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Investigating Stakeholder Perspectives on the Knowledge Management of Construction Projects: A Case Study of the Vietnamese Construction Industry

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Abstract: Knowledge management (KM) is imperative for the successful completion of complex projects. This research, which constitutes a recent doctoral dissertation, centers on exploring the KM practices of internal project stakeholders in managing emergent events within construction projects during the construction stage. Herein, a qualitative approach was utilized. Twenty-five semi-structured interviews were conducted with experts from five internal project stakeholders. A thematic analysis was subsequently conducted using NVivo12 qualitative data analysis software. This study identified a total of eleven types of events categorized into four major themes. Furthermore, the analysis highlighted KM mechanisms applied by construction project stakeholders to overcome the events. In the emergent events context, personalization techniques, such as face-to-face meetings and discussions, are more effective for problem-solving. This study aims to enable Vietnamese construction companies to understand the importance of different KM mechanisms in the emergent events context and offers recommendations on effective KM.

Keywords: knowledge management; Vietnam; emergent events; construction industry; design variations; building projects

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Citation: Ulhaq, I.; Maqsood, T.; Khalfan, M.; Le, T.; Rauf, A. Investigating Stakeholder Perspectives on the Knowledge Management of Construction Projects: A Case Study of the Vietnamese Construction Industry. *Buildings* **2023**, *13*, 2745. https://doi.org/10.3390/buildings13112745

Received: 22 August 2023
Revised: 4 October 2023
Accepted: 21 October 2023
Published: 30 October 2023

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1. Introduction

Project complexity and uncertainty are recognized as major phenomena [1–3]. Emergent events negatively impact project performance [4–6]. The construction industry is apparently a major benefactor to the domestic economy of any country, contributing more than 10% of global GDP [7]. In Vietnam, almost all the construction projects are characterized by delays and overspending due to the poor management of unknown events [8–10]. The role of managerial capabilities and that of the project stakeholders' expertise and skills in handling large projects in the Vietnamese construction context has been established [11,12]. Furthermore, low-quality outputs, extended project timelines, legal disputes, and cost overruns are commonly reported in recent studies conducted in the Southeast Asian region [6,10,13,14].

The role of knowledge and learning is perceived as a catalyst for effectively managing changes and events [15,16]. Studies have confirmed a close relationship between construction learning and complexity; it is proposed that due to the utilization of similar project methods, similar knowledge management techniques could be reused to overcome change events [17,18]. With regard to KM, the construction industry exhibits a poor record;

loss learning is linked to up to 57% of project variations [19] and 10% of rework spending [20,21]. Consequently, because knowledge transfer from projects to organizational units remains unpredictable, failures outnumber learning opportunities [22,23]. Thus, it is recommended that project participants should carefully consider capturing construction project knowledge throughout the project life cycle in scenarios for future reuse [24].

This study, which aims to explore the KM practices applied by internal construction project shareholder organizations, adopts a qualitative approach, and conducts semi-structured interviews in which experienced construction experts from the Vietnamese construction industry are considered. This study can potentially enable researchers and practitioners to gain an in-depth understanding of emergent events, and to utilize KM strategies to overcome these events; thus, project performance can be enhanced.

2. Literature Review

2.1. Resource-Based View and Knowledge-Based View

This research employs the theoretical frameworks of the Resource-Based View (RBV) and Knowledge-Based View (KBV). Barney [25] emphasized the strategic significance of a firm's internal resources and capabilities in achieving a sustained competitive advantage. The underpinning concept that rationalizes the former framework is explained as follows: organizational resources (e.g., skills, knowledge, and firm capabilities) are essential for successful project delivery [25]. Consequently, for organizational resources, successful management practices (which should be valuable, unusual, and difficult to replicate) offer organizations a competitive advantage over their competitors. In the construction sector context, organizations with valuable assets can respond to shifting market conditions more optimally and overcome complex and uncertain scenarios through their valuable resource pools [26]. Because KBV focuses on human resources, by overseeing the cognitive abilities of employees, the members of such organizations can potentially engage in chaotic and change management scenarios.

According to Grant and Baden-Fuller [27], KBV focuses on leveraging knowledge assets within an organization to gain a competitive edge. It underscores the role of knowledge creation, accumulation, integration, and application in shaping competitive strategies. The significance of knowledge generation, dissemination, and implementation as crucial factors through which organizations can effectively respond to dynamic contexts and generate value is highlighted [28,29]. Construction projects are managed through several shareholder firms who introduce diverse knowledge via people; thus, their basic share, dissemination, and utilization of knowledge assets are key for collaboration, which influences the handling of mistakes and emergent scenarios [30–32]. In summary, strategically managing the knowledge obtained from the projects prevents the 'reinventing the wheel' scenario and enhances project performance [33,34].

