PROGRESSIVE DESIGN-BUILD OPPORTUNITIES AND CHALLENGES: A LITERATURE REVIEW

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ABSTRACT: Risk transfer, insurance acquisition, and claims management can be challenging for complex construction projects. Various studies have separately identified qualifications-based selection, target pricing, and teaming agreements as contracting and procurement approaches to mitigate these challenges. Progressive design-build (PDB) methods can encompass all these approaches. Still, research on the PDB method's opportunities and challenges is lacking. With design-build project delivery expected to account for nearly 50% of the United States design and construction market by 2025, there is a need for innovative contractual solutions that address current challenges and capitalize on opportunities for improvement during the early stages of the project lifecycle. Owners and design-builders often face challenges in managing risk and fostering effective partnerships. Imbalanced risk allocation and misaligned stakeholder expectations can lead to project delays, budget overruns, and disputes between the project team. This literature review aims to identify opportunities and challenges in Phase 1 and 2 of the PDB project delivery method. A literature review of scholarly articles published on PDB was conducted to achieve the study objective. The study findings showed that PDB provides opportunities to enhance cost and schedule certainty, allocate risk equitably, enhance negotiation flexibility, and reduce claims and disputes in the construction industry. Yet, other challenges were identified, such as legislative restrictions, lack of owner education, team integration difficulties, and lack of industry interest. This paper contributes to the body of knowledge by understanding the opportunities and challenges associated with PDB in Phases 1 and 2.

1. INTRODUCTION

Complexity is inherent in the construction industry due to the unique project characteristics (Gransberg et al. 2013). This complexity poses challenges that can reduce profitability and investment attractiveness (Jahan et al. 2022). Yet, early collaboration, flexibility, and effective communications between project stakeholders have been shown to mitigate the impacts of the complex nature of the construction industry (Akintan and Morledge 2013a). The Progressive Design-Build (PDB) method is an innovative and dynamic approach that emphasizes flexibility, collaboration, and transparency. The overlapping nature between the main two phases, Phase 1 (pre-construction) and Phase 2 (construction), in the PDB method enables progressive development of the project documentation based on shared decisions between the owner and the design-build team (DBIA 2017, 2018). Under this method, the owner uses a qualification-based or best-value selection to select the design-builder, then "progresses" toward the technical and commercial aspects of the project (DBIA 2018 p. 18). In Phase 1, the owner and design-builder work collaboratively to define and validate the preliminary design. Then, the project team utilizes managerial knowledge across different managerial, technical, and operational levels of expertise to develop the design, considering cost, quality, timeline, functionality, constructability, maintainability, and serviceability (Gransberg and Molenaar 2019a). Once the design reaches a certain level of clarity, approximately 40% to 60%, and satisfies the owner's expectations, the design-builder submits a commercial proposal for Phase 2. If parties disagree on the terms for the second phase, the owner executes the "off-ramp" right, which gives the owner the option to terminate the contract after Phase 1 if an agreement on cost or scope is not reached (DBIA 2017, 2018).

Progressive Design-build (PDB) enables owners to make informed and systemic decisions aligning with their initial goals and visions. Accordingly, PDB has become a popular project delivery method in different sectors, such as highways, aviation, industrial, public buildings, private buildings, and water/wastewater (Alleman and Tran 2020a, 2021). Figure 1 illustrates the conceptual diagram of PDB. The figure shows three essential concepts that apply to PDB but not to the traditional Design-Build (DB) method, including the design-builder role in establishing the final price and negotiating the Guaranteed Maximum Price (GMP) based on open-book pricing. If the GMP cannot be mutually agreed the owner executes the "off-ramp" and then bids on the project's construction using Design-Bid-Build (DBB) (Alleman and Tran 2021; DBIA 2017; Gransberg and Molenaar 2019b).

