COLLABORATIVE PROJECT DELIVERY METHODS: A SCOPING REVIEW

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Abstract. Understanding how to systemise, organise, and finance the design, construction, operation, and maintenance activities are all parameters needed to be optimised simultaneously in a Project Delivery Method. To meet the challenges of increasingly complex projects, a new class of delivery methods is emerging. These methods are often labelled “collaborative” since they seek to align the client’s interest with those of the supply chain. The purpose of this article is to present the current state-of-the-art through a review of 156 identified articles concerning Partnering, Integrated Project Delivery, Alliancing, Relational Contracting, and Relationship-Based Procurement. A framework for the methodological procedure based on the state of the art within qualitative research was elaborated and is reported on in this paper. The results show that there is a range of research on collaborative project delivery methods across the world. By analysing the study purposes, important themes generated and delineated as a) Conceptualisation, b) Implementation and experiences, c) Pros & Cons, d) Building Partnership & Social Dimensions, and e) Performance and Success. The paper provides an overview of collaborative project delivery methods identified in the realm of academic journals. Secondly, knowledge gaps have been identified by creating a summary of the body of evidence.

Keywords: project delivery methods, collaboration, partnering, integrated project delivery (IPD), alliancing, relational contracting (RC), relationship based procurement (RBP), partnerships, contracting, procurement.

Introduction

Demand for resource efficiency, emerging Health, Safety, and Environment (HSE) issues, advances in building technology, requests for sustainable production as well as more demanding Building Acts and Regulations, etc. all lead to the continuous increase of contemporary construction project complexity. To address this, Fischer et al. (2017, p. 69) maintain that construction projects need to be optimised according to four parameters: buildable, operable, usable and sustainable. To optimise all parameters, a suitable project delivery method (hereafter PDM) must be selected.

To clarify the use of the term PDM, this study follows the definition outlined by Miller et al. (2000), defining it as “a system for organizing and financing design, construction, operations and maintenance activities that facilitates the delivery of a good or service”. New delivery methods typically emerge as a response to increasingly complex construction projects. These methods are often labelled “collaborative” due to the focus on aligning the interests of the client with the rest of the project supply chain (Oakland & Marosszeky, 2017, p. 15). A plausible argument for this shift is that complex projects require all parties involved to focus on the final product, i.e. find a proper solution to the problem, and not focus on shifting risk or claims procedures, as is often the case in the industry. Another argument for the shift is the risk for work-related crime and other ethical challenges associated with traditional project delivery (Engebø et al., 2017, 2018; Lohne, 2017; Vee & Skitmore, 2003). Actors should seek collaboration to achieve common objectives, instead of competing to achieve diverging ones.

According to the Construction Industry Institute (2003), the purpose of a PDM is to facilitate maximum achievement of the project owner’s objectives. The attention on the project owner’s objectives is well anchored through the Principal-Agent theory. This is, however, challenged by actors and academics seeking to broaden the perspective towards user’s objectives and societal ob-
jectives such as sustainability. The PDM defines the roles through the procurement route, the sequence of project phases, as well as setting a framework for organisation, roles and responsibilities. Tran and Molenaar (2015) state that the choice of PDM is often made ad hoc with little insight into how the decision will influence the final project risk allocation. This argument is supported by, for example, Ladre et al. (2006), maintaining that clients continue to select the same method based on habit, without necessarily considering what suits each project. When choosing PDM, the responsible party may choose from many different types of PDMs currently used in the construction industry. However, the no formalised and structured selection process exists for choosing a suitable PDM (Construction Industry Institute, 2003; Oyetunji & Anderson, 2001). Furthermore, Tran and Molenaar (2015) underline that actors in the construction industry are seeking out alternative PDMs, most notably Partnering, Integrated Project Delivery (IPD) and Alliancing.

Emerging forms of PDMs emphasise aspects such as collaboration throughout the project (Fischer et al., 2017, p. 314). Walker and Lloyd-Walker (2015, p. 95) state that trust, commitment, and the nature of co-learning through collaboration are all linked elements at the core of collaborative PDMs. The research presented in this article assesses the most common collaborative PDMs, notably Partnering, Integrated Project Delivery (IPD), Alliancing, Relational Contracting (RC) and Relationship-Based Procurement (RBP). The classification are loosely based on Walker and Lloyd-Walker (2015).

The use of collaborative PDMs for construction projects raises concerns such as practicalities, organisation, the extensiveness, the process, etc. To pursue consolidation in the research on collaborative PDMs, a scoping review according to the prescription of Arksey and O’Malley (2005) was undertaken. The study addresses the following two research questions:

1. What research has been carried out on Collaborative Project Delivery Methods?
2. What are the most important gaps in the research?

The paper is divided into the following sections. To begin, the theoretical framework is presented in the next section. Next, in the “Methodology” section, the scoping literature review method and how it was carried out. Then, the findings are presented under the sub-sections: “Partnering”, “Alliancing”, “Integrated Project Delivery”, “Relational Contracting”, “Relational-based Procurement”, and “Comparative Studies”. The results are then discussed, following the same structure as the result section. The last section offers the answers to the research questions, identifying the gaps in the literature on collaborative project delivery methods for construction projects and concludes by providing suggestions for future research.

1. Theoretical framework

PDMs are important for everyone that conducting projects, regardless of industry. Further, every project across sector- and industries has a PDM. The PDMs discussed in this paper are mostly applicable to the construction industry as contract and organization is essential parts of the PDM and both contract and organizational structures (traditions and practices) are specific to industries. Following Söderlund (2011, p. 43) projects are classified according to four logics, that is size, institutional and industry context, organisational context, and lastly task features (complexity, uncertainty, etc.). This article emphasises the construction industry context.

Construction projects are described as being unique and not repetitious coming in various shapes, sizes, and complexities (Forbes & Ahmed, 2010, p. 8). They work towards specific schedules and budgets to produce a specific result (Miller et al., 2000). For construction projects, complexity can be understood in terms of differentiation (the number of varied elements) and interdependencies (degree of interrelatedness between these elements). Furthermore, it is proposed that differentiation and interdependencies are seen in the context of organisational, technological, informational complexity dimensions (Baccarini, 1996). These characteristics determine the appropriate actions to manage them successfully, meaning that management techniques must similarly adapt to the environment.

As complexity increases, changes need to be made to the management structures within projects. Project management is based on elements such as integration, systemic management, simultaneous management, the use of teams, and managing functional plans simultaneously and interdependently internal (Williams, 1999). Integration is proposed as a way of managing project complexity as collaborative working actors liaise closely in decisions, understand each other’s requirements and constraints, and have confidence in one another’s commitment to the achievement of a common aim (Austin et al., 2002). The management function of integration is therefore particularly important, and an essential function of project management (Baccarini, 1996). This sets the prerequisite and context for so-called collaborative project delivery methods. A common characteristic for all collaborative project delivery methods is that they seek to provide a framework for integration. Thus, as the trend is shifting towards more collaborative forms of project delivery, it creates a need to synthesise prior knowledge and research on these types of project delivery methods so that knowledge gaps are identified and, in the future, filled.

1.1. Types of project delivery methods

A PDM is a system used for organising and financing design, construction, operations, and maintenance services for a structure or facility by entering into legal agreements with one or more entities or parties (Miller et al., 2000). However, different terminologies concerning the phenomena exist, e.g.:

- Contract Strategy (Warene, 1989);
- Construction Contracting Method (Gordon, 1994);
- Building Procurement Systems (Love et al., 1998b);
- Construction Procurement System (Rwelamila et al., 2000);
Furthermore, studies on specific aspects of project delivery methods by focusing on two key characteristics, integration of delivery and source of finance. The asset of this framework is that it cuts through the jargon and delineates project delivery methods by simplifying the classification that applies to project delivery methods by focusing on two key characteristics, integration of delivery and source of finance. Furthermore, studies on specific aspects of project delivery methods are abundant, see for instance:
- Project Delivery method selection (Chen et al., 2010; Mafakheri et al., 2007; Mostafavi & Karamouz, 2010);
- Characteristics affecting the choice of project delivery method (Liu et al., 2014, 2015, 2016, 2019).

1.2. Emerging project delivery methods

There exist several specific PDMs for designing and constructing buildings and infrastructure. Some PDMs have prevailed for decades, while others have emerged relatively recent. While terminology varies, the dominant paradigm within this field is the division between so-called traditional and relationship-based project delivery methods. This is not a discrete categorisation, rather a continuum. Table 1 provides a categorisation given by Walker and Lloyd-Walker (2015, p. 16): "Traditional – Segregated Design and Delivery procurement Forms", "Focus on Integrating design & delivery processes – emphasising planning and control" and "Focus on integrating project design & delivery teams – emphasising collaboration and coordination". Traditional is described as forms of procurement that tends to separate the design and delivery, typically Design-Bid-Build (DBB). Traditional project delivery is also characterised by a large degree of responsibility for the client. Focus on Integrating design & delivery processes are methods that have some degree of integration, mainly through contractual or physical planning and control systems. As opposing to methods that segregates the Design and Delivery, emerging delivery methods empha-
are all principles needed to be considered when choosing a delivery method (Miller et al., 2000). In summary, the literature is rich in descriptions regarding the need for collaborative project delivery methods, and considerations to be made when implementing such. While actors in the construction industry continuously test new project delivery methods, there exists no coherent framework describing a uniform approach to collaborative project delivery methods.

Collaborative project delivery methods in the context of the construction industry imply a variety of topics like economics, organisation, contracts, procurement, technology, people management, risk management among others. Furthermore, project delivery covers a range of perspectives, i.e. industry, organisation, actors or society. Sullivan et al. (2017) state that researchers need identifying clear advantages and disadvantages of each PDM in specific situations. However, before moving forward, it is evident that there exists a need for a comprehensive review of the current state of research on collaborative project delivery methods. This is especially true for relatively new types of collaborative PDMs that lack empirical based evidence regarding performance (Mesa et al., 2016). PDM is important for every instance that conducts project work, regardless of industry. Thus, it is of importance to project management as a field. Every project (across sector- and industries) has a PDM. Professional actors have well developed PDM’s, while others may have less so. The PDM forms the structure of the decision-making- and of the project, on which every project owner depends to achieve effective governance, and every project manager needs to control his/ her project. The project delivery methods discussed in this paper is mostly applicable to the construction industry as contract and organization is essential parts of the PDM and both contract and organizational structures (traditions and practices) are specific to industries.

2. Methodology

This study uses a scoping review methodology. The scoping methodology was chosen as the strengths of this method is that it provides a framework for creating an overview of the state of a field as well as serving as a specific tool for mapping a broad and diverse topic that collaborative project delivery methods is. Since the method is less rigid than a systematic review, it is possible to impose flexibility in selection and inclusion of literature; for example, by including literature with a wide range of study designs and methodologies, and to combine qualitative and quantitative studies, which again is a necessity when assessing literature within the field of project management and project delivery method where no coherent paradigm regarding study design exists.

The methodology originates from the field of medicine, but have been successfully adopted within other fields (see for example, Davis et al., 2015; Griffiths et al., 2009; Lohne et al., 2019; O’Donnell et al., 2017). Furthermore, the methodological approach is concerned with the identification of the current state of understanding within a chosen field. Often, it addresses an exploratory research question aimed at mapping key concepts and research gaps, by searching, selecting and combining existing knowledge (Arksey & O’Malley, 2005; Colquhoun et al., 2014). According to Arksey and O’Malley (2005), there
are at least four common reasons for undertaking scoping reviews. This paper is concerned with identifying gaps in the existing research literature regarding Collaborative Project Delivery Methods.

This scoping review implements the framework outlined by Arksey and O’Malley (2005). The framework consists of five steps: 1. Identify the research question; 2. Identify relevant studies; 3. Study selection; 4. Chart the data; and 5. Collate, summarise and report the results. However, it also implements the contribution to the methodology made by Levac et al. (2010), Daudt et al. (2013), and Colquhoun et al. (2014). Levac et al. (2010) propose some clarification regarding the particular framework, drawing from their own experience. Daudt et al. (2013) offer specific recommendations such as being flexible regarding the research questions and engaging the whole research team throughout every step of Arksey and O’Malley’s (2005) framework. Colquhoun et al. (2014) contribute with clarity to the definition and methodology itself.

Before starting the review, methodical guidelines were set. In the initial stages, it was chosen to emphasise original studies published in peer-reviewed journals and conference proceedings from the last 30 years. Articles published in conference proceedings were filtered out later in the review process. These boundaries sharpened the scope of the search, as the study is limited to a population of publications that exclude popular science, industry reports, and Governmental reports. The methodical guidelines gave clear boundaries for the scoping review. The methodical guidelines are summarised in Table 3.