It has been established that an organization's competitive advantage is derived from its knowledge and literary work, which emphasizes the growing significance of KM (an imperative for successful organizations) [35]. Knowledge is defined as a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating novel experiences and information. It originates in and is applied in the minds of knowers; furthermore, it is transferred into documents, organizational routines, processes, practices, and norms [36]. Knowledge is often perceived as either explicit or tacit. Nonaka [29] describes explicit knowledge as structured knowledge that is stored in the form of written material or numerical expressions. Explicit knowledge is easy to understand, apply, and organize; this type of knowledge is easily communicated [37]. On the other hand, tacit knowledge is explained as notions, know-how, and experiences; values and emotions; and norms acquired through learning and actions [29,38]. De Long and Fahey [39] further differentiated tacit knowledge as individual and social knowledge. It is emphasized that the latter form of knowledge is highly tacit in nature, and it is accumulated through collective learning and teamwork. Because knowl-

edge is an intangible asset, knowledge complexity increases the difficulty of articulation and dissemination among all business sectors [34,40].

2.2. KM in Organsiations

KM refers to the process of creating, capturing, sharing, and disseminating knowledge throughout organizations [41,42]. Most researchers propose that KM is a critical strategic resource for firms of all sizes [36]. Conducting efficient and frequent exchange of staff-centered knowledge and experiences is one of the most significant practices for acquiring a competitive edge [25,43]. The benefits of KM induce dividends for business leaders who perceive the value of knowledge and consider it accordingly [29,44–46]. Several authors have listed various challenges associated with capturing and disseminating knowledge in the organizations. In the construction industry, these challenges include the temporary nature of construction projects, virtual teams, lack of client requirements for knowledge sharing, logistical issues, time pressure, and insufficient level of detail [6,47]. Thus, implementing effective KM strategies and policies can enable organizations to develop knowledge cultures in the pursuit of a consistent knowledge drive [21,22,48,49]. From this perspective, knowledge becomes a prerequisite in the construction industry, and capturing and documenting project-related knowledge becomes an essential strategic reuse for future construction project management [50–52].

The reviewed literature highlighted two commonly applied KM methods, namely codification and personalization [53]. The codification approach focuses on explicit knowledge, and it is reliant on technology systems (e.g., databases for storage, retrieval, and rebuilding); herein, the knowledge workers internalize knowledge through email, groupware systems, document management tools, social media applications, and cloud-based intranet applications [41,49,54]. In addition, the codification of knowledge opens up the possibility of achieving economies of scale in the re-use of knowledge, thereby developing the intellectual assets of a company [53]. The personalization approach focuses on the tacit knowledge of individuals through social engagements [55]. This approach is centered on exploiting the soft aspects associated with the communication and sharing of knowledge and experiences through personal interactions [56]. The personalization approach provides a rich medium for communication and is key to the success of knowledge sharing and transfer. Because both approaches offer considerable support, they are simultaneously utilized in organizations [6]; however, organizations should develop a balanced approach to meet their KM goals. Using a codification approach, companies should focus on developing a clear IT strategy; thus, they can develop systems and train staff members on how to store and transfer information [53].

2.3. Emergent Events in Construction Projects

Complexity, uncertainty, and ambiguity are elements of projects [3]. The discourse on unexpected events is described using several perspectives, including deviations, exceptions, surprises, unforeseen events, and emergent events [16,19,21,57]. Herein, the term emergent events refers to 'events that were not originally planned and expected to take place as part of the project' [16,58]. In project environments, emergent events entail several factors, such as change orders, variations in design, poor communication, information unavailability, and material delays [19,21,57]. The recent literature review focused on the causative factors of design changes linked to the project team and external stakeholders [59]. To understand construction project change dynamics more optimally, Yap and Abdul-Rahman [32] classified the events that lead to design changes based on the different categories of project stakeholders, namely internally and externally related stakeholders. Furthermore, they also classified the impacts of design changes on project performance into direct and indirect impact.

The poor handling of emergent events can be expensive: it can lead to litigation and disputes, which further impact project performance [60]. Depending on the scale and criticality of the issue, teams and project members should develop effective change

management strategies [61]. Several authors emphasized the design changes and their impact on project performance directly leading to rework [20,62,63], schedule delays, and cost overruns [32,59,64–68]. Ilter and Celik [68] investigated the perception of changes in building projects with regard to diverse stakeholders in several nations and observed that the riskiest change causes vary as per the characteristics of organizations and geography.

2.4. KM in the Emergent Events Context

Construction projects are prone to change events, which introduce the following challenges: time-boundedness and design complexity [3,17]. Because unforeseen scenarios offer an opportunity for a considerable amount of knowledge creation, capturing and disseminating this knowledge is an essential part of the organizational learning effort [69]. It is proposed that change scenarios and decision-making require inputs from different sources of knowledge due to the complexity of scenarios. Construction project knowledge is typically personal (tacit) and requires expert judgement, previous experience, and commitment to solving the emergent problem [38]. In case of design issues, it might be necessary to adapt previous solutions, adjusting parameters and knowledge according to the new requirements [70]. Moreover, the existing literature notes that people reuse their personal experience and previous project knowledge to resolve the issues by adapting the knowledge [71]. It is noted that, often, the lack of time and criticality of design changes and shareholder pressure impact the capturing and dissemination of knowledge into a proper format; thus, individuals often rely on informal approaches [49]. Several studies have advocated the KM and project learning concepts as key determinants for project shareholder satisfaction and successful project delivery [72,73]. Inter- and intra-project learning could potentially induce opportunities for organizations to enhance construction project performance and enable teams to avoid undesirable consequences [31,74]. Using a mixed method approach, Wang and Yap [65] observed that a well-executed KM might facilitate the mitigation of financial damage occasioned by contract modifications and disagreements. Yap and Lim [74] observed that several project-related design change management scenarios were highly collaborative and required stakeholders' knowledge inputs; thus, the 'reinventing the wheel' scenario can be avoided. Since projects involve various stakeholders, learning during the course of the project is hemangiomas owing to the level of collaborative activities [69]. Saoud and Omran [66] developed a technology-enabled visualized knowledge model using a building information model (BIM) as a design-change tool; thus, designers could effectively conduct design changes in the construction sector.