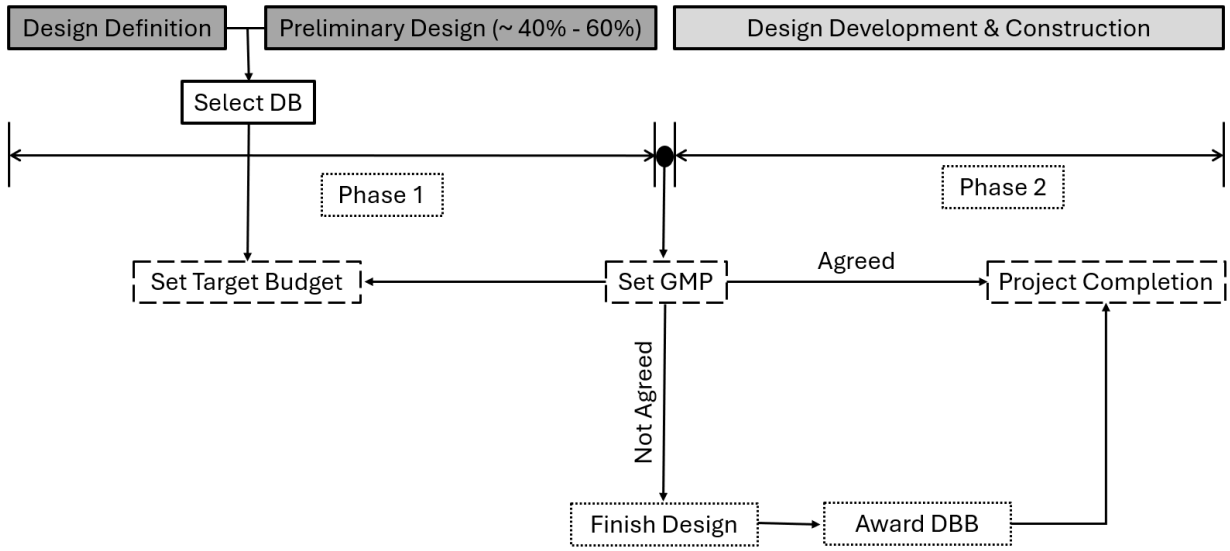

Figure 1: Progressive Design-Build Conceptual Process (Adapted from: Gransberg and Molenaar 2019b)

The scholarly work concentrated on conceptual and mechanism aspects of the PDB method, with little or no concentration on the potential challenges and opportunities. So, limited attention has been given to PDB opportunities and challenges. For example, Gransberg and Molenaar (2019) studied the mechanism of PDB in highway projects and compared it to the Construction Manager at Risk (CMAR); the study's findings showed that both methods have a similar format and process but differ regarding owner design liabilities, as the owner retains the design liability in the CMAR methods, which is not the case in the PDB method. Similarly, Alleman and Tran (2021) conducted a study to compare the procurement mechanism to qualify the design-builder in the PDB highway projects and found that qualification based selection provides more benefits to the project stakeholders. Adamtey (2021) compared PDB to traditional design-build in terms of time and cost performance to provide empirical evidence on the performance of the PDB delivery method. The findings showed that PDB projects have better time and cost performance than other project delivery methods.

Other scholarly work concentrates on specific challenges at the macro level without clearly indicating the challenges' impact and presence during the project lifecycle. For instance, Gransberg (2023) studied the enabling legislation from states authorized to use alternative project delivery methods and found that PDB can be successfully implemented using a wide variety of approaches with different degrees of legislative constraints, such as using existing DB authority without explicitly stating using PDB. Similarly, Alleman and Tran (2020c) studied DB in all 50 states of the United States and found PDB is allowed in only five states as legislative language does not support PDB.

The objective of this paper is to explore the opportunities and challenges associated with PDB projects across the project lifecycle, with a particular focus on Phases 1 and 2. It aims to provide the owner and design-builder communities with a comprehensive understanding of the benefits of adopting the

progressive design-build approach and to identify potential challenges, enabling the development of effective strategies to mitigate their impacts.

