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Enhancing design–bid–build project delivery: A comprehensive review and framework for contractor selection and project optimisation in the construction industry

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Abstract: The construction industry is one of the fastest growing and most profitable in the world. The industry is vital, especially in Qatar where infrastructure is growing. In the construction industry in Qatar, design–bid–build (DBB) is the most common project delivery technique; nonetheless, it has several drawbacks. Through a thorough assessment of the literature, this study attempts to investigate the DBB project delivery technique in the construction sector. A total of 10 studies met the inclusion criteria. The findings demonstrated that in comparison to DB, CM, CMAR and PPP project delivery methods, the DBB project delivery technique has some advantages and disadvantages. Project delivery techniques are crucial to the construction sector, which is essential to the growth of the national economy. The present study examines the design–bid–build (DBB) methodology, which is a traditional paradigm that presents ongoing difficulties in terms of contractor selection and project delivery effectiveness. A thorough examination of the existing studies was carried out using PRISMA guidelines. The study found that there was a substantial knowledge gap, as previous studies have mostly highlighted problems without providing a systematic foundation for remedies. The correct framework should be chosen based on factors including cost, time and location. In Qatar, low-bid projects that have well-defined objectives and well-defined contractor pre-qualification might benefit greatly from the application of the DBB project delivery approach. A few of shortcomings of the research are the researcher's prejudice, the incompleteness of the material gathered and the analysis of the findings. To replicate better findings, a comparable study can be undertaken in similar geographic places in the future. Robust pre-qualification procedures for contractors, improved designer–contractor communication, incorporation of cutting-edge project management systems and efficient risk management techniques were among the useful suggestions that surfaced. The study emphasises how crucial it is to maximise the DBB approach in the building sector. Subsequent research should corroborate these suggestions, investigate the incorporation of technology, evaluate the extended-term efficacy of undertakings and promote interdisciplinary cooperation. Through this activity, the construction industry may contribute to the sustainable growth and development of the industry by improving project results and the overall efficiency of the DBB model.

Keywords: construction management, design built, design bid built, contractor selection, optimisation, PRISMA criteria, construction management at risk

1 Introduction

The construction industry plays a vital role in supporting other industries, including housing, transportation and commerce, thus serving as a critical driver of a nation's economic growth. Disagreements are likely to arise in construction industry endeavours due to the complex nature of infrastructure development, the involvement of varied organisations and individuals and the substantial financial commitments connected with such projects. Significantly, a notable proportion of building projects experience debates and disputes, ranging from 10% to 30%. Typically, one in every four of these disagreements results in the initiation of a formal claim. It might be contended that the annual expenditure associated with the resolution of claims and disputes falls within the range of $4–20 billion, hence requiring public funding. The expenses associated with dispute resolution encompass legal fees,

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personnel compensation, the management of strained relationships that may discourage customer retention and other associated expenditures. According to Oyelami et al. (2021), the financial implications of disputes might be significant and ultimately undermine the efficacy of a project.

The lack of project disputes can sometimes be seen as an indication of achievement, alongside other measures such as the absence of cost escalations, schedule extensions and quality deficiencies. Numerous studies have been undertaken to examine various ways aimed at alleviating the negative consequences of conflicts and disagreements, with the ultimate goal of enhancing the effectiveness of building projects. It is widely acknowledged that cultivating a collaborative project environment, identifying common ground among stakeholders and enhancing communication may effectively mitigate conflicts. Moreover, previous research has demonstrated that the knowledge about the attributes of the selected project development system (PDS) is a crucial factor in increasing the probability of successfully completing a project. This is because it influences the participants' understanding, shared understanding and collaborative project conditions (Zuber et al. 2018).

Furthermore, by the careful selection of contract type and procurement method at the initial planning phase, as well as the agreement on project risk distribution after the delivery methodology, the involved parties may develop a collaborative team-oriented approach. Stakeholders have the potential to mitigate conflicts of interest throughout the construction phase by promoting transparent communication and knowledge exchange, adhering to timely payment of invoices and empowering project workers to proactively resolve unanticipated challenges, at the very least prior to escalating them. Therefore, it is important to examine the impact of the characteristics of design bid build delivery systems on project functionality within the construction sector, with the aim of mitigating potential drawbacks and maximising benefits (Salla 2020). Within the realm of the construction industry, several project delivery techniques exist, each contingent upon factors such as project kind, budgetary constraints, temporal parameters and intricacy.

The term 'project delivery system' encompasses the entirety of the construction process, encompassing activities such as design, planning and construction. Project delivery systems establish the respective roles and responsibilities of the many stakeholders engaged in a project, serving as a structured framework for organising the processes of design, procurement and construction. The utilisation of several project execution methodologies, such as design–build (DB), design–bid–build and construction management (CM) at risk, has been found to be viable in the field of construction (Khalafallah et al. 2019).

In the design–bid–build approach, the client engages a team of specialised professionals to undertake the comprehensive design of the project and generate the necessary tender papers, which serve as the basis for soliciting competitive bids from contractors. The selected bidder enters into a contractual agreement with the client and, in accordance with the specified design and specifications, carries out the project under the supervision of the consultants. Under these arrangements, contractors possess little capacity to engage in the design process. Kereri and Turner (2017) believe that the DB project delivery technique entails the client entering into a singular contract with a sole industry, therefore consolidating the management of both the design and construction phases.

According to the terms outlined in the contract, the DB approach offers the client the advantage of having a one point of contact for all design and construction-related activities. The completion of the design and construction can be carried out either entirely or partially by a singular DB contractor, or alternatively, many contractors may be employed as subcontractors. According to Abou Chakra and Ashi (2019), in design–bid–build projects, the collaboration between designers and contractors mitigates the existence of a competitive relationship between consultants and contractors.

The design–bid–build project delivery method has been widely utilised in the building industry mostly due to its conventional and sequential approach to project execution. The design–bid–build methodology has faced challenges pertaining to the process of contractor selection and the efficient execution of projects. The primary objective of this study is to enhance project delivery and optimise the design–bid–build process by examining innovative frameworks for contractor selection.

Historically, the construction industry has exhibited a preference for the design–bid–build (DBB) process of project delivery. According to Abou Chakra and Ashi (2019), the conventional approach involves the project owner initially selecting a design team, followed by the solicitation of bids from contractors. The DBB strategy has several advantages, one of which is the establishment of well-defined responsibilities and tasks at each stage of the project. However, it is important to acknowledge that there are also certain limitations associated with this approach that might impact project completion. The improvement of the design–bid–build (DBB) technique has emerged as a significant research focus to enhance project execution and contractor selection. The objective of this study is to

make a contribution to the advancement of knowledge in the field by conducting a comprehensive examination of contemporary frameworks for the selection of contractors and evaluating their impact on the outcomes of project delivery, specifically in terms of cost, quality and adherence to schedule (Kereri and Turner 2017).