2.5. A Case of the Vietnamese Construction Industry

Despite the COVID-19-induced disruptions, the construction industry remains one of the leading industries, with high-level expenditure (VND 1.57 trillion in 2021) [75]. According to the General Static Office of Vietnam (GSO), Vietnam's construction industry was the fourth largest sector prior to the COVID-19 outbreak, with a consistent performance growth exceeding 7% [76,77]. Due to the pronounced pandemic, tough measures have been enforced, and the Vietnamese government's travel restrictions have led to a 4.6% decrease in growth in the second quarter of 2020 [77]. Over the past decade, the industry's productivity has grown due to 'Doi Moi' reforms and World Trade Organization (WTO) membership [78]. From 2000 to 2009, the sector exhibited a 9.6% annual growth despite difficulties occasioned by the real estate crisis. Consequently, construction industry reorganization from 2012 to 2014 increased workforce pay by an average of 13.8% per year, which is considerably faster than other sectors [76].

The most recent data obtained from the General Statistics Office (GSO) of Vietnam exhibits a significant growth in the registration of new construction firms, with 22,127 new organizations established in the first eight months of 2021 [79]. Many of these firms, however, remain small-scale, with five to ten workers [76]. The industry employed 4.6 million individuals between 2015 and 2020 [79]. Furthermore, survey findings indicate that with regard to work force, FDI ownership is a large contributor, employing 58% of employees as

compared to state-owned and private local Vietnamese construction businesses [76]. Due to regulatory changes and new reforms, the industry has shifted towards contemporary construction in collaboration with international contractors, enhancing professionalism and aptitude to construct high-rise structures [78].

Although statistics on the growth of Vietnamese construction are optimistic, Le [80] recently observed that despite the industry's 41% growth increase since 2008, performance-related issues still exist. Furthermore, the FPT Securities report [78] notes that local contractors are unable to handle government procurement, possess inadequate site management abilities, and lack a trained workforce. Studies conducted on the industry emphasized the sector's low performance and project completion track record [14]; the industry exhibits a higher failure rate, with 75% of construction projects being delayed and 66% exceeding the stipulated budget [9].

Recent studies on the Vietnamese construction industry identified several factors, including KM and project performance [81]. Several authors identified sourcing expertise, technology utilization for information and knowledge sharing [82,83], management effectiveness [84], human resources development [85,86], financial capacity [86,87], teamwork [88], and soft skills [89] as key pillars affecting construction project performance (Table 1). Moreover, in construction project management, previous studies stated that unskilled labor, workmanship, poor design capabilities, and obsolete construction technology impact an organization's ability to manage complex projects in Vietnam [11]. The recent literature has enriched these findings, highlighting several factors, such as employee attitude, motivation, tools, inadequate working circumstances, poor experience, and a lack of coordination and control [90–92]. Furthermore, research on the construction sector indicates that local specialists' lack of expertise in managing design revisions [90], poor engagement of teams, and lack of communication among stakeholders [8] leads to disputes and litigation [10].

Table 1. Review of construction project performance literature in the Vietnamese construction industry.

	Author	Method	Data Collection	Main Findings
1.	Dao and Nguyen [82]	Case study	Interviews, observations, and document analysis	BIM adoption extended project duration and increased project costs. Organizational restructuring was required for effective BIM implementation.
2.	Dinh, Dinh [81]	Literature review and qualitative case study	Case study data obtained from road construction projects	Selection of construction materials in the preliminary design phase can be based on economic performance using life cycle costing.
3.	Do, Nguyen [93]	Quantitative	Survey questionnaire disseminated to stakeholders in construction projects	Variation orders and claims or disputes exert a direct effect on project performance, which, in turn, influences shareholder performance.
4.	Hai and Tuan [84]	Quantitative	Questionnaire survey from professionals involved in public construction works management	Certain behavioral dimensions of planning function management significantly impact management effectiveness in public construction works.
5.	Nguyen and Hadikusumo [85]	Quantitative	Survey questionnaire from practitioners involved in EPC projects	Human resource development positively affects human resource competency, job performance, and project success in EPC projects.
6.	Nguyen and Chileshe [87]	Mixed method	Survey; semi-structured interviews	Critical causative factors for construction project failure in Vietnam include poor project planning, lack of experience, design changes, and financial capacity issues.
7.	Nguyen and Do [94]	Literature review	Analysis of research on construction projects	Variation orders exert a significant impact on project performance and indirect effects on shareholder performance.
8.	Tam, Toan [83]	Quantitative questionnaire survey with BIM users	Questionnaire survey with BIM users	BIM-related factors, especially external factors, exert a significant impact on construction project performance.