2. METHODOLOGY

The two stages or phase characteristics of the PDB are the main differentiation factor between PDB and traditional DB. So, the researchers implemented a literature review to identify potential opportunities and challenges in Phases 1 and 2, as different activities and deliverables in each stage required identifying the potential opportunities and challenges. The results were summarized according to Phases 1 and 2. This is a detailed description of the main activities involved in Phases 1 and 2 of the PDB projects' lifecycle:

- **Phase 1 (Pre-construction Services):** defined project goals, scope, and budget, develop preliminary design, early estimation, and engineering and constructability review.
- **Phase 2 (Construction Services):** finalizing the design and GMP or targeted maximum price, executing the project, testing and commissioning, and handover.

Similar to the method implemented by Han and Leite (2022). The literature review followed three main steps. First, the researcher utilized the Web of Science Database, the American Society of Civil Engineering (ASCE) Library, and Google Scholar to identify journals of interest that have published articles on PDB. Then, researchers identified articles using the following combination of keywords: (1) "progressive design-build*" OR "progressive design build*" OR "progressive design/build*" AND "Construction*" OR "design*" OR "builder*" OR "contractor*"; where * represents a wildcard so the query will use variations of the words. "Construction*" was used to constrain the relevant results to the study. These terms searched the entire article's text, including the title, abstract, and keywords.

Thirty-two articles were identified within step 1. Step 2 included reviewing article titles and abstracts to assess whether articles were relevant to the literature review; sixteen remained after step 2. Step 3 involved reviewing the full articles to assess whether the study pertained to PDB opportunities and challenges in the construction industry. Eight studies were excluded as they did not describe opportunities and challenges during the project lifecycle. After this step, eight articles remained. Table 1 lists the journals included and identified after each step. Further, this table illustrates the venues where PDB-related journal articles were published during this search (January 2025).

Table 1: Journals Included in Literature Review and Number of Articles Identified in Each Step of the Literature Review Process

Journal	Articles Identified in Step 1	Articles Included After Step 2	Articles Included After Step 3
Journal of Legal Affairs and Dispute Resolution in Engineering and Construction	14	9	4
American Water Works Association Journal	5	0	0
Transportation Research Record	2	2	2
Journal of Construction Engineering and Management	3	2	1
Journal of Engineering Design and Technology	1	1	1
Organization Technology and Management in Construction	1	0	0
Civil Engineering Magazine	2	1	0

Journal of Management in Engineering	2	1	0
ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems	1	0	0
Journal of Structural Design and Construction Practice	1	0	0
Total Number of Articles	32	16	8

3. RESULTS AND DISCUSSION

This section lists and discusses the opportunities and challenges in the PDB projects. The opportunities and challenges are categorized based on the main two phases in PDB projects (i.e., Phase 1 and 2). The authors used the phases to classify the results as various scholars considered them the main differentiation factor between the traditional DB and PDB. Different scholarly work concentrates on Phase 1 more than other than Phase 2 due to the criticality and complexity of the activities and outcomes of this phase (Adamtey 2021a; Alleman and Tran 2021; Gransberg and Molenaar 2019a). Yet, other researchers highlighted the critical connection between the two phases and the consequences of misalignment (Alameri and Esmaeili 2023; Gad et al. 2019); even a few scholars stated that if owners executed the “off-ramp” right, the project would transfer from PDB to DBB. Accordingly, the authors categorized tables based on the mechanism of PDB.