Studies regarded as relevant were identified within the sources presented in column 2, Table 3. The chosen databases were perceived to comprehend key publishers and journals concerning the scientific field of project management in an unbiased manner. Keywords for the literature search were selected from a broad area: project delivery methods. However, since standard terminology does not exist within the area of research, several combinations of keywords were used, such as project delivery, project delivery model, project delivery method, project delivery system, project procurement, procurement strategy, and contract strategy. To narrow the search towards collaborative project delivery methods, more specific terms – such as partnering, alliancing, integrated project delivery (IPD), collaborative, cooperative, relational contracting (RC) and early contractor involvement – were used. The next step was to combine these keywords into search queries. Almost all combinations were tried, as shown in Table 4.

Some of these search queries gave an unmanageable amount (>10000) of hits, and as a response, operators such as “NOT,” “OR” and “*” were used to narrow the search. Furthermore, the hits were filtered using operators such as “TITLE-ABS-KEY” as well as limitations such as “CONSTRUCTION” or “CONSTRUCTION*”. After implementing these limitations, 489 articles were selected for a second refining process. Table 4 gives an extract and overview of the search history. The table shows the number of hits in the respective databases. The numbers in parenthesis are the searches that were thoroughly examined.

In the second refining step, two of the authors filtered out articles after having read the abstracts. Due to the ambition of tightening the scope, a set of exclusion and inclusion criteria was adopted for reducing the number of articles. First, studies considered too narrow were excluded. To elaborate, articles focusing on highly specific aspects of project delivery such as the use of a particular tool (e.g., BIM, co-location, and risk assessment amongst other) were sought to be excluded. Secondly, studies focusing on so-called traditional project delivery (DBB, DB, and Construction manager-at-risk etc.) were excluded. Finally, the included studies had to address specific collaborative project delivery methods according to the categories set in the theoretical framework (notably Partnering, Integrated Project Delivery, Alliancing, Relational Contracting, and Relationship-Based Procurement). When the abstracts were reviewed, and the relevance was unclear, an investigation of the full article was conducted. In this step, two particular recommendations made by Levac et al. (2010) was followed: two researchers including the main author independently reviewed full articles for inclusion, and if a disagreement occurred, a third researcher was included to discuss the matter. At the end of this step, 237 articles remained.

After the second refining step, the necessary data and information on each article was collected. This included geographical location, study purpose, methodology, means of data collection, and important findings.

| 1. General guidelines | 2. Sources | 3. Collected data | 4. Reporting the Results |
|-----------------------|------------|-----------------|-------------------------|
| Sources: electronic databases, selected journals, and specific recommendations; Timespan: last thirty years (1987–2017); Sources must be peer-reviewed Access to full-text; English language | Oria (Norwegian university libraries); Scopus; Elsevier Engineering Village; Web Of Science; ASCE Library; Science Direct; Personal database/ highly; recommended articles by members of the research team | Title, author(s), year of publication, study location; Thematic category (delivery method scrutinised); Keywords; Aim/ purpose of the study; Methodology; Important results | Statistical summaries; Charts/graphs/visual illustrations; Tables sorting findings after study purpose |
Urban mobility is a critical concern for sustainable urban development. The current urbanisation trend has led to an increase in the demand for efficient public transport systems, which often results in the expansion of existing road networks. However, this approach has been limited in its effectiveness, leading to congestion, increased road safety risks, and compromised urban aesthetics.

The literature review was conducted to explore existing knowledge and identify gaps in relation to collaborative project delivery and urban mobility. The search was performed using Scopus, a bibliographic database, with the following search string: TITLE-ABS-KEY (Project delivery (system OR model OR method) AND All Fields (Collaborative OR Integrated)).

The search resulted in 350 articles, which were refined and screened to ensure relevance to the study’s objectives. A total of 156 articles met the inclusion criteria and were included in the final analysis. These articles were classified into various categories, including those concerning Project alliancing, Project Partnering, Integrated project delivery, Alliancing, and Relational contract.

The data was then collated, summarised, and reported in a structured manner. The results were structured to provide a comparative viewpoint. The analysis of the findings revealed that collaborative project delivery has the potential to significantly reduce project costs, improve project outcomes, and enhance stakeholder satisfaction. However, it also highlighted the need for further research on the implementation and success of collaborative delivery models in urban mobility projects.

Geographical location was recorded according to the first author’s institutional belonging. The purpose of the study was identified – in the authors’ own words – and categorised. Regarding methodology, the articles were classified as either “Qualitative”, “Quantitative”, or “Mixed method”. While “mixed method” is a broad term, the classification was used when the study had both quantitative and qualitative aspects of equal importance (i.e., if a study used a preliminary and generic questionnaire, but reported and discussed its findings on qualitative interviews it would not be a mixed method study, but a qualitative one). For data collection, the categories observed include study, case study, interviews, survey, document study or other. A few studies did not inform on these matters, so a qualified assessment of the data collection method was undertaken. An important results category was added for statements that represented a contribution or answer produced by the particular study. All the data and information on each article was recorded in a spreadsheet.

The third refining step started with 237 articles. A significant reduction in the number of articles was achieved after it was decided to exclude conference proceedings publications. The assumptions were that authors with high esteem of their work would aim for an acknowledged journal rather than conference proceedings. Next, all articles that did not address one of the pre-defined categories regarding collaborative project delivery were scrutinised, and articles with research purpose considered outside the scope of the review were removed. After this step, the final sample consisted of 156 articles. In the final step, the 156 articles that met the inclusion criteria were analysed. The sample was divided into six subsets – 62 articles concerning Partnership, 27 articles concerning Alliancing, 28 articles concerning Integrated project delivery, 8 articles concerning Relational-based procurement, 22 articles concerning Alliancing, and 9 articles concerning Relational contracting. The results were structured chronologically according to the research questions.

When it comes to collating, summarising and reporting the results, we did not assess the quality of the studies, as this is – according to Arksey and O’Malley (2005) – outside of the purpose of a scoping review. We realise that the collected data, such as thematic category and methodology, may contain errors. To elaborate, some publications did not offer a description of methodology and others did not provide exact labels such as “qualitative” or “quantitative” leading to some cases where the researchers had to interpret. As a scoping review should provide a narrative or descriptive account of available research, reducing the number of articles included is often necessary, which again raises the question about finding the right balance between breadth and depth, i.e. focusing on covering all available research or providing a detailed analysis of the study.

Within the final sample there was a wide array of purposes. A paper regarding conceptualisation (e.g. a discussion on definitions) is structurally, and in terms of impact, different from a paper reporting and evaluating on performance and success. To better understand the broader use of knowledge, the study decided to sort papers between six sub-categories: “Conceptualisation”, “Implementation and experience”, “Pros & Cons”, “Building partnership & Social Dimensions”, and “Performance and success”. The categories were based on the sample of literature and were made to draw more distinct lines between them.

Table 4. Overview of search history – numbers in brackets are search queries thoroughly reviewed.

| Search number | Additions to the search string (represented using a Scopus search format) | Oria | Web of Science | ASCE | Scopus | ScienceDirect |
|---------------|--------------------------------------------------------------------------|------|----------------|------|--------|---------------|
| 1             | TITLE-ABS-KEY (Project delivery (system OR model OR method) AND All Fields (Collaborative OR Integrated)) | 265  (43) | 158 (17) | 88 (54) | 1727 (67) | 2074 (350) |
| 2             | TITLE-ABS-KEY Project procurement (system OR model OR method) AND All fields (Construction) AND TITLE-ABS-KEY (Collaborative OR Integrated) And Peer-reviewed | 70  (42) | 4699 (16) | 328 (154) | 537 (194) |
| 3             | TITLE-ABS-KEY (Integrated OR Collaborative) Project Delivery AND All fields (Construction) | 286 (75) | 53 (29) | 31 (31) | 5437 (82) | 379 (129) |
| 4             | TITLE-ABS-KEY Project Partnering AND TITLE-ABS-KEY (construction) AND Peer reviewed | 672 (199) | 459 (70) | 113 (59) | 1836 (84) | 2130 (23) |
| 5             | TITLE-ABS-KEY Project alliancing AND TITLE-ABS-KEY (construction) AND Peer reviewed | 409 (97) | 126 (10) | 81 (1) | 402 (71) | 25 (25) |
| 6             | TITLE (Collaborative OR Cooperative OR Relational OR Integrated) Project ((system OR model OR method OR Arrangement) AND TITLE-ABS-KEY (construction) AND Peer reviewed | 831  (39) | 869 (79) | 65 (24) | 1189 (24) | 8689 (537) |
| Total         |                                                        | 350  | 247 | 185 | 563 | 721 |

The results were structured to provide a comparative viewpoint. The results were structured chronologically according to the research questions. Within the final sample there was a wide array of purposes. A paper regarding conceptualisation (e.g. a discussion on definitions) is structurally, and in terms of impact, different from a paper reporting and evaluating on performance and success. To better understand where the body of knowledge is most mature it was decided to sort papers between six sub-categories: “Conceptualisation”, “Implementation and experience”, “Pros & Cons”, “Building partnership & Social Dimensions”, and “Performance and success”. The categories were based on the sample of literature and were made to draw more distinct lines between them. While this is a simplification (i.e. a paper can report on Performance, but also discuss Pros & Cons overall), an approach where a paper could inhabit several sub-categories would muddy the field. The sub-categories with central keywords are found in Table 5.
The review has certain of limitations. First, the “scoping review” approach is less strict than, for example, “systematic reviews”, however, this allows for a more rapid mapping that again is beneficial for an expanding research field. Secondly, it is not a quality assessment, i.e. it takes findings at face value and does not evaluate the quality or the validity of the research. Thirdly, it is not a recommendation or ranking of the body of literature. Fourth, all included articles are written in English.

3. Results

The following section outlines the findings from the review process, as according to the research questions. A categorisation of the 156 articles in the final sample resulted in the distribution shown in Figure 1. The final sample included 62 “Partnering” articles, 27 “Alliancing” articles, 28 “Integrated project delivery” articles, 8 “Relational-based procurement” articles, 22 “Relational contracting” articles and 9 “comparative” articles. Figure 2 shows the method distribution. As we can see, the distribution is relatively even, indicating that there does not exist one favoured or dominant method for researching project delivery methods.

Figure 3 shows publications sorted after the geographical (based on institution/ university) belonging of the main author. As we can see, only 21 different countries are represented which is just above 10% of all countries recognised by the UN. The low representation implies that this research field is still immature, at least in regards of global reach. Furthermore, there is an Anglo-American dominance, followed by China/ the South-East Asia region, and then the Nordic countries.

| Study Purpose | Keywords |
|---------------|----------|
| Conceptualisation | Overview / Definition / Description / Conceptualisation / Philosophical Framework / Infrastructure / Model / Procurement Approach |
| Implementation and Experiences | Implementation / Adoption / Lessons Learned / Adoption of the Practice |
| Pros & Cons | Benefits/ Problems/ Issues/ Barriers Incentives/ Reasons for Partnering/ Success Factors |
| Building Partnership & Social Dimensions | Trust, Motivation, Commitment, Personal Behaviour, etc. Owner-Contractor Relationship Partnering Relationship |
| Performance and Success | Analysis of Project Performance for Partnering Projects/ Project Control/ Partnering Assessment/ Assessment Tools |

Table 5. Study purpose categorisation and keywords

Figure 1. Distribution according to categories

Figure 2. Methodical distribution

Figure 3. Countries & publications
Another observation is that we can to some degree connect geographical distribution and the thematic categories. Even though the sample is small, we can see that the USA is the most prominent promoter of IPD research. Australia has the same role regarding Alliancing research. Partnering is more divergent with the most prominent publishers being USA (17), UK (14), Hong Kong (11), China (6) and Sweden (6). The same goes for research labelled as RC and RBP, with the most prominent being Hong Kong (8), Australia (7), USA (7), Singapore (3) and UK (3). Despite being an interesting observation, it is not possible to generalise based on such a small sample. However, it is possible to argue that the prominence of research on specific methods in geographical areas is possibly correlated to which methods are used by industry in that area. It could also correlate with prominent researchers in each respective area (like Bresnan, Walker, Love, Rahman, etc.). Both are likely to influence the direction of conducted research.

Figure 4 shows publications per year. As we can see, there is a steady increase in publications in this field since emerging in the early nineties. For example, partnering research emerged during the early nineties, while IPD research appeared more than ten years later.

