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DEVELOPING A GENAI METHODOLOGY FOR DATA ANALYSIS IN INDUSTRIALIZED CONSTRUCTION: A LEAN VIEW

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ABSTRACT

The research explores the potential of Generative Artificial Intelligence (GenAI) in enhancing data analysis processes within industrialized construction projects. The central question investigates whether a methodology can be developed to integrate GenAI into research workflows for construction projects. Existing studies highlight the challenges and opportunities of AI adoption in the construction industry but lack practical frameworks for its application in research, underscoring the need for this study.

The study employs GenAI across three phases studies: analyzing standardized data from 13 projects to identify common patterns and best practices, processing 57 interview transcriptions from industry leaders to assess readiness for industrialized construction, and comparing manual versus AI-supported analysis using 39 projects from an online industrialized construction database. The findings reveal that GenAI significantly reduces data processing time, enabling researchers to focus on in-depth analysis. Key lessons include the importance of prompt design, the context of data inputs, and the trade-offs between generic and customized AI models.

Building on these insights, the study proposes a GenAI-based methodology aligned with Lean Construction principles. The methodology was evaluated through a Likert-scale survey with seven construction professionals, confirming its clarity, feasibility, and applicability across various construction contexts.

KEYWORDS

Industrialized Construction, Generative AI, GenAI, Data Analytics, Lean Construction.

INTRODUCTION

Industrialized construction promises transformative benefits, including increased productivity, cost efficiency, time savings, and enhanced sustainability (Broadhead et al., 2023; Chen, 2023; Vásquez-Hernández et al., 2025). However, these benefits depend on rigorous evaluation processes to overcome adoption barriers, identify best practices, and address the implementation outcomes. This necessity underscores the importance of systematic research efforts, which rely heavily on efficient data collection, processing, and analysis. To address

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these demands, the adoption of emerging technologies, particularly Generative Artificial Intelligence (GenAI), has become indispensable in optimizing data analysis workflows (Varma et al., 2024; Korinek, 2023).

GenAI has shown remarkable potential in various industries, enabling organizations to improve decision-making processes, enhance efficiency, and drive innovation. In the context of industrialized construction, GenAI's applications can streamline workflows, reduce inefficiencies, and support innovation, aligning seamlessly with the principles of Lean Construction. These principles focus on waste reduction, maximizing stakeholder value, and fostering continuous improvement by integrating technology and collaborative practices (Ghimire, Kim, & Acharya, 2023; Rane, 2023; McKinsey, 2024). By enabling the rapid processing and synthesis of complex datasets, GenAI offers opportunities to infer Lean Construction-based insights, such as value identification, waste reduction strategies, and best practices for process standardization.

Although industrialized construction is the primary context addressed in this study—mainly due to the nature of the data analyzed—the methodology proposed is not exclusive to this area. The framework is generalizable and can be adapted to other domains within the construction industry, or even in broader sectors that demand efficient and Lean-aligned data analysis.

Despite this potential, the construction industry lags in adopting advanced technologies compared to other sectors. Challenges such as fragmented workflows, lack of standardization, and data silos impede effective implementation (Onatayo et al., 2024). GenAI, however, offers a pathway to address these issues by enabling researchers to streamline data processing and uncover actionable insights at unprecedented speeds.

Recent literature has explored the potential of GenAI to support design generation, compliance checking, and project documentation in construction (Ghimire et al., 2023; Mohamed & Abuelmaatti, 2024; Taiwo et al., 2025). However, most existing studies focus on specific applications or tools, with limited attention given to structured frameworks that guide the integration of GenAI into research workflows—especially those aligned with Lean Construction principles. This gap restricts the industry's ability to translate data into actionable knowledge, limiting opportunities for value creation and continuous improvement.

This study addresses a key gap in the literature: the absence of practical frameworks that integrate GenAI into research processes while aligning with Lean Construction principles. To tackle this, a structured methodology is proposed to streamline data analysis, reduce inefficiencies, and enhance value in industrialized construction research. Grounded in three phases studies, the approach demonstrates GenAI's potential to improve workflow efficiency, eliminate non-value-adding tasks, and support iterative learning in line with Lean principles.

Therefore, the research question in this study is: Can a methodology be developed to integrate GenAI into research processes for industrialized construction projects effectively? By exploring this question, the paper seeks to contribute to academic discourse and practical advancements in the field, establishing a foundation for future innovations in construction research and practice.