Additionally, the project delivery method known as design–bid–build consists of a sequential process that includes the design phase, the bidding procedure and the construction phase. To establish project requirements and specifications, the proprietor often engages in consultation with an architect or engineer. The project is subjected to a competitive bidding process, wherein construction companies present their respective proposals. Once the contract is awarded to the bidder that demonstrates the highest level of reasonableness and capability, the building phase commences. The design–bid–build technique has garnered significant criticism due to several fundamental flaws, despite its extensive utilisation. The process of contractor selection poses significant problems. The conventional methodology commonly places a higher emphasis on cost-related factors over other significant considerations, such as the qualifications, experience and past track record of contractors. Consequently, this approach may lead to the selection of contractors who may not be the most suitable for the task, resulting in suboptimal outcomes (Yu et al. 2017). Additionally, the design–bid–build process has the potential to cause delays and inefficiencies in project delivery. Potential challenges may arise in the areas of collaboration, communication and fragmentation due to the continual nature of the process, which involves several stages and transitions. The project's budget, quality and timeliness may be adversely affected by these issues, leading to costly delays, rework and project delays (Salla 2020). To tackle these problems, innovative frameworks have been developed to enhance the selection of contractors and enhance project delivery in accordance with the design–bid–build process. These frameworks include additional factors for contractor selection, including credentials, experience, technical competence and prior performance. Kalsaas et al. (2018) propose that the integration of processes and utilisation of collaborative methods can contribute to the improvement of communication, teamwork and overall effectiveness of a project.

The construction sector in Libya has exhibited distinct characteristics and has garnered significant attention. The building industry in Libya exerts a greater economic impact than the combined influence of the industrial and service sectors. The measurement of success of other economic sectors often relies on the growth of the building industry. The outcome of a construction project was often influenced by the chosen project delivery method. To complete a project, the owner has the option to select from a range of techniques and combinations. Both the contractor and the owner have the potential to get benefits from various strategies, although it is important to acknowledge that there are also drawbacks associated with these approaches. The primary objective of construction work is to enhance a nation's infrastructure since it attracts greater investment and contributes to the growth of the gross domestic product (GDP). The construction industry possesses a distinctive characteristic in that it has the potential to stimulate the development of several other economic sectors. To meet the objectives of project owners, construction contractors must prioritise efficiency and cost-effectiveness in their operations. Nevertheless, as a result of evolving objectives, enhanced design, a more comprehensive comprehension of requirements and budgetary factors, these standards typically undergo modifications during the course of the project. The construction industry has been actively seeking efficient project delivery techniques for some years to enhance the efficacy of several available delivery systems, including design–bid–build (DBB) and DB. Youssef et al. (2017) assert that the DB technique enjoys global popularity.

The utilisation of design–bid–build (DBB) procedures is prevalent in construction projects due to its numerous advantages. This section examines the primary advantages of the design–build–bid (DBB) model, encompassing the separation of design and construction phases, leveraging contractor expertise, well-defined responsibilities and a competitive procurement process.

One of the primary advantages of the design–bid–build (DBB) strategy is the clear delineation of duties and responsibilities for all stakeholders involved in the construction project, including the owner, architect/designer and contractor. The systematic and sequential approach employed in this strategy establishes well-defined boundaries, thus facilitating the management of expectations and allocation of responsibilities. The level of clarity mentioned here contributes to the improvement of communication among all project participants, ensuring that they possess a constant awareness of their respective obligations. Competitive bidding constitutes an extra element of the design–bid–build (DBB) approach. This approach involves soliciting bids from contractors based on the parameters of the project. Subsequently, the proprietor has the opportunity to assess and compare many offers to determine the most cost-effective option. The use of a competitive pricing system has the potential to provide cost efficiencies for the proprietor via the promotion of

transparency and the increased probability of securing favourable terms and pricing agreements.

An additional advantage offered by the design–build–bid (DBB) approach is its ability to establish a distinct demarcation between the design and construction stages. Consequently, the owner is afforded the opportunity to own a completely formed design prior to the commencement of any construction activities. The occurrence of design alterations throughout the building phase is reduced when the design is finalised prior to the commencement of construction. The enhanced project execution is facilitated by the decreased probability of delays and disruptions resulting from modifications in design.

Furthermore, throughout the phases of bidding and construction, contractors have the opportunity to use their expertise and insights on constructability through the utilisation of the design–bid–build (DBB) approach. Contractors, by virtue of their exclusion from the design process, has the ability to offer valuable insights, views and proposals derived from their specialised knowledge in construction procedures. This engagement has the potential to yield enhanced value engineering, as the contractor offers perceptive suggestions for cost reduction and improved project efficiency through adjustments or new techniques. The utilisation of the design–build–bid (DBB) approach fosters innovation and cooperation via the incorporation of the contractor's expertise, potentially resulting in an enhanced final product of superior quality.

1.1 Limitations of the design–bid–build methodology in construction projects

The design–bid–build (DBB) process presents certain advantages; nevertheless, it is imperative to acknowledge its associated limitations. This section examines the possible drawbacks associated with the design–bid–build (DBB) approach, which encompass restricted involvement during the design phase, the potential for change orders, inadequate communication and collaboration among project participants and an extended project timeline.

One significant limitation of the design–bid–build (DBB) process is the potential for limited collaboration and communication among those involved in the project. The potential presence of a sequential structure in this process might potentially provide challenges for effective collaboration between the contractor and designer, potentially resulting in miscommunications or disagreements throughout the construction phase. The presence of distinct responsibilities might potentially hinder the contact and collaboration between different entities, hence limiting the utilisation of their respective abilities to their maximum potential.

The DBB technique is susceptible to the occurrence of change orders and unanticipated expenditures during the building process. When a design is finalised prior to the commencement of construction, there is an increased likelihood of encountering unforeseen issues that were not adequately considered during the design phase. Unforeseen challenges, such as site-specific constraints or building feasibility, may necessitate modifications to the original design, resulting in change orders and potentially augmenting project expenses.

Furthermore, the sequential nature of the DBB approach contributes to extended project timeframes. Instead of being completed concurrently, each step, including design, bidding and construction, is sequentially concluded. Therefore, the design–bid–build (DBB) strategy often results in extended project durations compared to alternative project delivery methods that allow for simultaneous design and construction. The duration of the construction process may be extended in its entirety, and project timelines may experience inefficiencies as a result of the sequential progression of phases.

