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Towards Better Constructability Reviews: Insights from AEC Professionals

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Constructability reviews are valued for their ability to control costs, maintain schedules, enhance collaboration, and improve safety compliance. This study explores the current practices, benefits, and challenges of constructability reviews in the Architecture, Engineering, and Construction (AEC) industry, based on insights from interviews with industry professionals. It was evident from the interviews that early identification of potential issues through these reviews reduces costly change orders and enables critical elements to be addressed without compromising other project priorities. However, challenges persist, including the timing of contractor involvement, limited owner engagement, inconsistent standardization, contractual constraints, and the difficulty of obtaining meaningful input from subcontractors. Additionally, there is a gap between academic research and practical applications, with practitioners emphasizing traditional, hands-on approaches over BIM-focused methods. Findings from this study highlight the importance of senior-level involvement and early stakeholder engagement, as well as the need for standardized guidelines, better documentation, and more effective communication among project participants. Addressing these challenges can lead to more effective constructability reviews, resulting in improved project efficiency, reduced costs, and enhanced safety, ultimately benefiting all stakeholders involved in construction projects.

Keywords: Constructability review, project management, project stakeholders, owner involvement.

Introduction

Typical construction projects are designed, planned, and built to meet clients' needs while complying with regulations. A project's success is often measured by timely, budget-conscious completion that ensures safety and functionality. Despite sharing common goals, every project is unique due to varying conditions and constraints. While many factors can be controlled through early planning and formal constructability review, unforeseen challenges frequently arise. A constructability review is a structured evaluation of project documents, such as plans, specifications, and contracts, conducted by experienced professionals from the Architecture, Engineering, and Construction (AEC) fields. The objective is to optimize construction methods, sequencing, and material selection before the project breaks ground. By analyzing these project documents, the experts aim to prevent potential issues that could result in delays, cost increases, or compromised quality and performance. It is worth mentioning here that in projects using collaborative delivery methods such as Design-Build, Construction

Management at Risk, or Integrated Project Delivery, constructability reviews occur during the design phase with contractor input, improving efficiency. However, in projects using the Design-Bid-Build delivery method, reviews happen post-award, limiting adjustments and increasing risks.

Without formal constructability reviews, project performance may suffer from undetected design gaps and other missing information, leading to costly changes, rework, and time overruns. In turn, budget overruns and schedule delays are more likely. Additionally, a lack of early identification of conflicts between building systems or trades can negatively impact construction efficiency and productivity. Addressing constructability issues reactively, rather than proactively, can also compromise quality and increase safety risks due to impractical construction methods or unidentified hazards. Furthermore, without a formal review, opportunities for innovation, cost savings, and improved buildability may be missed.

The benefits of conducting constructability reviews are well documented (CII, 2006). Stamatiadis et al. (2017) noted that the benefit-to-cost ratio of these reviews is greater than two. However, despite their documented advantages, constructability reviews are not mandatory and vary significantly across projects in terms of implementation, timing, and approach.

The objective of this study was to examine current constructability review practices within the AEC industry through qualitative interviews with experienced professionals. The research will explore how constructability reviews have evolved, assess their perceived value, identify who is involved in the process, and evaluate the timing and extent of reviews. Additionally, it will gather suggestions for improving constructability review practices.

Literature Review

Constructability, as defined by the Construction Industry Institute (CII), is "the optimum use of construction knowledge and experience in planning, design, procurement, and field operations to achieve overall project objectives" (CII, 2006). The constructability review process offers several significant benefits, such as reducing costs, enhancing schedule efficiency, improving project quality, and increasing safety while managing risks more effectively (CII, 2006). This review allows for the identification of design errors early on, preventing costly mistakes and improving material procurement and project sequencing. Moreover, a well-executed constructability review can ensure the seamless integration of construction knowledge across all phases of a project, thereby minimizing delays and optimizing the entire process (Araújo, Saldanha, Gohr, & Nascimento, 2022).

Despite these advantages, a consistent understanding and application of the constructability review process is often lacking across the industry. Constructability is frequently confused with value engineering (VE), although the two differ significantly. VE focuses on functional analysis and life-cycle costs, while constructability leverages construction experience to ease construction tasks (CII, 2006). Similarly, the term "buildability" refers to the practical ease of assembling a structure but does not encompass the broader integration of construction knowledge into planning and design, as constructability does (Araújo, Saldanha, Gohr, & Nascimento, 2022).

The process of constructability review relies heavily on effective communication and collaboration among all project stakeholders. In practice, poor communication, unclear risk allocation, and design errors frequently contribute to construction disputes. This has far-reaching effects as over half of construction disputes stem from issues with incomplete or inadequate design documents, a problem that often arises when design firms fail to conduct thorough document audits before bidding (Francis,

Ramachandra, & Perera, 2022). This points to a critical need for standardization and consistency in how constructability reviews are understood and implemented.