RESEARCH METHOD

The methodological framework adopted in this study builds upon exploratory research and incorporates three distinct phases. These phases evaluate the application of GenAI to streamline research processes in industrialized construction projects, with each focusing on specific data types and methods of evaluation: standardized project data, interviews, and industrialized construction datasets.

As illustrated in Figure 1: Framework for Developing a GenAI-Based Methodology in Industrialized Construction Research, the framework integrates key processes across these phases, emphasizing the iterative nature of prompt refinement, data processing, and contextual analysis.

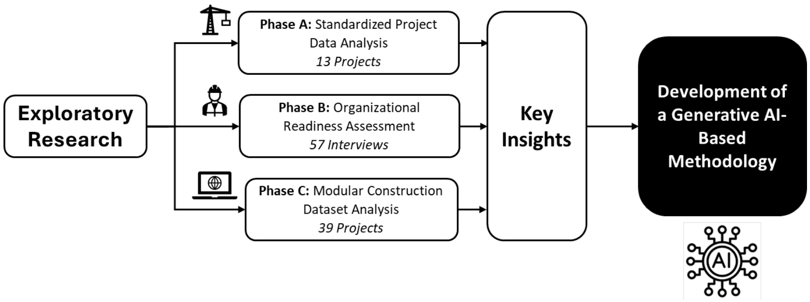

Figure 1: Framework for Developing a GenAI-Based Methodology in Industrialized Construction Research

EXPLORATORY RESEARCH

The study begins with an exploratory phase to identify gaps and opportunities in existing workflows of data analysis in industrialized construction. This phase involves a thorough literature review and consultation with industry experts to ensure the study aligns with pressing challenges in the field (Ghimire et al., 2023; McKinsey, 2024). The exploratory approach ensures that the research addresses practical industry needs while contributing to academic discourse.

PHASE A: STANDARDIZED PROJECT DATA ANALYSIS

This phase tested the ability of GenAI to identify patterns and common elements across 13 industrialized construction projects. Each project was documented using a standardized description format to ensure consistency and facilitate comparative analysis. The primary objective was to identify best practices shared across projects, providing insights into recurring successful strategies.

Workflow: (1) Data Preparation: Project descriptions were compiled into a Word document to streamline data input. (2) AI Processing: The document was uploaded into a ChatGPT interface using the Web Split Prompt technique, enabling iterative analysis of the dataset. (3) Interactive Prompting: Structured prompts guided the AI to identify key factors and common patterns, focusing on best practices demonstrated across the projects.

PHASE B: ORGANIZATIONAL READINESS ASSESSMENT

This phase examined the role of context and prompt refinement in leveraging GenAI to evaluate organizational readiness for adopting industrialized construction practices. Data was collected through interviews with representatives from various companies, and audio recordings were transcribed using Microsoft Teams.

Workflow: (1) Data Transcription and Initial Setup: Audio recordings from 57 interviews were transcribed using Microsoft Teams' automatic transcription feature. This process involved playing back the audio in an individual meeting with transcription enabled. At the end of the playback, Teams generated a transcription file for each interview. Longer transcriptions were divided into smaller segments using the web-based tool Split Prompts to facilitate their input into ChatGPT 4.0. (2) Split Prompt Technique: The transcription files from the 57 interviews were uploaded into ChatGPT 4.0 using the Split Prompt technique. This method facilitated iterative processing by breaking the data into manageable segments, ensuring compatibility with the AI model. (3) Prompt Refinement and Contextual Input: Initial prompts were proposed and reviewed by the research team. Through collaborative refinement, prompts were adjusted to ensure high-quality outputs tailored to the context of industrialized construction. (4) Data Analysis and Report Generation: The refined prompts enabled the identification of key themes and organizational gaps. The results were synthesized into structured reports that served as foundational inputs for the research team to conduct a deeper analysis.

PHASE C: INDUSTRIALIZED CONSTRUCTION DATASET ANALYSIS

This phase compared GenAI-supported analysis to traditional manual workflows using data from 39 industrialized construction projects. The objective was to identify client-centric value variables such as sustainability, adaptability, and cost efficiency.

