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A Structured Framework for Implementing PMBOK Eighth Edition in Construction Projects Based on Alignment Analysis

Amir Faraji [1,2], Shima Homayoon Arya [1,2], Hannan Abagheri Mahabadi [1], Tahereh Meydani Haji Agha [2] and Payam Rahnamayiezekavat [1,*]

[1] Construction Project Management Department, Khatam University, Tehran 1991633357, Iran; a.faraji@khatam.ac.ir or a.faraji@westernsydney.edu.au (A.F.); sh.homayoon@khatam.ac.ir or s.homayounarya@westernsydney.edu.au (S.H.A.); h.abagheri.8754@khatam.ac.ir (H.A.M.)

[2] School of Engineering, Design and Built Environment, Western Sydney University, Penrith, NSW 2751, Australia; t.meydani@khatam.ac.ir

* Correspondence: p.zekavat@westernsydney.edu.au

Abstract

The shift from process-driven approaches to principle- and domain-based approaches in the PMBOK Guide has presented major challenges to construction professionals operating in highly systematic processes, rigorous contracting, and risky management environments. Although PMBOK 7 promoted value creation and flexibility, its abstract nature has generated uncertainties in terms of application in construction projects. In this regard, PMBOK 8 is attempting to overcome this weakness by integrating operational Principles in a hybrid framework but lacks empirical evidence concerning its practicality in construction projects. This research aims at exploring the possibility of operationalizing and customizing the PMBOK 8 to support construction project management practices using both text mining and expert-based analysis techniques. Comparative text mining analysis has been conducted between PMBOK 6, 7, and 8, followed by interviews with 21 experts from the construction industry and project management. It can be seen that PMBOK 8 shows high congruence with construction needs in terms of governance, risk management, resource management, and flexibility. However, there remain deficiencies in important construction-related domains, such as contract administration, claims management, and health, safety, and environment (HSE). In response to these issues, this study proposes three complementary frameworks for implementing PMBOK 8 in construction: a Construction Maturity Model (CMM8), Construction Domain Alignment Index (CDAI), and Critical Implementation Path (CIP8). Three complementary models are suggested by this research to support the construction-based implementation of PMBOK 8, which includes CMM8, CDAI, and CIP8. These outputs form a knowledge-based tool for evaluating the construction alignment and implementation activities from the PMBOK 8 domains. This study offers a structured approach to analyzing the relevance of PMBOK 8 to construction project management.

Keywords: evolution of PMBOK; PMBOK 8; construction project management; content analysis; conceptual framework; context-based decision-making

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1. Introduction

Construction is considered one of the most complicated and highly uncertain areas in the global economy [1]. The construction processes are characterized by an organization's fragmented structure, the formation of a project team from multiple organizations

on a project basis, contractual relationships, and high risks associated with technology, finances, and regulations [2]. In contrast to production and IT processes, construction operations are carried out in dynamically changing environments that require changes in design, conflict resolution, adherence to certain safety measures, and overcoming of external interruptions [3]. Such specifics explain the constant emergence of problems related to the schedule, cost overruns, contract violations, and litigation cases. With the growing size and complexity of infrastructure, energy, and megaprojects, the insufficiency of traditional methods of project management becomes even more evident [4].

Over the last few decades, the construction sector has experienced a significant shift due to digitization and the implementation of new delivery approaches. The technologies used include building information modeling (BIM), digital twins, monitoring via sensors, and analysis [5]. At the same time, hybrid project delivery frameworks that incorporate both predictive approaches and agility and collaboration have become common in construction projects. This includes integrated project delivery (IPD), design-build, and alliance frameworks [6]. While this brings about benefits and opportunities, the increasing complexity and need for flexibility create new challenges for the field [7]. Standard project management approaches often fall short due to their focus on linearity and static control processes that do not facilitate the iterative nature of current processes. This creates the need for new frameworks that could guide managers in hybrid environments and digitally enabled environments [8].

The Project Management Body of Knowledge (PMBOK) Guide has been widely used for decades as a standard guide to project management practice in many different sectors, including the construction sector [9]. The Sixth Edition of PMBOK provided a process framework based on the use of process groups and specific Inputs, Tools and Techniques, and Outputs (ITTOs). This was quite suitable for construction projects, which rely heavily on contracting and regulatory compliance issues such as scope, cost, schedule, procurement, and quality management. Conversely, the prescriptive characteristic of PMBOK 6 rendered the framework impractical under dynamic conditions due to its strict processes, which were bound to curtail organizational flexibility and innovation. With the uncertainty, complexity, and technological developments experienced by construction industry projects, the rigidity of the project management framework became a source of concern as regards process orientation [10].

PMBOK Seventh Edition introduced a paradigm shift from the existing framework by adopting a transition from process groups to value delivery and tailoring via Principles and Performance Domains. This was because of emerging theories in project management that focused on systems thinking, flexibility, and adaptive decision-making [11]. Although PMBOK 7 enhanced conceptualization and alignment with current management theories, its abstraction became an obstacle regarding implementation by practitioners. The absence of processes and ITTOs in PMBOK 7 hindered construction managers in implementing the guidelines of PMBOK, particularly on risk management, procurement, and contract administration. There was a gap between theory and practice in the field of construction project management [12].

The PMBOK Eighth Edition, which has been released recently, is an attempt to integrate the best features of process-based approach and Principles-based approach in the form of system-based approach or hybrid approach. Specifically, PMBOK 8 contains some operational components like models, artifacts, ITTOs, etc., but still retaining its core concepts of tailoring, value creation, and systems thinking. The above approach, which can be considered a hybrid approach, will be more applicable to construction project management [13]. However, the applicability of PMBOK 8 within construction projects has yet to be investigated thoroughly.

While PMBOK 8 may provide theoretical benefits, little systematic analysis has been performed to determine the applicability of PMBOK 8 in the context of construction project management. The existing literature has yet to align the performance areas of PMBOK 8 with the process-centric mental model that exists in the construction industry. Moreover, no study has assessed the potential use of ITTO components, reintroduced in PMBOK 8, to improve governance, risk management, and decision-making in highly contract-focused construction settings. Issues specific to construction, including contract management, claim management, and health, safety, and environment (HSE), have yet to be addressed within the scope of PMBOK 8.

To bridge the observed gaps, this study seeks to determine the effectiveness of PMBOK 8 in construction project management and to formulate implementation tools that will facilitate its implementation. To accomplish that objective, this study seeks answers to the following research questions:

RQ1: How does the structure of PMBOK 8 and its Performance Domains differ from those of PMBOK 6 and PMBOK 7 with regard to the needs of construction projects?

RQ2: What are the gaps specific to the construction industry that remain unaddressed in PMBOK 8, especially in areas such as contract management, claims management, and health, safety, and environment (HSE)?

RQ3: How is PMBOK 8 to be implemented by formulating the tools necessary to facilitate its implementation in practice?

From the above research questions, there are several contributions made by this research to the existing body of knowledge in construction project management. It offers a comparative text mining analysis of PMBOK 6, 7, and 8, suggests a Construction Maturity Matrix (CMM8), and Construction Domain Alignment Index (CDAI) for evaluation purposes, and recommends a Critical Implementation Path (CIP8) that will help translate the guidance offered by PMBOK 8 to construction projects. This paper proceeds as follows: The Section 2 describes the development history of the PMBOK Guide; the Section 3 explains the research methodology; the Section 4 analyzes the findings; the Section 5 introduces the proposed implementation tools; and the Section 6 discusses conclusions and future research.

2. Project Management Standards in Construction

PMBOK is considered to be one of the most prominent methodologies among the project management approaches, as it is widely acknowledged by both academic researchers and professionals [14]. It serves as a framework that encompasses key terms and Principles aimed at creating consistency and governance [15]. In construction projects, where a contractually based nature and higher risks are more typical, PMBOK has often been discussed as a guiding methodology for organizing activities within the project and decision-making [16]. Therefore, a deeper comprehension of how PMBOK emerged and its structure should be obtained first in order to understand its usefulness for the construction field [17].

The PMBOK Guide, from its first publication back in 1996, has been continuously developed in connection with changes to the project management environment and new managerial paradigms that have emerged over time [18]. Early versions concentrated mainly on creating a common language of terminology and Knowledge Areas associated with project management. In later versions, there was more emphasis on process groups, the implementation of control systems, and ITTO [19]. Thus, the main features of the PMBOK framework were process orientation and a strong reliance on documentation. These features were especially suited to construction projects due to the requirements of traceability and accountability in the construction sector [20]. PMBOK 1 (1996) set the foundations of the project management process, as it defined the main Principles and terms in this field by mentioning nine Knowledge Areas associated with project management. It represented

a first attempt at standardizing the process of project management. In PMBOK 2 (2000), the author elaborated on the terms and topics discussed in PMBOK 1 and included the Process Groups (Initiating, Planning, Executing, Monitoring and Controlling, and Closing). In PMBOK 3 (2004), project management practices were better explained, and Stakeholder Management was added to the Knowledge Areas. PMBOK 4 (2008) clarified the terminologies and process descriptions while broadening the definition of Change Management and Risk Management in recognition of growing project complexity. The release of PMBOK 5 (2013) was considered to be a significant move because it introduced Agile practices and emphasized issues related to sustainability and social responsibility. Then, PMBOK 6 can be seen as a mature process-oriented framework, combining both predictive and Agile practices and exhibiting a hybrid orientation without losing the governance-related structure. On the other hand, PMBOK 7 can be seen as an important paradigm shift in which processes were replaced by Principles, and Performance Domains concentrated on delivering value. This modification was expected to make the framework more adaptable but caused some confusion concerning implementation, especially for construction projects with established procedures and well-defined contractual terms [21–23].

The publication of PMBOK 8 seems to represent the attempt to balance these two approaches, incorporating a system-based model integrating Principles, Performance Domains, and actionable elements that were reinstated in this Edition [24]. This change may open up new opportunities for aligning PMBOK Principles with demands of construction projects, including but not limited to governance issues, risk management, resource coordination, and custom-tailoring [25]. However, the impact of these structural changes on construction project management practices remains understudied in the current academic literature. Most research efforts concentrate on theoretical exploration of the PMBOK evolution process or its applications at large, leaving out the evaluation of its applicability to construction [26].

Hence, in this section, a review of current project management standards in construction is provided, with a special focus placed on evolution of PMBOK models [27]. It must be noted that instead of giving a historical outline of all relevant versions, only comparisons of PMBOK 6, 7, and 8 are given due to their relevance to construction processes. The purpose of this part is to set a basis for further analysis of PMBOK 8 within the construction project context.

In order to build up a theoretical framework for exploring the evolution of the PMBOK Guide and its implications for construction project management, a comparative discussion on PMBOK Editions is offered in Table 1 below. In this table, some major structural elements, including Knowledge Areas/conceptual bases and innovative features introduced in various PMBOK Editions, are summarized to demonstrate the evolution of such a guidebook from a process-based framework towards a Principles-based approach and hybrids. This comparative analysis is especially important considering construction projects, in which the interplay among procedures, governance processes, and flexibility should be taken into consideration in an effective management process. Through this summary, Table 1 lays down the analytical groundwork for exploring the implications of recent PMBOK Editions—mainly PMBOK 6, 7, and 8—for construction project management.

Table 1. Structural evolution and comparative characteristics of PMBOK Editions.

Edition/Year	Core Structure/Focus	Key Knowledge Areas/Concepts	Major Innovations or Changes
PMBOK 1 (1996)	Introduction to project management Principles—foundational concepts	9 Knowledge Areas (scope, time, cost, quality, human resources, communications, risk, procurement, integration)	First comprehensive standardization of project management knowledge across industries
PMBOK 2 (2000)	Expanded and refined concepts, introduced formal process groups	9 Knowledge Areas, with increased detailing of processes	Introduction of Process Groups (Initiating, Planning, Executing, Monitoring and Controlling, Closing)
PMBOK 3 (2004)	Clearer process integration, defining project management "best practices"	10 Knowledge Areas (added Stakeholder Management)	Introduction of the concept of "generally recognized good practices"; enhanced stakeholder management processes
PMBOK 4 (2008)	Standardization of terminology, process improvement	10 Knowledge Areas with fully defined processes	Enhanced definitions and detailed processes for change management, risk management, and integration
PMBOK 5 (2013)	Incorporation of Agile methodologies and sustainability Principles	10 Knowledge Areas with added focus on Agile and Stakeholder Management	Introduction of Agile methodology, deeper focus on sustainability, social responsibility
PMBOK 6 (2017)	Comprehensive and detailed process structure, more emphasis on Agile	10 Knowledge Areas with 49 processes, focus on Agile integration	Full integration of Agile practices alongside traditional approaches, Earned Value Management (EVM) integration
PMBOK 7 (2021)	Shift from process-based to Principles-based approach, focus on value delivery	8 Performance Domains (integration, scope, schedule, cost, quality, resources, risk, stakeholder management)	Abandonment of process groups, introduction of 12 Principles; emphasis on value-driven delivery and tailoring practices
PMBOK 8 (2025)	Continued value-based approach with more focus on modern project challenges	Hybrid structure: Principles + Performance Domains + returning Process Groups (redefined)	Focus on integrating AI, automation, enhancing risk management, and offering increased flexibility through tailoring to suit the needs of complex projects

2.1. Evolution of PMBOK Frameworks: A Comparative Perspective (PMBOK 6–7–8)

For an effective evaluation of the transformational processes within contemporary project management standards' structures and concepts, this research pays attention to the comparative analysis of three major Editions: PMBOK Sixth Edition (with its Extension in certain contexts), Seventh Edition, and Eighth Edition [28]. Such choice of sources is justified by their important role in the transition of PMBOK from the process-focused approach into the Principles-based one. PMBOK 6 and its Extension are considered mature sources that demonstrate the traditional process-focused approach in project management, which implies providing guidelines related to the procedures and processes of the field [29]. At the same time, PMBOK 7 is characterized by the adoption of new paradigm and Principles

related to value delivery and adaptability, whereas PMBOK 8 represents an attempt to create an integrated model that includes both perspectives and uses the system-oriented approach.