Table 1. *Cont.*

	Author	Method	Data Collection	Main Findings
9.	Toan, Tam [86]	Quantitative	Survey distributed to project managers	Critical factors impacting construction labor productivity include construction management ability, financial status, work discipline, and resource availability.
10.	Vo, Nguyen [88]	Quantitative	Survey questionnaire conducted with construction projects	Disputes in the Vietnamese construction industry arise from factors such as the diversity of working styles, reluctance to work, and poor teamwork.
11.	Vu and Vu [95]	Qualitative	Semi-structured interviews with professionals and validation with consultancy construction experts	The developed KM model enables construction design consulting companies to enhance design performance and decision-making.
12.	Zuo, Zhao [89]	Quantitative	Survey with project management professionals	Project managers' soft skills significantly contribute to project success factors and overall project success.

The significance of KM in the Vietnamese construction industry has been emphasized in the existing literature. However, there is an apparent lack of research specifically focused on KM within the Vietnamese construction sector [8]. Tien and Nhi [96]'s research, which utilized KM platforms, acknowledged that social and technological processes were deployed in Vietnam's international FMCGs, thereby enhancing KM. Exploring the role of technology transfer in multinational projects, Nguyen and Aoyama [97] observed that KM is often affected due to cultural differences among teams, affecting multinational collaborations. In addition to culture, studies have also highlighted the need to develop documented knowledge transfer procedures [98]. The research emphasized several factors (e.g., social, technological, and organizational), namely lack of feedback, motivation, and knowledge culture, that impact KM in Vietnamese organizations [12,98–100]. Furthermore, the failure of KM practices is linked to several factors, such as the lack of time, suitable tools for knowledge sharing, and language or communication capability among staff [101]. According to studies, compared to international organizations, local Vietnamese construction organizations place low value on KM and focus on task completion [96]. Nevertheless, local organizations must prioritize human factors, clear standards, methods, and policies for knowledge transfer, as well as the cultural components of KM. A few studies have noted the role of KM in increasing organizational performance and worker efficiency. Using a survey to identify the critical KM factors in the construction industry, social capability among staff members, encouragement, culture, and technological capability exhibit a stronger link to KM effectiveness in construction organizations [102].

Based on the KBV lens, this study explores the KM practices in the context of emergent scenarios in construction projects. Therefore, this study adopts an exploratory approach to understand the current KM practices in Vietnamese construction organizations and aims to answer the following research question (RQ).

RQ: How do internal project stakeholders employ KM to overcome emergent scenarios?

3. Methodology

3.1. Pilot Study

The pilot study involved interviews with project stakeholders engaged in two distinct projects. A case study methodology was employed, focusing on interpretation and engaging in a dialogue on the experiences of experts [103]. Data gathering was conducted through semi-structured interviews. This study adopts the questions from KM literature in construction and management. Yin [103] argued that the verification of questions is an important process in starting the case study research. In this regard, a pilot study as recommended by Yin [103] was carried out using semi-structured interviews to improve the conceptual framework for this research (Figure 1).

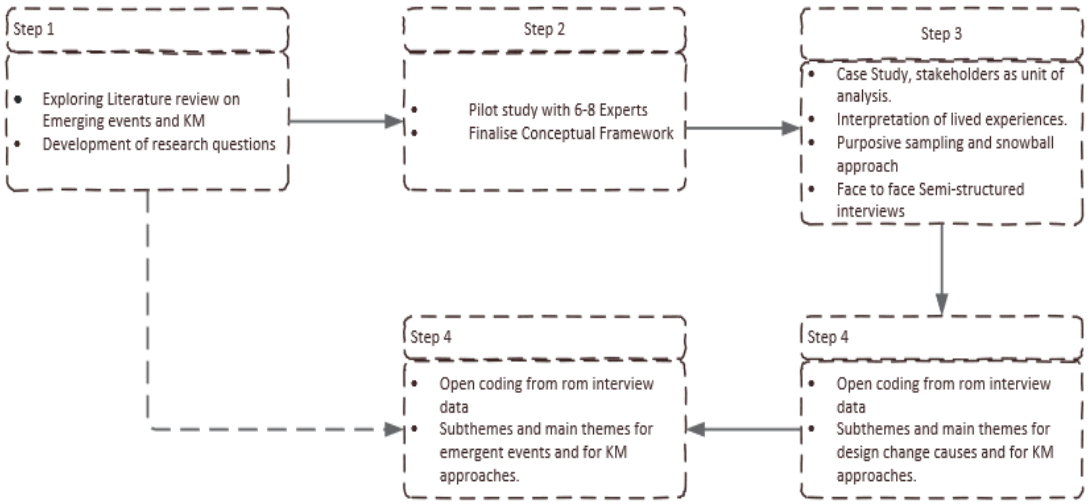


Figure 1. Different research process stages.