As Figure 5 shows, around 50% of the sample is published in the following four journals: "Journal of Management in Engineering", "International Journal of Project Management", "Journal of Construction Engineering and Management" and "Construction Management and Economics". This observation is valuable for everyone interested in the subject; it gives a clue to where to find relevant research as well as where to submit research. A limited number of authors stand behind a substantial part of the final sample, as indicated by Figure 6. The figure shows authors on at least four publications.

When it comes to what research has been carried out, specific findings can be derived. There seems not to be one particular methodical approach that stands out. Research on collaborative PDMs is carried out using methods categorised as qualitative, quantitative, conceptual and mixed. A substantial number of the publications within the category partnering, could be due to the loose definition of partnering. Together, the three categories partnering, alliancing and IPD contain 75% of the publications. They represent a substantial part of the identified research on collaborative PDMs. The research field seems to be driven by a limited number of researchers that come from a limited number of countries. Besides, it appears that four journals have published a substantial part of the research. Even though there is confusion in terminology, the field of research seems more concentrated than what was expected from the outset. One reason for the Anglo-
American dominance may be that English is the lingua franca of scientific publication and that this article concerns only publications written in English. Furthermore, it is not farfetched to believe that countries such as France and Germany (one publication each in this sample) are publishing research on the topic, but in their own languages. Table 6 shows research on collaborative PDMs according to the categories and research method. Overall, 29 (18.6%) studies used non-empirical method. There were 53 (34%) studies classified as using a qualitative research approach, and 45 (28.8%) studies classified as using a quantitative research approach. Among the 156 studies, 29 (18.6%) were identified as having a mixed research approach. Conceptual approaches were most prominent in Partnering and Relational-based procurement (22.6% and 25.0%, respectively). For Alliancing, qualitative studies dominated (55.6%). The choice of a qualitative research approach may be due to the ability of qualitative research to provide insight into phenomena. The IPD category was very empirical-heavy (90%) with qualitative (35.7%), quantitative (35.7%) and mixed method (17.9%). Surprisingly, the comparative studies category was not dominated by quantitative research (11.1%), but instead qualitative (44.4%). However, the low number of studies included in the category makes the notion less significant.

### 3.1. Partnering

Partnering was the largest (n = 62) PDM category within the sample. This might be explained by its loose definition or that it was the first “collaborative” PDM to be written about until 1998 (i.e. the only one which “existed”). Partnering may be viewed as the basic – or rather – original collaborative project delivery method, and the starting point from where the others have sprung from. The study purposes show an even distribution of articles across Conceptualisation (25.8%), Implementation and Experiences (12.9%), Pros & Cons (22.6%), Building Partnership & Social Dimensions (22.6%), and Performance and Success (14.5%).

Table 7 below shows the Partnering articles sorted by study purpose and Figure 7 shows the partnering articles by year. As we can see from Figure 7, Partnering seemed to peak at three different occasions, first in 2000, 2003 and then in the year 2007. There are zero publications in this particular sample in the years 1998, 2006 and 2009. After the peak year of 2007, we have seen a steady stream (except in 2009) of publications over the years, albeit no year has more than half the number at the peak. The year without publications may be explained by the emerging and rival concepts or the use of terminology such as integrated project delivery.
3.2. Alliancing

Most of the articles which fall under "Alliancing" can be traced back primarily to Australia and New Zealand. The earliest studies followed the National Museum of Australia-project (Walker, 2002; Hauck et al., 2004), however, as the PDM matured it was adapted into a wider range of projects. The recent years has seen a surge in research interest into Alliancing projects, as shown in Figure 8. A possible explanation for this is due to the increasing number of projects available for post-evaluation and a maturing industry. Table 6 presents the identified literature, categorised by purpose.

The Table 8 below shows the Alliancing articles sorted by study purpose. As seen, Alliancing in a ten-year period from 2001 to 2011 were characterised by sporadically publications. After 2011 a steady increase of publications emerges, possibility due to the growing number of projects using the Alliancing approach.

3.3. Integrated Project Delivery

IPD is an emerging category dominated by conceptual papers, and papers focusing on social dimensions. The emphasis on social dimensions as trust, motivation, commitment, personal behaviour etc. may arise because these factors often are pointed out as benefits from using this project delivery method. As Figure 9 reveals, studies on IPD have increased somewhat consistently since 2013–2014.

Table 7. Partnering

| Study purpose                      | Authors                                                                 | Weight (n/%) |
|-----------------------------------|-------------------------------------------------------------------------|--------------|
| Conceptualisation                 | Bresnen and Marshall (2000c); Cheng et al. (2001); Naoum (2003); Cheng and Li (2004); Lu and Yan (2007b); Bresnen (2007); Bygballe et al. (2010); Eriksson (2010); Hartmann and Bresnen (2011); Gottlieb and Jensen (2012); Eriksson (2015); Du et al. (2016); Brve et al. (2017); Anthony et al. (2017); Conley and Gregory (1999); Eriksson and Pesämaa (2013) | n = 16 25.8% |
| Implementation and Experiences    | Osama (1994); Larson and Gray (1994); Peña-Mora and Harpoth (2001); Humphreys et al. (2003); Manley et al. (2007); Eriksson and Nilsson (2008); Bayliss et al. (2004); Beach et al. (2005) | n = 8 12.9% |
| Pros & Cons                       | Li et al. (2001); Ng et al. (2002); Packham et al. (2003); Chan et al. (2003a, 2003b); Wood and Ellis (2005); Lu and Yan (2007a); Alderman and Ivory (2007); Crespin-Mazet and Portier (2010); Chan et al. (2013); Mollaoglu et al. (2015); Black et al. (2000); W. T. Chen and T.-T. Chen (2007); Chan et al. (2008) | n = 14 22.6% |
| Building Partnership & Social Dimensions | Drexler and Larson (2000); Bresnen and Marshall (2000a, 2000b, 2002); Swan and Khalfan (2007); Kadefors et al. (2007); Mason (2007); Laan et al. (2011a); Du et al. (2016); Cheng (2016); Wang et al. (2016); Lazar (2000); Cheung et al. (2003); Cacamis and Asmar (2014) | n = 14 22.6% |
| Performance and Success           | Weston and Gibson (1993); Larson (1995, 1997); Krebs and Epstein (1996); Gransberg et al. (1999); Black et al. (2000); Ali et al. (2010); Anderson and Polkinghorn (2011); Chen and Wu (2012) | n = 9 14.5% |

Figure 7. Partnering

Table 8. Alliancing

| Study purpose                      | Authors                                                                 | Weight (n/%) |
|-----------------------------------|-------------------------------------------------------------------------|--------------|
| Conceptualisation                 | Sakal (2005); Yeung et al. (2007); Chen et al. (2012); Johnson et al. (2013); Hosseinian and Carmichael (2013); MacDonald et al. (2013); Vilasini et al. (2014); Lahdenperä (2017) | n = 8 29.6% |
| Implementation and experiences    | Walker et al. (2001); Walker (2002); Keniger and Walker (2002); Hauck et al. (2004); Che Ibrahim et al. (2017); Fernandes et al. (2017); Hietajärvi et al. (2017a, 2017b) | n = 8 29.6% |
| Pros & Cons                       | Love et al. (2010)                                                      | n = 1 3.7%   |
| Building Partnership & Social Dimensions | Davis and Love (2011); Laan et al. (2011b); Yitmen (2013); Lloyd-Walker et al. (2014); Hietajärvi and Aaltonen (2018) | n = 5 18.5% |
| Performance and Success           | Che Ibrahim et al. (2013, 2014, 2015); Chen et al. (2015); Walker et al. (2015) | n = 5 18.5% |
The detailed categorisation of study purposes related to IPD is recorded in Table 9. A reflection from this sub-sample is that the very definition of IPD varies from publication to publication and that sub-terms such as IPD Lite, Lean IPD, etc. have emerged. The fact that the definition fluctuates creates challenges when comparing articles in the sample. The differentiation between IPD and IPD Lite may be that IPD Lite methods do not utilise the Multi contractual framework that so-called “true” IPD projects uses. Instead they seek to emulate the perceived consequences and effects provided by the IPD method.

3.4. Relational contracting

The articles on relational contracting do not point towards a specific research problem. Contrary to the previous categories, relational contracting mainly implies a conceptual approach to procurement, contracting and project delivery. Figure 10 illustrates that relational contracting peaked on two occasions (2006 and 2012) and that no significant trend is emerging, expect the period 2012–2015.

As seen in Table 10, the most commonly reported study purpose was “Pros & Cons” (36%), namely articles focusing on benefits, problems, issues, barriers, incentives, and success factors amongst other.

3.5. Relational-based procurement

The term “Relational-based procurement” is defined as an umbrella term envisaging a spectre of collaborative project arrangements. We have chosen to include this search term/category in this scoping review. The following is a

| Study purpose                          | Authors                                                                 | Weight (n/%) |
|----------------------------------------|-------------------------------------------------------------------------|--------------|
| Conceptualisation                      | Matthews and Howell (2005); Kraatz et al. (2014); Sarkar (2015); Zhang et al. (2016); Sarkar and Mangrola (2016); Ma et al. (2018); Osman et al. (2015, 2017) | n = 8 28.6%  |
| Implementation and Experiences         | Bygballe et al. (2015); Esther Paik et al. (2017); Rowlinson (2017)        | n = 3 10.7%  |
| Pros & Cons                            | El-adaway (2010); Ghassemi and Becerik-Gerber (2011); Nejati et al. (2014); Nida et al. (2015); Nanda et al. (2017) | n = 5 17.9%  |
| Building Partnership & Social Dimensions | Zhang et al. (2012, 2013); Sun et al. (2015); Paolillo et al. (2016); Pishdad-Bozorgi and Beliveau (2016b, 2016a); Pishdad-Bozorgi (2017); Kokkonen and Vaagaasar (2018) | n = 8 28.6%  |
| Performance and Success                | Hanna (2016); Asmar et al. (2016); Xie and Liu (2017); Mesa et al. (2016)   | n = 4 14.3%  |
short summary of our findings. Publications reporting on Relational-based procurement do not follow any particular trend; instead, the term is just sporadically used in research reporting on the phenomena, as seen in Figure 11.

Table 11 profiles how the articles concerning Relational-based procurement were organised according to study purpose. The Relational-based procurement category is dominated by research focusing on Conceptualisation (37.5%), Pros & cons (25%), and Building partnership & Social dimensions (25%). It was rather surprising to see that this category was not dominated by empirical case studies, as the "procurement" label implies some practicality regarding this category. An explanation may be, as seen with some of the other categories, that the case studies seem to use industry labels such as Alliancing, and IPD.

3.6. Comparative studies

The comparative studies category may be an “other” category consisting of studies that did not quite fit into the previous categories. The emergence of comparative studies may be seen as an indicator of a maturity within this particular research field. The different approaches have been around for a sufficient time so that research effort on comparing the approach against each other has been conducted.

The characteristics of the nine studies are summarised in Table 12. As these articles are concerning evaluation or comparison of collaborative project delivery methods, the table lists the studies by delivery methods under scrutiny.

In addition, both Table 12 and Figure 12 show that studies that seek to compare different collaborative project delivery methods emerge sporadically. Unlike the result from the other categories, the comparative studies category results show no evident pattern in increase in research.

4. Discussion

In this section, we discuss our findings and implications for the field as according to the following six main categories – "Partnering", "Alliancing", "Integrated Project Delivery", "Relational Contracting", "Relational-based Procurement", and "Comparative Studies". Within the categories, we present the findings according to the five study purposes Conceptualization, Implementation and Experiences, Pros & Cons, Building Partnership & Social Dimensions, and Performance and Success.
Our scoping review identified 156 studies, a number indicating that research on collaborative project delivery methods is developing. Within the field there is a diverse and growing range of topics being researched. The categorisation of the research based on the study purpose proved to be difficult since several studies had multiple purposes. The solution was to mention the article just once even though it may touch upon other categories. For example, the “Pros & Cons” may overlap with both the “Conceptualisation” and the “Implementation & Experiences” category.

4.1. Partnering

The following consists of a discussion of the Partnering category, following the study purposes Conceptualisation, Implementation and Experiences, Pros & Cons, Building Partnership & Social Dimensions, and Performance and Success. We acknowledge that it can be discussed if some of the articles have been miscategorised.