Workflow: (1) Data Preparation: A PDF containing data from 39 projects was uploaded into a customized GPT environment, enabling the AI to access and process relevant information. (2) Objective Definition: The primary goal was to identify client-centric value variables across these projects. (3) Testing: Two workflows were evaluated:

- GenAI Workflow: A researcher interacted with the customized GPT model, leveraging structured prompts to extract and categorize client value variables.
- Manual Workflow: A researcher conducted a traditional manual analysis of the project data to identify the same variables.

SYNTHESIS AND METHODOLOGY DEVELOPMENT

Following the analysis in the three phases, critical lessons were synthesized to guide the development of a structured methodology for integrating GenAI into research workflows. Key lessons include:

- The importance of prompt design and refinement for ensuring quality outputs.
- Trade-offs between using generic and customized AI models.
- There is a need to align AI processes with Lean Construction principles such as waste reduction, value maximization, and continuous improvement.

A feedback loop was incorporated into the methodology to refine processes based on lessons learned. This iterative approach ensures continuous improvement and adaptability to diverse research contexts. Furthermore, the final version of the methodology was evaluated by seven industry professionals through a structured Likert-scale survey, confirming its clarity, feasibility, and applicability across construction contexts.

DATA RELIABILITY, VALIDITY, AND ETHICAL CONSIDERATIONS

Data reliability and ethical considerations were addressed across all phases. Standardized formats ensured consistency in project descriptions (Phase A), while interview data (Phase B) came from real industry interactions and were transcribed using verified tools. In Phase C, manual and AI analyses were cross-validated for consistency. Ethical safeguards included data anonymization, secure handling, and strategies to mitigate AI bias through prompt refinement and human oversight.

RESULTS

This section presents findings from three phases that illustrate the role of GenAI in advancing research processes in industrialized construction. Phase A identifies patterns from standardized project data, Phase B assesses organizational readiness through interviews, and Phase C compares manual and AI-supported analyses. These results inform the development of the proposed GenAI-based methodology.

IDENTIFYING PATTERNS AND BEST PRACTICES WITH GENAI IN INDUSTRIALIZED CONSTRUCTION PROJECTS

Phase A involved analyzing standardized data from 13 industrialized construction projects to evaluate the potential of GenAI in streamlining research workflows. The focus was on how GenAI aligns with Lean Construction principles, such as waste reduction, value maximization, and continuous improvement, by enabling efficient data processing and cross-analysis. The use of GenAI significantly reduced the time required to analyze large datasets, allowing researchers to concentrate on extracting meaningful insights and patterns.

As illustrated in Figure 2 in Phase A: Workflow for Standardized Data Analysis Using GenAI, the methodology employed in this phase highlights the structured approach to data collection, AI-driven pattern recognition, and the iterative refinement of prompts. This figure provides a visual representation of how GenAI was utilized to extract actionable insights from complex datasets, aligning with Lean principles by reducing inefficiencies in the research process.

This phase highlighted the need for well-structured prompts and contextual inputs to guide AI analysis effectively. GenAI's ability to generate actionable insights aligns with Lean principles by reducing inefficiencies, supporting previous research on AI's role in optimizing workflows and decision-making (Rane, 2023; Ghimire et al., 2023).

The findings from Phase A revealed recurring industrial patterns across the 13 industrialized construction projects. Notably, GenAI identified the frequent use of prefabricated structural systems as a key contributor to cost reduction and project scalability. Sustainability emerged as a dominant theme, with energy-efficient designs and eco-friendly materials adopted in over 70% of the projects. Moreover, standardized workflows—including pre-defined module sequences and repeatable quality control routines—were associated with fewer delays and smoother site assembly.

These findings have clear implications for industry practice. Firms can use these recurring patterns as reference points for decision-making, particularly in early-stage planning and design. The consistency of these insights across geographically and organizationally diverse projects underscores the potential for industry-wide benchmarking. By translating raw project data into actionable insights, GenAI supports strategic alignment with Lean Construction principles such as waste minimization, standardized value delivery, and continuous improvement.

