a project delivery. The RII of 9 contractual and 6 behavioral principles recorded high importance level including 12 variables on early involvement and collaboration of key participants in a project. This indicates the significance of these variables in ensuring an efficient project delivery that seeks to promote a common good of key participants and the project by tying their success together.

Respondents commented that construction plays a vital role in the world; hence the identified points in the survey are very relevant for projecting a common good in construction. It was also indicated that effective planning of projects is necessary to ensure value for money in construction. Finally, there should be a good team build up where all parties involved will be willing to execute their duties and roles to avoid blame game.

This study presents valuable data to industry practitioners and academics in understanding the inherent potentials in IPD towards projecting a common good to key participants and the project. It presents the significance of contractual and behavioral principles of IPD including variables on early involvement and collaboration of key participants in improving the efficiency of project delivery. It provides an empirical evidence and pragmatic data to expand knowledge on IPD in projecting a common good, a field that has not received adequate research in previous studies. A further research is therefore recommended to build on the current study by considering a case study to further establish the extent of a common good of key participants in implementing an IPD project in the construction industry.

REFERENCES

AIA and McGraw-Hill Construction (2007) *Integrated Project Delivery: A Working Definition*, California Council, Sacramento / The American Institute of Architects

- AIA and AIACC (2007) *Integrated Project Delivery: A guide*, Available from http://info.aia.org/SiteObjects/files/IPD_Guide_2007.pdf [Accessed 19 May 2019].
- Argandoña, A (1998) The stakeholder theory and the common good, *Journal of Business Ethics*, **17**(9-10), 1093-1102.
- Becerik-Gerber, B and Kensek, K (2010) Building Information Modelling in architecture, engineering and construction: emerging research directions and trends, *Journal of Professional Issues in Engineering Education and Practice*, **136**(3), 139-147.
- Creswell, J W (2003) *Research Design: Qualitative, Quantitative and Mixed Method Approaches, 2nd Edition*, Thousand Oaks, CA: Sage Publications.
- Creswell, J W and Creswell, J D (2017) *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*, Thousand Oaks, CA: Sage publications.
- El-Asmar, M, Hanna, A S and Loh, W-Y (2013), Quantifying performance for the integrated project delivery system as compared to established delivery systems, *Journal of Construction Engineering and Management*, **139**(11), 04013012.
- El-Adaway, I H (2010) Integrated project delivery case study: Guidelines for drafting partnering contract, *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, **2**(4), 248-254.
- Finnis, J (2011) *Natural Law and Natural Rights*, Oxford: Oxford University Press.
- Fish, A (2011) *Integrated Project Delivery: The Obstacles of Implementation*, Masters Dissertation, Kansas State University, Department of Architectural Engineering and Construction Science.
- Garay, J P (2015) The concept of work in a common good theory of the firm, *Business and Professional Ethics Journal*, **34**(1), 45-70.
- Hamzeh, F, Rached, F, Hraoui, Y, Karam, A J, Malaeb, Z, El-Asmar, M and Abbas, Y (2019) Integrated project delivery as an enabler for collaboration: A Middle East perspective, *Built Environment Project and Asset Management*, **9**(3), 334-347.
- Harper, C M, Molenaar, K R and Cannon, J P (2016) Measuring constructs of relational contracting in construction projects: The owner's perspective, *Journal of Construction Engineering and Management*, **142**(10), 04016053.
- Holt, G D (2014), Asking questions, analysing answers: Relative importance revisited, *Construction Innovation*, **14**(1), 2-16.
- Ilozor, B D and Kelly, D J (2012) Building Information Modelling and Integrated Project Delivery in the commercial construction industry: A conceptual study, *Journal of Engineering*, **2**(1), 23-36.
- Jayasena, H S and Senevirathna, N S (2012) Adaptability of integrated project delivery in a construction industry, *In: World Construction Conference 2012- Global Challenges in Construction Industry*, 28-30 June 2012, Colombo, Sri Lanka.
- Jones, B (2014) Integrated Project Delivery (IPD) for maximizing design and construction considerations regarding sustainability, *Procedia Engineering*, **95**, 528-538.
- Kahvandi, Z, Saghatforoush, E, Mahoud, M and Preece, C (2019) Analysis of the barriers to the implementation of Integrated Project Delivery (IPD) A meta-synthesis approach, *Journal of Engineering, Project and Production Management*, **9**(1), 2-11.
- Kamar, M and Anuar, K (2011) *Critical Success Factors to Industrialised Building System (IBS) Contractor*, PhD Thesis, Salford, UK: University of Salford

- Mesa, H A, Molenaar, K R and Alarcón, L F (2016) Exploring performance of the integrated project delivery process on complex building projects, *International Journal of Project Management*, 34(7), 1089-1101.
- NASFA, COAA, APPA, AGC and AIA (2010) *Integrated Project Delivery for Public and Private Owners*, Available from <https://coaa.org/Documents/Owner-Resources/Industry-Resources/IPD-for-Public-and-Private-Owners.aspx> [accessed 19 May 2019].
- Nawi, M, Lee, A and Nor, K (2011) Barriers to implementation of the industrialised building system (IBS) in Malaysia, *The Built and Human Environment Review*, 4(1), 22-35.
- Nawi, M N M, Haron, A T, Hamid, Z A, Kamar, A M and Baharuddin, Y (2014) Improving integrated practice through Building Information Modelling-Integrated Project Delivery (BIM-IPD) for Malaysian Industrialised Building System (IBS) construction projects, *Building Information Modelling*, 15(2), 16.
- Nawi, M N M, Lee, A, Kamar, K A M and Zuhairi, A (2012) Critical success factors for improving team integration in Industrialized Building System (IBS) construction projects: The Malaysian case, *Malaysia Construction Research Journal*, 10(1).
- O'Connor, P J (2009) *Integrated Project Delivery: Collaboration Through New Contract Forms*, Minneapolis, MN: Faegre & Benson LLP / American Institute of Architects, 59.
- Raisbeck, P, Millie, R and Maher, A (2010) Assessing integrated project delivery: A comparative analysis of IPD and alliance contracting procurement routes. In: Egbu, C (Ed.), *Proceedings 26th Annual ARCOM Conference*, 6-8 September 2010, Leeds, UK. Association of Researchers in Construction Management, Vol. 2, 1019-28.
- Ribeiro, F L and Fernandes, M T (2010) Exploring agile methods in construction small and medium enterprises: A case study, *Journal of Enterprise Information Management*, 23(2), 161-180.
- Saunders, M, Lewis, P and Thornhill, A (2016) *Research Methods for Business Students, 7th Edition*, Harlow, UK: Pearson Education.
- Thomsen, C, Darrington, J, Dunne, D and Lichtig, W (2010) *Managing Integrated Project Delivery*, Available from <http://www.e-builder.net/Documents/IPD.pdf>
- Zeng, S, Tian, P and Tam, C (2005), Quality assurance in design organisations: A case study in China, *Managerial Auditing Journal*, 20(7), 679.