The conceptionalisation purpose consists of studies that develop or explore the concept of partnering. Partnering may be a specific strategy, but it can also describe a multifaceted practice. For example, Cheng et al. (2001) propose a partnering infrastructure and Cheng and Li (2004) build upon this paper by providing a practical model for partnering. Naoum (2003) introduces an overview of partnering practice. A slightly different take on the category is presented with a model evaluating the applicability of partnering used in a given situation (Lu & Yan, 2007). Another study proposes a buyer-supplier integration model based on clients’ collaborative purchasing practices (Eriksson & Pesámaa, 2013).

Other studies in this category describe specific elements that a partnering model may consist of, such as Eriksson (2010) who separates partnering into mandatory core procedures and collaborative tools. Another view on partnering is to see it as a framework encompassing: participants, objectives, knowledge, skills, tools, and techniques applied to pursue the objectives (Børve et al., 2017). Gottlieb and Jensen (2012) link the partnering concept to institutional theory and governance, seeing partnering as a project governance mechanism, and a collective sense-making process.

When it comes to implementation and experiences, a report from 1994 stated that partnering had shown a promise for improved relationships with contractors and reduced litigation (Osama, 1994). Some years later, a case study from Puerto Rico describes lessons learned from the Tren Urbano project, a $1.5 billion, 17.2-km heavy-rail project (Peña-Mora & Harpoth, 2001). Similarly, a case from the UK lowered costs, improved team approach and created less confrontation (Humphreys et al., 2003). Bayliss et al. (2004) report on a successful partnering venture in Hong Kong, focusing on tools that facilitated its success. In the empirical study done by Eriksson and Nilsson (2008), the client reduced the focus on price and facilitated a relationship based on trust and cooperation. Being slightly different than several other papers in this category, Beach et al. (2005) evaluated the progress UK construction industry made in its adoption of partnering. An important note about this category is that several case studies have been placed into other categories based on their stated study purpose.

Regarding pros & cons and reasons for adopting partnering Black et al. (2000) studied the contractors’, consultants’ and clients’ view on reasons for adopting partnering and what makes it a success. A second study sought to identify the problematic issues associated with project partnering based on contractors’ perceptions (Ng et al., 2002). Chan et al. (2003a) provide a review of 31 barriers to successful implementation of partnering (W. T. Chen & T.-T. Chen, 2007). Packham et al. (2003) found that

| Comparing | Authors |
|-----------|---------|
| Partnering/Alliancing | Manley (2002); Walker et al. (2002) |
| IPD/Relational Contracting | Chan et al. (2016) |
| Relationship-Based Procurement/Alliancing | Lahdenperä (2010) |
| Project Partnering/Project Alliancing/Integrated Project Delivery | Lahdenperä (2012) |
| RPB/Partnering | Doloi (2012) |
| Traditional/Integrated Project Delivery | Asmar et al. (2013); Bilbo et al. (2015) |
| Integrated Project Delivery/Alliancing | Heidemann and Gehbauer (2011) |
partnering did not offer many tangible benefits to small construction enterprises and often has a detrimental effect upon the contractor–subcontractor relationship. Chan et al. (2004) followed up on their 2003 paper with an examination of critical success factors, extracted by factor analysis on 41 variables. W. T. Chen and T.-T. Chen (2007), using factor analysis, identified 19 success factors divided into four clusters: collaborative team culture, long-term quality focus, consistent objectives, and resource sharing. Alderman and Ivory (2007) studied how changing commercial pressures, in the context of already fragile relationships, could lead to the abandonment of partnering, while Chan et al. (2008) provided insights into how partnering culture can be successfully developed with an Incentive Agreement. On a more strategic level, Crespin-Mazet and Portier (2010) suggest that the lack of diffusion and understanding of construction partnering may be due to the resistance of purchasers who feel threatened by the structural changes in their purchasing habits. According to Mollaoglu et al. (2015), of the top reported barriers to project partnering, the majority are cultural; and contrary to the literature according to them, none are legislative. On the other hand, factors such as “Faster construction time”, “Improvement of relationship amongst project participants” and “Improvement in communication amongst project participants” have been stated as significant benefits (Chan et al., 2003a). Furthermore, effective management of the partnering process can lead to positive outcomes, such as mutual trust, long-term commitment, creativity, shared vision, problem-solving ability, equity, cost-effectiveness, customer satisfaction and continuous improvement (Li et al., 2001).

In the subcategory of building partnership & social dimensions, the first paper examined the stability in the owner-contractor relationship (Drexler & Larson, 2000). A study the same year demonstrated how cognitive and social dimensions affect the use and impact of incentives (Bresnen & Marshall, 2000b). Furthermore, Bresnen and Marshall (2000a) explored the economic, organisational and technological factors that encourage or inhibit collaboration in practice. They found that people and relationships were considered the heart of collaboration, but that the lack of continuity in relationships frequently undermined attempts to secure the full benefits of collaboration. The nature and quality of relationships between client and contractor have also been studied (Bresnen & Marshall, 2002; Laan et al., 2011a). Cheung et al. (2003) examined the behavioural aspect of partnering; particularly trust as a success factor for partnering. Research also shows how procurement practice is influenced by goals of innovation and collaboration (Kadefors et al., 2007). Cheng (2016) proposes a novel approach with his research on developing an intention-based model according to the theory of planned behaviour. Cacamis and Asmar (2014) suggest the case that advancing the emotional intelligence (EI) of project participants can improve the partnering effort and ultimately result in increased project performance.

Regarding performance and success, a study from 1993 states that construction projects using partnering arrangement experienced significant cost and timesaving (Weston & Gibson, 1993). Other studies quantitatively assessed large samples, 280, 400 and 290 construction projects, respectively (Krebs & Epstein, 1996; Larson, 1995, 1997). Ali et al. (2010), Anderson and Polkinghorn (2011), Gransberg et al. (1999) also analysed the project performance of partnering projects quantitatively. Black et al. (2000) evaluated whether partnered projects in the Texas Department of Transportation performed better on average than non-partnered projects. Chen and Wu (2012) present the principles and algorithm of a project partnering assessment method and a case study to demonstrate the proposed methodology.

Being the category with most articles identified during the review, partnering appears at first sight to be well covered in literature. The articles origin from all over the world, but this project delivery method appears more often in Europe and Asia than in other places of the world. However, while being a project delivery method well covered in research, there are variations in how partnering is defined. Some definitions put weight on contractual terms, while others include multi-faceted practices. When describing multi-faceted practices, terms as trust – not to forget integration – appear. When the respective authors have problems with defining partnering, it may be because the terms trust and integration are hard to define.

If there is one research gap related to the partnering category that should be pointed at, it is that the identified literature does not have a clear description of how multi-faceted practices appears across the current definitions of partnering.

4.2. Alliancing

Amongst the publications with study purpose conceptualisation, Yeung et al. (2007) present a definition of alliancing in construction, clearly distinguishing amongst general prerequisites, hard (contractual) and soft (relationship-based) elements. Chen et al. (2012) explore cost management strategies and the supporting techniques used in project alliancing. Johnson et al. (2013) theorise how to utilise alliancing in federal construction effectively. Hosseinian and Carmichael (2013) derive the optimal gain share / pain share between risk-averse parties in alliancing projects. MacDonald et al. (2013) describe a value for money framework that can be used on alliance projects to improve the consideration of, and reporting of, value for money. While not primarily being about project alliancing, Vilasini et al. (2014) developed and evaluated a framework for process improvement in alliance projects. Lahlänenmaa (2017) aimed to define the means and mechanisms which influence the capacity of alliancing to produce value for money. Sakal (2005) discusses project alliancing as a relational contracting mechanism for dynamic projects.

To examine implementation and experiences, Walker (2002) studied – longitudinally – a successful building
construction project that used an alliancing approach. Walker et al. (2001) outline how the project agreement operating on the Australian National Museum project in Canberra, Australia facilitated a responsible and responsive workplace environment for construction workers. Besides, Keniger and Walker (2002) present a case study of the quality management system on the National Museum of Australia. In a third case study on the National Museum, Hauck et al. (2004) sought to determine to which extent it could be classified as a “collaborative project”. Hietajärvi et al. (2017a) wanted to understand what kinds of integration mechanisms are used and how they are developed during infrastructure alliance projects.

Furthermore, Hietajärvi et al. (2017b) identified key activities of opportunity management in an infrastructure alliance project. Che Ibrahim et al. (2017) explored features that could influence success in alliance contracting in the New Zealand construction industry. Fernandes et al. (2017) investigated whether it makes sense to use project alliancing in more everyday projects.

Love et al. (2010) examined the pros & cons with the alliance relationship development process for price competitive alliances, and how success factors impact different phases of this development process.

Davis and Love (2011) studied the relationship development process as a significant contributor to building partnership and social dimensions. Furthermore, Laan et al. (2011a) provide insights into how a project alliance contract develops cooperative relationships between client and contractor organisations. Using another approach, Yitmen (2013) examined how organisational cultural intelligence potentially affects the strategic alliancing ability to contract firms operating abroad. Another research topic is the no-blame culture and how the alliancing influences it (Lloyd-Walker et al., 2014). The last study with this study purpose investigated how specific characteristics of temporary organisations influences identity formation (Hietajärvi & Aaltonen, 2018).

Regarding performance and success, the first study in this category developed an assessment tool for team integration in alliance projects by using key indicators (KIs) for measuring team integration practice (Che Ibrahim et al., 2013). Che Ibrahim et al. (2015) developed an Alliance Team Integration Performance Index (ATIPI) that measures team integration performance in alliance projects. Che Ibrahim et al. (2014) enhance the existing ATIPI model with quantitative measures for each key indicator. Chen et al. (2015) tested the impact of uncertainty, frequency, and various dimensions of contracting parties’ asset specificity on three transaction cost elements (set-up, monitoring, and enforcement costs). A meta-analysis in this category reports on three studies of completed construction project alliance performances in 2008, 2010 and 2012 (Walker et al., 2015).

Alliancing appears to be a clearly defined project delivery method, at least in the Australian context. Here it could be noted that many of the articles in this category stems from Australia. An overweight of the articles have the study purposes conceptualization, implementation and pros & cons, while an underweight have building partnership & social dimensions and performance & success. The two last study purposes seem to be important in alliances, so the amount of research articles on these could be extended.

### 4.3. Integrated Project Delivery

While Matthews and Howell (2005) conceptualise IPD as a relational contracting mechanism, Kraatz et al. (2014) provide strategic and practical outcomes to guide the uptake of IPD in Australia. Sarkar and colleagues attempted to develop a framework for integrated lean project delivery methods in India (Sarkar, 2015; Sarkar & Mangrola, 2016). Zhang et al. (2016) provide a new method to select project parties for IPD-projects. Ma et al. (2018) suggests a collaboration platform for IPD projects to improve the efficiency of IPD collaboration. Osman et al. (2015) developed a readiness assessment model to implement in IPD construction projects, followed up with a study to assess how ready the Malaysian construction industry is for IPD (Osman et al., 2017).

Bygballe et al. (2015) examine implementation and experiences when studying the interplay between formal and informal contracting in five integrated project delivery projects. Esther Paik et al. (2017) examined the construction industry’s use of integrated project delivery as an innovative method of planning, designing, and building construction projects via inter-organisational teams. Rowlinson (2017) present the process changes required by building information modelling (BIM) and integrated project delivery.

When it comes to pros & cons, El-adaway (2010) presents a list of ten managerial and contractual issues to promote integrated project delivery through strategic partnering. Ghassemi and Becerik-Gerber (2011) investigated how successful IPD projects overcame legal, cultural, financial, and technological barriers. Nejati et al. (2014) studied whether it is possible to use IPD for collaborative mass housing building projects. Nida et al. (2015) stated that significant barriers are rooted in the way public owners perceive IPD. Nanda et al. (2017) investigated what key stakeholders considered to be the pros & cons for improvement in using lean thinking and tools in an IPD process.

Zhang et al. (2012) studied the flexibility of integrated project teams, and how to build partnership and social dimensions. The study was followed up with a summarising of factors that influence collaboration in IPD teams (Zhang et al., 2013). Sun et al. (2015) identified how communication behaviours in inter-organisational teams affect innovation. Paolillo et al. (2016) explored the procedural and social elements of a large commercial construction project utilising people-centred innovation (PCI). Pishdadr-Bozorgi and Beliveau (2016b) analysed the relationship between trust and IPD and offers analysis on how trust-building attributes are supported and leveraged by
IPD (Pishdad-Bozorgi & Beliveau, 2016a). The main author followed up with case studies to explore IPD from the standpoint of trust (Pishdad-Bozorgi, 2017). Lastly, Kokkonen and Vaagasaar (2018) investigated how management produces positive effects for collaboration in multi-partner, temporary collaborations.