The integration of Building Information Modeling (BIM) has been widely recognized as a best practice in constructability reviews due to its ability to simulate virtual site tours and identify design clashes. However, BIM also presents challenges, particularly regarding intellectual property rights, data ownership, and interoperability between different software platforms (Guerra & Leite, 2020). Additionally, legal concerns arise over data misuse, design delegation, and the uncertain status of 3D models as formal deliverables (Alsuhaibani, Han, & Leite, 2022). Inconsistent perceptions of BIM's utility across project phases further complicate its role in the constructability review process (Guerra & Leite, 2020).

Other factors such as the type of contract, the availability of skilled personnel, and the capacity to share lessons learned for future projects also influence the effectiveness of constructability reviews. It is crucial for reviewers to distinguish between legally binding contract documents and supplemental information, as contracts define the responsibilities and obligations of all parties involved (Abdul-Malak & Ezzeddine, 2023). CII's strategic guide to constructability includes corporate- and project-level milestones designed to standardize the process, along with tools such as evaluation matrices, constructability clauses, and continuous improvement mechanisms based on lessons learned (CII, 2006).

While constructability reviews typically require substantial time and resources upfront, this investment is generally recovered through fewer errors, reduced rework, and shorter construction timelines. Nonetheless, several challenges can hinder the successful implementation of constructability reviews. These include designers' limited understanding of construction requirements, owners' resistance to additional costs, and ambiguities in contract documents (Jadidoleslami, Saghatforoush, & Zare Ravasan, 2021; Goddard et al., 2011). Personality conflicts, poor information-sharing, and the absence of clear liability for incorrect data also pose obstacles, particularly in the face of unforeseen events or security issues (Ibrahim, Labib, Veeramani, Hanna, & Russell, 2021).

Despite these challenges, the benefits are clear - they improve project outcomes by addressing problems early, enhancing safety and scheduling, and promoting a more efficient construction process. However, the lack of a consistent understanding of the constructability review process underscores the need for a formal and standardized process to fully realize these benefits.

Research Method

To build on concepts identified during the literature review, qualitative data collection was conducted through interviews with AEC industry professionals recruited through purposive sampling. Participants included designers, engineers, owners' representatives, and construction professionals.

Potential participants were invited to take part in the study via email. Of the 15 individuals approached, 11 participated as interviewees. The participants had an average of over 21 years of industry experience in various roles within the AEC industry (Table 1). Out of the 11 participants, nine had completed a bachelor's degree, one had an associate's degree, and one held a master's degree as their highest level of education. The interview questions were shared with the participants in advance to ensure adequate preparation. All interview materials and protocols were approved by the Institutional Review Board (IRB) at the University of Oklahoma.

Interviews were conducted in one of two formats: virtual meetings via Microsoft Teams, where recordings and automatic transcriptions were generated, and in-person meetings with audio

recordings. Each interview followed a consistent structure, beginning with a biographical introduction of the participant, followed by responses to a structured list of questions. Upon completion of the interviews, all audio recordings were reviewed, and transcripts were cross-referenced to ensure accuracy and anonymized.

Table 1. Background information of the participants

Participant	Position	Years in Current Position	Years in Industry
#1	Mission Critical Construction Superintendent	2	24
#2	Hospitality Vice President Operations (Hotel)/Owners' Representative	15	25
#3	Preconstruction Controls Manager/Estimator	4	8
#4	Senior Architect/Owner's Representative	1	20
#5	Construction Company Owner	4	27
#6	Vice President Operations Construction	8	25
#7	Vice President of Construction Development	1	16
#8	Construction Project Manager	4	17
#9	Architect Project Manager	7	23
#10	Mechanical Engineer/Owner's Representative	2	18
#11	Director of Architecture	1	35

Findings

Standard Practice and Procedure

The responses from the participants indicate that constructability reviews are widely implemented across project teams, though the processes differ significantly between organizations. While project owners typically assume that constructability concerns are addressed during the design phase, contract terms often limit contractors' involvement during early design, which can reduce the effectiveness of constructability reviews. Depending on factors such as project scope, complexity, and the team's prior experience working together, project teams adapt their approach to conducting these reviews.

Some participants mentioned the absence of a formalized approach in their organizations, while others relied on structured checklists to carry out the reviews and document their findings. Participant 4 emphasized the value of performing multiple levels of review, stating: "*We actually have two levels of review...a constructability review and a quality assurance/quality control review.*" This dual-layered approach was regarded as essential for aligning stakeholders' goals and ensuring smooth project execution.