The first case project involved the development of pressure-sensitive adhesives in an industrial manufacturing facility. It commenced in the middle of 2017 and was financed by a multinational investor. The project adopted a design–build procurement method. Due to the specialized equipment needs for plant manufacturing, the client primarily chose suppliers based on cost and quality considerations. Interviews were performed with key individuals obtained from various organizations involved in the project, namely the client, the construction firm, two contractors specializing in mechanical and electrical aspects as well as firefighting, and an industrial material supplier.

The second case project involved the construction of a hydro power plant, aimed at fulfilling the contemporary electricity demand in Vietnam. It commenced in September 2018 and received both domestic and international funding. The project team opted for a traditional procurement approach, commonly chosen for public projects, where partners were selected based on the lowest fixed price. Because of the complex technological aspects, effective collaboration among all partners was crucial; thus, the project's successful and punctual completion was ensured. Interviews were conducted with key representatives from different organizations involved in the project, including a consultant specializing in engineering design, a contractor for piling, and two suppliers managing the application of the cement, sealant, and chemical coating.

Firstly, the pilot study helped the research team to assess the appropriateness and structure of the questions, ensuring that the gathered information was coherent, easily understandable, and accurate. Secondly, the analysis of two pilot case outcomes indicates that the Vietnamese construction industry is multicultural, owing to the influx of FDIs. Firms who have already engaged with international partners value more systematic project management practices, knowledge, and teaming concepts. With respect to KM, organizations utilize tacit and explicit knowledge and a variety of documentation approaches; however, traditional methods are often followed. Feedback and communication are observed as key project management issues. It became apparent that the private building sector exhibits a value relationship and is advanced in regard to the application of different technologies, such as email, official site meetings, and document management systems, whereas industrial and public clients still utilize traditional and manual paper-based approaches. Moreover, although long-term relationships are key to gaining and sharing project-related information, in day-to-day communication and coordination, mobile phones and Internet messaging are commonly utilized for sharing information and knowledge. Organizations in emergent scenarios often collaborate with internal and external experts to solve problems. Furthermore, the lack of knowledge exhibited by the client, lack of coordination and communication among partners, project deadlines, and multiple project

engagements impact KM practices. Additionally, some limitations pertaining to culture and behavior are mentioned.

3.2. Data Collection

This research applied semi-structured interviews conducted by experts from five different construction project stakeholders who were involved in the construction phase of a building project. Using purposive sampling and a snowball approach, experts were identified, and a total of 25 interviews were conducted with experts who agreed to participate [104]. Upon confirmation from interviewees, an ethics approval letter and project information along with interview questions were sent via email. Face-to-face interviews were conducted with the experts, and each interview lasted 60–90 min. The researcher traveled to either office and project sites or a neutral location (coffee house, shared office space).

The interviewer began by asking interviewees questions pertaining to demographic information (i.e., designation, education level, industry type, gender, and experience relevant to the construction projects). Interview participants were asked to share their experience on emergent events with a focus on the current project they had been involved with. An open-ended approach was adopted, and fifteen questions were asked; thus, contextual interpretations were obtained. The following questions were asked about a current project: (1) an example of an emergent situation or event, (2) the impact of events on project performance, and (3) the KM method applied to solve the situation. The number of interviews is apparently appropriate because convergence was achieved, and this observation may be attributed to the halt in the emergence of novel ideas [105,106]. Although most studies stated that saturation could be achieved with 11–15 interviews [104], we conducted 25 interviews because we expanded the exploration to multiple shareholder groups (see Table 2). In total, we transcribed 200 pages of interview data using Microsoft Word documents; the data were captured in the form of audio files. Coding and thematic analysis were performed using the nVivo12 software package [62,106,107].

Table 2. Respondents' profiles.

#	Stakeholder Type	Designation	Industry	Qualification	Experience [Years]
P1	Client	Project Manager	Construction	Undergraduate	11–15
P2		Chief Financial Officer	Label Stock and Adhesive Manufacturer	Master's	11–15
P3		Program Manager	Construction	Master's	16–20
P4		Project Coordinator	Higher Education	Master's	16–20
P5		Director Property and Operations	Higher Education	Master's	16–20
P6	Contractor	Managing Director	Construction	Undergraduate	16–20
P7		Managing Director	Construction	Master's	16–20
P8		Project Director	Construction	Undergraduate	11–15
P9		Project Coordinator	Technical/Engineering	Undergraduate	16–20
P10		Project Manager	Technical/Engineering	High School Diploma	21–25
P11	Design and Consulting	Project Director	Construction	Undergraduate	16–20
P12		Senior Business Development Manager	Technical/Engineering	Undergraduate	7–10
P13		Project Manager	Construction	Master's	7–10
P14		Program Manager	Construction	Undergraduate	11–15
P15		Program Manager	Construction	Undergraduate	11–15