PMBOK 6 is largely considered as an approach that follows a process-centric orientation and has five process groups and ten Knowledge Areas consisting of 49 processes altogether [30]. This particular version can be described as highly prescriptive and instructive, as it outlines the specific processes that need to be carried out, the necessary inputs and outputs of those processes, the application of appropriate tools and techniques as well as allocation of responsibilities within each process [31]. These qualities of PMBOK 6 make it highly applicable to traditional projects where project management requires solid governance, proper documentation, and contractual control. It is often used for construction projects [32]. However, in spite of its practical nature, PMBOK 6 has been receiving criticism for lack of flexibility in the environment of fast changes and increasing uncertainties.

With respect to the rise in complexity associated with business landscapes, the use of Agile approaches and hybrid project delivery modes has made the weaknesses of strict procedural approaches evident [33]. In particular, as the nature of projects has become more and more fast-paced, dynamic, and value-focused, the reliance on adherence to procedures alone has not been sufficient anymore. Consequently, a change in perspective has been introduced with respect to the structure of PMBOK that is reflected in a new conception of PMBOK 7. Instead of focusing on procedures, the new version of PMBOK focuses on Principles, including twelve main Principles and eight performance areas [34]. Thus, rather than explaining what should be carried out in certain situations, PMBOK 7 explains why decisions are taken and how value is created.

Flexibility and adaptability of the PMBOK 7 framework are emphasized in that the methodology encourages project managers to utilize whatever methods fit the situation. A special section introduces an array of models, methods, and tools, including both Agile and traditional approaches [35]. The Principles-oriented approach helps to foster creativity and innovation while ensuring agility and resilience of organizations [36]. Hybrid project management methodologies have been recognized by PMBOK 7 as an option for combining predictive and Agile methodologies based on projects' specifics [37]. Although PMBOK 7 offers great opportunities for project managers, the absence of specific procedures and ITTOs poses problems for its implementation. In particular, the issue becomes topical in documentation-intensive industries, such as construction [38].

PMBOK 8 can be seen as an attempt at integratively addressing the weaknesses and strengths of PMBOK 6 and PMBOK 7. Following the framework outlined in PMBOK 7, which includes domains such as governance, scope, schedule, financial management, stakeholders, resources, risks, and quality management, among others, PMBOK 8 brings back structured approaches by juxtaposing predictive and Agile models for every domain [24]. In doing so, the new Edition aims at retaining the flexibility advocated in PMBOK 7 while maintaining a clear structure. One of the key elements of PMBOK 8 lies in the explicit focus on customization, as project management necessarily involves constant changes in structures, processes, and governance systems depending on the specifics of each project.

In all these Editions, there has been considerable change with regard to the position of a project manager. In PMBOK 6, the project manager was seen in terms of executing processes with significant decision-making power, working under a command-and-control structure that depends upon technical knowledge. On the other hand, in PMBOK 7, there is an effort to view the project manager in terms of facilitating value, decision-making, and adaptive or servant leadership, thus shifting from processes towards Principles, mindsets, and skills [39]. In the case of PMBOK 8, the project manager becomes a delivery leader who needs to blend his work of governance, systems thinking, and decision-making in various

delivery models. These changes in the roles and models of project management can be summarized using Table 1 below. Table 2 shows the gap analysis across PMBOK versions.

Table 2. Gap analysis across PMBOK versions [24,40,41].

Comparison Dimension	PMBOK 6	PMBOK 7	PMBOK 8
Core Philosophy	Process-based	Principles-based	Integrated hybrid model
Structural Elements	49 Processes, 10 Knowledge Areas	12 Principles, 8 Performance Domains	7 Performance Domains + Models + Practices
Tailoring Approach	Limited, procedural	Central and emphasized	Systematic, practical, and detailed
ITTOs	Fully included	Removed	Reintroduced through models and artifacts
Agile Integration	Minimal	Conceptual	Practical, with hybrid pathways
Value Delivery	Output-focused	Value-focused	Value + feedback + continuous learning
Industry Applicability	Strong for traditional industries	Broad but abstract	Enhanced applicability with industry-driven models
Limitations	Weak agility, less relevant for hybrid environments	Lack of ITTOs and detailed processes caused confusion	Increased complexity, requires interpretation for teams
Decision Authority	High	Shared	Context-driven
Leadership Style	Command and control	Servant/adaptive	Contextual hybrid
Responsibilities	Process execution	Principle alignment	Integrated governance + value
Competency Emphasis	Technical skills	Mindset + soft skills	Systems + hybrid expertise

The gap analysis presented in Table 2 points out the key issue that underlies the recent development of the PMBOK methodology, namely the necessity of combining procedure compliance with adaptability. Although the PMBOK 6 version offers good operational efficiency and governance control, its low level of flexibility restricts the system's effectiveness in complex project conditions. On the other hand, the PMBOK 7 version, which focuses on Principles, value realization, and adaptive leadership, is less prescriptive and, therefore, more challenging to implement. Specifically, due to the lack of clear guidelines, its application may be ambiguous when working with phase-based or contract-based projects such as those in construction management. PMBOK 8 combines the two versions' features by incorporating domain-specific flexibility and adding new operational components. This convergence of process orientation and Principles-driven guidance forms the conceptual basis for a hybrid delivery paradigm, which is visually synthesized in Figure 1.

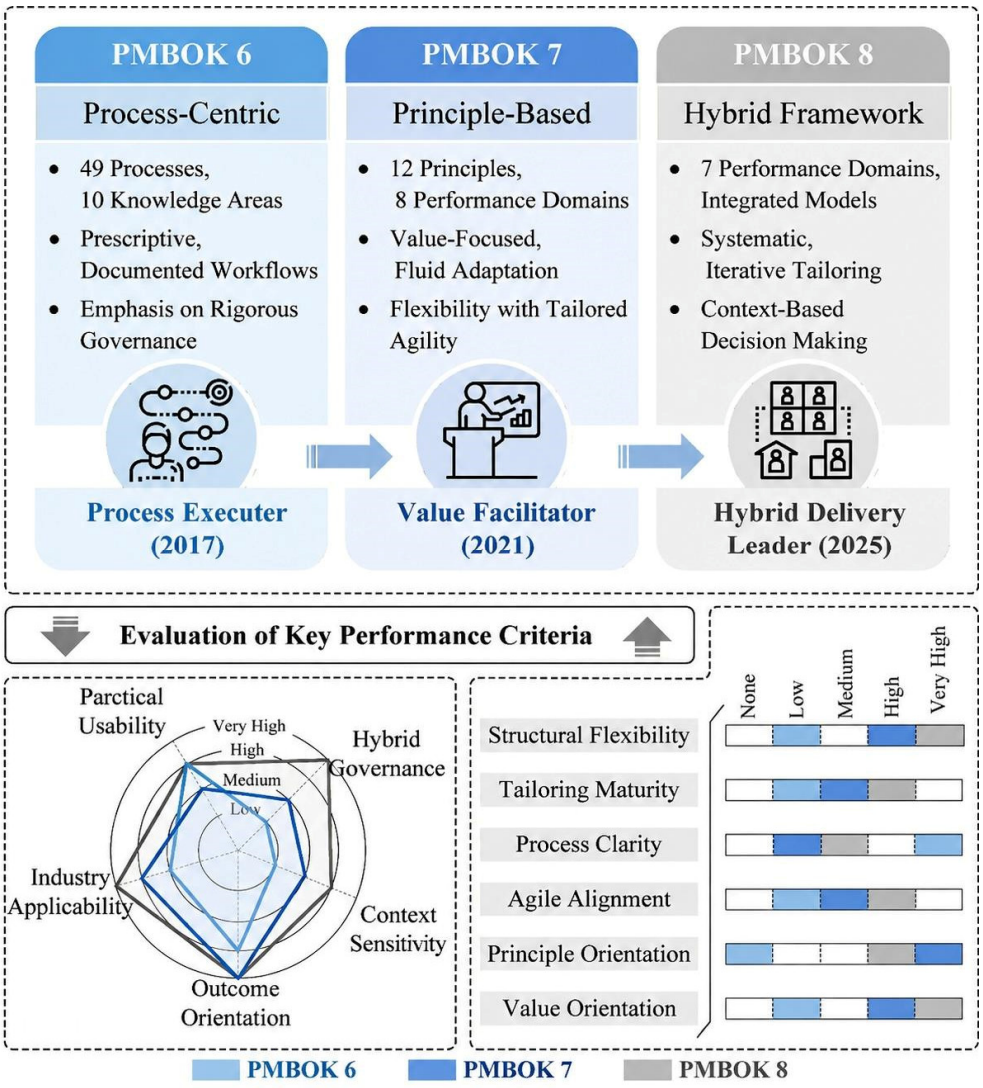


Figure 1. Conceptual evolution of PMBOK frameworks.

2.2. Assessing the Applicability of PMBOK 8 in Construction Projects

Even though there have been notable conceptual advancements in the recent Editions of PMBOK, a significant limitation lies in the application of theoretical guidelines to create structures that could be consistently adopted in construction project settings [42]. Principles-based and domain-oriented structures are flexible and goal-oriented; however, in most cases, projects in the construction sector need to be aligned along a particular lifecycle, assign specific duties and deliver tangible documents to enable effective management and monitoring. This limitation is even more pronounced when one applies generic domains to projects with clearly structured phases as practiced in the construction industry. An operational approach to PMBOK 8 must be developed.

Following this progression, PMBOK 8 extends its past versions with the help of a hybrid approach, which integrates useful features into domain-specific and flexible solutions. Although maintaining the Performance Domains of PMBOK 7, PMBOK 8 offers models, methods, and artifacts, which increase the visibility of processes without using the procedural approach. This issue is especially relevant for construction project management, where processes, documentation, and control should go along with flexibility and collaboration [13].

In order to convert the logic of the domain-based structure outlined in the PMBOK 8 into a more practical and executable format that aligns with construction project settings, an operational mapping based on process alignment can be developed. As shown in Table 3 below, the Performance Domains of the PMBOK 8 could be systematically mapped to the process groups of Initiating, Planning, Executing, Monitoring and Controlling, and Closing while maintaining the flexibility that was highlighted by the hybrid approach.

Table 3. Lifecycle-based operationalization of PMBOK 8 domains and typical ITTO applications [24].

Process Group	Key Integrated Domains	Typical ITTO Application
Initiating	Governance, Stakeholders	Project Charter, Authorization
Planning	Scope, Schedule, Finance, Risk	WBS, Cost Estimation, Schedule Baseline
Executing	Resources, Governance, Stakeholders	Team Leadership, Communication Plans
Monitoring and controlling	Governance, Risk, Finance	Performance Indicators, Corrective Actions
Closing	Governance	Lessons Learned, Handover Reports

In the operational alignment mapping, there is an attempt to address the shortcomings of previous versions of PMBOK, especially PMBOK 7. Although PMBOK 7 contains some useful information from a theoretical perspective, its high level of abstraction and lack of detailed procedure can make it difficult to apply in contract-based industries [43].

Thus, PMBOK 8 represents a solid basis for the analytical and methodological approach taken in this paper. Being able to incorporate elements of governance, hybrid delivery approaches, and performance measurement in domains makes it an ideal choice when tackling the intricacies of construction projects of today. As shown in Table 3 below, the suggested organizational framework acts as a link between the development of the idea of PMBOK and the empirical methodology described in the next sections of this study.

The operation mapping shown in Table 3 is a tool for how PMBOK 8 Performance Domains can be systematically implemented throughout the lifecycle of the construction project. Although this tool provides an organized and contextualized process for implementation, its applicability and robustness need to be tested systematically. To this end, there is a need to conduct an evaluation on whether the tool is consistent, complete, and domain-oriented. It is against this backdrop that this paper proposes the methodology used for the research.

3. Research Methodology

In conducting the research, a qualitative-analytical methodology was chosen as it is designed for development of an operationally applicable framework for utilization of the PMBOK Eighth Edition in construction projects. The choice of the research method was based on its consistency with the theoretical and integrative purpose of the study, i.e., combining project management Principles from the existing literature and finding structural and practical weaknesses in each Edition of the PMBOK. The research is not oriented towards testing hypotheses or using a large amount of empirical data; therefore, methods such as document analysis, text mining, and interviews are preferred.

To answer the research questions and construct a consistent picture of the development of the project management standardization through PMBOK Editions 6, 7, and 8, the research started with an extensive literature review of project management frameworks, standardization techniques, and previous research comparing PMBOK. The methodology used in past research was assessed to develop a solid theoretical framework and place the research within the context of project management studies. Since the paradigm shift

towards a Principles and domains-based framework in the PMBOK Sixth Edition is rather new, the standards of PMBOK were considered the main source of data for this research. For this purpose, the guidelines developed by PMBOK up to the Sixth Edition, Seventh Edition, and Eighth Edition of the framework have been scrutinized due to their well-known acceptance as internationally recognized standards for project management along with the representation of the changing philosophies in project management. These guidelines have been analyzed based on the structural elements, which include process groups, Knowledge Areas, Guiding Principles, Performance Domains, system elements, and relevant practices, focusing particularly on the aspects of governance processes, lifecycle fit, decision-making processes, flexibility, and execution processes, especially considering their importance for construction projects.

Considering that there has been a significant change in the structure, language, and organization of concepts from the PMBOK Sixth Edition through to the latest PMBOK Eighth Edition, the text mining method was used to identify concepts in a consistent and repeatable way. The Voyant Tools online text mining application was used to analyze textual contents of each PMBOK Edition separately. Text mining software allows analyzing large amounts of text to discover quantitative patterns such as word frequency, co-occurrence of terms, and context in which those words appear to determine what are the dominant concepts and structure of the text. In this study, Knowledge Areas in PMBOK Sixth Edition, Guiding Principles and Performance Domains in PMBOK Seventh Edition, and system-based components in PMBOK Eighth Edition were explored to uncover the changes in PMBOK conceptualization in different Editions. The results of the text mining phase offered insight into the relationship among different components of PMBOK Editions both explicitly and implicitly and served as an input for the next stage—expert evaluation. Figure 2 shows the Research Process framework.

In advance of the text mining process, preparation of the three PMBOK corpora was conducted with consistency in order to provide an opportunity for comparison of the Editions. The text in the source documents was transformed into text ready for importing into Voyant Tools, and the same corpus preparation process was conducted for PMBOK 6, PMBOK 7, and PMBOK 8. In the process of corpus preparation, the main goal was to make sure that the text was consistently prepared and ready to be processed with the text mining software, without performing any Edition-specific transformations that may produce artificial differences between the corpora. Then, the corpora were imported into Voyant Tools and analyzed with the same settings for word frequency, lexical, and co-occurrence analysis of the three Editions. Hence, all the differences observed across the Editions were treated as differences in the textual content of the PMBOK Editions.