Documentation and archival practices for constructability reviews varied across the organizations that participated in this study, though there was a shared preference for cloud-based platforms like Google Suite, Newforma, and Box to store the review data, to be accessed by relevant stakeholders. In terms of process efficiency, the importance of thorough documentation was highlighted by most of the participants, as one remarked: "*You document, or you die*" (Participant 7). Proper documentation and distribution of information are critical for generating institutional knowledge, which can inform future constructability reviews. One of the participants highlighted this reliance on institutional knowledge, stating: "*A lot of our constructability review is more institutional knowledge... we apply it to the next project*" (Participant 6). Other participants emphasized the importance of dedicated knowledge management roles within organizations to ensure that lessons learned from constructability reviews are distributed effectively and used in future projects.

Owners' Involvement in Constructability Review

During the interviews, participants were asked to identify who typically participates in constructability reviews, their qualifications or roles, the level of collaboration involved, and whether a management hierarchy influences the process. All participants indicated that a senior-level team member typically champions constructability reviews within the organization. These reviews are conducted collaboratively with specialized subcontractors and subject matter experts throughout the project lifecycle, depending on time availability. However, the main challenge was not managerial hierarchy but rather timing and contractual constraints. The issue is more about timing than hierarchy, with late involvement limiting the contractor's ability to impact constructability. Another concern was subcontractor involvement before official engagement. Many subcontractors are reluctant to contribute without assurance of compensation.

When discussing owner involvement in constructability reviews, two participants noted that owners on their projects were not involved, attributing this to a lack of understanding regarding the benefits of such reviews. One participant noted: "*[Owners] just focus on the outcome, the aesthetics, the costs, [and] they just want to see your finished product on budget*" (Participant 5). Some owners assume that since they are hiring architects and engineers, the final product will be flawless and will not require any additional review or evaluation. While more owners are starting to recognize the importance of constructability reviews, it's not yet a common practice. For the owners who engage in the process, internal AEC review time is directly tied to project billing. On average, participants reported allocating 25-100 billing hours to constructability reviews, with approximately 0.1-0.5% of the total fee potentially linked to this activity, depending on the complexity and the inclusion of consultants. In some cases, owners may request a "page turn" meeting, where the AEC team and owner representatives discuss plans in detail, which facilitates an open dialogue on design input and maintenance considerations.

Benefits of Constructability Review and the Challenges

The benefits of constructability reviews are well established, and the participants reinforced many of these advantages. They emphasized that constructability reviews not only help control costs and maintain schedules but also encourage collaboration across teams. By engaging stakeholders early and conducting thorough reviews, projects can avoid delays and ensure that everyone is aligned on the overall goals before construction begins.

One of the key points made by several participants was the financial impact of constructability reviews. Much of project management revolves around cost control through finding ways to save, and planning for and preventing unexpected expenses. Early constructability reviews play a crucial role in identifying potential scope gaps or issues that could lead to costly change orders later in the project. By addressing these concerns early, projects can avoid budget overruns and ensure that critical elements are covered without sacrificing other priorities.

Beyond cost and schedule management, constructability reviews also contribute to safety compliance and efficient material procurement. Several participants noted that these reviews help ensure that projects meet safety regulations and that the materials selected are readily available. Choosing locally or regionally available materials helps maintain project schedules and reduces the risk of delays due to supply chain disruptions.

Even despite these benefits, the participants identified several challenges associated with the constructability review process. The most commonly mentioned issue was communication

breakdowns between various parties. Delays in receiving feedback from key stakeholders, such as the owner or architect, were frequently cited as significant barriers to progress. Time constraints were another major challenge, with participants highlighting the difficulty of conducting a thorough review within limited timeframes. Modern cloud-based tools have been highlighted as a partial solution, facilitating simultaneous work across teams to expedite the process without compromising quality. Another organizational challenge that emerged involved internal adherence to standards. Some participants mentioned the difficulty of ensuring all team members conform to established procedures, which can result in inefficiencies when individual preferences diverge from standard practices.

Resource limitations, particularly the availability of products and materials, were also identified as a challenge. Recent fluctuations in product availability, particularly over the past two to three years, have caused disruptions. When specified materials are not readily available, teams are often forced to find substitutes, which can result in aesthetic or functional compromises and may trigger the need for an additional round of reviews. Changes requested by the owner during the construction phase can exacerbate these issues, leading to the need for re-constructability reviews to address potential conflicts or errors in the new designs. Managing both the time and effort required to evaluate and process these changes is another key challenge.

Constructability reviews are fundamentally collaborative efforts requiring strong communication and goal alignment among stakeholders. Several participants noted that successful projects rely on clear expectations, accountability, and a shared understanding of what can realistically be achieved within the project's constraints. Misalignment between the owner's expectations and what the design and construction teams can deliver is a frequent issue. While designs may look appealing in renderings, the practical value and feasibility of certain design elements may be lacking.