Table 2. *Cont.*

#	Stakeholder Type	Designation	Industry	Qualification	Experience [Years]
P16	Subcontractor	Program Manager	Glass/Facade Installation	Master's	11–15
P17		Project Supervisor	Technical/Engineering	Undergraduate	11–15
P18		Program Manager	Pile Construction and Consulting	Undergraduate	16–20
P19		Assistant Chief Engineer	Electrical	Undergraduate	7–10
P20		Director	Ceramic, Porcelain Tiles	Undergraduate	11–15
P21	Supplier	Supply Manager	Cement Manufacturing	Master's	11–15
P22		Supply Manager	Ceramic Tiles/Flooring	Master's	21–25
P23		Sales Manager	Furniture	Master's	11–15
P24		Supply Manager	Furniture	Undergraduate	11–15
P25		Supply Manager	Textile and Fabric	Undergraduate	11–15

3.3. Analysis

A content analysis approach was utilized to identify common themes, and the five shareholder groups were considered [103,107]. While analyzing the data, we considered the respondents' perspective on the reasons for the emergent events that arise during construction and on KM practice-related mechanisms for decision-making aimed at overcoming the unfavorable scenario.

At the initial stage, we conducted thorough data analysis; thus, we extracted all relevant excerpts on the design issue, design change rationale, and KM practices for overcoming the change. Subsequently, a first-order coding process was undertaken, with a deliberate effort to maintain fidelity to the interviews' verbatim expressions. After several iterations, and with the assistance of senior researchers, we finalized 56 codes. In the subsequent round, we recombined codes and rearranged them as either second-order codes or sub-themes. Through subsequent iterations, we developed aggregated themes and named them using appropriate labels [106]. The final thematic analysis was shared with an academic expert (co-authors on this work), and the provided feedback was modified.

4. Findings

The following sections present the findings on emergent events and related KM practices applied through the thematic analysis.

4.1. Emergent Events

Table 3 indicates that the thematic analysis identifies four main types of emergent events, namely design changes, supply delays, safety-related incidents, and poor workmanship.

Table 3. Thematic analysis of emergent events.

Theme	Sub Theme	Statement
Design changes	Poor requirements' understanding	'Design teams exhibit poor understanding' (P1, P2, P5). 'Project manager offering limited perspective' (P3).
	Market-driven changes	'Clients often change requirements due to market pressures or concepts promoted by their head offices' (P9). 'New standards on sustainability requires the construction companies to comply with these requirements' (P21).
	Cost and time issues	'Design changes can be costly and lead to project extensiboonons, impacting time and cost' (P7). 'The rapid attention and early identification of design changes can essentially mitigate their impact on project performance' (P6).

Table 3. *Cont.*

Theme	Sub Theme	Statement
Supply delays	Material quality issues	'Steel failed the test and needed replacement' (P12). 'The exit cover quality was still inconsistent; therefore, we had to send it back to the factory' (P3).
	Material supply issues	'Often, a problem related to material delivery is due to materials' shortage' (P15). 'Sometimes, they cannot meet a client's demand for an earlier delivery date' (P22).
	Material substitution	'Replace materials to cut costs' (P24). 'COVID compelled firms to purchase from the local market' (P21).
Safety-related incidents	Safety guidelines and equipment	'Large organizations possess safety guidelines and safety equipment on site' (P7). 'Human safety is paramount' (P11). 'Weak safety measures are key issues in local companies' (P14).
	Safety supervision and preparedness	'Large-scale projects are usually supervised by foreigners; however, accidents still occur' (P18). 'Human attitude is a key factor for safety incidents"No one was ready to manage the issue' (P12). 'This organization comprehensively utilizes methods to avoid such accidents through the application of preventative measures' (P16).
	Compliance and safety training	'The enforcement of rules is lax; in Vietnamese projects, the fine is not significant' (P10). 'Workers exhibit no serious attitude on safety' (P2). 'Companies and staff must comply, and compliance should be enforced through 'punishment and penalties' (P5).
Poor workmanship	Insufficient training	'In rural areas, they [Workers] often exhibit no construction background' (P13). '… heavily relies on consultants for crafting project requirements' (P11).

4.1.1. Design Changes

In construction projects, the inevitability of design changes presents a challenging landscape for project partners. These changes can disrupt the well-established project plan, affect deadlines, inflate costs, and even compromise the quality of the final deliverable. As noted in the literature, design changes lead to delays and disruptions resulting in litigation or, in the worst-case scenario, project abandonment [108].

One of the primary causes of design changes is the poor understanding of requirements. This issue, often associated with design teams, can be attributed to several factors (e.g., miscommunication, ambiguous documentation, or inadequate domain knowledge). When requirements are not well-understood, the basis for design decisions is not robust; thus, modifications are required during subsequent project phases. P14 noted that 'the clients understanding of the project is based on that of their own project managers, but things are different.' Furthermore, a contractor noted the delays by stating 'during a project, this [change] leads to extension' (P17). It was noted that errors and omissions in the original design can lead to disputes among partners; thus, design documents can exacerbate the problem. A project manager commenting on door design issues noted '[local clients] tended to replace technical requirements which occasioned the estimation errors related to changes in the original design' (P27).