For validating, clarifying, and situating the results obtained from the process of text mining, expert judgment was then conducted via structured interviews, where a major focus was on developing a conceptual framework of PMBOK Eighth Edition implementation in construction projects. The concepts and their conceptual mappings were transformed into a series of structured interviews aiming to fulfill two interconnected analysis purposes. First, the purpose was to uncover underlying relationships among the Knowledge Areas of PMBOK Sixth Edition and Performance Domains/Guiding Principles of the Seventh and Eighth Editions of PMBOK. Second, there was a higher-level analysis purpose, which aims at constructing a coherent conceptual framework that will map the system-based framework of PMBOK 8 into an operational framework based on the unique nature of construction projects.

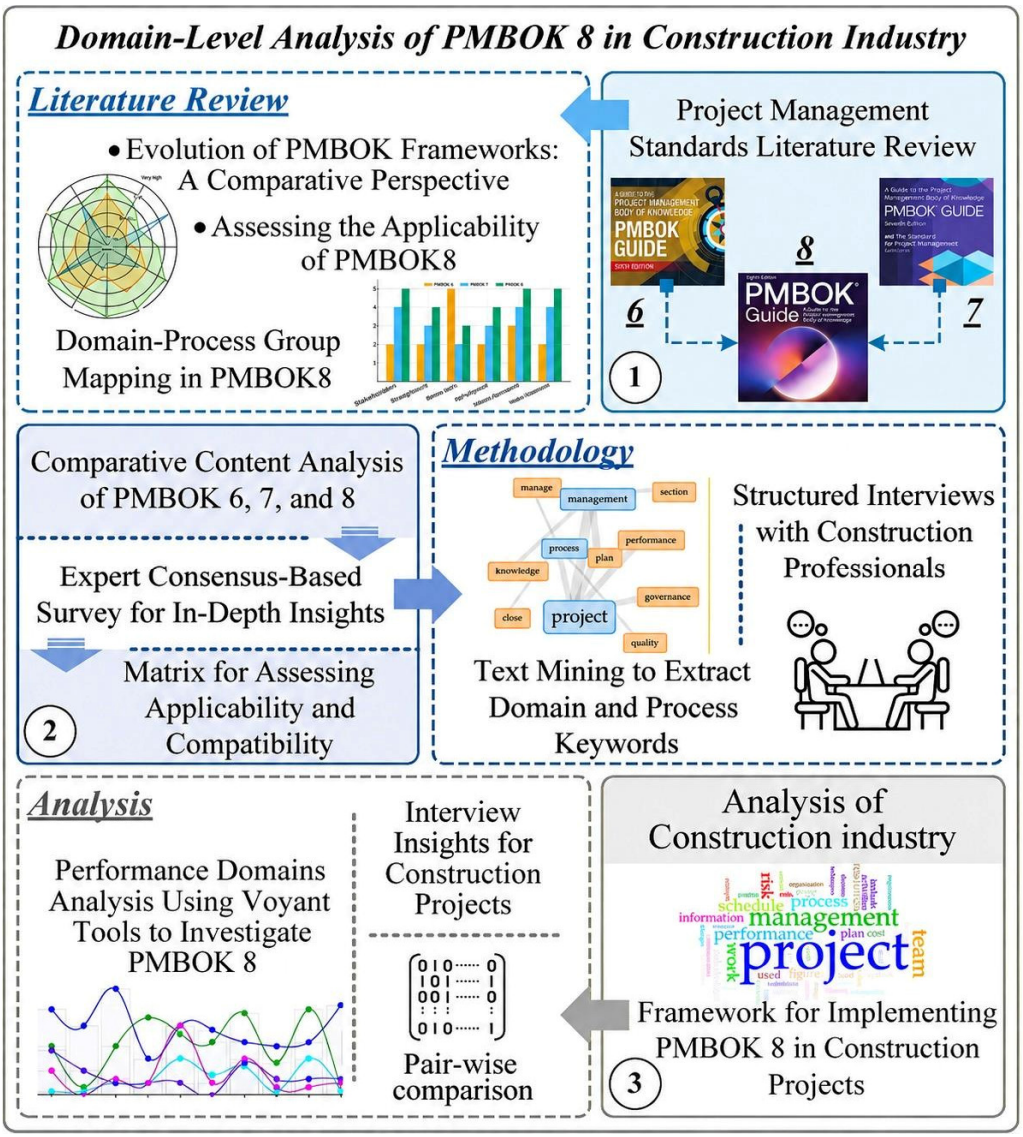


Figure 2. Research Process.

The interview instrument used a structured approach, which contained 25 closed questions measured on a percentage scale and 5 pairwise comparison questions. The use of closed questions enabled the researchers to consistently evaluate experts' perceptions regarding their degree of agreement about the extent of conceptual fit, importance, and applicability of the PMBOK framework components in all Editions. Meanwhile, through the pairwise comparison questions, experts could explain the way they establish relational judgments and prioritizations concerning particular domains, Principles, and elements of the PMBOK system, which are hard to determine from analyzing text alone. In this regard, it is necessary to note that each interview session took place in around 25–30 min, as this amount of time is enough to consider not only the issues related to the relationship between PMBOK concepts but also their application. In addition, each interview was conducted online in order to enhance the accuracy of data collection and analysis. All expert judgments were used to synthesize the findings into a conceptual framework.

The following are the two dimensions that have been used in aligning PMBOK 8 domains in the construction sector: perceived importance and difficulty of implementation. Perceived importance has been defined by the relevance of a given PMBOK 8 domain towards effective management of construction projects. Difficulty has been defined as the

perceived level of difficulty of implementing and adopting the specific PMBOK 8 domain to construction projects, which may involve further interpretation and tailoring to meet the needs of the construction projects. It is important to note that difficulty is not meant to measure the inherent complexity or the technical complexity of performing project activity, but the perceived difficulty of implementing the domain within construction projects.

The study design was arranged to answer each research question individually. RQ1 was answered via comparative text mining of PMBOK 6, PMBOK 7, and PMBOK 8 with regard to their alignment to project management Knowledge Areas. RQ2 was answered via identifying and interpreting alignment discrepancies in relation to construction industry requirements, especially regarding contract administration, claims, and HSE. RQ3 was answered by implementing identified alignment patterns within the CMM8, CDAI, and CIP8 frameworks.

For determining the applicability and consistency of these concepts within the project context, it was important to conduct an analysis of expert viewpoints on different types of projects as well as the stages of their lifecycle. Thus, in order to obtain the best possible results, purposive sampling was chosen as the most appropriate strategy because experts had significant professional experience in construction and project management.

A purposive sampling technique was adopted by use of predefined inclusion criteria to ensure that participants have direct and relevant experience within construction project management as well as knowledge on issues relating to project governance, risk, contracts, resources, stakeholders, or delivery. In order to ensure that an appropriate level of professional and academic qualification was obtained, participants were required to have at least a bachelor's degree and have no less than seven years of professional experience in either construction or project management fields. The approach adopted in sampling was not based on the need for the experts to be statistically representative of the construction industry but rather to obtain varied perspectives of projects rather than the profession of experts. Thus, the 21 participants involved in this study were professionals in roles such as clients, contractors, consultancies, research and development, and project management with expertise in areas such as contract management, construction engineering, cost estimation, coordination of projects, construction project management, and digital construction. With the help of numerous iterations, experts pointed out common and inconsistent areas between three Editions of PMBOK and revealed its practical application to real-life situations. As a result, a comparative framework was created, which demonstrated connections between Principles, domains, and system elements of all three studied Editions of PMBOK.

The following Table 4 describes the demographic and professional features of the 21 experts who have been involved in this research. It must be noted that the number of respondents is appropriate for qualitative research involving expert opinions and targeted towards consensus-based evaluation. These participants were diverse in terms of age, educational level, and profession. They ranged from young professionals to seasoned experts who had been involved in the industry for over 20 years. Hence, the gathered information was able to cover various views regarding practical aspects of the topic under investigation. Diversity in terms of gender, education, profession, expertise, and experience created heterogeneity in the expert panel and minimized the chances that the assessment of alignment would be influenced by one particular profession. However, such diversity should not be seen as any kind of representation for the construction industry in terms of statistics.

Table 4. Demographic and professional profile of the participating experts.

Demographics		Number	Percentage
Gender	Male	13	62%
	Female	8	38%
Age	27–35	5	24%
	36–44	9	43%
	45–53	7	33%
Educational level	Bachler	4	19%
	Master	11	52%
	PhD	6	29%
Profession	R&D	8	38%
	Consultant	3	14%
	Contractor	6	39%
	Client	4	19%
Years of Experience	7–14	7	33%
	15–22	10	48%
	23–30	4	19%
Expertise	Contract Manager	2	10%
	Construction Engineer	4	19%
	Cost Estimator	3	14%
	Project Coordinator	3	14%
	Construction Project Manager	7	33%
	Digital Construction Specialist	2	10%

4. Results of Text-Based Content Analysis of PMBOK Editions

Comparative results in terms of lexical frequency, distribution, co-occurrence, and structure for PMBOK Editions 6, 7, and 8 have been obtained using text analysis. They are provided below in descriptive form and then considered together with the alignment assessment made by experts. Through systematic approaches to text mining, the study focuses on the analysis of prevalent terminology, co-occurrence patterns, and linguistic characteristics to explore shifts in structural characteristics and conceptual focus within successive Editions of the PMBOK Guide. The results described below have been obtained solely from text-based analysis and will be evaluated through expert-based analysis subsequently.

The first stage of the text-based analysis aimed at establishing the dominance of certain lexical patterns in PMBOK Editions 6, 7, and 8. To facilitate comparative analysis, the word frequencies for each Edition were calculated and visualized through a normalized bubble chart representation. Such a representation allows for a relative comparison of terms based on their prominence, as both frequency and distribution are accounted for in the same figure. Through standardization of terms' occurrences, the analysis helps to evaluate changes in conceptual focus across successive Editions of the PMBOK Guide.

Figure 3 shows how the bubble chart representation allows the observation of notable disparities in lexical preference in regard to PMBOK Editions 6, 7, and 8. Specifically, the Sixth Edition is characterized by frequent lexical items that refer to the process performance and process management and control concepts. The above statistics suggest that there is greater lexical relevance of terms related to processes in PMBOK 6. The above pattern is reflective of the process-oriented nature of the Edition; nonetheless, frequency of occurrence of a word does not serve to validate its importance and effectiveness. Thus, the above lexical statistics have been analyzed on the basis of the difference in lexical emphasis of terms rather than their importance. In comparison, the Seventh Edition reveals a more diversified lexical distribution, wherein the frequently used items refer to concepts such as Principles-

based thinking, stakeholder orientation, and value creation. Finally, the Eighth Edition demonstrates a relatively balanced domination of key concepts, including governance, integration, and lifecycle considerations.

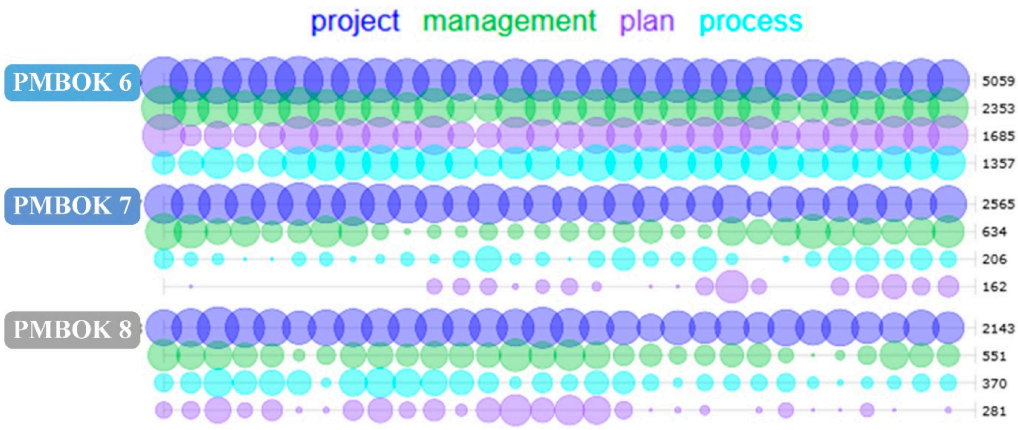


Figure 3. Comparative bubble chart of dominant lexical patterns across PMBOK Editions 6, 7, and 8.

In addition to the aforementioned graphic representation of the differences between Editions 6, 7, and 8 of the PMBOK Guide in Figure 3, some numerical measures have been developed that help assess the nature of the texts' structural composition. As shown in Table 5, measures like word number, lexicon number, type-token ratio, and lexical density point to some distinct features of the structure of the texts of all three Editions. Namely, there appears to be relatively higher redundancy in the Sixth Edition, as well as lower lexical dispersion; it seems to contain more specialized vocabulary, which is characteristic of procedural language. The Seventh Edition is marked by increased lexical variety—greater vocabulary range and fewer repeating terms, pointing to a principled nature of the text. Finally, the Eighth Edition displays an intermediate pattern of textual structure: it contains more structured vocabulary than the Seventh one but also shows a certain degree of lexical variety.

Table 5. Lexical metrics derived from text mining analysis of PMBOK Editions 6, 7, and 8.

No.	Title	Words	Types	Ratio	Words/Sentences
1	PMBOK 6	157,909	7552	5%	25.0
2	PMBOK 7	95,726	9167	10%	20.3
3	PMBOK 8	81,645	12,195	15%	30.1

The synthesis provided in Figure 4 shows the comparison of lexical structures used within PMBOK Sixth, Seventh, and Eighth Editions, which includes integration of word frequency distribution analysis and cross-Edition relational mapping. Instead of displaying the isolated term frequencies, the figure highlights how the prominent terms change their frequency and connections between one another across consecutive Editions.

In all the three versions of PMBOK, the term "project" happens to be the most commonly occurring term in the standard. Apart from this common lexical reference point, variations can be seen in the lexical predominance of some of the other terms in these different Editions of PMBOK. In the PMBOK 6 version, terms such as "plan", "process", and "risk" happen to have significant occurrence, thus suggesting a higher predominance of process and planning-related terms lexically. In PMBOK 7, terms such as "team", "members", and "performance" seem to occur more often, thus suggesting a wider predominance of terms

related to people and performance. In PMBOK 8, the revival of the term "process" in association with terms such as "management" and "performance" suggests a co-predominance of process-related and system-related terms lexically.