Moreover, the participation of the contractor throughout the design phase is limited by the design–bid–build (DBB) approach, thus diminishing their potential contributions and comments. The potential benefits of value engineering proposals and the perspectives of contractors, which have the potential to enhance the effectiveness and cost-efficiency of building procedures, are often disregarded or improperly utilised. The absence of effective communication and coordination between the contractor and design team can lead to missed opportunities for incorporating construction-oriented perspectives and innovative ideas into the design process.

The suitability of the design–bid–build process is contingent upon the specific characteristics of the project, the preferences of the owner and the desired level of stakeholder involvement. Certain project delivery approaches, such as CM or DB, may exhibit heightened significance, particularly in the context of intricate or time-sensitive projects necessitating extensive coordination and communication between the construction team and design professionals.

1.2 Problem statement

The problem that will be addressed in this study is stated as follows:

The design–bid–build project delivery approach is widely utilised in the construction industry, despite

challenges pertaining to contractor selection and the optimisation of project management efficiency. The prevailing methodology for contractor selection prioritises pricing considerations while neglecting other significant aspects such as expertise and qualifications, potentially resulting in suboptimal outcomes. The design–bid–build process, due to its linear characteristic, sometimes gives rise to challenges such as misunderstanding, fragmentation and coordination concerns. These challenges, in turn, contribute to delays and excessive expenditures. There is a pressing need for a unique framework that may enhance the selection of contractors and optimise project delivery within the design–bid–build process to overcome existing challenges and enhance overall project performance.

The construction industry faces ongoing challenges due to the frequent occurrence of disputes and conflicts throughout building projects. The significance of this problem is of great importance due to its impact on several industries and stakeholders involved in building, with far-reaching implications for national economies.

This topic holds significant relevance for contractors, project owners and industry experts. The resolution of conflicts and optimisation of project delivery methods within the design–bid–build (DBB) framework may lead to several benefits, including reduced costs, timely project completion and enhanced outcomes.

The resolution of this matter holds significance due to the frequent involvement of governments and other public organisations in funding construction projects. The financial burden of conflicts has a significant influence on national budgets and the broader economic growth of countries, often necessitating public aid.

The matter of conflicts and inefficiencies in construction projects has significant implications for the financial stability and the completion of vital infrastructure projects. Consequently, it is imperative for governments and project partners to proactively tackle this issue.

1.3 Research question

The question is 'What are the consequences of design–bid–build delivery systems on project functionality in the construction industry?' This question is significant since it addresses the introduction's key theme. More importantly, it hopes to provide insights that could transform this ubiquitous project delivery system. The study examines how design–bid–build (DBB) factors affect project success.

The major audience – project owners, contractors and construction industry professionals – is eager for answers. These parties want to improve DBB project delivery to generate timely, cheap and high-quality solutions. Government agencies, which fund building projects, want to learn how to execute them to maximise revenues and promote the nation.

1.4 Aim and objectives

This research study evaluates cutting-edge frameworks for project delivery and contractor selection to improve design–bid–build (DBB) project delivery.

This research has the following objectives:

- Evaluate current contractor selection frameworks for the DBB project delivery strategy.
- Evaluate the influence of project delivery frameworks on cost, quality and deadline adherence.
- Suggest innovative ways to enhance contractor selection and DBB project delivery.

1.4.1 Significance and target audience

The study recognises its potential significance by adding to construction industry knowledge, particularly about project delivery approaches. Project owners, contractors and industry professionals should find useful information and advice in the results. To improve services and benefit more industry stakeholders, construction project productivity and efficiency must be increased.

2 Literature review

2.1 Previous investigations

The DBB strategy has been the subject of a significant amount of research, as has the topic of project delivery techniques used in the construction industry. This research has given significant insight on the challenges that exist in this field as well as the potential solutions. Notable research in this area has focused on the following:

2.1.1 Gains in success and efficiency

Previous research has demonstrated that the DBB methodology may result in successful and efficient project execution. Researchers have demonstrated that it is possible to shorten the duration of projects, as well as reduce the number of delays that occur, by enhancing communication and cooperation, as well as by optimising the

sequencing of project phases. According to Ma et al. (2018), this has contributed to an increase in the overall success of construction projects by lowering overall costs and ensuring that projects are finished on schedule.

2.1.1.1 Methodologies for the selection of contractors

The findings of some promising studies have indicated improved techniques for selecting contractors, methods that take into account not only pricing but also experience, credentials and prior results. According to the findings of study conducted by Tran et al. (2018), utilising an approach that is more comprehensive throughout the process of selecting a contractor has the potential to result in better project outcomes as well as contractors that are a better fit for the work.

2.1.1.2 Enhanced cooperation

Research has demonstrated that integrated processes and cooperative methods can help to decrease the downsides of the DBB technique, which include problems with communication and fragmentation. Research has shown that improved project efficiency and smoother coordination are possible outcomes of collaborative efforts between design teams and contractors (Ireland 2022).

2.2 Failed attempts

2.2.1 Putting an excessive amount of emphasis on cost

Earlier research has shown that there is a tendency for people to prioritise cost when selecting a contractor over a number of other crucial factors to take into account. This emphasis could lead to decisions that are less than optimal and difficulty in completing the project since the contractors may not have the necessary expertise or experience (Li et al. 2019).

2.2.2 Concerns relating to communication and fragmentation

The linear structure of the DBB approach is frequently the cause of its shortcomings, which in turn lead to difficulties in communication and fragmentation among the various stakeholders. According to Kisi et al. (2017), these issues may lead to more work, budget overruns and project delays, all of which may have a detrimental impact on the successful completion of the project.

In conclusion, previous research in related disciplines has demonstrated both success and failure in resolving challenges with the DBB project delivery approach. These results can be attributed to a variety of factors. Certain studies have shown that improved contractor selection, collaboration and efficiency can be achieved; however, a few other studies have indicated the risks associated with placing cost above other essential variables, as well as the challenges posed by communication failures and fragmentation. These findings provide a helpful starting point for the investigations that are now continuing with the goal of improving the DBB strategy.

Based on the thorough literature assessment, it is clear that earlier research has made significant contributions to understanding the problems and possibilities associated with the design–bid–build (DBB) strategy in the construction sector. The examined research, however, did not expressly offer a new paradigm to address the highlighted issues. This overview of the literature provides background for our study, which attempts to overcome this gap by offering a unique paradigm for improving DBB project delivery.

Our research acknowledges the need for a new viewpoint and aims to add to the current body of knowledge by giving a thorough and unique approach. The next sections of the article will explain our proposed framework, explaining its essential components and offering a complete review of how it overcomes the flaws mentioned in the literature. We recognise the significance of not just recognising current difficulties but also actively suggesting and explaining actual solutions to improve project delivery within the DBB paradigm.