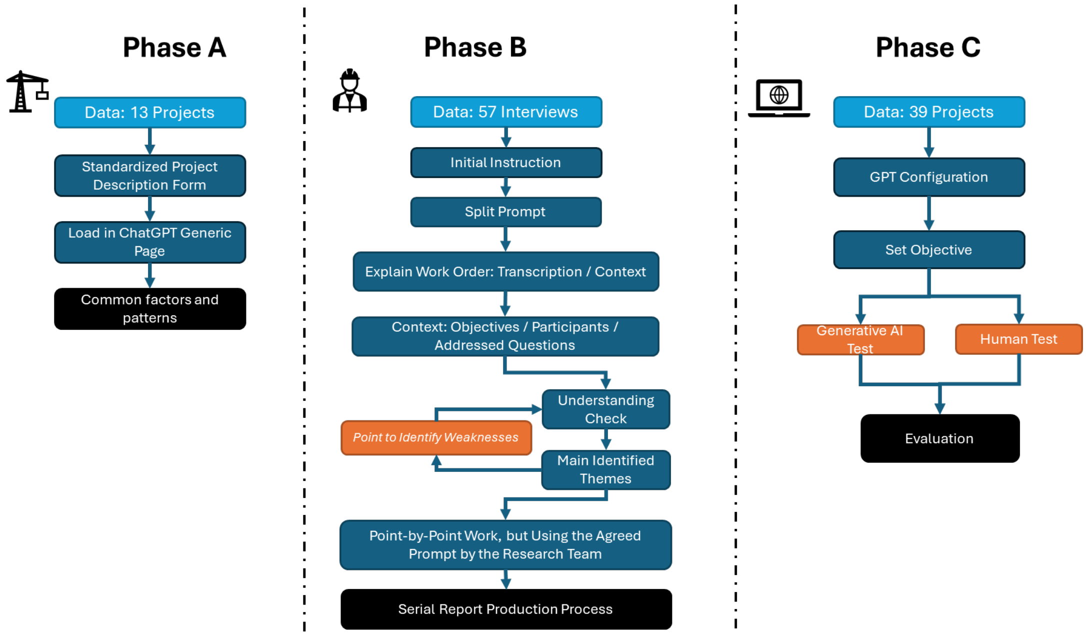

Figure 2: Workflow for Phases A, B, and C

Analyzing Interviews with GenAI to Assess Organizational Readiness for Industrialized Construction

Phase B focused on utilizing GenAI to process and analyze 57 interviews with industry representatives, aiming to evaluate organizational readiness for adopting industrialized construction practices. This phase demonstrated how GenAI aligns with Lean Construction principles by enabling efficient data synthesis, reducing waste in research workflows, and supporting continuous improvement through iterative refinement of prompts.

As illustrated in Figure 2 in Phase B: GenAI Workflow for Organizational Readiness Assessment, the methodology employed in this phase emphasizes the integration of contextual information, iterative prompt refinement, and efficient data processing. The figure provides a visual representation of the structured approach to leveraging GenAI for qualitative data analysis, highlighting how these processes supported the identification of organizational readiness gaps.

The integration of detailed contextual information into the AI model significantly enhanced the relevance and quality of the outputs. This iterative process underscored the importance of prompt design and refinement in tailoring the analysis to specific research objectives. The speed of GenAI was particularly evident in this phase, as 57 interviews were analyzed within two weeks—an achievement that reversed traditional workflows by completing data processing faster than data collection.

The GenAI-assisted analysis of 57 interviews in Phase B uncovered organizational gaps that pose critical challenges for the adoption of industrialized construction. These included resistance to digital tools, fragmented decision-making structures, lack of internal process standardization, and varying levels of technological readiness. For example, while some firms reported formal innovation departments and digital roadmaps, others relied entirely on ad-hoc processes without clear governance or KPIs for innovation.

These findings are vital for industry stakeholders. Understanding readiness at the organizational level helps companies identify internal barriers before scaling up industrialized construction strategies. Moreover, the use of GenAI enabled a faster and more consistent evaluation of qualitative data, suggesting a scalable approach for conducting internal diagnostics or industry-wide readiness assessments. For policymakers or industry associations, this methodology could support the development of maturity models or digital adoption benchmarks across firms and regions.

These barriers to adopting industrialized construction practices are consistent with previous research on challenges faced in developing countries (Ortega et al., 2023).