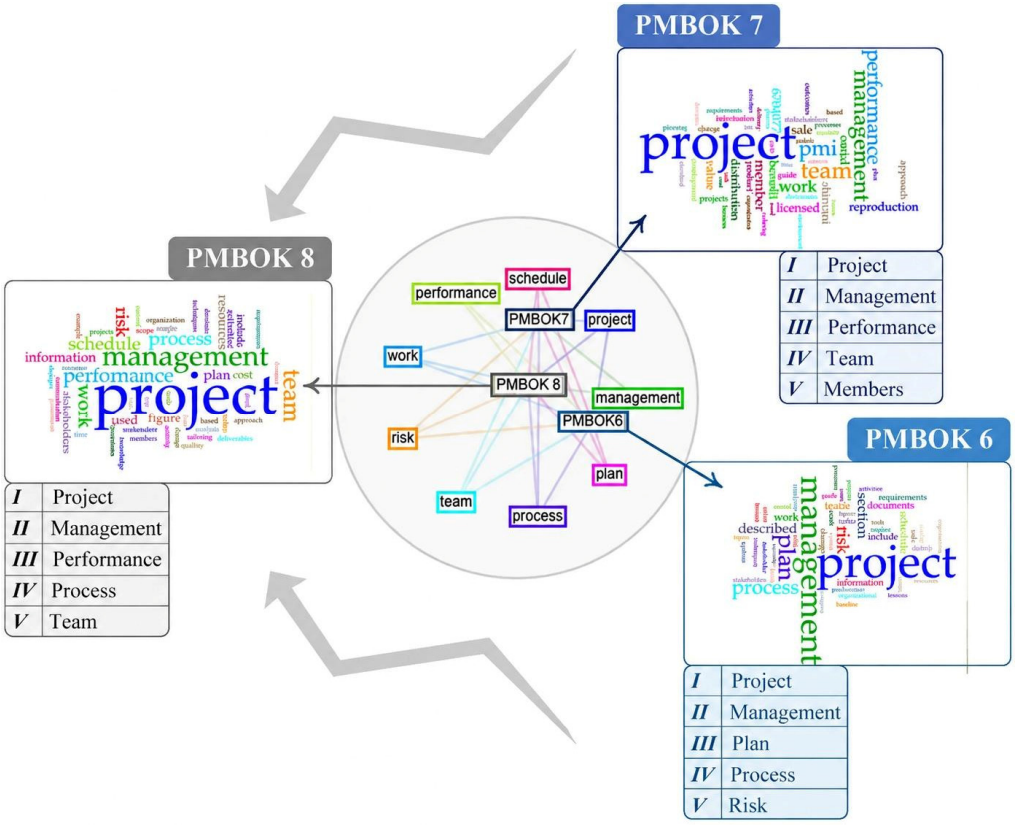


Figure 4. Comparative lexical structure and cross-Edition conceptual mapping of PMBOK Sixth, Seventh, and Eighth Editions.

Network visualization serves as another descriptive measure of the relationship between the most frequently occurring words in the text. The observed shifts in the location and connections for terms such as "management," "performance," "process," "team," and "risk" show that there are differences in the lexical structure of the Editions. Combining frequency analysis and network visualization leads to the conclusion that there is a shift from the more concentrated lexical structure focused on the use of process-related vocabulary in PMBOK 6 to a more scattered lexical structure in PMBOK 7 and PMBOK 8. This conclusion is made about the textual structure of the Editions and does not refer to the practical effectiveness and importance of one Edition compared to others. Figure 4 shows the lexical and conceptual development through the three Editions of PMBOK.

Extending from the comparative network analysis of PMBOK 6, 7, and 8 Editions, the next step in the text-based analysis further limits its scope to the Eighth Edition. Although the previous analyses have drawn attention to structural and lexical correlations between successive Editions of the standard, the main purpose of this paper is to implement the system-based logic of PMBOK 8 in construction projects. Therefore, in the following analysis, the emphasis will be made solely on the internal conceptuality of PMBOK 8. It includes analyzing the frequency, salience, and interrelation of terms related to PMBOK 8's Performance Domains, system components, and operational elements.

After carrying out the comparison between the different Editions, the study was further narrowed down to only examine the textual structure of PMBOK Eighth Edition. In this phase, the content analyzed was the entire PMBOK 8 Guide, especially paying close attention

to Performance Domain descriptions, systems component explanations, delivery models, and execution instructions. This phase aimed at detecting any dominant lexical patterns, distribution of terms, and relationships that exist within the PMBOK 8 guide to show how the system-based project management standard works internally. By analyzing only the Eighth Edition independently of previous Editions, this allowed for clear identification of the way the Eighth Edition's concept is structured textually.

Lexical analysis of PMBOK 8 reveals a clear presence of vocabulary pertaining to systems thinking, value creation, and context adaptation. Vocabulary that is used very often is also linked to Performance Domains, governance structures, stakeholder interactions, and delivery contexts. This is indicative of a prevalence of ideas relating to systems interaction, adaptation, and performance within the text rather than an assessment of the actual relevance of these ideas within projects. Compared to the previous Editions, the lexical composition indicates a more complex text structure while the relevance of the ideas is separately assessed by the expert analysis.

The following Figures 5–11 contain the stream graphs and word-link networks representing not only the distribution of the dominant terms among the document fragments but also the relationship between the main concepts in the PMBOK Eighth Edition sections entitled Governance, Scope, Schedule, Finance, Stakeholders, Resources, and Risk. In all the aforementioned sections, the term "project" emerges as a common anchor in the PMBOK 8 discourse. Specifically, it demonstrates a high relative frequency and acts as a node in the word-link network, with a robust connection with the section-specific concepts (such as management, performance, governance, scope, schedule, cost, and risk).

In the section of Governance (Figure 5), "project" maintains its prominence throughout the segments, with strong ties to "management," "governance," "process," and "performance." This implies that there is consistent use of project governance approaches and not localized ones. For the Scope section (Figure 6), peaks of "project" are evident, with ties to "scope," "requirements," and "management." These peaks denote that there is interlinked discussion of defining the scope, identifying requirements, and managing performance within the section. Within the Schedule section (Figure 7), "schedule" and "project" dominate alternately, with strong lexical ties between "schedule," "performance," and "project."

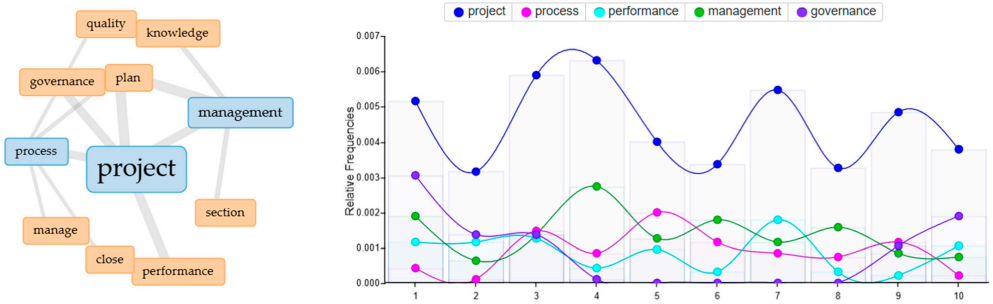


Figure 5. Stream graph and words link in the Governance Section.

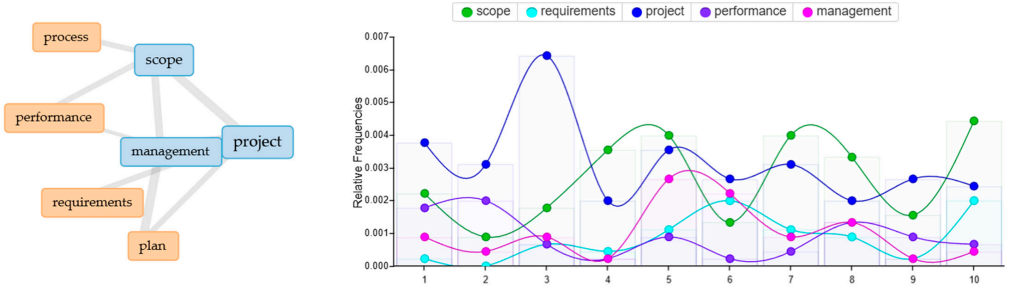


Figure 6. Stream graph and words link in the Scope Section.

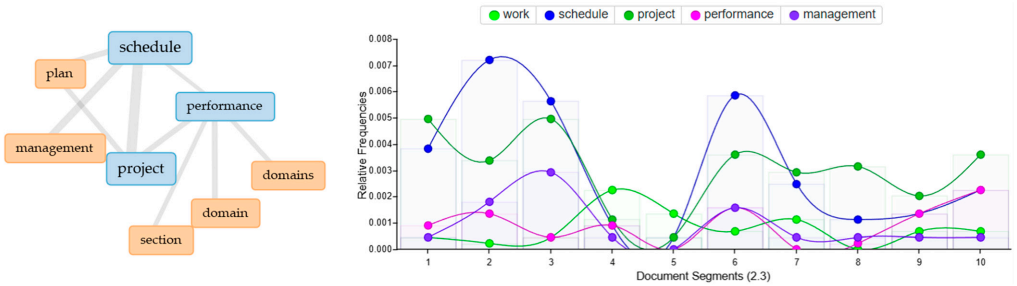


Figure 7. Stream graph and words link in the Schedule Section.

The Finance section (Figure 8) features clear mid-section peak formations with regard to the occurrence of such keywords as "project," "cost," "management," "baseline," and "performance." The presence of close relations between "estimates," "reserves" and cost-related lexemes also point at a balanced and unified focus on finance planning and baseline control and performance monitoring. The Stakeholders section (Figure 9) features the dominance of "project," alongside the formation of a complex network consisting of keywords such as "stakeholder," "engagement," "communications," "management," and "plan." Identification, engagement planning, and communication thus appear to be dispersed along the segments of the article and treated in a distributed manner. The Resources section (Figure 10) shows a somewhat less static but dynamic pattern, featuring clear peak occurrences and close relationships of such terms as "team" and related resources with "management" and "performance," emphasizing the importance of team management and resource planning while maintaining a consistent connection to the article's core—the project management. Finally, the Risk section (Figure 11) shows the prominent dominance of the "risk" keyword and its centrality among other keywords such as "analysis," "responses," "performance," and "management."

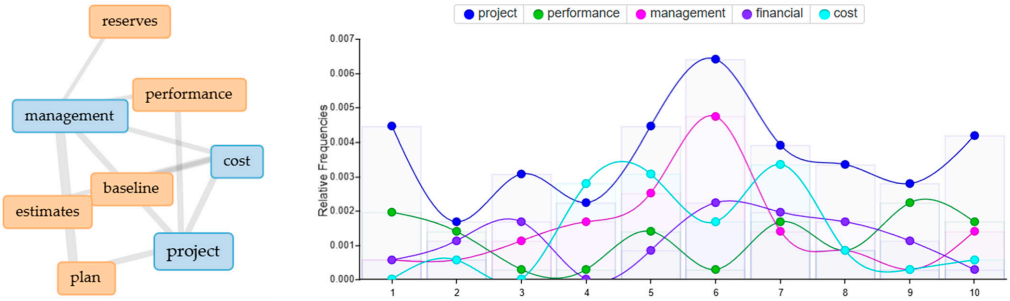


Figure 8. Stream graph and words link in the Finance Section.

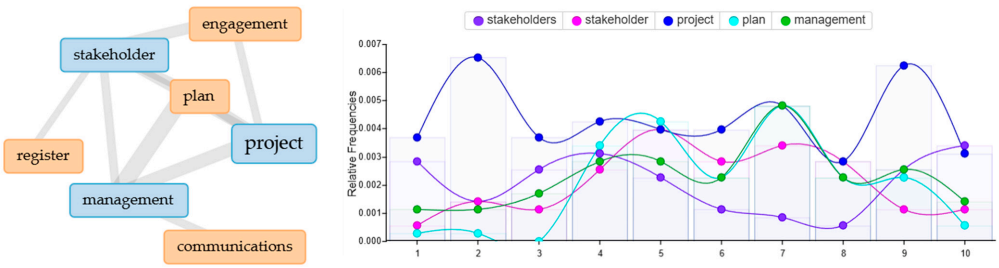


Figure 9. Stream graph and words link in the Stakeholders Section.

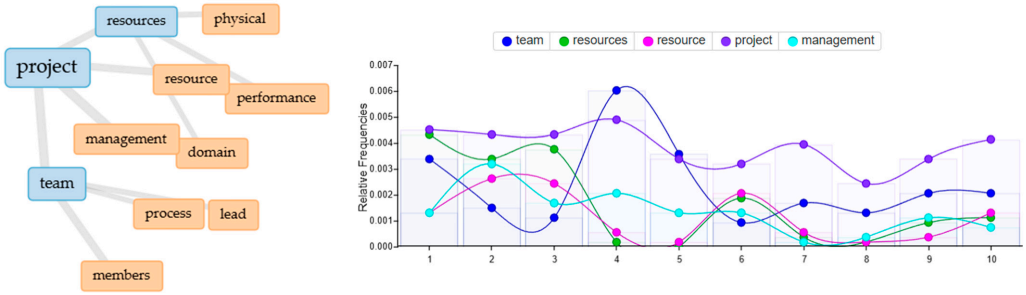


Figure 10. Stream graph and words link in the Resources Section.

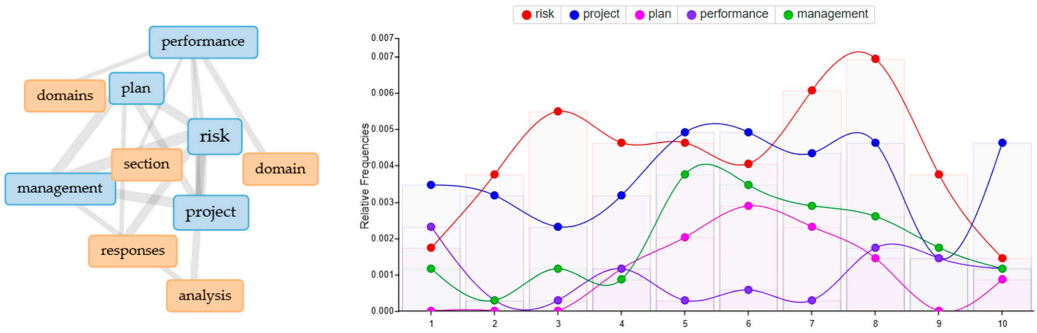


Figure 11. Stream graph and words link in the Risk Section.