Hanna (2016) collected quantitative data and evaluated performance and success of IPD in building construction projects across a wide range of performance metrics. Mesa et al. (2016) showed with a sensitivity analysis that project outcomes were sensitive to communication, alignment of interests and objectives, teamwork, trust, and gain/pain sharing. Asmar et al. (2016) presents the development, validation, and implementation of comprehensive project performance metrics. Xie and Liu (2017) study the relationship between contract provisions and financial incentives in IPD projects.

When it comes to IPD, the review revealed many articles with a descriptive presentation of implementation and experience. The articles apply different definitions of IPD – represented by sub-terms as IPD Lite, Lean IPD etc. The pure IPD articles are often written by authors from – or associated with – American Universities. Therefore, the project delivery methods actually presented share many, but not necessarily all, characteristics. Several of the IPD articles have study purpose related to partnership and social dimensions. Fewer of them study if IPD results in performance and success. The articles describe what is done, but do not provide empirical data on the results of IPD.

4.4. Relational contracting

Rahman and Kumaraswamy (2002) provide a conceptual overview of relational contracting. The same authors offer more insight into the particularities of the concept in their 2004 follow-up paper (Rahman & Kumaraswamy, 2004). Rahman et al. (2007) identified contractual and non-contractual incentives for designing appropriate RC project teams. Yeung et al. (2012) state that five core elements are always included in the conceptualisation of RC, namely “commitment”, “trust”, “cooperation and communication”, “common goals and objective”, and “win–win philosophy”.

Kumaraswamy et al. (2005) – reporting from pros & cons – provided a list of factors facilitating RC, as well as factors deterring RC. Cheung et al. (2006) studied the application of relational contracts and found eight critical factors. Based on implementation and experiences, Ling et al. (2006) found that RC could be facilitated by having top management support, alignment of project objectives, relationship building, and appropriate contractual incentives.

Claims and disputes represent a problem for the construction industry. Yates and colleagues give an overview and describe how such issues are prevalent on projects that use relational contracts. Furthermore, they provide measures to avoid this (Yates & Duran, 2006; Yates & Epstein, 2006). It is observed that trust can offer incentives to RC in construction (Rahman & Kumaraswamy, 2008).

Rahman and Kumaraswamy (2012) state that RC implies collaborative efforts from the stakeholders, and maintenance of the relationships during project execution.

Experiences from specific case studies are documented, for example from the first project to be procured via relationship contracting in South Australia (Zou & Zillante, 2012). El-adaway (2012) studied how risk-retention groups provided insurance coverage against third party claims under relational contracts, and why this approach succeeded. Zhang and Li (2015) provide a theoretical framework for understanding risk perception and financial incentives in RC from the social and individual perspectives.

With regards to building partnerships and social dimensions, Gil and Marion (2012) examined the effect of past and future relationships between contractors and subcontractors in the highway construction market. Ling et al. (2015) developed mathematical models to predict the interpersonal relationships between clients, contractors, and consultants at the end of public projects. A study from Australia suggests that clients and consultants play an important role in setting the tone in interpersonal relationships (Ling et al., 2015).

As for performance and success, Ning and Ling (2015) investigated whether project complicatedness influenced the adoption of RC in public construction projects. Not many studies sought to uncover whether specific characteristics of RC could be linked to project success, but Ling et al. (2014) state that RC could boost project performance.

The lack of articles concerning “building partnerships and social dimensions” and “Performance and success” may be prescribed to the fact that the literature seems to regard Relational contracting as a set of “principles [that] embrace and underpin various approaches (…)” (Rahman & Kumaraswamy, 2002). Thus, a possible explanation to this gap in the research on performance of projects using relational contracting is because performance-studies are using labels that imply real-life project delivery methods such as Alliancing and Integrated Project Delivery. The label and the concept of Relational Contracting are of more academic interest than practical interest. Practitioners might view Relational Contracting as an obscure term only used by academics sitting in their ivory tower. Thus, researchers doing case studies are inclined to use the same labels as practitioners use when reporting on their findings.

4.5. Relational-based procurement

Love et al. (1998a) suggest – on a conceptual level – that concurrent engineering in construction improves the way in which projects are procured. Rahman and Kumaraswamy (2005) examined the importance of a single set of different factors for selecting consultants, contractors, subcontractors, suppliers, and clients for collaborative working arrangements. Kantola and Saari (2016) aimed to reveal the most functioning project delivery systems for nearly zero-energy building projects.
Mollaoglu-Korkmaz et al. (2011) studied how project delivery methods influence an owner’s ability to achieve sustainability goals, based on how they were implemented and the experiences from that. Ey et al. (2014) investigated current practices of collaborative procurement in Australia, focusing less on the pros and more on the cons. Rahman et al. (2016) studied Relationship-based procurement (RBP) approaches in the Australian construction industry and the future direction of collaborative project procurement arrangements.

Dewulf and Kadefors (2012) investigated how the formalised context influenced partnership building and social dimensions. The objective of Kwofie et al. (2017) was to delineate the nature of collaborative practices in the South African construction Industry.

The final sample does not contain any studies directly linking performance and success with Relational-based procurement. One aspect worth mentioning is that no articles about Best Value Procurement (BVP) or Competitive Dialogue (CD) were identified. An explanation for this is that neither Best Value Procurement (BVP) nor Competitive Dialogue (CD) was used as a search term. Another reason is that Best Value Procurement (BVP) and Competitive Dialogue (CD) are relatively “new” terms, so related research is maybe published primarily in conference proceedings (and thus excluded from the final sample).

A limitation of the relational-based procurement category is the use of “procurement”. As stated in the theoretical framework, a project delivery method includes more than the procurement strategy. Procurement involves the selection of the most appropriate actor(s) for delivering the design and construction of the project. It is of limited value to study collaboration if the design, construction, operations and maintenance activities are not involved. There are relatively few hits within the category relational-based procurement, and a clear gap in research regarding performance and success.

4.6. Comparative studies

Manley (2002) provides an overview of the extent to which road agencies nationally and internationally have adopted partnering and alliancing on road projects. Walker et al. (2002) clarify the nature of project alliancing, and how to differentiate between Alliancing and Partnering. Lahdenperä (2010) conceptualise a novel type of two-stage target-cost contracting system, which combines early contractor selection and price containment. Heidemann and Gehbauer (2011) show that with a lean approach, project results will be positively influenced by a cooperative project delivery. Doloi (2012) investigated the underlying attributes and factors critical to the success of relationship agreements compared to traditional practices. Asmar et al. (2013) studied the performance differences between IPD and more established delivery systems. Bilbo et al. (2015) sought to identify the impact(s) of using IPD and Construction Management at Risk as project delivery methods on the construction of healthcare buildings. Lahdenperä (2012) clarifies the similarities and differences between Partnering, Alliancing, Integrated project delivery, and Relational contracting by examining their key features one by one and concerning each other.

A core issue of comparative studies is the challenge of comparing different project delivery methods that are applied to unique projects in a unique context. As seen above, the studies address this by various means. One, for instance, identified metrics such as quality, schedule, and project changes that were comparable across contexts. Others focused on common drivers such as cost efficiency, trust and communication using a questionnaire. However, due to all the variables discussed, care should be taken when interpreting these findings as one cannot easily verify by using control groups. A control group in this instance would be a nearly identical project in a nearly identical context. To sum up, the number of comparative studies of collaborative project delivery methods is limited. It appears to be difficult to compare beyond a description of the methods. To compare whether one method is better suited to build partnership & social dimensions or to a larger extent leads to performance and success is difficult, because projects and their contexts differ. This possibly explains the low number of comparative studies.

4.7. Knowledge gaps

Comparing and contrasting the characteristics of the different concepts is a challenging endeavour, but this article provides some clarification on the concept of collaborative project delivery methods, most evidently by identifying several knowledge gaps in the current body of literature. New PDM’s are, at the core, implemented to ensure success in ways traditional PDM’s are lacking. Partnering is the category which is most well covered in literature. However, there are still variations the concept is defined and reported, and the literature does not describe how multi-faceted practices appear across the current definitions of partnering. Alliancing has been around for a long time, but still has a knowledge gap regarding how to building partnership and why this increases the likelihood of greater performance and project success. The emerging category of IPD is not as well-researched and seems to need more case studies on real projects. Being the “youngest” project delivery method, the category still lacks comprehensive reviews of performance and success.

Even though there is increasing number of articles on the subject, few studies are done on how the project delivery method affected project performance. Therefore, the knowledge is scares on how the characteristic that sets the different project delivery methods apart actually affect performance. The articles may state why the method was chosen, and the rationale behind the selection. For example, by providing a walkthrough on why aligning the interest of the owner with that of the supply-chain should generate better project, without describing the cause-effect relationship between aligning interests and performance of the particular project. Studies related to Performance
and Success tend to use the same label, categorising their research as that practitioners use, i.e. Alliancing or IPD. This is most evident in the discussion surrounding relational contracting i.e. it is a concept gathering academic and theoretically interest but lacks empirical evidence.

Only four out of 156 articles mention performance metrics (quantitative) in their key findings. All four were quantitative in nature. The review identified specific frameworks for measuring the performance of collaborative project delivery methods. However, it seems that these frameworks are not utilised by the research community i.e. by for example test them empirically on projects, conducting comparative case studies etc. It can be argued that several studies articles studied “effects”, or “how (...) affected”. Yet, these studies are often of qualitative nature and conclude that “The key to success of (...) is establishing a clearly defined contract which equitably aligns efforts and rewards (…)”, or similar. One article developed a performance metric, two articles present (same author) one and the last article proposes a need for standard performance indicators.

Soft elements are an important aspect of collaborative PDM. However, few articles study soft elements such as culture explicitly. Even more, soft element such as trust is often regarded as an effect, outcome, or a success factor. On the other hand, a soft element such as collaboration is viewed as a needed prerequisite – but it can also be a desired outcome. Even scarcer are studies that seek to link soft elements and performance, or articles examining the cause effect between hard and soft elements. Although 28 articles highlight “trust” in their conclusion, the number was surprisingly low. Furthermore, trust is often mentioned as a prerequisite needed or as a critical success-factor for building relationships. Trust has become a buzzword surrounding collaborative project delivery methods. The word has emerged to become an abstract concept surrounded by mysticism – as trust is viewed by many scholars and practitioners as being the elusive and highly sought-after ingredient in a successful collaborative PDM.

The core collaborative project delivery methods in construction project are Partnering, Alliancing, and IPD. Relation-based procurement is limited to the strategy of procuring for collaboration, while Relation-based Contracting is mostly of academic interest (philosophy/principles). An explanation may be that the empirical-based research on collaborative PDMs are often descriptive in nature, focusing on describing phenomena’s, situations, and events as they occur. Thus, case studies seem to use industry labels such as Alliancing, and IPD which implies that national and regional context matters. Therefore, constraints such as government, national legislations, standards and local practices all contribute and affect significantly on how and what type of research that are reported. Relation-based procurement, as per definition, is limited to the client strategy for contracting a suitable party to carry out projects. In the light of project delivery methods, the term relational-based procurement proposes structural limitations as to how to study collaboration if construction process (the design, construction, operations and maintenance activities) are not involved.

Conclusions

This paper contributes to the current state of research on collaborative project delivery methods. Firstly, it provides an overview of categories of collaborative project delivery methods identified in the realm of academic journals. Secondly, knowledge gaps in the research literature have been identified by creating a summary of the body of evidence according to the study purpose of the identified articles.

The results offer a structural take on collaborative project delivery methods by examining the categories Partnering, Integrated project delivery, Alliancing, Relational contracting, and Relationship-based procurement according to the study purposes Conceptualisation, Implementation and Experiences, Pros & Cons, Building Partnership & Social Dimensions, and Performance and Success. This study has not assessed the quality, nor does it give a ranking of the body of literature. The findings can help the scholars and practitioners in the construction sector advance their knowledge on collaborative PDMs, as well as provide direction for future research.

What research has been carried out on collaborative project delivery methods?

Our study suggests that a comprehensive endeavour has been carried out within the field of collaborative PDM. However, a substantial part of the sample is centred on a limited number of authors such as Walker, Kumaraswamy, Rahman, Shan, etc. Further, around 50% of the sample is published in four journals: “Journal of Management in Engineering”, “International Journal of Project Management”, “Journal of Construction Engineering and Management” and “Construction Management and Economics”. A remark is the connection between geographical distribution and thematic category. The study reveals that the prominence of research on specific project delivery methods seems to be aligned with the methods used by the industry in the geographical area. USA, for example, is the prominent promoter of IPD research and Australia has the same role with regards to research on Alliancing. The increase in research articles, especially related to IPD and Alliancing may also be related to the steady increase in real-life projects available to conduct research on. As for research in construction, research is very dependent on the industry.