Market-driven changes represent another significant driver of the analyzed design changes. Clients, driven by market pressures or concepts from their head offices, may change project specifications mid-stream. These changes are often a response to evolving customer preferences, competitive pressures, or shifts in industry trends. Although adapting to the market is a necessary aspect of business, it poses challenges for project teams striving to maintain project stability: a specialist sub-contractor noted that 'a change in the market dynamics often leads to customized design' (P19). Sustainable design has become a fundamental aspect of the construction industry. The advancement of design standards

towards sustainability is not a recent development: a supplier stated that 'new standards on sustainability require the construction companies to comply with these requirements' (P21).

Design changes are not void of financial and temporal consequences. Often, the client works with other stakeholders to minimize the project management or value management costs; however, such issues could occasion cost implications. A design consultant stated the following: 'we identified a transfer beam issue which impacted the cost and extended the project deadline' (P11). He further stated that this approach could impact project profitability by potentially straining resources. Therefore, rapid attention and the early identification of design changes are essential; thus, their impact on project performance can be mitigated. It was noted that when design changes are not identified promptly, they can escalate into larger issues that disrupt project progress. A design manager noted that 'the early involvement of stakeholders, including clients, project managers, and design teams' (P6) is crucial in addressing the cost management challenge.

4.1.2. Supply Delays

Supply delays are a ubiquitous challenge that project managers encounter in various industries. These delays can disrupt project schedules, increase costs, and even compromise the quality of utilized materials. The analysis identified material quality, material supply, and material substitution as key issues that lead to supply delays.

One of the key causative factors for supply delays is material quality issues. Substandard materials not only jeopardize the integrity of the project but also lead to project delays and additional costs. Project stakeholders often encounter scenarios where 'materials fail quality tests, necessitating their replacement' (P12). Moreover, a client noted that material quality concerns occasion supply delays by stating '… consistency of the exit cover's quality was inadequate for us, necessitating its return to the factory' (P3). The existing literature highlighted the relationship between irregularities in material quality results and delays as well as the resultant project setbacks. Subsequently, this study discussed the second sub-theme, namely material supply issues, such as delivery shortages or delays, which are common causative factors for supply delays in various projects. These issues were attributed to a variety of factors, including logistical challenges. One contractor proposed that unexpected demand fluctuations are common; the individual stated, 'often, a material delivery problem is occasioned by a shortage of materials' (P15).

Moreover, the analysis observed that the shortage associated with the supply of essential materials negatively affects project timelines; a supplier stated, 'COVID impacted the shortage of materials' (P21). A similar statement was offered by a supplier who proposed that a lack of data-availability planning for earlier deliveries are often possible. The supplier stated, 'Sometimes, they cannot meet a client's demand for an earlier delivery date' (P22). Analysis indicates that although it was evident that cost-cutting measures are deemed necessary, the substitution of material demands during the COVID-19 pandemic, involving logistical challenges and international transportation limitations, led project teams to opt for material substitution.

Due to the unavailability of logistics and disruptions in international transportation, project teams turned to local markets for material sourcing. However, this shift induced potential quality and supply challenges: a supplier articulated, 'COVID compelled us to purchase from the local market' (P21). Despite the potential drawbacks, this approach was recognized for its cost-reducing benefits; a supply manager noted, 'the replacement of materials enabled firms to cut costs' (P24). It is imperative to acknowledge that while such decisions present an avenue for cost reduction, they concurrently introduce risks if not meticulously executed, potentially occasioning quality challenges. Thus, the strategic and careful evaluation of material substitution becomes pivotal in maintaining a delicate balance between cost efficiency and project quality.

4.1.3. Safety-Related Incidents

Safety-related incidents in the construction industry are an urgent concern, demanding the utmost attention from all participating stakeholders. This discussion explores the various facets of safety issues in construction, including the presence of safety guidelines and equipment, the significance of safety supervision and preparedness, and the crucial role of compliance and safety training. The crucial nature of safety concerns on construction sites, emphasizing the need for concerted efforts to address them, is considered to be critical; a design consultant stated, "'Human safety' is apparently one of the 'critical concerns'" (P11). While two respondents (P7, P11) noted that improvements in safety measures have been affected, the presence of safety guidelines and equipment alone may not sufficiently ensure a safe working environment. It was further emphasized by the consulting manager that safety measures can only be effective if they are well-implemented and enforced. The lack of preparedness and a proactive rather than passive approach to safety issues was identified as a challenge: a consultant representative stated, 'safety supervision and preparedness require more effort due to a lack of understanding and 'human attitude' (P12). For compliance and safety training, several representatives raised concerns on the enforcement of safety rules and regulations. One of the client representatives indicated that to mitigate accidents and ensure safety, it is essential for workers to consistently adhere to safety protocols. One of the identified underlying issues was a lack of incentives for workers to comply with safety guidelines and a lack of seriousness; the client representative stated, 'Rules are lax, and fines are not significant' (P10, P5). The existing literature has emphasized the need for effective training. Organizations must ensure that every worker is well-prepared and has received training on safety skills before joining any project [109].