In summary, all seven diagrams collectively show that PMBOK 8 translates its conceptualization of domains by using a project-oriented lexicon that is constantly re-contextualized in terms of governance, scope, scheduling, financial controls, stakeholders, resources, and risk management, as seen through stream graph and centrality measures.

As a collective result of the linguistic analysis, it is evident that the PMBOK Eighth Edition constructs a richly inter-connected conceptual model based on overlapping lexical relations in which the domains of performance, system parts, and context play their roles. Relational vocabulary and the lack of strict procedural sequence suggest a system perspective in representing the body of knowledge in project management. Such results constitute a sound textual basis for subsequent expert review and lay ground for moving on to interpretation.

5. Results: Expert-Based Alignment and Implementation Modeling

5.1. Expert-Based Alignment Matrix Results

As a means of systematically collecting expert opinions on the links existing between various PMBOK components in different versions, the initial step in the results analysis relates to an expert-based alignment matrix. The latter is based on aggregated answers collected from the structured interview completed by experts. In the process, experts have assessed the extent to which PMBOK Sixth Edition Knowledge Areas aligned in terms of both concept and practice with the newly introduced Performance Domains, Principles, and system elements in the Seventh and Eighth Editions.

The final alignment matrix presents a summary of the experts' views concerning continuity, change, and divergence among the different Editions of PMBOK. It highlights issues that have conceptual similarities and those that exhibit moderate and low levels of alignment, particularly in relation to construction-oriented structural classes and project situations. The summary of the findings from this expert alignment analysis is presented in Table 6 below.

Table 6. Cross-Edition expert alignment matrix linking PMBOK 6, PMBOK 7, and PMBOK 8 structural elements.

Other PMBOKs	PMBOK 8						
	Governance	**Scope**	**Schedule**	**Finance**	**Stakeholder**	**Resource**	**Risk**
PMBOK 6 (Construction Extension)	-	-	-	-	-	-	-
Integration	5	3	3	3	4	3	4
Scope	3	5	3	2	3	2	2
Schedule	2	3	5	2	2	2	3
Cost	2	2	2	5	2	2	2
Quality	3	3	3	3	3	2	3
Resource	3	2	2	2	3	5	2
Communications	3	3	2	2	4	2	2
Risk	4	3	3	3	3	3	5
Procurement	2	2	2	4	2	2	2
Stakeholder	3	3	2	2	5	2	2
HSE	2	1	1	2	1	2	4
Financial	1	1	1	5	1	1	2
Claim	1	1	1	4	1	1	2
PMBOK 7	-	-	-	-	-	-	-
Stakeholders	4	3	2	2	5	3	3
Team	3	2	2	2	3	5	2
Development Approach and Lifecycle	3	4	3	3	3	3	3
Planning	3	5	4	3	3	3	3
Project Work	3	4	3	3	3	3	3
Delivery	3	3	3	3	3	3	3
Measurement	3	3	3	3	3	3	3
Uncertainty	4	3	3	3	3	3	5

The background colors indicate the relative scores. Darker shades indicate higher scores, while lighter shades indicate lower scores. Therefore, the color gradation has been retained to facilitate the visual interpretation and comparison of the results.

Table 6 illustrates the aggregate alignment measures as provided by experts regarding alignment between the Knowledge Areas of PMBOK Sixth Edition and the respective extension to construction management along with the Performance Domains and system elements of PMBOK Eighth Edition. Each entry in the table represents the mean value of alignment as calculated from the experts' ratings on the percentage scale. Higher scores suggest greater alignment. The matrix helps in assessing the degree of alignment between the domains directly. Diagonal dominance can be seen in several cases, suggesting the internal consistency of the comparable functional domains within different Editions, whereas the entries along the diagonals reveal the linkages between legacy Knowledge Areas and Performance Domains in PMBOK 8.

5.2. Pattern Extraction Across PMBOK Editions

The second phase of analyzing the findings is based on the scoring of alignments presented in Table 6. The recurring patterns of alignment between PMBOK Editions 6, 7, and 8 were identified to facilitate systematic comparison. Categorical divisions of high, medium, and low alignment scores were established based on the distribution of scores from the experts' opinions. Through this, domains demonstrating continuity, transition,

and discontinuity between the process-based and domain-based structure of the PMBOK methodology were systematically identified.

The high-alignment patterns were obtained from the domains where there was consistency in the reporting of higher score values, showing a high perceived alignment between the legacy Knowledge Areas and the Performance Domains under the PMBOK 8 structure. The moderate-alignment patterns were found in the domains that showed inconsistency in the scoring results, thus implying partial conceptual similarities or relationships between versions of the PMBOK. Lastly, the low-alignment patterns were obtained in the domains where lower scores were consistent, indicating a lack of direct alignment between the previous PMBOK structure and the current Eighth Edition's system approach to management.

The alignment patterns identified by the expert matrix analysis were summarized into Table 7, which presents the most significant patterns using categorization based on alignment score levels. Patterns of high values suggest areas with consistently high alignment regardless of the version of the PMBOK, whereas patterns of moderate values represent areas of partial or transitional alignment. Sector-specific low-value patterns relate mostly to construction-oriented extensions, whereas single-source continuation identifies instances where high alignment can only be traced back to its immediate predecessor conceptually.

Table 7. Summary of alignment patterns identified from the expert-based matrix.

Pattern Type	Pattern Description	Evidence Source
High Repeated Values	High scores (≥4) observed across multiple PMBOK 6 and 7 rows	Integration, Stakeholder, Risk, Team, Uncertainty
Moderate Values	Scores of 3–4 frequently observed across PMBOK 7 rows	Planning, Delivery, Measurement
Sector-Specific Low Values	Persistent low scores (≤2) in Construction Extension	HSE, Claim, Financial
Single-Source Continuity	High score linked to only one predecessor row	Scope = Scope, Finance = Cost

5.3. High-Alignment and Critical Domains

This subsection highlights areas that score high in alignment consistency across different versions of PMBOK, according to the expert evaluation matrix. High alignment areas refer to those areas that show consistency of scoring high (scores of 4 and above) through multiple predecessor models. As illustrated in Table 8 below, there are areas that show consistency of scoring high through multiple rows generated from the PMBOK Sixth and Seventh Edition models. Specifically, Integration, Stakeholder, Risk, Team, and Uncertainty show consistency of scoring high, where high scores can be seen across multiple rows.

However, other domains, like Planning, Delivery, and Measurement, show moderate patterns of alignment, which have score variations between 3 and 4. While these domains do not show a consistent score throughout Editions like top-performing domains, there is partial continuity in their score variations. The rows related to sectors under the construction extension are seen to have relatively low scores, particularly in the HSE, Claim, and Financial rows. It is apparent from the low scores for such rows that there is little to no structural correspondence between these rows and domains in PMBOK Eighth Edition. There is also an interesting pattern of continuity in a single row observed in the results. Single-row continuity indicates continuity between a domain in one particular row of the predecessor Edition only. Some examples of single-row continuity are conceptual continuity between scope structure and finance-related elements and cost categories.

Table 8. High-alignment contributions to PMBOK 8 domains.

PMBOK 8 Domain	High Scores (≥4) Count	Contributing Rows	Descriptive Insight
Governance	3	Integration = 5 Risk = 4 Stakeholders (7) = 4	Strong multi-source reinforcement
Risk	3	Risk = 5 Uncertainty = 5 HSE = 4	Deep cross-Edition alignment
Resource	2	Resource = 5 Team = 5	Strong relevance to construction workforce
Scope	1	Scope = 5	Single-source continuity
Finance	1	Cost/Financial = 5	Single-source continuity

Numbers in parentheses indicate the corresponding PMBOK edition.

5.4. Sector-Specific Misalignments in Construction Projects

The patterns of alignment for sector-specific structure classes are based on an analysis of expert evaluation matrix scores and show variance across construction-based structural category types. The pattern of variance of scores suggests that some construction-oriented rows have lower levels of alignment scores compared to other structural categories. These variance patterns are captured in Table 9.

Table 9. Low-alignment patterns in Construction Extension.

Extension Row	Score Range	Domains with Lower Alignment	Descriptive Observation
HSE	1–2 (Risk = 4)	Governance, Scope, Schedule, Finance, Resource	Limited lexical correspondence across most domains
Claim	1–2 (Finance = 4)	All except Finance	Narrow structural linkage concentrated in one domain
Financial Extension	1–2 (Finance = 5)	All except Finance	Domain-specific correspondence pattern

Rows related to construction-related HSE, Claim, and Financial control issues have often been associated with scores having low to moderate alignment values. This is unlike the results obtained from the general PMBOK structures whose rows had a relatively more or less equal range of score distribution in terms of alignment values.

Comparison between rows indicates that lesser numbers of high value scores have been obtained in rows related to the Construction Extension compared to rows related to the core structural elements of PMBOK structures developed previously. From the column-wise comparison of rows in relation to their correspondence to certain domains, it becomes clear that contributions made by the construction structural rows to these domains were relatively lower, while for others, the contributions were wide-ranging. Therefore, from the results presented above, it becomes clear that there is no consistent distribution of scores with respect to correspondence of rows in the construction rows.

5.5. Construction Maturity Matrix (CMM8) Results

Results of Construction Maturity Matrix (CMM8) are shown below for calculating the extent of structural maturity demonstrated by PMBOK Eighth Edition domains based on the needs of construction projects. This matrix includes the summation of experts'

evaluation scores of different structural categories within domains for comparing the pattern of maturity level quantitatively. Results of this calculation process are summarized in Table 10 below.

It is notable that structural maturity levels are not evenly distributed in all the domains. In particular, the domains of Governance, Risk, and Resources possess high maturity levels with respect to their structures. On the contrary, there are several domains that possess average maturity levels that are fairly well-balanced. There are also relatively fewer domains whose maturity levels are relatively lower. This represents poor structural maturity levels when compared to construction structural expectations.

From the row-wise structure of distribution, it can be noted that certain structural dimensions have greater impacts on various domains whereas some of them exhibit limited impacts. Such differences arise due to differences in structural maturity contributions rather than uniform structural maturity contributions throughout the whole matrix. Through column-wise analysis, it can be seen that maturity levels do not solely depend on only one structural dimension but many others.

Table 10. Aggregated Construction Maturity Matrix (CMM8) scores across structural criteria.

Criterion	Contributing Rows (from Matrix)	Raw Scores	Mean (0–5)	Readiness (%)
Governance Strength	Integration, Risk, Stakeholder (7)	5, 4, 4	4.33	86%
Risk Maturity	Risk, Uncertainty, HSE	5, 5, 4	4.67	93%
Resource/Contractor Coordination	Resource (6), Team (7)	5, 5	5.00	100%
Contract and Claim Complexity	Claim, Financial, HSE	1, 1, 1	1.00	20%
Tailoring Capability	Planning (7), Development Approach (7), Project Work (7)	5, 4, 4	4.33	86%
Digital Integration	Schedule (7), Delivery (7), Measurement (7)	4, 3, 3	3.33	67%

Numbers in parentheses indicate the corresponding PMBOK edition.

Overall, from the CMM8 matrix, it is evident that maturity levels of PMBOK Eighth Edition domains are structured and possess varied tendencies, magnitudes, and dimensions. Based on such analysis, a solid base is created for interpretation of structural maturity levels of domains.

5.6. Construction Domain Alignment Index (CDAI)

The Construction Domain Alignment Index (CDAI) was determined in order to obtain an overall quantitative assessment reflecting the degree of structural alignment between the domains of PMBOK Eighth Edition and construction-related project needs. CDAI is derived from the combined evaluations of experts on the domains in terms of various structures into an alignment index that aims at capturing cumulative patterns of alignment rather than individual cases of alignment. Through the integration of various dimensions of structure into one quantitative index, the CDAI allows for comparisons among domains while retaining the multidimensionality of the evaluation process. Importance was rated from 0 to 5, while difficulty ranged from 1 to 3. It is these two factors that later became combined into the CDAI.

The CDAI was calculated as a product of the average rating of the importance and the average rating of the difficulty within each of the eight PMBOK domains. In other words, CDAI was designed as a priority measure, not as the psychometric validity coefficient. A

high CDAI value was allocated to the domains that were both important and difficult to implement in construction practice. Table 11 illustrates the CDAIs for each of the domains.

Table 11. CDAI: Construction Domain Alignment Index.

PMBOK 8 Domain	Importance (0–5)	Difficulty (1–3)	CDAI (Importance × Difficulty)	Priority Level
Governance	4.33	3	12.99	Very High
Risk	4.67	3	14.01	Very High
Resource	5.00	2	10.00	High
Stakeholder	4.33	2	8.66	Medium
Schedule	3.33	2	6.66	Medium–Low
Scope	4.33	1	4.33	Low
Finance	3.00	1	3.00	Very Low

Nevertheless, it is clear from the calculation of the values of these indices that there does exist some extent of variation in the values in question within the domain groups, thus indicating that the degree of consistency within the framework is not uniform but rather differs according to different domains to some extent. While some of the domains seem to have fairly high degrees of CDAI values, which indicate higher degrees of structural agreements within them, there are other domains that have lower to moderate degrees of these values, indicating lower degrees of structural agreement in these domains.

Moreover, on comparing the values of CDAI in different domains, it can be seen that these values are arranged in a continuous fashion without clustering. Thus, it can be said that there exists a continuum of consistency among different domains, and the degree of structural agreements in these domains varies to different extents.

A further analysis of index dispersion similarly shows that domains whose structures contain contributions from several structural rows generally possess wider cumulative scores than those whose structures demonstrate a localized pattern of correspondence. These differences result from the variance in the range of contributions made to structural units as well as from the extent of multiplicity of predecessor structures involved in each domain structure.

At the aggregate level, the findings presented through the CDAI offer a general quantitative measure for structural alignment across all domains, providing opportunities for comparison of their respective degrees of correspondence using the same scale. In effect, the CDAI is an integrative index that integrates the overall alignment patterns of different domains based on expert opinions. These conclusions mark the end of the empirical part of this study.