Knowledge gaps – implications

This scoping review identifies needs for more research on collaborative project delivery methods. Table 13 summarises explicitly which PDMs that are studied with which study purpose, and implicitly which topics that require more research.
As the preceding discussion demonstrates, there is some overlap between the PDMs. However, there are knowledge gaps related to each of the PDMs. A clear description of how multi-faceted practices appear across the current definitions of partnering seems to be missing. Alliancing appears to be clearly defined in the Australian context. Social dimensions and performance seem to be missing. Some overlap between the PDMs, however, there are some fundamental elements concerning partnership & social dimensions (i.e. the need for commitment, the need for trust etc.), but not necessarily how to actually promote it.

Additionally, the research on PDMs lacks empirical data on performance. The empirical studies on collaborative PDMs are often descriptive by nature. More specifically, there is a need for more research on the cause-effect relationship regarding certain on the topic of PDMs elements. This is especially true for papers addressing soft elements and culture. Studies describe the need for trust etc., but not necessarily how to actually promote it.

There seems to be no unified theoretical framework for collaborative PDMs, despite an increasing amount of literature. A related issue is that no unified terminology exists, either. The fluctuation in terms, practicalities such as national contractual legislation and standards and cultural differences may be significant barriers. Various regions and professional environments use a variety of terms. This happens on a macro-level (i.e. partnering, alliancing, IPD), but is observed on the micro-level as well. For example, a wide variety of terms are used to describe similar fundamental elements concerning partnership & social dimensions (i.e. the need for commitment, the need for shared objectives, etc.).

Literature does not – to a large extent – consider how context impacts the PDMs. To exemplify, research from Scandinavia may take for granted the high levels of trust that characterises the Scandinavian construction industry. This trust may impact the PDM, but if taken for granted it will affect how research is reported and which research aspects are emphasized. The literature must consider context and not only the relationship between the principal (the client) and the agent (the contractors).

Analyses of the cause-effect relationships are difficult but needed. A collaborative project delivery method includes contractual elements that promote collaboration, and it looks like a common perception that the more contractual elements, the better. However, the elements’ respective contribution to collaboration is unclear. As such, there is a need for more research on the cause-effect relationship regarding certain on the topic of PDMs elements. This is especially true for papers addressing soft elements and culture. Studies describe the need for trust etc., but not necessarily how to actually promote it.

Data availability statement

Data generated and analysed during the study are available from the corresponding author by request.

References

Aarseth, W., Andersen, B., Ahola, T., & Jergeas, G. (2012). Practical difficulties encountered in attempting to implement a partnering approach. *International Journal of Managing Projects in Business*, 5(2), 266–284. https://doi.org/10.1108/17538371211214941

Alderman, N., & Ivory, C. (2007). Partnering in major contracts: Paradox and metaphor. *International Journal of Project Management*, 25(4), 386–393. https://doi.org/10.1016/j.ijproman.2007.01.002

Alhazmi, T., & McCaffer, R. (2000). Project procurement system selection model. *Journal of Construction Engineering and Management*, 126(3), 176–184. https://doi.org/10.1061/(ASCE)0733-9364(2000)126:3(176)
Che Ibrahim, C. K. I., Costello, S. B., & Wilkinson, S. (2014). Establishment of quantitative measures for team integration assessment in alliance projects. *Journal of Management in Engineering*, 31(5), 04014075. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000318

Che Ibrahim, C. K. I., Costello, S. B., & Wilkinson, S. (2015). Development of an assessment tool for team integration in alliance projects. *International Journal of Managing Projects in Business*, 8(4), 813–827. https://doi.org/10.1108/IJMPB-02-2015-0019

Che Ibrahim, C. K. I., Costello, S. B., Wilkinson, S., & Walker, D. H. T. (2017). Innovation in aligning for improved delivery of road infrastructure projects. *International Journal of Managing Projects in Business*, 10(4), 700–720. https://doi.org/10.1108/IJMPB-11-2016-0088

Chen, G., Zhang, G. M., & Xie, M. (2012). Cost management in project aligning: An exploratory investigation. *Applied Mechanics and Materials*, 174–177, 2893–2897. https://doi.org/10.4028/www.scientific.net/AMM.174-177.2893

Chen, G., Zhang, G., & Xie, Y. M. (2015). Impact of transaction attributes on transaction costs in project alliances: Disaggregated analysis. *Journal of Management in Engineering*, 31(4), 04014054. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000259

Chen, T.-T., & Wu, T.-C. (2012). Construction project partnering using fuzzy based decision making methodology. *Journal of the Chinese Institute of Engineers*, 35(3), 269–284. https://doi.org/10.1080/02533839.2012.655462

Chen, W. T., & Chen, T.-T. (2007). Critical success factors for construction partnering in Taiwan. *International Journal of Project Management*, 25(5), 475–484. https://doi.org/10.1016/j.ijproman.2006.12.003

Chen, Y. Q., Liu, J. Y., Li, B., & Lin, B. (2011). Project delivery system selection of construction projects in China. *Expert Systems with Applications*, 38(5), 5456–5462. https://doi.org/10.1016/j.eswa.2010.07.008

Chen, Y. Q., Lu, H., Lu, W., & Zhang, N. (2010). Analysis of project delivery systems in Chinese construction industry with data envelopment analysis (DEA). *Engineering, Construction and Architectural Management*, 17(6), 598–614. https://doi.org/10.1108/09699981011090215

Cheng, E. W. L., & Li, H. (2004). Development of a practical model of partnering for construction projects. *Journal of Construction Engineering and Management*, 130(6), 790–798. https://doi.org/10.1061/(ASCE)0733-9364(2004)130:6(790)

Cheng, E. W. L., Li, H., Drew, D. S., & Yeung, N. (2001). Infrastructure of partnering for construction projects. *Journal of Management in Engineering*, 17(4), 229–237. https://doi.org/10.1061/(ASCE)0742-597X(2001)17:4(229)

Cheng, E. W. L. (2016). Intentions to form project partnering in Hong Kong: Application of the theory of planned behavior. *Journal of Construction Engineering and Management*, 142(12), 04016075. https://doi.org/10.1061/(ASCE)CO.1943-7862.0001200

Cheung, S. O., Ng, T. S. T., Wong, S.-P., & Suen, H. C. H. (2003). Behavioral aspects in construction partnering. *International Journal of Project Management*, 21(5), 333–343. https://doi.org/10.1016/S0263-7863(02)00052-2

Cheung, S. O., Yiu, K. T., & Chims, P. S. (2006). How relational are construction contracts? *Journal of Professional Issues in Engineering Education and Practice*, 132(1), 48–56. https://doi.org/10.1061/(ASCE)1052-3928(2006)132:1(48)

Colquhoun, H. L., Levac, D., O’Brien, K. K., Straus, S., Tricco, A. C., Perrier, L., Kastner, M., & Moher, D. (2014). Scoping reviews: time for clarity in definition, methods, and reporting. *Journal of Clinical Epidemiology*, 67(12), 1291–1294. https://doi.org/10.1016/j.jclinepi.2014.03.013

Conley, M. A., & Gregory, R. A. (1999). Partnering on small construction projects. *Journal of Construction Engineering and Management*, 125(5), 320–324. https://doi.org/10.1061/(ASCE)0733-9364(2001)127:4(346)

Construction Industry Institute. (2003). IR165-2 – Owner’s tool for project delivery and contract strategy selection user’s guide (2nd ed.). https://www.construction-institute.org

Crespin-Mazet, F., & Portier, P. (2010). The reluctance of construction purchasers towards project partnering. *Journal of Purchasing and Supply Management*, 16(4), 230–238. https://doi.org/10.1016/j.jpursup.2010.06.001

Cullen, P.-A. F., & Hickman, R. J. (2012). Conflicts between contract law and relational contracting. *Lebanon Construction Journal*, 49–60.

Daudt, H. M. L., van Mossel, C., & Scott, S. J. (2013). Enhancing the scoping study methodology: A large, inter-professional team's experience with Arksey and O’Malley’s framework. *BMC Medical Research Methodology*, 13(1), 48. https://doi.org/10.1186/1471-2288-13-48

Davis, P., & Love, P. (2011). Alliance contracting: Adding value through relationship development. *Engineering, Construction and Architectural Management*, 18(5), 444–461. https://doi.org/10.1080/09699981111165167

Davis, R., Campbell, R., Hildon, Z., Hobbs, L., & Mitchie, S. (2015). Theories of behaviour and behaviour change across the social and behavioural sciences: A scoping review. *Health Psychology Review*, 9(3), 323–344. https://doi.org/10.1080/17437199.2014.941722

Dewulf, G., & Kafekors, A. (2012). Collaboration in public construction – contractual incentives, partnering schemes and trust. *Engineering Project Organization Journal*, 2(4), 240–250. https://doi.org/10.21573727.2012.684876

Doloi, H. (2012). Empirical analysis of traditional contracting and relationship agreements for procuring partners in construction projects. *Journal of Management in Engineering*, 29(3), 224–235. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000141

Drexler, J. A., & Larson, E. W. (2000). Partnering: Why project owner-contractor relationships change. *Journal of Construction Engineering and Management*, 126(4), 293–297. https://doi.org/10.1061/(ASCE)0733-9364(2000)126:4(293)

Du, L., Tang, W., Liu, C., Wang, S., Wang, T., Shen, W., Huang, M., & Zhou, Y. (2016). Enhancing engineer-procure-construct project performance by partnering in international markets: Perspective from Chinese construction companies. *International Journal of Project Management*, 34(1), 30–43. https://doi.org/10.1016/j.ijproman.2015.09.003

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. https://doi.org/10.1061/(ASCE)LA.1943-4170.0000024

El-adaway, I. H. (2012). Promoting the sustainability of relational contracting through addressing third party insurance obstacles. *Journal of Management in Engineering*, 29(3), 216–223. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000140

El-adaway, I. H., Abotaleb, I., & Eteifa, S. (2017). Framework for multiparty relational contracting. *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, 9(3), 04517018. https://doi.org/10.1061/(ASCE)LA.1943-4170.000238
Kantola, M., & Saari, A. (2016). Project delivery systems for nZEB projects. Facilities, 34(1/2), 85–100. https://doi.org/10.1108/F-03-2014-0025

Ke, Y., Ling, F. Y. Y., & Zou, P. X. W. (2015). Effects of contract strategy on interpersonal relations and project outcomes of public-sector construction contracts in Australia. Journal of Management in Engineering, 31(4), 04014062. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000273

Keniger, M., & Walker, D. H. T. (2002). Quality management in construction: An innovative advance using project alliance in Australia. The TQM Magazine, 14(5), 307–317. https://doi.org/10.10951/095547899021039743

Kokkonen, A., & Vaagaas, A. L. (2018). Managing collaborative space in multi-partner projects. Construction Management and Economics, 36(2), 83–95. https://doi.org/10.1016/j.cme.2017.1347268

Kraatz, J. A., Sanchez, A. X., & Hampson, K. D. (2014). Digital modeling, integrated project delivery and industry transformation: An Australian case study. Buildings, 4(3), 453–466. https://doi.org/10.3390/buildings4030453

Krebs, J. E., & Epstein, A. J. (1996). Project controls within a partnering arrangement for competitive cooperation. In Transactions of 40th AACE International Annual Meeting. Vancouver, Canada.

Kumaraswamy, M. M., Rahman, M. M., Ling, F. Y. Y., & Phng, S. T. (2005). Reconstructing cultures for relational contract systems selection. Construction Management and Economics, 23(7), 783–796. https://doi.org/10.1016/j.cme.2010.487534

Kwofie, T. E., Aigbavboa, C. O., & Matsane, Z. S.-S. (2017). Collaborative practices in South African construction project delivery. International Journal of Construction Supply Chain Management, 7(2), 39–55.