4.1 Opportunities and Challenges in Phase 1

Table 2 lists various opportunities for implementing the PDB method during the preliminary phase. These include providing the owners and design-builder with an early cost and scheduling certainty as the design progresses with inputs from project stakeholders. Complete and sound design documents reduce future change orders and claims, reflecting less chance of future cost growth, schedule growth, and scope creep (Assaf et al. 2018). Additionally, it increases the chance that all parties agree on the GMP later on during the submission of the commercial proposal (Adamtey 2021a; Gransberg and Molenaar 2019b). Furthermore, PDB offers innovative solutions tailored to the project’s unique needs, ensuring better value for money. This opportunity is essential for projects with high-technology or complex requirement (Alleman and Tran 2020a; Gad et al. 2019). PDB increases the owner’s control and flexibility of the project scope, a success factor in mega projects. Most of the changes can be proposed and discussed during Phase 1, with inputs from all parties, reducing future rework and administrative burden to account for changes (Alleman and Tran 2021).

Table 2: Opportunities in Phase 1

Opportunities in Phase 1	Academic References
Early Cost and Scheduling Certainty	(Adamtey 2021b; Alameri and Esmaeili 2023; Alleman and Tran 2020b, 2021; Gad et al. 2019; Gransberg 2023; Gransberg and Molenaar 2019b; Nguyen et al. 2024; Salih et al. 2024)
Increase Project Innovation	(Adamtey 2021b; Alameri and Esmaeili 2023; Gad et al. 2019; Gransberg 2023; Nguyen et al. 2024; Salih et al. 2024)
High control and Flexibility of Scope	(Adamtey 2021b; Alameri and Esmaeili 2023; Alleman and Tran 2020b; Gad et al. 2019; Gransberg 2023)
Early Vertical and Horizontal Expertise Inputs	(Adamtey 2021b; Alameri and Esmaeili 2023; Alleman and Tran 2021; Gad et al. 2019; Nguyen et al. 2024; Salih et al. 2024)
Price Negotiation Flexibility	(Adamtey 2021b; Alleman and Tran 2020b; Gad et al. 2019; Gransberg and Molenaar 2019b; Nguyen et al. 2024)
No Commitment for Phase 2 “Off-Ramp”	(Alameri and Esmaeili 2023; Alleman and Tran 2021; Gad et al. 2019; Gransberg 2023; Gransberg and Molenaar 2019b; Nguyen et al. 2024)

More Equitable Risk Allocation	(Adamtey 2021b; Alameri and Esmaeili 2023; Alleman and Tran 2020b, 2021; Gad et al. 2019; Gransberg 2023; Gransberg and Molenaar 2019b; Nguyen et al. 2024; Salih et al. 2024)
Lower Cost Due to Responsible Contingencies	(Adamtey 2021b; Alleman and Tran 2020b, 2021; Gransberg 2023; Gransberg and Molenaar 2019b)
Early Contractor Involvement	(Adamtey 2021b; Alameri and Esmaeili 2023; Alleman and Tran 2020b, 2021; Gad et al. 2019; Gransberg 2023; Gransberg and Molenaar 2019b; Nguyen et al. 2024; Salih et al. 2024)
Flexible Procurement of Project Team	(Adamtey 2021b; Alameri and Esmaeili 2023; Gransberg and Molenaar 2019b)
Owners' Involvement in the Design Process	(Adamtey 2021b; Alameri and Esmaeili 2023; Alleman and Tran 2020b, 2021; Gad et al. 2019; Gransberg 2023; Nguyen et al. 2024)
Open Book Pricing	(Alameri and Esmaeili 2023; Alleman and Tran 2021; Gad et al. 2019; Gransberg 2023; Gransberg and Molenaar 2019b; Nguyen et al. 2024)
No Spearin Design Liability	(Adamtey 2021b; Alameri and Esmaeili 2023; Alleman and Tran 2020b, 2021; Gad et al. 2019; Gransberg 2023; Gransberg and Molenaar 2019b; Nguyen et al. 2024; Salih et al. 2024)