Comparative Evaluation of Workflows: Human vs. AI-Assisted Analysis in Industrialized Construction Projects

Phase C compared GenAI-assisted and manual workflows in analyzing 39 industrialized construction projects. As shown in Figure 2, the workflow illustrates how GPT customization enhanced the AI's ability to extract context-specific insights. GenAI significantly reduced analysis time—less than half compared to the manual approach—while delivering structured and consistent outputs. This aligns with Lean principles by minimizing waste and enabling researchers to focus on higher-value tasks. Although AI captured greater detail in areas like innovation and sustainability, nuanced interpretation still required human oversight, supporting a hybrid human-AI model.

Table 1 illustrates the agreement levels between AI and manual analysis. Phase C provided empirical evidence for the comparative value of GenAI-assisted workflows in real industrial contexts. In analyzing 39 industrialized construction projects, the AI-supported approach completed tasks in less than 50% of the time compared to manual methods. Importantly, it delivered greater consistency in outputs and deeper insights in dimensions such as sustainability scoring and client value mapping.

For instance, while manual analysis often grouped innovation under general comments, GenAI was able to differentiate between types of innovation (e.g., process, product, digital) and associate them with specific project features. This level of granularity equips firms with better benchmarking tools and knowledge extraction processes, enabling continuous learning from past projects. Furthermore, the comparison chart in Table 1 illustrates areas where AI outperformed or matched manual efforts, offering compelling evidence for hybrid approaches that combine automation with expert oversight.

This phase offers industry stakeholders a practical demonstration of how GenAI can streamline repetitive analytic tasks while elevating the quality of insights extracted from project data. The evidence gathered supports the adoption of GenAI not only as a research tool, but as an operational asset for project review, quality assurance, and strategic learning.

A key finding was the need to balance GenAI's efficiency with human expertise. While AI accelerated workflows and provided structured outputs, human judgment was essential for interpreting complex results. These findings align with industry research advocating hybrid approaches that integrate AI with domain knowledge (McKinsey, 2024; Ghimire et al., 2023).

Table 1: Comparison of Agreement Levels Between AI and Manual Analysis Outputs

Compared Project	Degree of Agreement	Justification
Project A: Modular Health Facility	Moderate agreement	Both responses highlight speed, sustainability, and functionality in modular design; however, Response 2 is more technical and detailed in its approach.
Project B: Emergency Modular Hospital	High agreement	The responses share elements such as efficient design, fast construction, and adaptability, with Response 2 providing more technical details.
Project C: Regional Health Center	Moderate agreement	They align in sustainability, logistics, and resistance to climatic conditions, but Response 2 includes technological and operational specifications absent in Response 1.
Project D: Tribal Health Facility	Low agreement	Response 1 is more general in terms of design and functionality, while Response 2 offers a detailed approach to sustainability, innovation, and adaptability.
Project E: National Health Agency	Low agreement	Response 2 is significantly more detailed, highlighting advanced design elements, specific medical functionality, and innovative technology.

Response 1: Human-Driven Analysis
Response 2: AI-Prompted Analysis Using Customized GTP

KEY INSIGHTS

The synthesis of findings from the three phases of this study reveals critical insights into the integration of GenAI into research processes for industrialized construction projects. These lessons underscore the transformative potential of GenAI while highlighting areas requiring careful consideration and strategic decision-making.

Time Optimization: GenAI significantly reduces the time required for data processing. This efficiency allows researchers to allocate more time to in-depth analysis, enhancing the quality of insights and decision-making, the implementation of GenAI shifts the time balance in research workflows, reducing the effort spent on repetitive tasks and creating more opportunities for comprehensive analysis. These findings align with broader research indicating that AI tools can optimize workflows by automating repetitive tasks (McKinsey, 2024; Ghimire et al., 2023).

Prompt Development: The design and refinement of prompts emerged as a critical factor in ensuring the quality of AI outputs. Collaborative and iterative approaches to prompt development were particularly effective, demonstrating the importance of aligning prompts with the specific context and objectives of the research.

Customization vs. Generic AI Models: The choice between a customized GPT environment and a generic one depends on the specific needs and constraints of the project. While customized GPT models provided enhanced relevance and depth in outputs, generic models also delivered satisfactory results when paired with well-structured prompts.

Balancing Automation and Expertise: While GenAI accelerates data processing, human expertise remains indispensable for interpreting nuanced findings and contextualizing results within broader research objectives. This hybrid approach ensures both efficiency and depth in research processes.