Laan, A., Noorderhaven, N., Voordijk, H., & Dewulf, G. (2011a). Building trust in construction partnering projects: An exploratory case-study. Journal of Purchasing and Supply Management, 17(2), 98–108. https://doi.org/10.1016/j.pursup.2010.11.001

Laan, A., Voordijk, H., & Dewulf, G. (2011b). Reducing opportunistic behaviour through a project alliance. International Journal of Managing Projects in Business, 4(4), 660–679. https://doi.org/10.1108/17538371111164065

Lahdenperä, P. (2010). Conceptualizing a two-stage target-cost arrangement for competitive cooperation. Construction Management and Economics, 28(7), 783–796. https://doi.org/10.1016/j.cme.2010.11.001

Lahdenperä, P. (2012). Making sense of the multi-party contractual arrangements of project partnering, project alliancing and integrated project delivery. Construction Management and Economics, 30(1), 57–79. https://doi.org/10.1016/j.cme.2011.648947

Lahdenperä, P. (2017). Towards a coherent theory of project Allianciing: Discovering the system’s complex mechanisms yielding value for money. Construction Economics and Building, 17(2), 41–61. https://doi.org/10.5130/aceb.v17i2.5292

Larson, E. W. (1995). Project partnering: Results of study of 280 construction projects. Journal of Management in Engineering, 11(2), 30–35. https://doi.org/10.1061/(ASCE)0742-597X(1995)11:2(30)

Larson, E. W. (1997). Partnering on construction projects: A study of the relationship between partnering activities and project success. IEEE Transactions on Engineering Management, 44(2), 188–195. https://doi.org/10.1109/17.584926

Larson, E. W., & Gray, C. (1994). Project partnering in the construction industry: The wave of the future? National Productivity Review, 14(1), 15–24. https://doi.org/10.1002/npr.4040140104

Lazar, F. D. (2000). Project partnering: Improving the likelihood of win/win outcomes. Journal of Management in Engineering, 16(2), 71–83. https://doi.org/10.1061/(ASCE)0742-597X(2000)16:2(71)

Levac, D., Colquhoun, H., & O’Brien, K. K. (2010). Scoping studies: advancing the methodology. Implementation Science, 5(1), 69. https://doi.org/10.1186/1748-5908-5-69

Li, H., Cheng, E. W. L., Love, P. E. D., & Irani, Z. (2001). Co-operative benchmarking: A tool for partnering excellence in construction. International Journal of Project Planning, 19(3), 171–179. https://doi.org/10.1016/S0263-7863(99)00033-2

Ling, F. Y. Y., Ke, Y., Kumaraswamy, M. M., & Wang, S. (2014). Key relational contracting practices affecting performance of public construction projects in China. Journal of Construction Engineering and Management, 140(1), 04013034. https://doi.org/10.1061/(ASCE)CO.1943-7862.0000781

Ling, F. Y. Y., Rahman, M. M., & Ng, T. L. (2006). Incorporating contractual incentives to facilitate relational contracting. Journal of Professional Issues in Engineering Education and Practice, 132(1), 57–66. https://doi.org/10.1061/(ASCE)1052-3928(2006)132:1(57)

Ling, F. Y. Y., Tan, P. C., Ning, Y., Teo, A., & Gunawansa, A. (2015). Effect of adoption of relational contracting practices on relationship quality in public projects in Singapore. Engineering, Construction and Architectural Management, 22(2), 169–189. https://doi.org/10.1108/ECAM-10-2013-0093

Liu, B., Huo, T., Liang, Y., Sun, Y., & Hu, X. (2016). Key factors of project characteristics affecting project delivery system decision making in the Chinese construction industry: Case study using Chinese data based on rough set theory. Journal of Professional Issues in Engineering Education and Practice, 142(4), 05016003. https://doi.org/10.1061/(ASCE)EI.1943-5541.0000278

Liu, B., Huo, T., Meng, J., Gong, J., Shen, Q., & Sun, T. (2015). Identification of key contractor characteristic factors that affect project success under different project delivery systems: Empirical analysis based on a group of data from China. Journal of Construction and Engineering Management, 32(1), 05015003. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000388

Liu, B., Huo, T., Shen, Q., Yang, Z., Meng, J., & Xue, B. (2014). Which owner characteristics are key factors affecting project delivery system decision making? Empirical analysis based on the rough set theory. Journal of Management in Engineering, 34(1), 05014018. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000298

Liu, B., Xue, B., Huo, T., Shen, G., & Fu, M. (2019). Project external environmental factors affecting project delivery systems selection. Journal of Civil Engineering and Management, 25(3), 276–286. https://doi.org/10.3846/jcem.2019.7460

Lloyd-Walker, B. M., Mills, A. J., & Walker, D. H. T. (2014). Enabling construction innovation: the role of a no-blame culture as a collaboration behavioural driver in project alliances. Construction Management and Economics, 32(3), 229–245. https://doi.org/10.1016/j.cme.2014.09.006

Lohne, J. (2017). Ethical behaviour in the design phase of AEC projects. International Journal of Managing Projects in Business, 10(2), 330–345. https://doi.org/10.1108/IJMPB-06-2016-0049

Lohne, J., Kjesbu, N. E., Engebø, A., Young, B., & Laedre, O. (2019). Scoping literature review of crime in the AEC indus-
try. Journal of Construction Engineering and Management, 145(6), 03119002.
https://doi.org/10.1061/(ASCE)CO.1943-7862.0001648
Love, P. E. D., Gunasekaran, A., & Li, H. (1998a). Concurrent engineering: A strategy for procuring construction projects. International Journal of Project Management, 16(6), 375–383. https://doi.org/10.1016/s0263-7863(97)00066-5
Love, P. E. D., Mistry, D., & Davis, P. R. (2010). Price competitive alliance projects: Identification of success factors for public clients. Journal of Construction Engineering and Management, 136(9), 947–956. https://doi.org/10.1061/(ASCE)1076-0342(2010)136:9(947)
Love, P. E. D., Skitmore, M., & Earl, G. (1998b). Selecting a suitable procurement method for a building project. Construction Management and Economics, 16(2), 221–233. https://doi.org/10.1016/0263-7863(98)000208
Lu, S., & Yan, H. (2007b). A model for evaluating the applicability of partnering in construction. International Journal of Project Management, 25(2), 164–170. https://doi.org/10.1016/j.ijipm.2006.09.009
Lu, S., & Yan, H. (2007a). An empirical study on incentives of strategic partnering in China: Views from construction companies. International Journal of Project Management, 25(3), 241–249. https://doi.org/10.1016/j.ijipm.2006.08.004
Lu, S., & Yan, H. (2007b). A model for evaluating the applicability of partnering in construction. International Journal of Project Management, 25(2), 164–170. https://doi.org/10.1016/j.ijipm.2006.09.009
Ladre, O., Austeng, K., Haugen, T. I., & Klakegg, O. J. (2006). A dedicated collaboration platform for Integrated Project Delivery. Automation in Construction, 15(7), 689–696. https://doi.org/10.1016/j.autcon.2010.02.004
MacDonald, C., Walker, D. H. T., & Moussa, N. (2013). Towards a project alliance value for money framework. Facilities, 31(5/6), 279–309. https://doi.org/10.1002/flip.1846
Mafakheri, F., Dai, L., Slezak, D., & Nasiri, F. (2007). Project delivery system selection under uncertainty: Multicriterion multilevel decision aid model. Journal of Management in Engineering, 23(4), 200–206. https://doi.org/10.1061/(ASCE)1089-4258(2007)23:4(200)
Manley, K. (2002). Partnering and alliancing on road projects in Australia and internationally. Road and Transport Research: A Journal of Australian and New Zealand Research and Practice, 11(3), 46–60.
Manley, T. R., Shaw, W. H., & Manley, R. C. (2007). Project partnering: A medium for private and public sector collaboration. Engineering Management Journal, 19(2), 3–11. https://doi.org/10.1080/10429247.2007.11431726
Mason, J. R. (2007). The views and experiences of specialist contractors on partnering in the UK. Construction Management and Economics, 25(5), 519–527. https://doi.org/10.1080/02637830701326828
Matthews, O., & Howell, G. A. (2005). Integrated project delivery: An example of relational contracting. Lean Construction Journal, 2(1), 46–61.
Mejlønder-Larsen, Ø. (2018). Improving collaboration between engineering and construction in detail engineering using a project execution model and BIM. Journal of Information Technology in Construction (ITcon), 23(16), 324–339.
Mesu, H. A., Molenaar, K. R., & 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. https://doi.org/10.1016/j.ijipm.2016.05.007
Migliaccio, G. C., Edward Gibson, G. Jr., & O’Connor, J. T. (2008). Changing project delivery strategy. Public Works Management & Policy, 12(3), 483–502. https://doi.org/10.1177/1087724X07311805
Miller, J. B., Garvin, M., J., Ibs, C. W., & Mahoney, S. E. (2000). Toward a new paradigm: Simultaneous use of multiple project delivery methods. Journal of Management in Engineering, 16(3), 58–67. https://doi.org/10.1061/(ASCE)0742-597X(2000)16:3(58)
Mollaoglu-Korkmaz, S., Swarup, L., & Riley, D. (2011). Delivering sustainable, high-performance buildings: Influence of project delivery methods on integration and project outcomes. Journal of Management in Engineering, 29(1), 71–78. https://doi.org/10.1061/(asce)me.1943-5479.0000114
Mollaoglu, S., Sparkling, A., & Thomas, S. (2015). An inquiry to move an underutilized best practice forward: Barriers to partnering in the architecture, engineering, and construction industry. Project Management Journal, 46(1), 69–83. https://doi.org/10.1002/pmj.21469
Mostafavi, A., & Karamouz, M. (2010). Selecting appropriate project delivery system: Fuzzy approach with risk analysis. Journal of Construction Engineering and Management, 136(8), 923–930. https://doi.org/10.1061/(ASCE)CO.1943-7862.0000190
Nanda, U., Rybkowski, Z. K., Pati, S., & Nejati, A. (2017). A value analysis of lean processes in target value design and integrated project delivery: Stakeholder perception. HERD: Health Environments Research & Design Journal, 10(3), 99–115. https://doi.org/10.1177/193586716670148
Naoum, S. (2003). An overview into the concept of partnering. International Journal of Project Management, 21(1), 71–76. https://doi.org/10.1016/S0263-7863(01)00059-X
Naoum, S., & Egbu, C. (2015). Critical review of procurement method research in construction journals. Procedia Economics and Finance, 21(Suppl. C), 6–13. https://doi.org/10.1016/S2212-5671(15)00144-6
Nejati, I., Javidrabi, M., & Mohabibar, A. H. (2014). Feasibility of using an Integrated Project Delivery (IPD) in mass housing collaborative projects. Advances in Environmental Biology, 8, 211–218.
Ng, S. T., Rose, T. M., Mak, M., & Chen, S. E. (2002). Problematic issues associated with project partnering – the contractor perspective. International Journal of Project Management, 20(6), 437–449. https://doi.org/10.1016/S0263-7863(01)00025-4
Nida, A., Youngcheol, K., & Irtishad, A. (2015). Critical look into the relationship between information and communication technology and integrated delivery in public sector construction. Journal of Management in Engineering, 31(5), 04014091. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000334
Ning, Y., & Ling, F. Y. Y. (2015). The effects of project characteristics on adopting relational transaction strategies. International Journal of Project Management, 33(5), 998–1007. https://doi.org/10.1016/j.ijipm.2014.12.006
O’Donnell, N., Kappen, D. L., Fitz-Walter, Z., Deterding, S., Nacke, L. E., & Johnson, D. (2017). How multidisciplinary is gamification research? Results from a scoping review. In CHI PLAY’17 Extended Abstracts. The ACM SIGCHI Annual Symposium on Computer-Human Interaction in Play (pp. 445–452). Association for Computing Machinery (ACM). https://doi.org/10.1145/3130859.3131412
Oakland, J., & Marosszeky, M. (2017). Total construction management: Lean quality in construction project delivery. Routledge. https://doi.org/10.4324/9781315694351
Osama, A. (1994). Partnering: A team building approach to quality construction management. *Journal of Management in Engineering, 10*(6), 26–29. https://doi.org/10.1061/(ASCE)9742-597X(1994)10:6(26)

Osman, W. N., Mohd Nawi, M. N., Anuar, H. S., Radzuan, K., & Osman, N. (2015). Readiness assessment for implementation of Integrated Project Delivery (IPD) in Industrialized Building System (IBS). *Jurnal Teknologi, 77*(4), 91–95. https://doi.org/10.11133/jt.v77i4.6046

Osman, W. N., Nawi, M. N. M., Zulhumadi, F., Shafie, M. W. M., & Ibrahim, F. A. (2017). Individual readiness of construction stakeholders to implement integrated project delivery (IPD). *Journal of Engineering Science and Technology, 12*, 229–238.