Figure 12 shows the process of analysis in the research study and shows how the main outputs of the various research phases are interrelated. The output from data gathering initially provides the basis for determining the maturity level of the construction projects in adopting PMBOK 8 using the CMM8. The gathered data are then analyzed for establishing the connection between PMBOK and the various construction domains using the CDAI. Lastly, based on the patterns of connection established, the CIP8 is derived as the framework for the implementation work packages. Figure 12 thus provides an integrated view of how the outputs of the data gathering process are interlinked among the succeeding analysis phases of the research study.

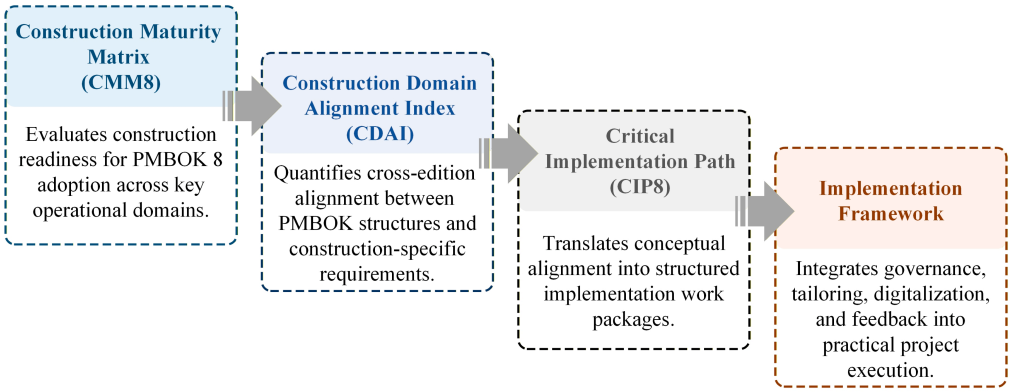


Figure 12. Conceptual progression from construction maturity assessment to PMBOK 8 implementation framework development.

6. Discussion

6.1. Cross-Edition Alignment and Structural Implications for Construction Projects

Based on the findings of expert alignment analysis, the conceptual consistency among different Editions of PMBOK (Editions 6, 7, and 8) is not uniformly distributed between domains; rather, there are certain clustering patterns in terms of conceptual consistency. The domains such as Governance, Stakeholder, Risk, Team, and Uncertainty maintain high levels of consistency throughout several versions of PMBOK. It is important to note that these domains seem to act as stabilizing agents in PMBOK, as they are consistently relevant irrespective of changes in philosophy.

However, the domains that relate to Planning, Delivery, and Measurement exhibit moderate alignment configurations. In other words, there is an indication of partial continuity together with some reconfigurations. This implies that although the fundamental managerial intents may be identifiable, the means through which they can be executed are different. There seems to be a shift from prescriptive procedures found in the PMBOK Sixth Edition to more flexible and domain-specific descriptions in subsequent versions.

From a project management in construction perspective, there is a lot that can be deduced from this alignment pattern. High alignment is indicative of those domains that require high levels of coordination, governance, and risk management. The consistent reinforcement of the concept across all Editions justifies the relevance of PMBOK 8 in solving the complexities involved in the field of construction projects. On the other hand, the moderate alignment in planning and delivery domains is attributed to the high level of variability involved in the lifecycle of construction projects and their modes of delivery.

Importantly, the sector-specific extensions concerning construction—HSE management, Claim, and Financial extensions—have shown a lack of alignment with the domains of the PMBOK Eighth Edition. Lack of such alignment demonstrates that although PMBOK 8 offers a sound conceptual framework for project management in general, there are some issues of concern inherent to construction practice that were not addressed explicitly in PMBOK 8. Thus, the application of the concepts of PMBOK 8 in construction practice would require additional efforts.

These specific findings should be interpreted in the context of the construction-related extensions and the literature on project management. The poor fit found in the cases of HSE, claims, and contract-related structure does not mean that the latter is not present in the area of project management at all; instead, it means that there is no structure in the PMBOK 8 that directly corresponds to these structures. It is crucial to distinguish the two aspects since construction projects demand extra mechanisms to handle contracts, change/variations management, claims, regulations, and site-based HSE management [11,35].

The gaps discovered also have practical and theoretical implications. On the practical side, the results imply that construction companies using PMBOK 8 will need some additional means for bridging from the general level domain-based guidance to the practice of contract administration, claims management, and HSE. Such means can include some project-based procedures, control systems based on contractual agreements, escalations, and construction-specific information needs in addition to the framework of PMBOK 8. On the theoretical side, the results imply that structural correspondence between a general project management standard and a specific sector's management system does not guarantee sufficient coverage by the operational aspects. This means that there is a need for some additional level of translation between the general domains of project management and the sector's specific practices. In this research, such a need serves as the foundation for developing CIP8.

In that regard, the current findings should rather be interpreted as an illustration of the contextualization gap between a general project management standard and construction-specific management needs. Moreover, the comparison with the PMI construction-related extension literature and the past empirical research helps determine if these gaps are due to the persistent construction-specific needs or are linked to the PMBOK 6/7-PMBOK 8 transition.

From this point of view, the value added by the current paper is not just in identifying the importance of contract management, claims, and HSE in the construction environment. The current paper demonstrates that the issues related to the construction context are not fully integrated into the structure of the PMBOK 8 standard.

6.2. Tailoring, Digitalization, and Context-Dependent Applicability

Besides the clear alignment strategies for cross-Edition integration presented in the previous subsection, the findings also point to tailoring and digitalization as implicit but significant indicators in the PMBOK Eighth Edition. The concepts of tailoring and digitalization do not appear in PMBOK 8 as independent disciplines or prescribed methods of approach; instead, they come into existence through the medium of alignment within moderate to high ranges, relational connectivity, and inter-domain connections observed in the expert review assessment.

This implicit quality becomes especially apparent in the examination of alignment patterns generated by structures based on the PMBOK Seventh Edition. As can be seen in Table 12 below, there are a number of alignment score ranges that extend across more than one PMBOK 8 domain for specific rows in PMBOK 7, including Planning, Development Approach, Delivery, and Measurement, among others. It becomes clear from the pattern that it is not simply a matter of the structure being equivalent, but that there exists a continuity of thought that needs to be transferred via adaptation to context. In the case of the Planning row, for instance, its wide distribution of alignments within the Scope, Schedule, and Governance domains implies that the planning function in PMBOK 8 is not limited to any particular sphere of activity but must be adapted on a case-by-case basis.

Table 12. PMBOK 7 structural signals indicating tailoring and digital dependency.

PMBOK 7 Row	Score Range	Related PMBOK 8 Domains	Interpretation
Planning	3–5	Scope, Schedule, Governance	Signals need for tailoring
Development Approach	3–4	Governance, Scope, Schedule	Implementation must be adapted
Delivery	3	All domains	Indicates operational dependency
Measurement	3	All domains	Digital monitoring tools required

Such characteristics of alignment demonstrate a purposeful shift away from process transfer towards a system-based approach in which project teams are supposed to interpret Principles, choose practices, and design delivery methods considering the project context. In environments typical for construction projects, including strict contractures, governmental control, and diverse stakeholder networks, such an approach presupposes additional risks and potential gains. Flexibility associated with the adoption of the system-based representation allows adaptation in various types of projects and delivery methods; at the same time, it increases requirements concerning the organization's maturity and competence in governance.

The process of digitalization, similarly to the discussed approach in project management, also employs an indirect representation approach. Instead of specifying certain digital tools or processes, the representatives of PMBOK 8 associate digital competence with governance, measurement, and resource coordination domains. Based on the analysis of patterns of alignment provided in Table 12, it can be concluded that digitalization is aimed at creating an infrastructure that ensures transparency and coordination of activities within various domains. Lack of operation guidance indicates organizational dependence on existing digital capabilities.

It should be stressed that the applicability matrix depicted in Figure 13 represents a conceptual synthesis obtained based on the analysis of the three PMBOK Editions and understanding their structural peculiarities. Therefore, the relative position of the three PMBOK Editions in the complexity-uncertainty plane cannot be regarded as an empirical estimation or an indication of the better applicability of one Edition in certain conditions. The applicability matrix is proposed to be used as a heuristic tool for demonstrating how the procedural structure, principled guidance, and systems orientation can influence project complexity and uncertainty.

Figure 13 shows the transition logic based on applicability, where the applicability domains of PMBOK Editions 6, 7, and 8 have been plotted using the axes of project complexity and environmental uncertainty. This approach does not mean that one methodology should be replaced with another in sequence but serves as an indicator of the areas of applicability within which the strengths and weaknesses of each methodology can be assessed. The PMBOK Sixth Edition is more suitable for a relatively stable and less uncertain environment where process management and documentation dominate. Conversely, the PMBOK Seventh Edition is an intermediate solution that allows for adaptive decision-making in an environment of moderate complexity.

In this conceptual explanation, PMBOK 6 appears to be more of a process approach for more stable and uncertain environments, while PMBOK 7 is seen as more of a Principles approach with more adaptability in different situations. PMBOK 8 appears to be more conceptualized towards environments that require both structure and adaptability.

Most significantly, the logic of change illustrated in Figure 13 implies that the shift towards PMBOK 8 would not be influenced solely by external characteristics of the project but would also depend on the organization's internal capabilities. If there is reluctance to accept interpretation ambiguity, poor hybrid skills, and inadequate digital infrastructure, then PMBOK 8 will prove difficult to implement successfully, especially among construction companies that exhibit lesser maturity in project management. Thus, the application of PMBOK 8 must be considered conditional instead of universal.

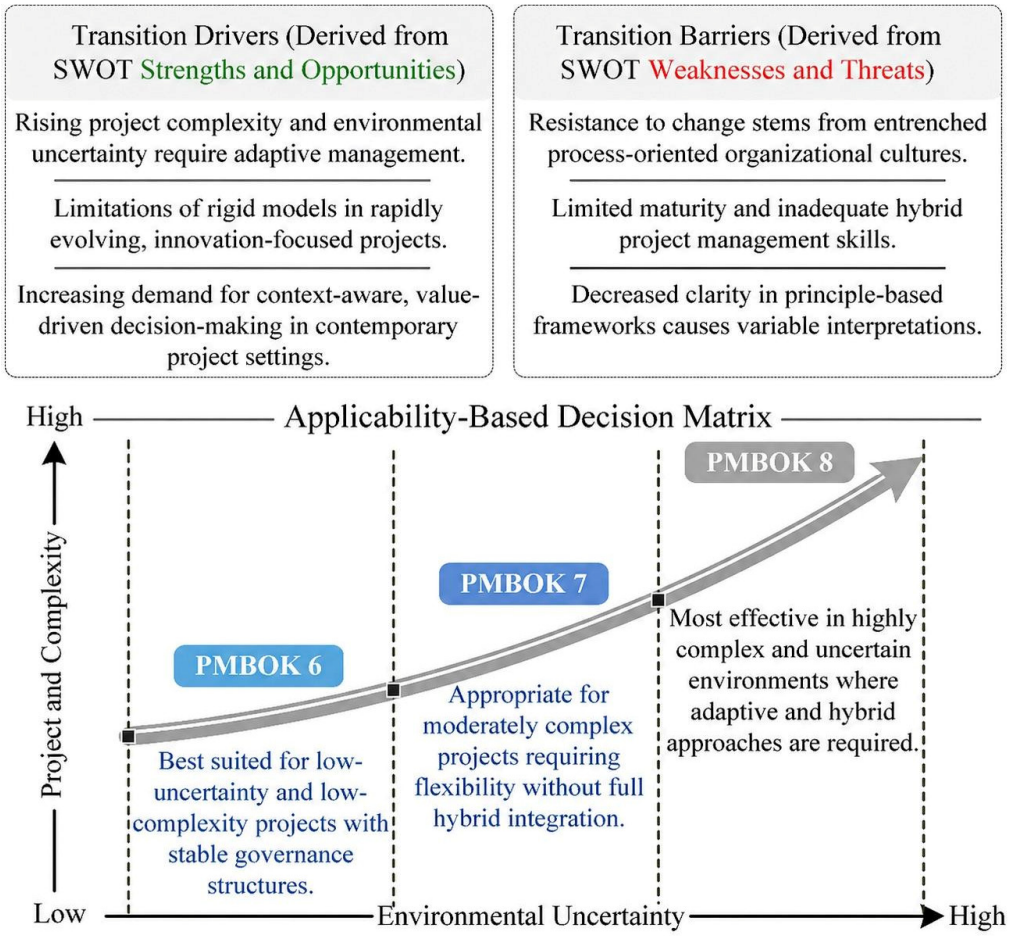


Figure 13. Conceptual applicability matrix for PMBOK Edition selection under varying project complexity and environmental uncertainty.

6.3. From Conceptual Alignment to the Critical Implementation Path (CIP8)

As demonstrated in the above findings in the analysis sections, the PMBOK Eighth Edition is consistent and flexible, conceptually based on the inter-Edition alignment patterns. However, the results also reveal a significant weakness of conceptual alignment because the alignment does not guarantee an efficient implementation of the concept, especially in construction projects that are governed by rigid contractual obligations, regulatory compliance, and other complex stakeholder involvement factors. The conversion from the structure to Principles and systems of management implies the inclusion of a necessary interpretation level that needs to translate into operational logic.

From the analysis results, it can be seen that even with high alignment in the domains of Governance, Risk, Stakeholders, and Resources, their application is highly dependent on the project environment and conditions. Likewise, the moderate alignment identified in planning, delivery, and measurement structures implies that these structures are moving away from being independent processes toward integration across domains. As discussed in Section 6.2, the inherent emergence of tailoring and digitalization in the framework supports the importance of interpretation. However, in construction projects where execution depends on contract compliance, regulatory obligations, and other defined lifecycle limits, it may become inconsistent or ambiguous without implementation support.

Together, these insights point out a gap between the conceptual framework at the standard level and its practical realization at the project level. Such a problem needs a mediating approach to translate the systems thinking of PMBOK 8 into the execution process through a sequence of activities that is appropriate to the construction projects' environment.

In this respect, this research introduces a Critical Implementation Path for construction projects (CIP8) that would transform PMBOK 8 into a set of execution activities.

Figure 14 shows an implementation process framework involving seven conditionally interdependent work packages (WP1-WP7), namely governance alignment, risk operation, resource and contractor coordination, contract and claim management, tailoring engine development, digital integration enablement, and a continuous feedback loop. This framework translates the systems and Principles-oriented nature of PMBOK 8 into a process that can be used in practice in the context of construction projects.