These lessons offer a roadmap for optimizing GenAI in construction research while aligning with Lean principles by reducing inefficiencies and maximizing analytical value. By streamlining data processing, AI allows researchers to focus on high-value tasks like hypothesis testing and result synthesis. Collaborative prompt development ensures AI outputs align with research goals while acknowledging inherent trade-offs.

GENAI-BASED METHODOLOGY

Based on the findings and lessons learned from the three phases of this study, a structured methodology is proposed to integrate GenAI into research workflows for industrialized construction projects. This methodology emphasizes efficient data collection, processing, and analysis while aligning with Lean Construction principles, such as waste reduction, value maximization, and continuous improvement.

Data Collection: The process begins with a systematic approach to gathering relevant data from various sources, including project documentation, interviews, and databases. Contextual details—such as objectives, participants, and specific research questions—must be recorded to provide a clear framework for AI-based analysis. This step ensures that the inputs are well-structured and tailored to the research objectives.

Understanding Check: Before proceeding with AI processing, an understanding check is conducted to verify that the collected data aligns with the defined context and objectives. This step also resolves any ambiguities in the data, which is crucial for maintaining the quality and accuracy of AI outputs.

Prompt Creation and Refinement: The development of prompts is a critical step in this methodology. Initial prompts are designed based on the research objectives and tested for effectiveness. Feedback from test iterations is used to refine the prompts, ensuring that the AI generates accurate and relevant outputs. Collaborative efforts during this step, as demonstrated in Phase B, enhance the alignment of prompts with the specific context and goals of the research.

Testing and Iteration: Once prompts are refined, the methodology involves iterative testing of the AI outputs. This phase evaluates the relevance, accuracy, and depth of the insights generated. Adjustments are made as needed to improve the quality of results, ensuring consistency across different datasets or project types.

Production and Output Synthesis: In the final stage, AI-generated insights are synthesized into structured outputs, such as reports or analysis summaries. These outputs are then reviewed by the research team to provide deeper interpretation and contextualization, ensuring they meet the strategic objectives of the study.

As shown in Figure 4, the proposed methodology follows an iterative process that refines prompts, integrates context, and validates each analysis stage. This framework harnesses GenAI's speed and efficiency while ensuring alignment with Lean Construction principles. Emphasizing prompt refinement, context setting, and iterative validation maximizes AI benefits without compromising quality. Its adaptability makes it suitable for diverse research applications in industrialized construction, reinforcing Lean principles by minimizing inefficiencies and focusing on value-driven processes.

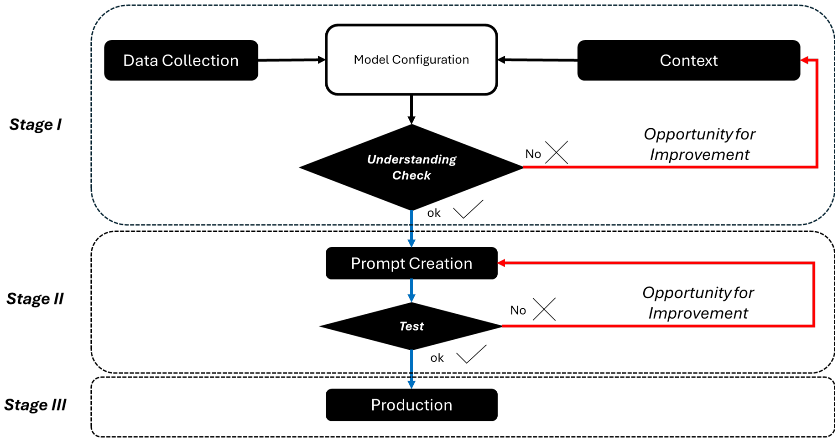

Figure 4: Proposed Methodology for GenAI AI Integration in Research Workflows

EVALUATION OF THE METHODOLOGY THROUGH EXPERT FEEDBACK

To complement the findings of the three phases, a Likert-scale survey was conducted with seven professionals experienced in construction and innovation. The participants included civil engineers, construction engineers, and architects, with professional experience ranging from 5 to 35 years. This diversity ensured that the evaluation considered multiple disciplinary perspectives and levels of seniority within the construction sector.