Oyetunji, A., & Anderson, S. (2001). *Rahman, M. M., & Kumaraswamy, M. M. (2008). Relational contracting and team strategy selection: User’s guide. Construction Industry Institute.*

Packham, G., Thomas, B., & Miller, C. (2003). Partnering in the house building sector: A subcontractor’s view. *International Journal of Project Management, 21*(5), 327–332. https://doi.org/10.1016/S0263-7863(02)00046-7

Paolillo, W., Olson, B. V., & Straub, E. (2016). People centered innovation: Enabling lean integrated project delivery and disrupting the construction industry for a more sustainable future. *Journal of Construction Engineering and Research, Article ID 3704289.* https://doi.org/10.1155/2016/3704289

Peña-Mora, F., & Harpoth, N. (2001). Effective partnering in innovative procured multicultural project. *Journal of Management in Engineering, 17*(1), 2–13. https://doi.org/10.1061/(asce)0742-597X(2001)17:1(2)

Pishdad-Bozorgi, P. (2017). Case studies on the role of integrated project delivery (IPD) approach on the establishment and promotion of trust. *International Journal of Construction Education and Research, 13*(2), 102–124. https://doi.org/10.1080/15578771.2016.1226213

Pishdad-Bozorgi, P., & Beliveau, Y. J. (2016a). A schema of trust building Attributes and their corresponding integrated project delivery traits. *International Journal of Construction Education and Research, 12*(2), 142–160. https://doi.org/10.1080/15578771.2015.1118171

Pishdad-Bozorgi, P., & Beliveau, Y. J. (2016b). Symbiotic relationships between integrated project delivery (IPD) and trust. *International Journal of Construction Education and Research, 12*(3), 179–192. https://doi.org/10.1080/15578771.2015.1118207

Rahman, M. M., & Kumaraswamy, M. M. (2002). Joint risk management through transactionally efficient relational contracting. *Construction Management and Economics, 20*(1), 45–54. https://doi.org/10.1080/014619101089862

Rahman, M. M., & Kumaraswamy, M. M. (2004). Contracting relationship trends and transitions. *Journal of Management in Engineering, 20*(4), 147–161. https://doi.org/10.1061/(ASCE)0742-597X(2004)20:4(147)

Rahman, M. M., & Kumaraswamy, M. M. (2005). Relational selection for collaborative working arrangements. *Journal of Construction Engineering and Management, 131*(10), 1087–1098. https://doi.org/10.1061/(ASCE)0733-9364(2005)131:10(1087)

Rahman, M. M., & Kumaraswamy, M. M. (2008). Relational contracting and teambuilding: Assessing potential contractual and noncontractual incentives. *Journal of Management in Engineering, 24*(1), 48–63. https://doi.org/10.1061/(ASCE)0742-597X(2008)24:1(48)

Rahman, M. M., & Kumaraswamy, M. M. (2012). Multicountry perspectives of relational contracting and integrated project teams. *Journal of Construction Engineering and Management, 138*(4), 469–480. https://doi.org/10.1061/(ASCE)CO.1943-7862.0000463

Rahman, M. M., Kumaraswamy, M. M., & Ling, F. Y. Y. (2007). Building a relational contracting culture and integrated teams. *Canadian Journal of Civil Engineering, 34*(1), 75–88. https://doi.org/10.1139/06-119

Rahmani, F., Khalifan, M., & Maqsood, T. (2016). Lessons learnt from the use of relationship-based procurement methods in Australia: Clients’ perspectives. *Construction Economics and Building, 16*(2), 1–13. https://doi.org/10.5130/ajceb.v16i2.4634

Rowlinson, S. (2017). Building information modelling, integrated project delivery and all that. *Construction Innovation, 17*(1), 45–49. https://doi.org/10.1108/CI-05-2016-0025

Rwelamila, P., Talukhaba, A., & Ngowi, A. (2000). Project procurement systems in the attainment of sustainable construction. *Sustainable Development, 8*(1), 39–50. https://doi.org/10.1002/(SICI)1099-1719(200002)8:1<39::AID-SD127+3.0.CO;2-Z

Sakal, M. W. (2005). Project alliancing: A relational contracting mechanism for dynamic projects. *Lean Construction Journal, 2*(1), 67–79.

Sarkar, D. (2015). A framework for development of Lean Integrated Project Delivery Model for infrastructure road projects. *International Journal of Civil and Structural Engineering, 5*(3), 261–271.

Sarkar, D., & Mangrola, M. (2016). Development of lean integrated project delivery model for highway projects. *International Journal of Construction Project Management, 8*(1), 25–42.

Simonsen, S. H. F., Skoglund, M. H., Engebø, A., Varegg, B. E., & Lexdre, O. (2019). Effects of IPD in Norway – A case study of the Tansberg project. In 27th Annual Conference of the International Group for Lean Construction (IGLC), Dublin, Ireland. https://doi.org/10.24928/2019/0157

Sullivan, J., Asmar, M. E., Chalhoub, J., & Obeid, H. (2017). Two decades of performance comparisons for design-build, construction manager at risk, and design-bid-build: Quantitative analysis of the state of knowledge on project cost, schedule, and quality. *Journal of Construction Engineering and Management, 143*(6), 04017009. https://doi.org/10.1061/(ASCE)CO.1943-7862.0001282

Sun, W., Mollaoglu, S., Miller, V., & Manata, B. (2015). Communication behaviors to implement innovations: How do AEC teams communicate in IPD projects? *Project Management Journal, 46*(1), 84–96. https://doi.org/10.1002/pmj.21478

Söderlund, J. (2011). Theoretical foundations of project management: Suggestions for a pluralistic understanding. In P. W. G. Morris, J. Pinto, & J. Söderlund (Eds.), *The Oxford handbook of project management*. Oxford University Press. https://doi.org/10.1093/oxfordhb/9780199563142.003.0003

Swan, W., & Khalifan, M. M. A. (2007). Mutual objective setting for partnering projects in the public sector. *Engineering, Construction and Architectural Management, 14*(2), 119–130. https://doi.org/10.1108/09699980710731254

Touran, A., Gransberg, D. D., Molenaar, K. R., & Ghavamifar, K. (2011). Selection of project delivery method in transit: Driver and objectives. *Journal of Management in Engineering, 27*(1), 21–27. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000027

Tran, D. Q., & Molenaar, K. R. (2015). Risk-based project delivery selection model for highway design and construction. *Journal of Construction Engineering and Management, 141*(12), 04015041. https://doi.org/10.1061/(ASCE)CO.1943-7862.0001024
van de Velde, D., & Ernst, F. (2008). Provision and management of dedicated railway systems: how to arrange competition. In H. Priemus, B. Flyvbjerg, & B. Van Wee (Eds.), Decision-making on mega-projects: Cost-benefit analysis, planning and innovation (Transport economics, management, and policy (pp. 263). Edward Elgar Pub. https://doi.org/10.4337/9781848440173.000211

Vee, C., & Skitmore, C. (2003). Professional ethics in the construction industry. Engineering, Construction and Architectural Management, 10(2), 117–127. https://doi.org/10.1108/09699980310466596

Vilasini, N., Neitzert, T., & Rotimi, J. (2014). Developing and evaluating a framework for process improvement in an alliance project: A New Zealand case study. Construction Management and Economics, 32(6), 625–640. https://doi.org/10.1080/01446193.2013.874565

Walker, D. H. T. (2002). Enthusiasm, commitment and project alliancing: An Australian experience. Construction Innovation, 2(1), 15–31. https://doi.org/10.1108/14714170210814667

Walker, D. H. T., & Lloyd-Walker, B. M. (2015). Collaborative project procurement arrangements. Project Management Institute, Inc.

Walker, D. H. T., Hampson, K., & Peters, R. (2002). Project alliancing vs project partnering: A case study of the Australian National Museum project. Supply Chain Management: An International Journal, 7(2), 83–91. https://doi.org/10.1108/13598540210425830

Walker, D. H. T., Harley, J., & Mills, A. (2015). Performance of project alliancing in Australasia: A digest of infrastructure development from 2008 to 2013. Construction Economics and Building, 15(1), 1–18. https://doi.org/10.5130/ajceb.v15i1.4186

Walker, D. H. T., Peters, R., Hampson, K. D., & Thompson, M. (2001). Achieving a responsive industrial relations environment for construction industry workers: A project alliancing case study. Construction Innovation, 1(4), 211–225. https://doi.org/10.1108/14714170110814613

Wang, T., Tang, W., Du, L., Duffield, C. F., & Wei, Y. (2016). Relationships among risk management, partnering, and contractor capability in international EPC project delivery. Journal of Management in Engineering, 32(6), 04016017. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000459

Wardani, M. A. E., Messner, J. I., & Horman, M. J. (2006). Comparing procurement methods for design-build projects. Journal of Construction Engineering and Management, 132(3), 230–238. https://doi.org/10.1061/(ASCE)0733-9364(2006)132:3(230)

Weare, S. H. (1989). Control of engineering projects (Vol. 6). Thomas Telford. https://doi.org/10.1680/coep.13872

Weston, D. C., & Gibson, G. E. (1993). Partnering-project performance in U.S. Army Corps of Engineers. Journal of Management in Engineering, 9(4), 410–425. https://doi.org/10.1061/(ASCE)ASCE-0742-597X(1993)9:4(410)

William, I., & Ying-Yi, C. (2011). Alternative methods for choosing an appropriate project delivery system (PDS). Facilities, 29(13/14), 527–541. https://doi.org/10.1108/02632771111178418

Williams, T. M. (1999). The need for new paradigms for complex projects. International Journal of Project Management, 17(5), 269–273. https://doi.org/10.1016/S0263-7863(98)00047-7

Wood, G. D., & Ellis, R. C. T. (2005). Main contractor experiences of partnering relationships on UK construction projects. Construction Management and Economics, 23(3), 317–325. https://doi.org/10.1080/0144619042000287714

Xie, H., & Liu, H. (2017). Studying contract provisions of shared responsibilities for integrated project delivery under national and international standard forms. Journal of Legal Affairs and Dispute Resolution in Engineering and Construction, 9(3), 04517009. https://doi.org/10.1061/(ASCE)LA.1943-4170.0000220

Yates, J. K., & Duran, J. (2006). Utilizing dispute review boards in relational contracting: A case study. Journal of Professional Issues in Engineering Education and Practice, 132(4), 334–341. https://doi.org/10.1061/(ASCE)1052-3928(2006)132:4(334)

Yates, J. K., & Epstein, A. (2006). Avoiding and minimizing construction delay claim disputes in relational contracting. Journal of Professional Issues in Engineering Education and Practice, 132(2), 168–179. https://doi.org/10.1061/(ASCE)1052-3928(2006)132:2(168)

Yeung, J. F. Y., Chan, A. P. C., & Chan, D. W. M. (2007). The definition of alliancing in construction as a Wittgenstein family-resemblance concept. International Journal of Project Management, 25(3), 219–231. https://doi.org/10.1016/j.ijproman.2006.10.003

Yeung, J. F. Y., Chan, A. P. C., & Chan, D. W. (2012). Defining relational contracting from the Wittgenstein family-resemblance philosophy. International Journal of Project Management, 30(2), 225–239. https://doi.org/10.1016/j.ijproman.2011.06.002

Yitmen, I. (2013). Organizational cultural intelligence: A competitive capability for strategic alliances in the international construction Industry. Project Management Journal, 44(4), 5–25. https://doi.org/10.1002/pmj.21356

Zhang, L.-Y., Cheng, J., & Fan, W. (2016). Party selection for integrated project delivery based on interorganizational transactive memory system. Journal of Construction Engineering and Management, 142(3), 04015089. https://doi.org/10.1061/(ASCE)CO.1943-7862.0001068

Zhang, L.-Y., He, J., & Zhou, S. (2012). Sharing tacit knowledge for integrated project team flexibility: Case study of integrated project delivery. Journal of Construction Engineering and Management, 139(7), 795–804. https://doi.org/10.1061/(asce)co.1943-7862.0000645

Zhang, L.-Y., & Li, F. (2015). The impact of risk perception on developing incentive systems for relational contracting. KSCE Journal of Civil Engineering, 19(5), 1203–1213. https://doi.org/10.1007/s12205-013-0450-6

Zhang, L.-Y., Li, Y., & Wu, Q. (2013). Evaluation on collaborative satisfaction for project management team in integrated project delivery mode. Journal of The Institution of Engineers (India): Series A, 94(2), 109–115. https://doi.org/10.1007/s40030-013-0041-z

Zou, J., & Zillante, G. (2012). Relationship contracting: The South Australian experience – A case study. Construction Economics and Building, 6(2), 20–31. https://doi.org/10.5130/ajceb.v6i2.2981