The operational framework of the CIP8 approach is outlined in Table 13 through the presentation of the goals, activities, deliverables, and rationale for each work package (WP1 to WP7). Prioritization is based on alignment measures such as CDAI and CMM8, which emphasize the significance and maturity level of each area in construction project execution.

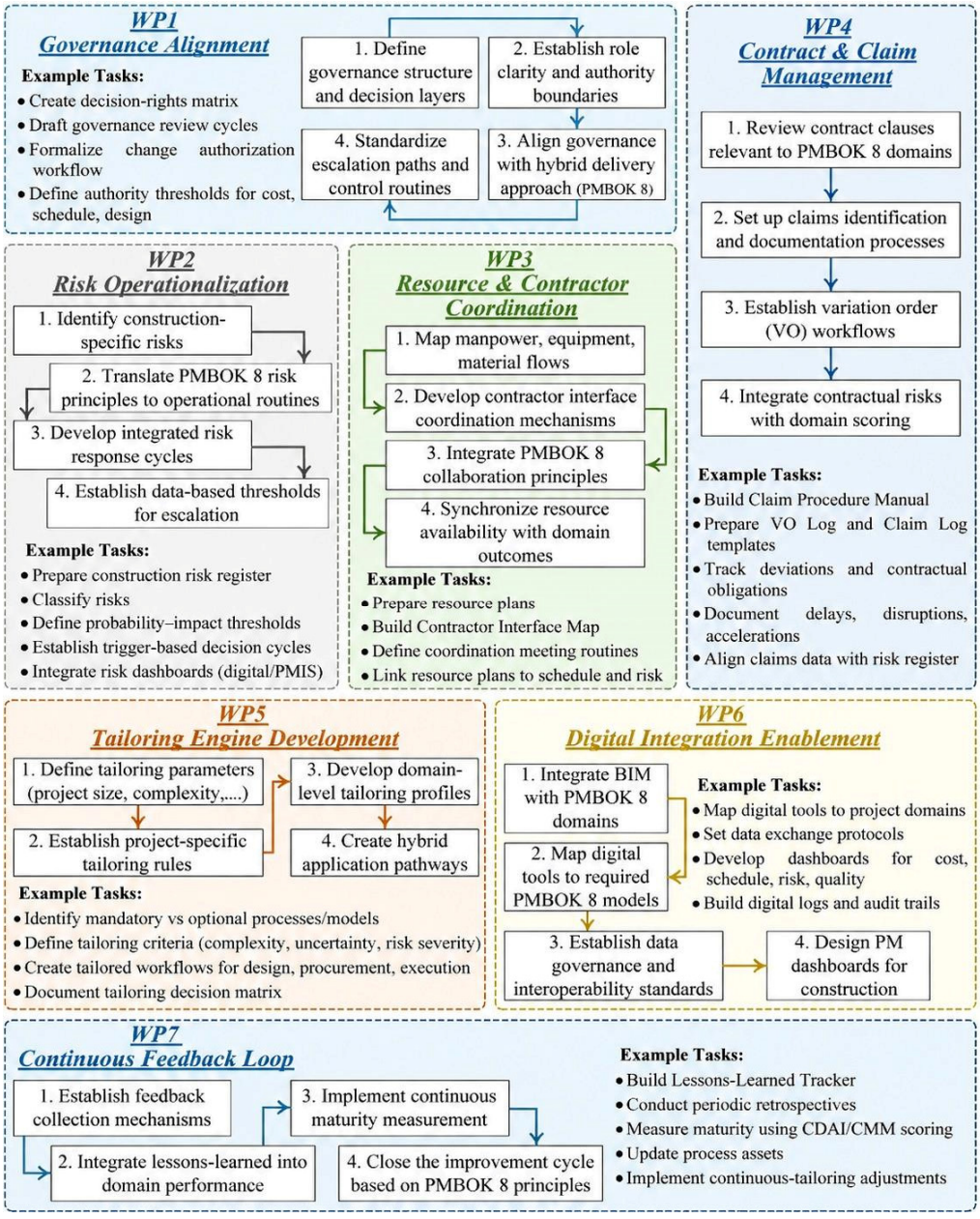


Figure 14. Critical Implementation Path (CIP8) for applying PMBOK Eighth Edition in construction projects.

Table 13. Critical Implementation Path (CIP8) for PMBOK Eighth Edition in construction projects.

Work Package (WP)	Objective (Passive)	Key Activities (Passive)	Expected Deliverables (Passive)	Priority Justification
WP1—Governance Alignment	To establish decision-making clarity and structural control	RACI matrices are formalized; governance gates are defined; authority levels are standardized	Governance Framework; Gate Review Model	Highest CDAI (Governance = 12.99)
WP2—Risk Operationalization	To enable proactive identification and handling of construction risks	Risk registers are updated; risk thresholds are defined; uncertainty analyses are integrated	Risk Register; Risk Threshold Map	Highest CDAI (Risk = 14.01)
WP3—Resource and Contractor Coordination	To strengthen coordination across multiple contractors and teams	Resource plans are harmonized; contractor interfaces are mapped; communication channels are formalized	Coordination Matrix; Contractor Interface Map	Strong alignment (CMM8 = 5.00)
WP4—Contract and Claim Management	To address construction-specific gaps not covered by PMBOK 8	Claim procedures are developed; VO workflows are documented; contract deviation logs are created	Claim Procedure Manual; VO Workflow	Lowest maturity score (1.00) → requires dedicated support
WP5—Tailoring Engine Development	To adapt PMBOK 8 guidance to project-specific and sector-specific contexts	Mandatory/optional artefacts are classified; tailoring profiles are created; PMBOK 7 linkages are mapped	Tailoring Guide; Process Profile Sheets	Moderate PMBOK 7 alignment signals
WP6—Digital Integration Enablement	To support scheduling, delivery, and measurement processes through digital tools	BIM usage is defined; dashboards are deployed; digital performance monitoring is established	BIM Baseline; Digital Dashboard	Needed due to moderate-score digital dependency
WP7—Continuous Feedback Loop	To create a mechanism for capturing and applying lessons learned	Feedback cycles are set; monitoring protocols are standardized; improvement logs are maintained	Lessons-Learned Loop; Improvement Tracker	Required for sustaining PMBOK 8 adaptations

The seven work packages within CIP8 depend on each other because each output from one work package becomes an input or a constraint to another work package. WP1 identifies the governance structure that defines the decision-making and accountability structures as well as escalation criteria within the framework. Based on this, WP2 defines the risk management structure by translating the PMBOK 8 concepts to risk management criteria and escalation thresholds. These outputs become an input for WP3 and help to define the contractual risks, variations, and claims within WP4. WP3 helps to support these processes through resource coordination and interaction with the contractors as well as resource availability to the project outcomes. In the same manner, WP4 helps to take into account the contractual risks within the governance and risk management structures defined in the preceding work packages.

Tailoring rules for the projects will be defined using WP5, which takes into account outputs and requirements from other work packages, thus providing that practices, processes, and controls chosen are tailored according to projects' specificities. Digital assistance

provided by WP6 will help perform information exchange, data management, interoperability, and performance measurement across relevant PMBOK 8 domains. It does not perform the function of a separate technological solution but rather allows coordinating and monitoring of other work packages. Finally, WP7 closes the loop on the process of improvement by adding learning and performance evaluation to the improvement of governance, risk management, resource coordination, contracts management, tailoring rules, and digital assistance. As a result, CIP8 can be better illustrated as a dependency network with feedback loops than as a linear chain of work packages.

Governance Alignment (WP1) represents the basic decision-making structure of the project, through the establishment of governance layers, role clarification, and alignment of control mechanisms with the hybrid delivery approach adopted. Instruments like the RACI matrix, governance gates, escalation process, and cost-schedule–design authority levels become part of the project and enable accountability in decision-making processes. Moreover, this stage represents the embedding of the PMBOK 8 framework into organizational structures, and as shown by its high CDAI score, it becomes one of the foundations for risk control, resource management, and project oversight.

Risk Operationalization (WP2) operationalizes the PMBOK 8 framework concerning risks into construction-specific risk practices through systematic identification, categorization, and cycling of responses to risks. Tools like risk registers, probability-impact thresholds, and triggers represent part of this approach. Considering that risks related to construction activities may involve supply chain disruption, equipment problems, or accidents, this is an important step that anticipates possible threats to project performance. Due to the high level of CDAI and alignment, WP2 plays a crucial role in decision quality.

Coordination of Resources and Contractors (WP3) tackles the challenge of multiple-actor execution through the organization of coordination efforts between manpower, equipment, and contractors. Coordination tools, including the matrix of coordination and the contractor interface map, facilitate the identification of interdependencies and responsibilities, while communication protocols minimize conflict situations. Through its connections to resource, scheduling, risk, and stakeholders' management, the WP3 package contributes significantly to the enhancement of system integration. The high degree of CMM8 relevance suggests that PMBOK 8 theoretically covers this WP3 area, but proper operation is vital in practice.

Contract and Claims Management (WP4) represents an important industry-specific component that is not covered in PMBOK 8 but which is very crucial for any construction project. WP4 includes the assessment of the contract terms, VO processes, the process of identification of claims, and contractual deviations. By establishing connections between claims management and risk management processes, this WP eliminates risks from the organizational standpoint. The relatively low levels of maturity noted in previous studies indicate that, without proper structuring of the process in question, the effectiveness of all other PMBOK 8 components can be significantly hampered.

The adaptation aspect of the proposed framework is illustrated in the concept of Tailoring Engine Development (WP5). The process captures the implicit logic behind the tailoring process, as noted during the alignment assessment phase. It involves the identification of tailoring variables (such as the size, complexity, and uncertainty of the project), determination of mandatory and non-mandatory processes, and creation of tailoring profiles and hybrid applications at the domain level. The integration of PMBOK 8 Principles and those of PMBOK 7, where necessary, allows for context-based tailoring without compromising methodological consistency.

As an addition to this, Digital Integration Enablement (WP6) implements the concept of digitalization not only as a standalone component but also as an inherent capacity. This

process involves the integration of BIM in PMBOK areas, use of digital dashboards for cost, schedule, risk and quality management, and implementation of data governance and interoperability. The real-time exchange of information, audit trails and visualization will provide better clarity and accuracy of decision-making. In light of the limited congruence in terms of digitalization, this set provides the necessary technological framework for implementing PMBOK 8 Principles.

Lastly, the Continuous Feedback Loop (WP7) provides for dynamic adaptation of the system via learning and performance feedback. Feedback-gathering methods, lessons-learned processes, maturity models such as CDAI and CMM, and continual improvement processes are incorporated into the operational aspects of the project. This work package emphasizes the process-oriented approach of the PMBOK 8 methodology by keeping process assets updated continually.

Taken together, the elements of the CIP8 approach enable a transition from the conceptual strengths of the PMBOK Eighth Edition to a practical implementation path suitable for construction projects. Instead of imposing a fixed methodology, it offers a logical process that enables governance control, lifecycle considerations, and contextualization. By incorporating sector-specific concerns related to issues such as contract management, resource coordination, tailoring, and digitalization, CIP8 makes the application of PMBOK 8 more relevant without changing its philosophy of adaptation.

In essence, such a combination of conceptual consistency, contextualization, and structure becomes the key factor making CIP8 an important part of transitioning from the evolution of project management frameworks to their implementation in practice. This approach also enables an assessment of maturity and performance metrics, making it possible to make a transition to concluding remarks of this study.

6.4. Comparison with Previous Research and Implications

The findings of this study are generally in line with previous studies, highlighting the necessity of striking a balance between structural project management practices and adaptation to context in construction. Earlier studies on hybrid project management in construction have also noted that the conventional plan-based project management approach may be inadequate where projects are subject to sequential changes and suggested hybridization of the two as a solution to incorporate both management practices and adaptation [3]. From this point of view, this finding that PMBOK 8 incorporates both domain and practice-related aspects is a contribution to the ongoing debate since it is analyzed through cross-Edition text analysis and alignment.

The insights regarding governance are also complementary to other research performed previously on construction projects, which has pointed out governance and integration as significant instruments of managing organizational, lifecycle, stakeholder, and knowledge aspects of construction projects. Specifically, studies on construction digitalization have indicated that project governance could serve as an organizational framework to integrate digital technologies into projects [4]. The strong alignment demonstrated in the governance, stakeholder, risk, and resources-related fields is, thus, in line with the existing literature in this respect. Nevertheless, the current research goes beyond this understanding, as it indicates the relation between the above areas and the PMBOK 8 framework and takes into account their alignment in the suggested implementation process.

Similarly, the results concerning the hybrid approach and tailoring are also aligned with the previous literature suggesting that construction projects might need various combinations of both predictive and adaptive approaches, as well as hybrid ones, based on specific conditions in which these projects are implemented [3]. However, instead of understanding a hybrid approach merely in terms of the selection of traditional and Agile approaches, the

current study perceives the process of adaptation as a translation layer between the general framework of the PMBOK 8 methodology and specifics of its implementation in construction projects. This provides an additional interpretation of tailoring as an implementation mechanism rather than only as a methodological preference.

The construction-specific issues with contract administration and claims management contribute to the existing literature on construction claims. Previous research focused on the necessity of proper contract administration, documentation, risk distribution, and the construction claims process in order to avoid and manage construction claims. The current research does not argue that these activities are insignificant in terms of project management practices. Rather, low congruence between Claim and Financial as well as other construction-specific issues and the eight PMBOK domains studied in this paper demonstrate that these requirements are structurally less related to PMBOK 8. This difference explains why construction-specific measures should be used to supplement the general project management approach regarding contractual administration and claims management.

Moreover, the results in terms of digitalization are equally in line with the findings that the digitalization of construction projects is contingent not only on digital technologies but also on organizational integration, governance, stakeholder coordination, and information management [5]. In contrast to this body of literature, the current paper adds another dimension to the discussion by recognizing digital integration as an implementation capability in CIP8.

Combining all of these observations leads to the understanding that the novelty of this research is not in the idea that construction project management should be focused on governance, hybrid delivery, digitalization, or claims management, but rather in the combination of these concepts for the sake of PMBOK 8 alignment analysis. Thus, the research extends the current literature by offering a framework for the relationship between PMBOK version evolution, gaps within construction project management, and implementation path via CMM8, CDAI, and CIP8.