Follow-through is crucial once issues are identified during the review process. Ensuring that problems flagged during review meetings—such as errors or missing information in the drawings—are addressed requires dedicated oversight and a commitment to closing the loop. Obtaining meaningful input from subcontractors can also be difficult, as they may not always *“put on that creative hat (as) they oftentimes don't understand the deliverable,”* (Participant 8). To improve efficiency, close-ended, specific questions should be posed to subcontractors, ensuring their time and expertise are used effectively.

Discussion

The interviews conducted in this study provide valuable insights into the current state of constructability reviews within the AEC industry. Several key themes emerged that highlight both the strengths and challenges associated with this critical project management activity. The interviews reinforce the well-established benefits of conducting constructability reviews, including cost control, schedule maintenance, enhanced collaboration, and improved safety compliance (Araújo, Saldanha, Gohr, & Nascimento, 2022). By identifying potential issues early, projects can avoid costly change orders and ensure that critical elements are addressed without compromising other priorities. The financial impact of constructability reviews is a key factor, as project management is largely driven by cost control and efficiency.

It was evident from the interviews how critical the role of senior-level team members is in championing constructability reviews within their organizations. These reviews are collaborative efforts involving specialized subcontractors and subject matter experts throughout the project lifecycle (CII, 2006). However, findings from this study indicate that the primary challenge is not related to managerial hierarchy, but rather the timing and contractual constraints that limit the contractors'

ability to meaningfully impact constructability. This underscores the importance of early and continuous involvement of all stakeholders, as opposed to the traditional model where contractors are brought in later in the process.

Regarding owner involvement, the interviews highlighted a concerning lack of understanding among some owners about the benefits of constructability reviews. Many owners assume that since they are paying architects and engineers, further review or evaluation is not required. This perception presents a significant barrier to the widespread adoption of constructability reviews, as owner engagement and buy-in are crucial to the success of this process. The study also highlights the urgent need to address the aging workforce in both design and construction, as the loss of institutional knowledge poses a significant challenge. Owners' engagement in collaborative constructability reviews becomes increasingly crucial in this context, as a means of capturing and disseminating lessons learned. In addition, the difficulty in obtaining meaningful input from subcontractors, who may be more focused on securing design changes that could lead to additional fees, is another concern that needs to be addressed.

Another notable finding is the emphasis placed by participants on traditional, hands-on review processes, in contrast to the literature's focus on legal (Alsuhaibani, Han, & Leite, 2022) and BIM-related (Guerra & Leite, 2020) constructability review issues. This suggests a potential disconnect between academic research and the realities faced by AEC practitioners on the ground and is likely rooted in the importance of constructability reviews being collaborative. Additionally, the lack of literature addressing the impact of different contract types on constructability reviews' liabilities and the potential benefits of the reviews' results for preassembly or value engineering work present opportunities for further investigation.

Key findings:

- Execution of constructability reviews varies significantly among organizations, with inconsistent standardization and tools used.
- Challenges remain in documenting and archiving constructability reviews' findings to enable lessons learned and future guidance.
- Involvement of senior-level team members and stakeholders is common, but owner engagement levels vary.
- Benefits include cost savings, improved design intent, enhanced safety, and greater efficiency.
- Common challenges include communication issues, time constraints, resource availability, changes during construction, and differing personalities.

Overall, the findings from the interviews highlight the importance of constructability reviews in the AEC industry and the need for a more standardized, collaborative, and technology-enabled approach to this process. Addressing the identified challenges and aligning stakeholder expectations can lead to more efficient and effective constructability reviews, ultimately benefiting all parties involved in construction projects.

Conclusions

The goal of this study was to examine current constructability review practices within the AEC industry and 11 experienced professionals were interviewed for that purpose using a structured interview process. The participants shared the review process followed at their respective organizations, their perceived value, and identified the challenges they face in the review process. Additionally, suggestions were gathered from the participants for improving constructability review practices.

Constructability reviews are critical for the success of AEC projects, as they allow for early identification and mitigation of potential issues. However, the industry still faces notable challenges related to standardization, communication, and the efficient management of data and knowledge linked to constructability reviews. To address these challenges, it is crucial for the AEC industry to develop more structured and widely implemented constructability review practices. This would involve creating standardized guidelines, enhancing communication and collaboration among stakeholders, and improving documentation and knowledge management systems. By adopting these improvements, the industry can fully leverage the benefits of constructability reviews, resulting in cost savings, increased safety, and better project outcomes for all involved parties.

The findings of this research provide a comprehensive overview of the current state of constructability reviews, highlighting progress made and areas needing further attention. Continuous efforts to tackle the challenges identified and promote best practices can contribute to the long-term success and sustainability of the AEC sector.

One limitation of the study is its reliance on purposive convenience sampling, which limited participants to the South-Central region of the United States, particularly Oklahoma and Texas. Nonetheless, the data collected offers valuable insights into the diverse ways organizations approach the constructability review process, demonstrating variability across the industry.

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