The collaborative environment is the underlying principle of PDB so vertical and horizontal inputs are an opportunity provided by the PDB methods, as knowledge and expertise are shared between all parties, resulting in robust construction documents with fewer chances of conflicts and impacts the construction sequence in Phase 2 (Alameri and Esmaeili 2023; Gad et al. 2019). Risk allocation is a critical aspect of the contractual relationship; PDB provides an opportunity for more equitable risk allocation than other project delivery methods. Thus, less contingencies are allocated relative to the overall project cost, which can result in optimal project costs (Adamtey 2021a; Gad et al. 2019; Gransberg and Molenaar 2019b). In addition, open-book pricing and Spearin design liabilities, which state that contractors are not liable for defects in owner-provided designs if they follow them exactly, provide a high level of transparency, which enables all parties to maintain a strategic relationship for future work. Owners have less pressure as the design responsibilities are shared among all parties, and pricing is determined with reasonable efforts to match the actual market price (Alleman and Tran 2021; Gad et al. 2019; Gransberg and Molenaar 2019a). Price negotiation combined with no commitment for Phase 2 from the owner's side gives the owner confidence to propose changes, goals, objectives, and expectations before agreeing on the commercial proposal. This opportunity distinguishes PDB from other project delivery methods (Adamtey 2021b; Gad et al. 2019; Gransberg and Molenaar 2019b).

4.2 Opportunities in Phase 2

Table 3 summarizes the opportunities in Phase 2. Various scholarly works emphasized the connections between the two phases. They highlighted that the opportunities and successes in Phase 2 stem from the opportunities and efforts in Phase 1. Alleman and Tran (2020b) conducted a study to identify the challenges of implementing PDB in highway projects. The study described off-ramped projects as failed projects, which reflects the importance of continuity and strong connections between the two phases. Accordingly, most of the listed opportunities in Table 3 are highly connected with Table 2.

Table 3: Opportunities in Phase 2

Opportunities in Phase 2	**References**
Cost Savings	(Adamtey 2021b; Alameri and Esmaeili 2023; Alleman and Tran 2020b, 2021; Gad et al. 2019; Gransberg 2023; Gransberg and Molenaar 2019b; Nguyen et al. 2024; Salih et al. 2024)
Accelerated Schedule (Ability to fast-track)	(Adamtey 2021b; Alameri and Esmaeili 2023; Alleman and Tran 2020b, 2021; Gad et al. 2019; Gransberg 2023; Gransberg and Molenaar 2019b; Nguyen et al. 2024; Salih et al. 2024)

Increase Project Constructability	(Alameri and Esmaeili 2023; Alleman and Tran 2020b; Gad et al. 2019; Gransberg and Molenaar 2019b; Nguyen et al. 2024; Salih et al. 2024)
Quicker Cost-effective Procurement	(Adamtey 2021b; Alameri and Esmaeili 2023; Gad et al. 2019; Gransberg 2023)
Innovative project Specific Solutions	(Adamtey 2021b; Alameri and Esmaeili 2023; Alleman and Tran 2020b, 2021; Gad et al. 2019; Gransberg 2023; Gransberg and Molenaar 2019b; Nguyen et al. 2024; Salih et al. 2024)
Increased Life Cycle Value of Money	(Adamtey 2021b; Alleman and Tran 2020b; Gad et al. 2019; Gransberg 2023; Nguyen et al. 2024)
Single Contract and Point of Responsibility	(Adamtey 2021b; Alameri and Esmaeili 2023; Alleman and Tran 2020b, 2021; Gad et al. 2019; Gransberg 2023; Gransberg and Molenaar 2019b; Nguyen et al. 2024; Salih et al. 2024)
Fewer Change Orders, Variations, and Claims	(Alleman and Tran 2021; Gad et al. 2019; Gransberg 2023; Gransberg and Molenaar 2019b; Nguyen et al. 2024; Salih et al. 2024)

As mentioned in the previous section, early cost and scheduling certainty are significant opportunities for PDB projects. It relates to the cost saving in Phase 2, as project stakeholders provide reasonably certain prices and schedules in Phase 1, builders are more aware of the necessary construction means and methods to align with the pre-set costs and schedules (Adamtey 2021b). The equitable risk allocation in Phase 1 reduces the contingencies, leading to lower costs (Gransberg and Molenaar 2019b). Furthermore, aligning construction means and methods, cost, schedule, and early contractor involvement increases project constructability; builders can utilize contemporary technologies to execute the project by the initially estimated completion date (Alameri and Esmaeili 2023).