3 Method

This systematic study employed the recommended systematic review methodology outlined by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. These recommendations were developed based on a protocol that underwent peer review. A systematic review is a comprehensive synthesis of pertinent studies pertaining to a certain topic, employing transparent and replicable methodologies to collect and amalgamate data from diverse sources. The methodologies employed in this investigation are delineated in the subsequent sections.

The study issue pertains to the optimisation of the design–bid–build project delivery technique with the aim of enhancing delivery efficiency and contractor selection. The findings are provided in compliance with the guidelines outlined by the PRISMA.

3.1 Methodology

This section addresses the challenges in enhancing the design–bid–build (DBB) project delivery process for contractor selection and project delivery improvement within the construction industry. It also outlines the methodology employed to address this. The methodology employed in this study is a comprehensive and systematic approach.

Our study used a systematic review technique that adheres to the PRISMA standards to comprehensively evaluate the effectiveness of the design–bid–build (DBB) project delivery strategy.

3.1.1 Literature review

This section provides a comprehensive review of the literature relevant to the research topic.

Prior to conducting the inquiry, a thorough review of the existing literature was undertaken. During this phase, a comprehensive examination was conducted on the existing research, studies and frameworks pertaining to the DBB project delivery technique, contractor selection and project delivery within the construction sector. This facilitated the identification of specific topics that need more investigation and revealed gaps in existing knowledge.

3.1.2 Data acquisition

The data sources include relevant databases, scholarly articles and journals. The systematic selection of key databases such as Google Scholar, PubMed and Science Direct in for data collection was crucial in ensuring the comprehensive coverage of relevant literature.

3.1.3 Keyword search for conducting searches

This process involved the incorporation of numerous keywords in conjunction with an examination of relevant databases. The database was examined and comprehensively investigated, provided that the initial search results met the eligibility criteria. If the databases were not eligible, they were not examined. Ultimately, the three databases chosen were Google Scholar, PubMed and Science Direct. To locate pertinent articles and methodically acquire resources pertaining to the DBB project delivery, contractor selection and project delivery enhancement within the construction industry, a methodical approach was developed. This approach involved the utilisation of a structured keyword search method that incorporated Boolean operators such as AND, NOT and OR. The search methodology was modified to narrow down the language parameters exclusively to English and focus solely on papers published between January 2013 and June 2023. To maintain the study's focus on the construction industry, articles from other industries were excluded from the systematic review.

3.1.4 Criteria for eligibility

For selecting relevant papers for this systematic review, eligibility criteria were established. The inclusion criteria included a range of publication dates, a preferred language and specific types of research papers, such as case studies, experimental studies, qualitative studies and quantitative studies. Moreover, reviews, legislative assessments and opinion articles were excluded.

Prior to investigation, some prerequisites were set. We utilised articles that were released between January 2013 and June 2023. We included all articles irrespective of geographical boundaries. However, due to linguistic constraints, only articles written in the English language were included.

The systematic review exclusively comprised experimental articles, case reports and qualitative and quantitative studies. Therefore, opinion articles, reviews and legislative evaluations were excluded. To provide a thorough and all-encompassing viewpoint, the technique and research design were not limited or constrained and a diverse range of research were integrated to enhance design–bid–build projects in terms of contractor selection and project completion. This study aims to examine case studies related to selecting contractors and executing improvements within the timeframe of 2013 to 2023. The research will focus on queries and structures employed during this period.

3.1.5 Evaluation of quality

The articles resulted from the search were evaluated for their quality using the Critical Appraisal Skills Programme (CASP) checklist and were then checked against a collection of criteria. The articles were included if they met these criteria.

The reviewer established and executed a set of extraction components prior to the screening procedure to promote consistency in understanding and the collection of data. The CASP list was employed to score each study for the purpose of the research (Critical Appraisal Skills Programme [CASP] 2018).

1. Were the aims of the study clearly articulated?
2. Is it necessary to employ a qualitative methodology?
3. Was the research design able to adequately fulfil the purpose of the study?
4. Was the recruitment strategy in accordance with the objectives of the research?
5. Did the data collection method address the research topic?
6. Has the consideration of the mechanism by which responders communicate been correctly addressed?
7. Have ethical considerations been taken into account?
8. Was the data analysis sufficiently detailed?
9. Is the conclusion logically sound?
10. To what extent does the research hold value?

In this study, a comprehensive examination was conducted on each item included in the CASP list. A score of 2 was provided if the evaluation condition was met. In the event that the assessment criterion was not fulfilled, a score of 0 was allocated. A score of 1 was assigned to individual papers that either partially or did not fulfil the assessment requirements.

3.1.6 Extraction of data

A systematic analysis of carefully selected papers was conducted to extract pertinent information and data. To maintain the integrity and correctness of the data, the technique adhered to a systematic and standardised methodology.

3.1.7 Synthesis and analysis

The information or data in an academic context were combined and examined.

The examination of the research findings occurred subsequent to the extraction of the data. The primary focus of this inquiry was to examine the optimisation of the DBB project delivery methodology, specifically in relation to contractor selection and project delivery enhancement. During this phase, significant observations, recurring patterns and prevailing trends were identified and consolidated.

3.1.8 Recommendation

Based on the findings, it is recommended that further research be conducted to explore potential solutions or strategies to address the identified issues.

From the data analysis, a range of valuable and innovative recommendations were generated with the aim of enhancing the DBB project delivery approach. The aforementioned recommendations were formulated with the objective of enhancing project delivery within the construction industry and addressing the challenges associated with the process of contractor selection.

3.1.9 Reporting

The study findings were reported in accordance with the PRISMA standards. This reporting system ensures the production of a study report that corresponds to the PRISMA requirements, while also maintaining a high level of organisation and comprehensibility.

3.1.10 Conclusion

In conclusion, it can be inferred that the aforementioned points support the notion that the topic at hand has been thoroughly examined and analysed.

The investigation concluded with a comprehensive summary that outlined the primary findings of the study and emphasised the significance of the recommendations put forth. The capacity of these solutions to enhance the DBB project delivery methodology in the construction sector was emphasised.

The present study utilises a systematic review methodology in accordance with the PRISMA criteria to thoroughly assess the design–bid–build (DBB) project delivery process.

The present study aims to conduct a comprehensive review of the existing literature to gain a deeper understanding of the subject matter.

Through a thorough analysis of the current body of literature, it has been determined that there are significant deficiencies in the comprehension of DBB project delivery, contractor selection and project delivery within the construction industry.

The process of gathering and organising data, as well as the approach used to retrieve relevant information, is given as follows:

Databases such as Google Scholar, PubMed and Science Direct were selected as prioritised sources for targeted data acquisition.