Participants assessed the clarity, feasibility, completeness, and applicability of the proposed GenAI methodology. As shown in Table 2, the results revealed a strong consensus among experts, with average scores ranging from 4.6 to 5.0 across all seven questions. The methodology was rated as easy to understand (5.0), feasible to implement (5.0), and clear in its comparison between AI and manual analysis (5.0). Furthermore, the structure and completeness of the methodology were positively assessed (4.9 and 4.6, respectively), and its applicability across different construction contexts was confirmed (4.6). These findings reinforce the perceived value and practical relevance of the methodology in industrialized construction and beyond.

Table 2: Expert Evaluation of the Proposed GenAI Methodology

Question	Answers from the experts [Likert Scale]	Average
1. The proposed GenAI methodology was effective in supporting data analysis in the context of construction projects.	5, 4, 5, 5, 5, 4, 4	4,6
2. The steps followed in the GenAI methodology were easy to understand.	5, 5, 5, 5, 5, 5, 5	5,0
3. The steps defined in the GenAI methodology are feasible to implement in professional practice.	5, 5, 5, 5, 5, 5, 5	5,0
4. The proposed sequence for implementing the GenAI methodology was logical and appropriate.	5, 5, 5, 5, 5, 5, 4	4,9
5. The elements included in the methodology are sufficient, making it a comprehensive and complete proposal.	5, 4, 5, 5, 5, 4, 4	4,6
6. I believe this methodology is applicable to other contexts within the construction sector.	5, 4, 5, 4, 5, 5, 4	4,6
7. The comparison between the results obtained through AI and those from manual analysis was clear, understandable, and useful for identifying differentiating contributions.	5, 5, 5, 5, 5, 5, 5	5,0

DISCUSSION

The findings highlight GenAI's transformative role in enhancing research workflows for industrialized construction. By reducing data processing time and enabling deeper analytical focus, GenAI supports Lean principles such as waste reduction. This shift allows researchers to prioritize high-value tasks like hypothesis testing and synthesis. Across all phases, well-structured and iteratively refined prompts proved essential to ensure quality outputs—demonstrating the synergy between AI capabilities and human expertise.

Despite these advantages, challenges remain that warrant careful consideration. The reliance on fragmented or incomplete datasets can introduce biases into the analysis, potentially compromising the validity of findings. Ethical concerns also arise when processing sensitive data, such as interview transcriptions or proprietary corporate information, highlighting the need for compliance with data protection regulations like the General Data Protection Regulation. From a technical perspective, there are trade-offs between using generic and customized AI models. While generic models offer versatility and broad applicability, they may lack the precision required for specific contexts compared to customized models, which demand more excellent resources and expertise. Addressing these challenges requires transparency, robust validation processes, and a commitment to ethical principles in the use of advanced AI tools.

Integrating GenAI into research workflows supports Lean Construction by reducing inefficiencies, enhancing value, and fostering continuous improvement. The iterative refinement of AI prompts mirrors Lean's learning cycles, ensuring accurate and context-aware outputs. While GenAI accelerates analysis, human expertise remains essential for interpreting complex results—highlighting the value of a hybrid model that combines AI efficiency with domain knowledge.

CONCLUSIONS

This study shows that integrating GenAI into research workflows benefits industrialized construction by aligning with Lean principles to optimize data processing, identify best practices, and accelerate analysis. The proposed methodology addresses inefficiencies and supports continuous improvement, allowing researchers to shift from repetitive tasks to deeper analysis and better decision-making.

The findings highlight key implications for integrating GenAI in construction research. Improved efficiency allows researchers to focus on complex analysis, enhancing decision-making. Effective prompt development through training ensures relevant AI outputs. Additionally, the strategic use of AI models offers flexibility, enabling practitioners to balance cost and precision by selecting customized or generic models based on project needs.

While this study highlights GenAI's benefits, it also identifies key areas for further exploration. Validating the methodology across diverse contexts is crucial to test its scalability and robustness. Future research should apply it to various construction projects and datasets to ensure real-world effectiveness. Addressing data fragmentation through preprocessing methods could enhance GenAI's utility in incomplete or inconsistent datasets.

Ethical concerns, including data privacy, bias, and transparency, require deeper investigation. Compliance with regulations and strong safeguards are essential to maintain trust in AI applications. By tackling these challenges, researchers can maximize GenAI's potential, advancing innovation and efficiency in industrialized construction while reinforcing Lean principles.

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