Procuring required materials and equipment represents around 70% of the project costs (Sariola 2018). The fast-tracking and overlap between the two phases enable stakeholders in Phase 2 to achieve quicker and higher cost-effectiveness procurement (Gransberg and Molenaar 2019b). In addition, giving time to the design-build team to qualify competent suppliers leads to cost savings, and fewer claims and disputes will arise (Gad et al. 2019). The single contract and point of responsibility are common opportunities for Phases 1 and 2. It provides owners and design-builders with streamlined communication, enhanced collaboration, accountability for outcomes, reduced change order disputes, faster decision-making, and improved risk management (Adamtey 2021b; Alleman and Tran 2020b, 2021; Gransberg and Molenaar 2019b).

4.3 Challenges in Phase 1

The opportunities associated with the PDB are not without challenges. Table 4 lists a few challenges found in the literature on PDB projects in Phase 1.

Table 4: Challenges in Phase 1

Challenges in Phase 1	References
Legislative Restriction	(Gransberg 2023; Gransberg and Molenaar 2019b)
Lack of Owner Education and Collaborative Mindset	(Adamtey 2021b; Alameri and Esmaeili 2023; Alleman and Tran 2020b, 2021; Gad et al. 2019; Gransberg 2023; Gransberg and Molenaar 2019b; Nguyen et al. 2024; Salih et al. 2024)
Demand on Owner Resources	(Alleman and Tran 2021; Gad et al. 2019; Gransberg 2023; Gransberg and Molenaar 2019b; Nguyen et al. 2024)
Lack of Industry Interest	(Adamtey 2021b; Alameri and Esmaeili 2023; Alleman and Tran 2020b, 2021; Gad et al. 2019; Gransberg 2023)
Team Integration Difficulties	(Adamtey 2021b; Alameri and Esmaeili 2023; Alleman and Tran 2020b, 2021; Gad et al. 2019; Gransberg 2023; Gransberg and Molenaar 2019b; Nguyen et al. 2024; Salih et al. 2024)

Negotiation Difficulties	(Alleman and Tran 2020b, 2021; Gad et al. 2019; Gransberg 2023; Gransberg and Molenaar 2019b)
Complexity of Dealing with Third Parties	(Adamtey 2021b; Alameri and Esmaeili 2023; Alleman and Tran 2020b, 2021; Gad et al. 2019; Gransberg 2023; Gransberg and Molenaar 2019b; Nguyen et al. 2024; Salih et al. 2024)
Unfairness of Ramp-off to the Design-Builder	(Alleman and Tran 2020c; Gad et al. 2019; Gransberg and Molenaar 2019b)

Legislative restriction can be classified as a major challenge in the United States, Alleman and Tran (2020c) reviewed the 50 states' DB legislations and found that the language does not support PDB methods, as the language either allows DB qualification-based selection or negotiated procurement, which restricts flexibility and adaptability (Alameri and Esmaeili 2023; Gad et al. 2019). Additionally, a price component is required in the proposal, which implicitly prohibits PDB. As a result, only five states allowed the PDB projects. This restriction prevents public agencies from utilizing the PDB method. Similarly, the owner required comprehensive education about the PDB process, as the procurement process is resource-intensive, requiring a significant commitment of both time and resources, which added another layer of complexity (Gad et al. 2019; Gransberg and Molenaar 2019a). Lack of owner education in the technical and managerial aspects of the construction projects might lead to disputes and misalignment of goals and objectives (Gad et al. 2019).