We conducted a systematic keyword search, employing Boolean operators, to refine our investigation to materials written in English and published between January 2013 and June 2023, specifically within the domain of the construction industry.

3.2 The criteria for determining eligibility

A rigorous set of criteria was implemented to assure the inclusion of only articles of high quality, with the deliberate exclusion of evaluations, legislative assessments and opinion papers.

3.3 Evaluation of quality

The research papers were assessed using the CASP list, with a focus on evaluating the clarity of study objectives, suitability of the research design and congruence between the recruitment technique and research objectives.

Data extraction, synthesis and analysis were carried out, which are fundamental components of academic research.

The selected publications were subjected to meticulous analysis in a methodical manner, wherein the findings were synthesised and interpreted.

The study aimed to analyse trends and patterns to optimise the DBB project delivery methodology, specifically focusing on contractor selection and project delivery enhancement.

3.4 Recommendations

Practical and inventive recommendations were formulated to effectively tackle the identified difficulties and improve the delivery system of the DBB project.

The enhancement of decision support and risk management systems has been underscored as crucial areas for improvement.

In summary, our research not only highlights significant deficiencies in the current body of literature but also puts forth practical approaches to enhance the efficiency of the DBB project delivery system. The incorporation of decision support and risk management introduces a new aspect to enhancing project results within the construction sector (Figure 1).

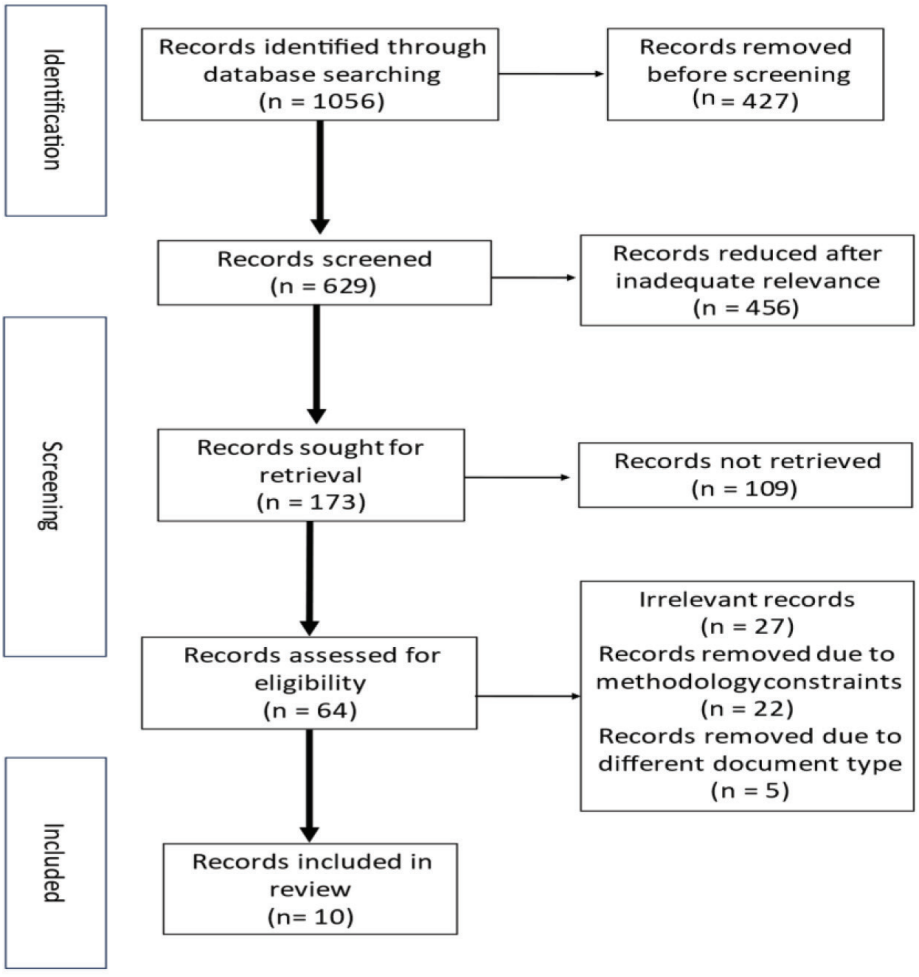

Fig. 1: Data extraction PRISMA diagram. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

4 Results

The literature review showed several building project delivery methods. One of the biggest managerial considerations is choosing the best project delivery method. It immediately impacts crucial performance factors like cost, quality, time and safety, which affect project success. The building sector offers several alterations and solutions to accommodate a variety of clients.

4.1 Design–bid–build delivery

Professionals used and standardised design–bid–build (DBB) components for all construction projects until 1990 (Friedlander 1998). DBB, a classic method, requires owners to sign two contracts: one with the design expert and another with the construction expert.

Since the split, more issues, conflicts, petitions and adjustment orders have caused delays and overspending (Azhar et al. 2014), this delivery method is often used in fixed-cost or lump-sum contracts, where a contractor completes work for a specified price. The owner is protected from cost adjustments by such a contract (Griffiths 1989).

Due to rising demand for heavy engineering programmes, the bulk payment contract was unable to finish the project on time due to challenges estimating the work. To create a unit pricing contract, the owner separates the project into bid components and estimates their effort. The contractor then estimates the direct cost of each component, project overhead, profit and other charges (Teicholz and Ashley 1978).

4.2 DB project delivery

The DB project delivery technique, also known as the DB approach, is a construction project management strategy that combines the design and construction phases into a single contract.

Increasing construction complexity in the 20th century required alternative delivery methods and stakeholder interaction. DB project delivery is growing in construction. DB manages building and design with the project owner utilising this strategy. Owners were initially unwilling to make this difficult adjustment because they worried contractual representation would lower construction project quality (Gransberg et al. 2006). These concerns were allayed as the project progressed because DB offers advantages like collaborative construction, where the designer and constructor work together.

DB also offers a fast-track option to start partial construction while the design is finalised, saving time and money. DB has evolved into bridge, develop-and-build, turnkey method, package deals, novation-DB, build–operate–transfer and others. All of these categories were designed for distinct construction scenarios (Algarni et al. 2007; Xia et al. 2011).

4.3 CM project delivery system

Alternative delivery method CM emerged about the same time as DB. The owner employs a building project company and a design firm early in CM's pre-construction phase. After that, the construction manager would advise the owner on building operations and design. It is apparent that this strategy encourages project collaboration. Owner involvement and notification are also needed (Gould 2012). Building management subclasses Construction Management at Risk (CMAR).