7. Conclusions

This research explored the use of PMBOK 8 within construction project management through the comparison of text-mined PMBOK Editions 6, 7, and 8, an assessment of alignment of the PMBOK framework using expert judgment, and the creation of implementation frameworks. Three objectives were fulfilled through this research process: identifying structural changes between the three Editions of the PMBOK, construction-specific alignment challenges, and tooling alignment and maturity patterns into PMBOK 8 for construction.

As for RQ1, comparative analysis revealed that PMBOK 8 presents an integrated structure in comparison with PMBOK 6 and PMBOK 7 due to the combination of Principles and Performance Domains with operational components. The alignment assessment conducted on the basis of the expertise opinion confirmed the higher level of alignment for categories such as governance, risk, stakeholders, team, and resources. Planning, delivery, and measurement reveal more moderate levels of alignment. The research results demonstrate that PMBOK 8 possesses components that comply with the existing construction management requirements but have a context-dependent structure.

In relation to RQ2, the research identified the construction-specific requirements gaps in areas such as contract administration, claims management, HSE, and other finance and industry-specific requirements. The identification of the above-mentioned gaps does not imply that those issues are not important for project management; however, they suggest there is no substantial correlation between the construction-specific requirements and the eight PMBOK domains covered in this research. Hence, it justifies the need for additional

procedures and mechanisms in the application of project management standards in the contract-based construction industry.

For RQ3, the maturity and alignment patterns found have been converted to three different outputs. The Construction Maturity Matrix (CMM8) offers a proposed model for measuring construction-based maturity within the framework of PMBOK 8. The Construction Domain Alignment Index (CDAI) presents a proposed priority model that considers both the importance and the difficulty of implementing certain domains. Finally, the Critical Implementation Path (CIP8) converts the priorities found into seven conditionally interdependent work packages dealing with governance alignment, risk implementation, coordination of resources and contractors, contract and claims management, tailoring, digital integration, and continuous feedback. Collectively, these three outputs present a proposed path for contextualizing PMBOK 8 rather than implementing the standards as a standalone construction methodology.

The theoretical contribution of this study is that it establishes a connection between the comparative analysis of standards in project management and the alignment with the specifics of a particular sector. Instead of looking into the evolution of different Editions of PMBOK only as changes in terminology or methodology, this study considers the connection between structural changes in standards and their adequacy to meet construction management needs. It gives rise to a framework for considering implementation of a general project management standard as a process of translation.

The practical contribution is that of offering a framework for the organizations that wish to contextualize PMBOK 8 in construction. The CMM8 can be employed in identifying maturity development needs, the CDAI can be used in identifying implementation needs of particular domains, and the CIP8 offers a suggested pathway to implementing these needs in practice. The tools presented are meant to serve as a complement to the standard PMBOK 8 with construction-specific implementation techniques, and not as its replacement.

There are a number of constraints that have limited the generalizability of the above results. First, the expert assessment was based on a fairly small purposive sample, and thus the above findings can only be taken as expert-based evidence of alignment as opposed to statistically representative estimations of the construction industry. Second, the analysis has only considered requirements for construction projects and therefore may not easily be generalized to other industries. Third, since CMM8, CDAI, and CIP8 are based on text analysis and expert assessment, they have not yet been implemented in any actual construction projects, and therefore their reliability and validity have yet to be proven.

Future research must provide empirical validation of the CIP8 framework either through longitudinal case studies or implementation studies in real-life construction projects. This must be conducted by comparing project situations both before and after the application of CIP8, or even by comparing projects applying CIP8 with other projects applying traditional project management approaches. The indicators used for evaluation must be measurable at the governance, process, and performance levels. These indicators may include schedule variance, cost variance, contractual claims incidence, variation in unresolved cases, disputes' incidence, risk responses' closure, decision escalation duration, and governance maturity scores, as well as completeness and timeliness of the project documentation. At the level of the CIP8 framework, future research should also consider issues of reliability and sensitivity of the CMM8 and CDAI indicators, as well as whether work packages with higher priority within the CIP8 lead to any measurable changes in project results. Before such field validation is provided, CMM8, CDAI, and CIP8 can be seen as proposed frameworks rather than empirically validated predictive tools. In general, although important from the perspective of theoretical development provided by PMBOK 8, the framework requires practical interpretation.

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Informed Consent Statement: Participation was voluntary, and the participants were made aware of the academic intent behind the experiment and how their answers would be used for research purposes. There is no collection or disclosure of any personal information. The findings have been presented in an aggregate and anonymous form.

Data Availability Statement: The original contributions presented in this study are included in the article. Further inquiries can be directed to the corresponding author.

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References

1. Faraji, A.; Rashidi, M.; Eftekhari, N.A.; Perera, S.; Mani, S. A bid/mark-up decision support model in contractor's tender strategy development phase based on project complexity measurement in the downstream sector of petroleum industry. *J. Open Innov. Technol. Mark. Complex.* **2022**, *8*, 33. [CrossRef]
2. Zulu, S.L.; Saad, A.M.; Ajayi, S.O.; Dulaimi, M.; Unuigbe, M. Digital leadership enactment in the construction industry: Barriers undermining effective transformation. *Eng. Constr. Archit. Manag.* **2024**, *31*, 4062–4078. [CrossRef]
3. Yuan, M.; Zang, W.; Li, L.; Yi, Z. Unveiling the multifaceted driving mechanism of digital transformation in the construction industry: A system adaptation perspective. *Systems* **2024**, *13*, 11. [CrossRef]
4. Marnewick, C.; Marnewick, A.L. Digitalization of project management: Opportunities in research and practice. *Proj. Leadersh. Soc.* **2022**, *3*, 100061. [CrossRef]
5. Abuhussain, M.; Alhamami, A.H.; Almazam, K.; Humaidan, O.; Bashir, F.M.; Dodo, Y.A. Integrating BIM, Machine Learning, and PMBOK for Green Project Management in Saudi Arabia: A Framework for Energy Efficiency and Environmental Impact Reduction. *Buildings* **2025**, *15*, 3031. [CrossRef]
6. Matos, S.; Lopes, E. Prince2 or PMBOK–a question of choice. *Procedia Technol.* **2013**, *9*, 787–794. [CrossRef]
7. Project Management Institute. *Project Manager Competency Development Framework–Third Edition*; Project Management Institute: Newtown Square, PA, USA, 2017.
8. Keleş, A.E.; Gülek, G.G.; Górecki, J. Use of Project Management Knowledge Areas in Civil Infrastructure Projects: Implications for Sustainability Assessment and Risk Analysis. *Sustainability* **2025**, *17*, 9129. [CrossRef]
9. Grau, N. Standards and Excellence in Project Management—In Who Do We Trust? *Procedia Soc. Behav. Sci.* **2013**, *74*, 10–20. [CrossRef]
10. Čabarkapa, J. Analysis and comparison of ISO 21500-Guidance on project management and PMBOK 6th Guide. In *Proceedings of the 5th IPMA SENET Project Management Conference (SENET 2019)*; Atlantis Press: Dordrecht, The Netherlands, 2019; pp. 266–271.
11. Chadee, A.A.; Mahabir, R.; Banerjee, K.S.; Verma, S.; Azamathulla, H.M. The causal nature of adopting standardized project management body of knowledge (PMBOK) on construction projects. *Discov. Civ. Eng.* **2025**, *2*, 168. [CrossRef]
12. Rodrigues, M.C.; Domingues, L.; Oliveira, J.P. Tailoring: A case study on the application of the seventh principle of PMBOK 7 in a public institution. *Procedia Comput. Sci.* **2023**, *219*, 1735–1743. [CrossRef]
13. Ciccardi, T.; Monassi, M. PMBOK Guide: A Guide to the Project Management Body of Knowledge. *Proj. Manag.* **2026**, *65*, 46–48. [CrossRef]
14. Rahnamayiezekavat, P.; Sorooshnia, E.; Rashidi, M.; Faraji, A.; Mostafa, S.; Moon, S. Forensic analysis of the disputes typology of the NSW construction industry using PLS-SEM and prospective trend analysis. *Buildings* **2022**, *12*, 1571. [CrossRef]
15. Skogmar, K. *PRINCE2, the PMBOK Guide and ISO 21500: 2012*; Axelos: London, UK, 2015.

16. Faraji, A.; Rashidi, M.; Khadir, P.; Perera, S. A Risk Analysis-Best Worst Method Based Model for Selection of the Most Appropriate Contract Strategy for Onshore Drilling Projects in the Iranian Petroleum Industry. *Buildings* **2021**, *11*, 97. [CrossRef]
17. Zandhuis, A.; Stellingwerf, R. *ISO 21500 Guidance on Project Management: A Pocket Guide*; Van Halen: 's-Hertogenbosch, The Netherlands, 2015.
18. Huemann, M.; Turner, J.R. *The Handbook of Project Management*; Routledge: Abingdon, UK, 2024.
19. Egie, M.C. Project management maturity level and pmbok 7th recommendations: Case study of an it service provider company. *Indones. J. Comput. Sci.* **2024**, *13*. [CrossRef]
20. Darko, A.; Oppong, G.D.; Chan, A.P.C. Introduction to Project Management. In *Developing a Body of Knowledge for Green Construction Project Management*; World Scientific: Singapore, 2025; pp. 19–76.
21. Davidov, P.; Ainbinder, I.; Ayoubi, N.; Avivi, B.; Eliyahu, L. Implementation of Project Management Knowledge Areas by Project Managers. *J. Eng. Proj. Prod. Manag.* **2023**, *13*, 138. [CrossRef]
22. Griffin, M.B.; Thomas, J.Y.; McMurtrey, M.E. The Evolution of Project Management: The Future Is Now? *J. Manag. Policy Pract.* **2022**, *23*. [CrossRef]
23. Takagi, N.; Varajão, J. *Success Management and the Project Management Body of Knowledge (PMBOK): An Integrated Perspective*; Association for Information Systems: Atlanta, GA, USA, 2020. Available online: https://aisel.aisnet.org/irwitpm2020/6 (accessed on 19 September 2026).
24. Project Management Institute. *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, 8th ed.; Project Management Institute: Newtown Square, PA, USA, 2025.
25. Bashir, R.; Sajjad, A.; Bashir, S.; Latif, K.F.; Attiq, S. Project managers' competencies in international development projects: A Delphi study. *Sage Open* **2021**, *11*, 21582440211058188. [CrossRef]
26. Faraji, A.; Rashidi, M.; Perera, S. Text Mining Risk Assessment–Based Model to Conduct Uncertainty Analysis of the General Conditions of Contract in Housing Construction Projects: Case Study of the NSW GC21. *J. Archit. Eng.* **2021**, *27*, 4021025. [CrossRef]
27. Lalmi, A.; Fernandes, G.; Souad, S.B. A conceptual hybrid project management model for construction projects. *Procedia Comput. Sci.* **2021**, *181*, 921–930. [CrossRef]
28. Kühn, A. Project Management Standards. In *International Business Development: A Concise Textbook Focusing on International B-to-B Contexts*; Springer: Berlin/Heidelberg, Germany, 2021; pp. 115–139.
29. Hübner, F.; Volk, R.; Schultmann, F. Project management standards: Strategic success factor for projects. *Int. J. Manag. Pract.* **2018**, *11*, 372–399. [CrossRef]
30. Catana, A.E.; Florescu, A. PMBOK Standards–A Structured Literature Review. *Recent J.* **2025**, *77*, 282–288.
31. Amaro, F.; Domingues, L. PMBOK 6th meets 7th: How to link both guides in order to support project tailoring? *Procedia Comput. Sci.* **2023**, *219*, 1877–1884. [CrossRef]
32. Sardroud, J.M.; Shirzadi, M. BIM Implementation for PMBOK Enhancement in the Construction Industry. *Proc. 60th Annu. Assoc. Sch.* **2024**, *5*, 695–703. [CrossRef]
33. Al-Zwainy, F.M.S.; Mohammedb, I.A.; Raheemb, S.H. Application project management methodology in construction sector. *Int. J. Sci. Eng. Res.* **2016**, *7*, 244–253.
34. Takkar, S.; Rayat, A.S.; Sharma, V.; Sarkar, T.; Jairath, K.; Singh, A. Problems and optimal methodologies agile project management solution in publicly accessible sector: A comprehensive evaluation of the literature. In *2024 7th International Conference on Contemporary Computing and Informatics (IC3I)*; IEEE: New York, NY, USA, 2024; pp. 207–213.
35. Faraji, A.; Rashidi, M.; Perera, S.; Samali, B. Applicability-Compatibility Analysis of PMBOK Seventh Edition from the Perspective of the Construction Industry Distinctive Peculiarities. *Buildings* **2022**, *12*, 210. [CrossRef]
36. Zambrano, L.; Atencio, E.; Mariani, C.; Mancini, M.; Atencio, E. Integration between PMBOK 7th concepts: A network analysis. In *Proceedings of the 14th International Conference on Industrial Engineering and Operations Management*; IEOM Society International: Southfield, MI, USA, 2024; pp. 1098–1108.
37. Couto, J.C.; Kroll, J.; Ruiz, D.D.; Prikladnicki, R. Extending the Project Management Body of Knowledge (PMBOK) for data visualization in software project management. *SN Comput. Sci.* **2022**, *3*, 283. [CrossRef]
38. Maslennikov, V.V.; Popova, E.V.; Lyandau, Y.V. Project management based on pmbok 7.0. In *Proceedings of the International Scientific and Practical Conference*; Springer: Cham, Switzerland, 2020; pp. 283–289.
39. Castañeda Vásquez, F.S.; Bachiller, M.V.; Llenliz Rut, B.; Aranda Gonzàlez, J.R.; Doctor, T.D.L.C.; Elmer, D. *Innovation in Project Management: Using the PMBOK 7th Edition in the Construction of Industrial Warehouses*; LACCEI: Boca Raton, FL, USA, 2024.
40. Project Management Institute. *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, 6th ed.; Project Management Institute: Newtown Square, PA, USA, 2017.
41. Project Management Institute. *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, 7th ed.; Project Management Institute: Newtown Square, PA, USA, 2021.

42. Paul, V.K.; Solanki, S.K.; Rastogi, A.; Yadav, P.S. *Establishing a Performance Index for Construction Project Managers*; Routledge: London, UK, 2023.
43. Desjardins, F. PMBOK® Challenges and Lessons. In *International Program and Project Management—Best Practices in Selected Industrie*; Springer: Cham, Switzerland, 2025; p. 85.

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