Lack of industry interest is a major challenge for PDB projects. Previous research indicates that many industry professionals continue to favor traditional delivery methods, with 15% preferring DBB, 47% DB, and 38% other delivery methods (Kolakowski 2024). This suggests that PDB may still be perceived by some as complex or unfamiliar. This resistance often arises from concerns about the shift in roles, responsibilities, and early collaboration requirements, which demand a higher level of trust, transparency, and communication across stakeholders. PDB projects sometimes face resistance, which hinders embracing the PDB (Alleman and Tran 2020b; Gad et al. 2019). Integrating the project team is another major challenge, as the team consists of professionals with different technical backgrounds and experience levels, so different perspectives might lead to conflict that reflects on the project's performance and progress, especially during the early phases (Adamtey 2021b; Alleman and Tran 2020b; Gad et al. 2019). This challenge is directly related to the owner's education and collaborative mindset. Finally, including all trade partners, suppliers, and vendors in Phase 1 is challenging and requires time and resources. Investing time and resources in high-level coordination during the initial phases might not be feasible for the project team in the early stages as it might been seen as a requirement in Phase 2 by project stakeholders (Abou Chakra and Ashi 2019; Bypaneni and Tran 2018).

4.4 Challenges in Phase 2

Challenges in Phase 2 are similar to challenges in most DB delivery methods. As all parties agree on the technical and commercial proposals, the construction phase mechanism is similar to the traditional DB. Yet, the literature highlighted a few challenges that might extend to Phase 2 from Phase 1. Table 5 lists the identified challenges in Phase 2.

Table 5: Challenges in Phase 2

Challenges in Phase 2	References
Lack of Owner Education	(Adamtey 2021b; Alameri and Esmaeili 2023; Alleman and Tran 2020b, 2021; Gad et al. 2019; Gransberg 2023; Gransberg and Molenaar 2019b; Nguyen et al. 2024; Salih et al. 2024)
Incomplete or Inaccurate Assumptions in Phase 1	(Adamtey 2021b; Alleman and Tran 2020b; Gad et al. 2019; Nguyen et al. 2024; Salih et al. 2024)
Massive Efforts to Maintain the Same Collaborative Environment in Phase 1	(Adamtey 2021b; Alameri and Esmaeili 2023; Alleman and Tran 2020b, 2021; Gad et al. 2019; Gransberg 2023; Gransberg and Molenaar 2019b; Nguyen et al. 2024; Salih et al. 2024)

Lack of Trade Partners and Suppliers in Phase 1	(Adamtey 2021b; Alameri and Esmaeili 2023; Alleman and Tran 2020b, 2021; Gad et al. 2019; Gransberg 2023; Gransberg and Molenaar 2019b; Nguyen et al. 2024; Salih et al. 2024)
Knowledge Gap in the Case of Team Change between the two Phases	(Alleman and Tran 2020b, 2021; Gad et al. 2019; Gransberg 2023; Gransberg and Molenaar 2019b)

Lack of owner education is a challenge with continuous impacts, as the owner has a massive influence on the technical and managerial decisions made during Phase 2; owners with little knowledge of the PDB or construction industry can pose a challenge to the project's success (Alleman and Tran 2020b; Gransberg and Molenaar 2019b). Furthermore, Phase 2 is built on the outcomes of Phase 1; incomplete or inaccurate technical or managerial assumptions in Phase 1 impact Phase 2 adversely. Thus, a clear line of communication between project stakeholders and aligning goals and objectives during Phase 1 is a critical success factor for Phase 2 (Alameri and Esmaeili 2023; Gransberg 2023).
The lack of trade partners and suppliers' involvement in phase 1 results in making assumptions based on involved project stakeholders' working experience and subjective judgment. These assumptions transfer to Phase 2 as a challenge. (Alleman and Tran 2020a; Gransberg and Molenaar 2019b). Different academic research highlighted the importance of close collaboration between all project stakeholders during the early phases (Akintan and Morledge 2013a; b; Bemelmans et al. 2012; Dossick et al. 2009). Many professional organizations encourage project stakeholders to embrace the collaborative mentality through partnering and alliancing. For example, the Design-Build Institute of America (DBIA) has issued various publications highlighting the role of collaboration in enhancing project performance and maintaining strategic relationships between project parties (DBIA 2017, 2018). Despite all the listed challenges in Phase 2, the literature emphasizes that PDB is a relatively new method, and shortcomings in its execution could have far-reaching consequences on the construction stage, potentially delaying projects and leading to costly claims and long dispute processes. Therefore, understanding these challenges and preparing the required strategies are important to limit their impact on the construction phase.