In this case, the building manager becomes a dealer and coordinates the programme and acts as the general contractor to finish the work. Owners benefit from this method and a contract with a maximum cost (Akpan et al. 2014). Compared to traditional DBB delivery, it leads to changing orders, pricing certainty and higher-quality goods and services (Rojas and Kell 2008; Carpenter and Bausman 2016). However, because the building sector still needs to enhance its delivery system, different distribution methods were designed to achieve specific aims, resulting in fragmented tactics (Azari-Najafabadi et al. 2012).

4.4 Integrated project delivery (IPD)

New IPD systems may solve this problem, according to researchers (Al-Mousli and El-Sayegh 2016). An 'approach that integrates people, systems, industry structures, and practices into a process that collaboratively harnesses the talents and insights of all participants' (Eckblad et al. 2007) reduces waste and maximises efficiency during design, fabrication and construction.

Azhar et al. (2015) specified six IPD qualities. Collective programme objectives, shared risk and reward, multiparty contracts, cooperative policy-making and control, and early key participant participation are examples. To address the drawbacks of the old DBB strategy, building programme delivery must be more integrated. This strategy promotes multiple cultures, which renders it unproductive and expensive owing to incompatibility, data and group decentralisation.

4.5 Public–private cooperation

Public–private partnership (PPP) brings private companies and the government together to build and operate public infrastructure. European private investments in public programmes stretch back to the 1800s, but the PPP concept was widely recognised and utilised in the building sector in the late 1900s. European nations and Asian and American nations shared such incidents in the 19th century (Kumaraswamy and Morris 2002).

This project delivery method has pros and cons. Successful project management and on-time delivery depend on efficient resource use and expertise sharing. Collaboration often wastes money and complicates initiatives. These projects are also likely to fail due to unfair risk allocation.

PPP benefits include sharing project risks; access to private sector funding, resources and experience; faster project delivery; and improved performance and service quality. After the 2007–2008 financial crisis, PPPs for infrastructure construction have grown in developed and developing nations (Osei-Kyei and Chan 2015).

However, PPP has significant limitations including a lengthy and complicated transaction process, the likelihood of higher costs, limited government control and flexibility, and the need for risk balance. PPP projects that benefit both the public and private sectors require risk management, open procurement and a well-defined contract (Figure 2).

The pros and cons of the various construction project delivery techniques are outlined in Table 1.

4.5.1 Relevance to research focus

Studies were chosen for their direct relevance to our major research goal, which is to enhance the design–bid–build (DBB) project delivery process. Each research selected addressed issues such as contractor pre-qualification, collaborative project delivery and innovative techniques that contribute to better project results in the construction industry.

4.5.2 Methodological rigor

Investigations using strong research procedures such as empirical investigations, case studies and systematic reviews were given preference. This assures the findings' dependability and validity, contributing to a more evidence-based synthesis.

Recent and influential works were picked to represent the most recent achievements and perspectives in the area of study. This aids in giving a current grasp of the issues under consideration.

4.5.3 Diversity of views

The studies were selected to reflect diverse perspectives, including geographical regions, construction project types and stakeholder roles. This method guarantees a thorough examination of the subject.

Following these guidelines helped us to compile a review of the literature that not only summarises published research but also sets the stage for future research by including studies that add to our understanding of the problems and possible solutions in the context of DBB project delivery.

4.5.3.1 Integration of diverse viewpoints

Our framework integrates insights from several viewpoints, such as risk management, decision support systems, building information modelling (BIM), contractor pre-qualification, collaborative project delivery and IPD. The novel part is how these components work together so well to provide a comprehensive perspective that is not possible with the current models.

4.5.3.2 Customisation for the design–bid–build (DBB) context

Our model is especially designed for the design–bid–-build (DBB) project delivery technique, whereas other

Fig. 2: Construction industry's framework for project delivery (*Source*: Ahmed and El-Sayegh 2021).

Tab. 1: Framework for project delivery

Project delivery framework	Pros	Cons
DBB	– Clearly defined roles – Competitive bidding – Separation of design and construction	– Absence of cooperation – Possibility of ordering changes – Protracted project timetable
DB	– One point of accountability – Improved cooperation – Expedited project completion – Possibility of cost reductions	– Restricted owner authority – Possible restrictions on design – Modifications made when building – Restricted competitive bidding
CM	– Early participation from the construction manager – Improved communication and collaboration. – Trade contractor selection and bid packaging – Optimisation and budgetary management	– An increase in project management complexity – Possibility of higher project expenses – Possibility of conflicts and lawsuits – Construction manager's little contribution to the design
CMAR	– Heightened intricacy in project management – Possible rise in project expenses – Potential for disagreements and lawsuits – Construction Manager's minimal design input	– A rise in complexity – Risk of cost overruns – Conflict of interest possibility – Restricted contractor competition
IPD	– Cooperation and unity – Early participation and proficiency – Sharing of risk and reward – Enhanced effectiveness and output	– A rise in complexity – Extended project launch – Limited availability of seasoned IPD teams; difficulties in making decisions
Public–private partnership	– Access to sector resources and knowledge Risk control – Effective project execution – Funding availability – Service and performance quality	– Both time intensive and complex – Expensive transaction process with possible increases in costs – Restricted authority and adaptability – Possibility of unequal risk distribution

CM, construction management; CMAR, construction management at risk; DB, design–build; DBB, design–bid–build; IPD, integrated project delivery.

frameworks may be more general in nature. This customisation fills a significant gap in the existing literature by guaranteeing that the framework is not only usable but also tailored for the particular possibilities and difficulties inside the DBB environment.

4.5.3.3 Emphasis on decision support and risk management

Our framework places a distinct emphasis on decision support and risk management systems, recognising their pivotal role in enhancing project outcomes. By delineating the specific mechanisms for effective decision-making and risk mitigation within the DBB framework, our work contributes actionable insights for practitioners and researchers alike.

4.5.3.4 Practical applicability

The developed framework is designed with a practical orientation, offering clear guidelines and actionable steps for implementation. This pragmatic approach distinguishes our work, ensuring that the proposed model is not only theoretically sound but also readily applicable in real-world construction project scenarios.

Table 2 displays the outcomes of a number of studies that compare and contrast various ways of programme delivery in the construction sector under a variety of different scenarios. The studies used a variety of research approaches to evaluate the usefulness of project delivery strategies in addition to the effects on programme delivery and performance. These research tools included surveys, interviews, literature reviews and blended techniques. The findings

Tab. 2: Results of different studies

Reference	Sample size	Methodology	Research objective	Framework studied	Results
Ghadamsi and Braimah (2016)		Mixed methodology (semi-structured survey and literature review)	To assess how the DBB procurement selection criterion affects the success of the programme in Libya	DBB	The project performance criteria (time, cost and quality) are impacted by 11 of the 12 selection criteria
Ebenezer (2020)	350	Quantitative survey conducted by experts in construction	To examine how Nigerian construction industry specialists view the performance quality of DB and DBB	DBB and DB	In terms of performance quality, DB performs better than DBB
Abou Chakra and Ashi (2019)	102 projects	Survey questionnaire	To compare Lebanon's DBB and DB project delivery methods	DBB and DB	The DBB programmes perform effectively in terms of timeliness, security and ongoing inspection. The database projects, on the other hand, function better in terms of cost, communication, risk mitigation and material storage
Peng and Kim (2022)	55 projects	Interviews that are semi-structured	To compare DMC with DBB in terms of building intensity, time, and cost	DMC and DBB	DMC outperforms DBB in terms of construction performance, time and cost.
Yu et al. (2016)		Review of the literature to develop a framework for assessing performance quality	To assess the effectiveness of the DBB delivery mechanism in addition to the DB quality	DBB and DB	
Lu et al. (2017)	144	Questionnaire survey	To evaluate the factors that affect database and DBB application cost performance overruns	DBB and DB	The DBB project delivery technique is heavily influenced by the owner's ability, which might result in cost overruns
AL-Smadi and Hndawi (2021)		Literature review	To compare the project delivery approaches of DBB and DB in the Jordanian construction sector	DB and DBB	DB projects are a good way for the Jordanian construction sector to reduce risk
Calahorra-Jimenez et al. (2020)	41 professionals	Interview survey and literature review	To assess the reasons for cost overruns throughout DBB's project phase	DBB project	Four elements have been identified as having the potential to lower cost overruns: accountability, goal-oriented selection process, efficient information interchange, and incorporation of the contractor's experience in the procurement phase.
Ogechi (2017)	Four case studies	Research based on case study	To compare the DBB and DB projects' project-party relationships	DBB and DB	Compared to DBB projects, DB projects have stronger links throughout the project supplier chain
Edward et al. (2013)	Secondary data from the Florida Department of Transportation	Quantitative research	To evaluate project delivery strategies in Florida based on their shortest duration and least expensive	DBB and DB	Programmes using DBB work well in terms of cost, whereas programmes using DB work better in terms of time

DB, design–build; DBB, design–bid–build.

presented a picture that was inconsistent in project delivery strategies used in the studies in the global construction sector. While some studies highlight the success of DB in terms of communication and performance quality, others demonstrate that the DBB delivery model performs better in terms of cost and safety. While some studies highlight the success of DB, others indicate that the DBB delivery model.

Ghadamsi and Braimah (2016) discovered, using a multi-methodological strategy, that the selection criteria utilised in DBB procurement had an effect on the timeliness, cost and quality of the construction projects. The findings lend credence to the findings of Calahorra-Jimenez et al. (2020), who highlighted a number of factors that can help reduce cost overruns. These factors include effective information sharing, a rigorous selection procedure, responsibility and the incorporation of contractors' prior experience into DBB projects. Lu et al. (2017) found that owner capabilities play a substantial impact on the cost overruns that occur in DBB programmes.

Salla (2020) conducted an investigation of the quality of project delivery strategies utilised in DBB and DB by utilising the viewpoints of construction industry experts in Nigeria's construction industry. According to the findings, database project operations are carried out in a high-quality fashion. While DBB initiatives performed well in terms of costs, Lichtenstein et al. (2013) discovered that DB projects performed better in terms of the amount of time they required. These findings are consistent with those discovered when they investigated how DB and DBB affect the quality of projects. The results, on the other hand, are in direct opposition to the findings that Abou Chakra and Ashi (2019) came to after researching Lebanon's various methods of project delivery. They found that DBB projects have a better track record in terms of meeting deadlines, maintaining a safe environment and undergoing ongoing inspections. On the other hand, DB initiatives have benefits for cost, communication, reducing risk and storing material. According to the findings of a case study conducted by Kereri and Turner (2017), the DB project delivery approach ensures a higher level of contact between the ongoing project and its various stakeholders than does the DBB approach. As a result, database projects provide a superior level of contact between the project and the party.

The research conducted by Peng and Kim (2022) evaluated the DMC and DBB project delivery systems by conducting a comparative analysis based on a variety of criteria, including construction performance, cost and time. The findings revealed that the DMC project delivery strategy performed better than the DBB in all three categories of time, money and construction performance; this highlights the numerous advantages that alternative and contemporary project delivery strategies have over the traditional DBB.

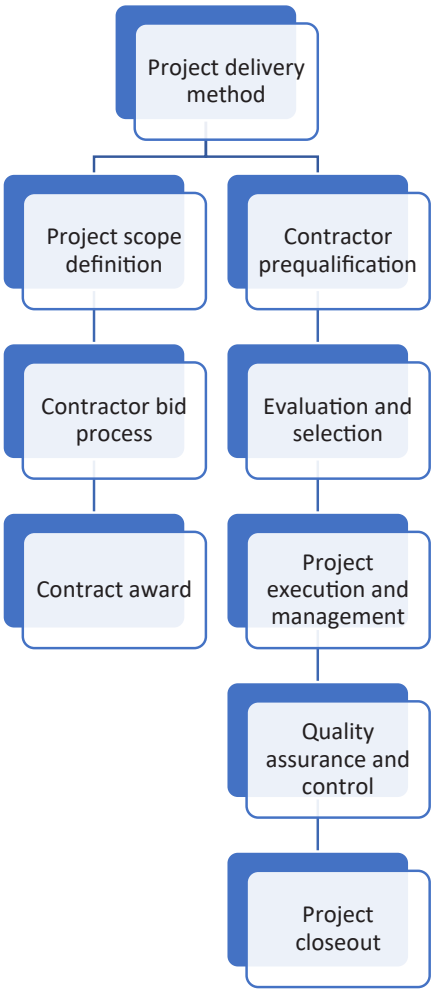

Fig. 3: Framework for project delivery.

The findings emphasised the necessity of taking into consideration a variety of factors before employing a certain strategy for the delivery of a project. Some of these variables include the context, the building project's objectives, the amount of money available and the amount of time available.

The findings led to the development of the following framework (Figure 3):

4.6 Answer to the research question

The research topic, which attempted to optimise the DBB project delivery approach for contractor selection and project delivery improvement, has been answered, thanks to a detailed examination and analysis of the relevant literature. The following is the answer that can be given to the research question:

The DBB project delivery method is fraught with a number of significant challenges in the construction industry, two of the most significant being the selection of a contractor and the successful conclusion of the project. In spite of the fact that earlier research has identified these challenges, a strategy that is more well-planned out and exhaustive is necessary to tackle these issues effectively. The research has provided several helpful recommendations for enhancing the DBB technique, such as instituting stringent pre-qualification procedures, enhancing stakeholder participation, leveraging cutting-edge technologies for project management and establishing effective risk management procedures. The DBB model's contractor selection and project delivery are two areas that can be improved with the help of the following suggestions.