4. CONCLUSIONS AND FUTURE RESEARCH DIRECTIONS

This study summarized extant literature focusing on opportunities and challenges in PDB projects; opportunities and challenges were categorized by project phases. The study focuses on eight peer-reviewed journal articles from three journals. It captured a snapshot in time as the articles were retrieved in January 2025 and focused on primary keywords, such as "Progressive Design-Build" and "Construction." The identified opportunities in Phase 1 revolve around the projects' financial, technical, managerial, and schedule aspects, reflecting the benefits of implementing the PDB methods to mitigate the project complexity and maintain strategic relationships between project stakeholders. These benefits include but are not limited to early cost and scheduling certainty, increasing project innovation, and high control and flexibility of scope.

The identified opportunities in Phase 2 reflect the strong and systematic connection between the two phases. Phase 1 activities and outcomes lead to a smooth and innovative execution process (Gad et al. 2019). Builders can concentrate more on qualifying competent suppliers and subcontractors, utilize technology to enhance construction means and methods, and provide high-quality products by avoiding re-work. Correspondingly, owners' opportunities in Phase 2 stem from the collaborative inputs from all parties in Phase 1, as owners can communicate their goals and objectives, which reduces change orders in Phase 2. Accordingly, the identified opportunities in Phase 2 were cost-saving, accelerated schedule, increased project constructability, quicker, cost-effective procurement, innovative project-specific solutions, increased lifecycle value of money, single contract and point of responsibility, and fewer change orders and disputes.

The presented opportunities are associated with challenges in both phases. Phase 1 challenges represent barriers to implementing the PDB method, such as legislative restrictions, lack of owner education, team integration difficulties, and lack of industry interests. These challenges prevent public and private owners from utilizing the collaborative environment in the project's early phases, yet mitigating these challenges is a time-consuming process, as the PDB method is relatively new and has limited history, for instance, according to the DBIA database only 91 projects have implemented the PDB method only (DBIA 2025). So, time is an essential factor to overcome Phase 1 challenges. Phase 2 challenges are approximately similar

to the traditional DB projects, reflecting that Phase 1 is more crucial to successfully implementing the PDB method.

One major limitation of this study lies in its narrow empirical foundation. Relying on only eight peer-reviewed journal articles restricts the generalizability and strength of the findings. While this limited scope offers a valuable initial exploration of PDB-related opportunities and challenges, it does not capture the full range of industry perspectives or emerging practices. Consequently, the findings are primarily qualitative and lack substantial empirical backing. The literature review also reveals the limited published studies on PDB, which underscores the significance of this study to expand and add to the existing body of knowledge on PDB delivery methods. While these constraints posed limitations on the scope of the study, they also provided the basis for future work. Future work can include more detailed or targeted topics, such as utilizing the found opportunities and challenges to propose tools for projects delivered by PDB methods as proposed by Adamtey and Onsarigo (2019). More specific studies could investigate the best strategies to utilize opportunities and mitigate challenges to manage risk more appropriately to reduce disputes and enhance insurance practices in PDB projects. Despite the broad scope of insurance and risk in the PDB projects, this study's findings can establish an initial step to systematically identifying strategies and practices to enhance the PDB implementation practices.

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