To summarise the findings, the research provides a foundation for addressing the challenges presented by the DBB project delivery technique and offers practical solutions to enhance the process of selecting contractors and delivering projects in the construction industry. For the DBB model to be totally optimised and for project outcomes to be improved, there is a need for both extensive study and practical application.

5 Conclusion

According to the conclusions of an in-depth study and a review of the relevant published material, the design–bid–build (DBB) project delivery technique used in the construction industry has problems with contractor selection and the successful execution of construction projects. When hiring a contractor, it is common practice to place an emphasis on cost above other vital aspects, such as the individual's level of experience and qualifications. This can lead to results that are less than ideal. In addition, because the DBB technique is structured in a sequential manner, it frequently results in problems with fragmentation, miscommunication and coordination. These problems can cause the project to run behind schedule and result in cost overruns. To address these issues and improve the overall performance of the project, a specialised framework is required to speed up the design–bid–build method, simplify the process of selecting contractors and speed up the delivery of the project. In the systematic review, a focus is placed on the many conceptual frameworks and methodological techniques that have been proposed as potential solutions to these problems. These frameworks evaluate a wider number of elements, in addition to the cost, such as skill, experience and the particular requirements of the project at hand.

The findings of this study highlight the need for addressing issues that exist within the DBB project delivery approach utilised within the construction industry. As a result of this study, there are several areas that need to be improved by performing a comprehensive analysis of the quantity of existing research and the quality of the literature. The purpose of the proposals is to improve the DBB process, which should result in a more successful completion of the project and a more effective selection of contractors. In spite of this, it is abundantly obvious that additional study and the actual use of the DBB model in the construction industry are prerequisites for fully realising the model's potential.

5.1 Realistic suggestions

The study came up with several helpful recommendations for improving the DBB project delivery strategy. These recommendations cover a wide variety of subject areas, including the pre-qualification of contractors, enhanced teamwork, advanced project management tools and effective risk management methods.

5.1.1 Knowledge gap and descriptive research design

The findings of this study have brought to light a significant void in the existing body of knowledge. Previous research has largely focused on identifying DBB model difficulties, but it has frequently lacked a systematic technique for tackling these obstacles in their entirety. This lack of a method has often been a limiting factor.

5.2 Possibilities regarding ongoing or future research

Using the information that was gleaned from this analysis, the following intriguing lines of inquiry for more research are suggested:

1. Carrying out suggestions and checking their accuracy: The next round of research needs to zero in on how the proposals made in this analysis can be put into practice in the real world. It is essential to conduct tests to determine whether or not these recommendations work in practice.

2. Comparative analysis
   Conducting research that compares and contrasts the outcomes of DBB project delivery with those of alternative project delivery methods, such as DB or CM, is one way to gain clarity regarding the relative

benefits and drawbacks of each strategy for delivering a project.

3. Requirements for industry acceptance and best practices
   Research needs to be carried out to determine the best way for the construction industry to put the proposed ideas into effect. This includes examining acceptance rates, obstacles linked to implementation and benefits that have been realised.
4. Additional outcomes of the project
   An investigation into the long-term benefits and viability of these enhancements can be gained through an analysis of the performance of construction projects over the long term that have implemented the recommended optimisation strategies.
5. The implementation of technology
   In light of the increasing significance of technology in the building sector, further research should investigate how cutting-edge technologies like BIM and project management software might be integrated to enhance the delivery of DBB projects.

In conclusion, the challenges and opportunities for enhancing the DBB project delivery technique have been analysed and detailed in this review or study. By putting an emphasis on actionable recommendations and outlining potential directions for future study, we hope to pave the way for continued progress in the construction sector in terms of both the quality of project outputs and the DBB model's capacity to increase overall efficiency. The construction sector needs to make innovation a priority and collaborate more closely to find methods of project delivery that are significantly more productive.

6 Recommendations

In the design–bid–build process, the primary focus of future research and development should be on the development of complete frameworks for contractor selection. These frameworks have to take a lot of factors into consideration, including cost, qualifications, competence, previous performance and fit for the requirements of the specific project at hand. It is also a good idea to have policies in place that ensure an open and objective selection process when making hiring decisions.

To improve adherence to schedules, quality and costs, the design–bid–build process needs to carefully evaluate contemporary project delivery approaches. It is possible to increase coordination, production and communication by leveraging collaborative technology, lean building principles and BIM while working on a project, for example.

In light of the challenges that are brought about by the linear structure of the design–bid–build process, it is essential to put in place mechanisms that are both effective at coordinating activities and communicating with one another. This may require planning frequent events, building open lines of communication and establishing common platforms that enable speedy decision-making and the exchange of information among those who are participating in the project.

To improve the design–bid–build process of project delivery, it is necessary to provide high importance to programmes that provide workers in the construction sector with opportunities for continuing professional growth and training. Students should leave these classes with the information and skills necessary to properly manage projects in today's modern environment, as well as the ability to hire contractors, effectively work with others and communicate with others.

The proposed method for contractor selection and an improved model for project delivery have to be developed first before it can be tried out on specific building projects. It is necessary to carry out a comprehensive analysis of the performance and outcomes of the pilot projects. This analysis should take into account a variety of factors, such as budget, punctuality, quality, satisfaction levels among stakeholders and the overall success of the project. The knowledge gained from these experimental initiatives can be applied to guide the development of subsequent adjustments and alterations to the model.

The design–bid–build project delivery method can be strengthened by employing a comprehensive framework for contractor selection, integrating modern project delivery techniques, putting in place effective channels for coordination and communication, allocating funds for professional development and training and testing and assessing the proposed framework. It is possible that the construction industry will be able to improve project performance and overcome the limitations of the traditional DBB strategy if it follows this advice and puts them into action. This will, in the end, result in good project outcomes.

7 Limitations of the study

Some of the limitations of the research are the lack of generalisability, practical application and the quantity of relevant information it has analysed. The conclusions of the research are different depending on the context of the building sector. As a result, it is essential to recognise

the differences in programme type and geographic location, as well as the ways in which these factors influence the effectiveness of the framework. In addition, there is a possibility that the researcher would overlook certain relevant studies, which might result in the analysis and findings having some holes in them. Although the results are significant for improving the delivery of the design–bid–build programme, there may be impediments in the way of actually implementing the improvements.

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