4.1.4. Poor Workmanship

Poor workmanship remains a persistent issue within the construction industry [110]. Respondents across various organizations, except subcontractors, have consistently highlighted causes and implications of poor workmanship. It was highlighted by two clients that outdated methods and failing to adapt to evolving project requirements is a considerable challenge for construction companies. Such practices can lead to suboptimal workmanship and impact project quality. A project director underscored this concern, stating that 'Individuals often utilize previous methods without noticing the impact on new projects or scenarios' (P4). The reliance on outdated methods can necessitate staff changes, contributing to project delays and increased costs. A poor understanding of project requirements further exacerbates these project performance-related challenges. A consultant indicated that clients often focus on profits and exhibit no interest in the latest innovations and methods by stating, 'we have presented a laser technology solution, but the client has not decided 6 months later' (P7). The shortage of skilled construction workers in rural areas, often with limited construction knowledge, compounds the problem of poor workmanship. A representative from a contractor firm noted that 'many individuals joining the construction sector exhibit farming backgrounds' (P12). The literature also indicated that poor workmanship impacts work-procedure compliance; it was stated that in remote locations, the subcontractors are often not knowledgeable enough on the international construction standards [21]. Moreover, it is stated that negligence is perceived as a lack of concern regarding safety and work permit requirements [111].

4.2. KM Practices to Overcome Emergent Events

This section discusses the four major KM practices that emerged from the thematic analysis. Using sub-themes, this section explains how respondents addressed the issues that arose due to emergent events, as well as how those issues influenced their KM processes. This theme comprises nine sub-themes that cover the KM mechanisms that firms utilize to manage such scenarios.

4.2.1. Expert-Driven Decision-Making

The process of effecting decisions in emergent events is inherently challenging owing to the intricate nature of the scenario and several influencing factors, including time constraints [112]. Thus, working closely with experts is incredibly beneficial in addressing various project complexities due to the significance of incorporating knowledge from other experts [113].

The thematic analysis revealed the role of collaboration with specialists in enhancing incomplete designs within project scenarios. It is noteworthy that most stakeholders, including clients, consultants, and suppliers, firmly advocate for the utilization of expert knowledge to uphold their reputation in the industry. One client participant appreciated the role of expert advice in overcoming negative customer sentiments related to building safety during the development of a facility. Further highlighting the importance of specialist knowledge, a design consultant noted that the client's limited expertise in specialized domains is necessary for them to outsource project management or design functions; thus, mistakes can be avoided. An analysis observed that collaboration with experts occurs through face-to-face discussions, informal meetings, and site visits.

In addition to collaboration with local experts, the thematic analysis indicates that consultation with international partners or head offices is seriously considered. A design director stated, 'local construction companies lack knowledge on product development, sustainability, and green practices. Specifically, the firms must meet the international standards by incorporating US and EU standards into their processes, owing to the existence of many FDI projects and investments. The director stated, *'we are hiring an expert who knows the international standard and can guide us' (P16).* A supplier-group representative stated that when grappling with product failures or late deliveries, seeking support from the regional head offices is crucial in decision-making owing to the existence of knowledge gaps. The analysis indicates that the knowledge gap is wider between local and global firms, and that only multinational organizations exhibit open access to knowledge. One design engineer stated, 'because we have cloud enabled lessons and a solution database, knowledge is a click away and open access is achievable' (P12). More than half of suppliers utilize a similar approach in case of a design change or product failure issues. It was stated that *'we receive expert advice from our regional head office in Malaysia or Hong Kong' (P21).*

4.2.2. Knowledge-Sharing Practices

Respondents from all shareholder groups widely agreed that KM is contingent on technology-based applications and platforms—particularly email and mobile messaging applications—in facilitating the sharing of information and collaboration. Additionally, the integration of advanced computer-assisted tools, particularly BIM software, is a pivotal enabler for enhanced collaboration and knowledge sharing, despite the associated challenges. Email emerged as a formal and prominent mode of communication, highly valued by consultants for its role in sharing vital project reports and facilitating daily routine documentation. Clients also acknowledged email usage; however, they consider the technology less engaging than face-to-face communication. The value of email as a mediator in communication between clients and stakeholders was underscored, highlighting its pivotal role in the construction project landscape. One consultant proposed that 'email is a crucial communication medium for information sharing as they act as a mediator between the client and other parties' (P12). Additionally, mobile messaging apps such as Zalo, Viber, and WhatsApp were lauded for exhibiting quick updates and large file sharing within the construction industry. Building Information Modeling (BIM) software is a significant tool lauded by consultants for its comprehensive capabilities in collaborative problem solving and design error rectification. While acknowledging its benefits, the following challenges were identified: the need for expertise and the complexities of integrating information from disparate systems. A consultant further noted that non-integrated technology leads to increased manual work because consultants must 'redo and convert the information back and forth from one system to another, a considerable amount of time is wasted' (P14).

In addition to technology platforms, respondents highlighted social interaction and interpersonal dynamics as critical components of effective knowledge management within project-based scenarios. The stakeholders highlighted the significance of informal and formal social mechanisms in facilitating knowledge sharing and collaboration. Face-to-face communication emerged as a prevailing mode of interaction. Respondents emphasized regular meetings and daily stand-up discussions as platforms for engaging in meaningful dialogues regarding project change issues. Moreover, stakeholders stated that face-to-face interactions were essential for immediate feedback and clarifications. For instance, one respondent from the client group stated, '… our contractors participate in a daily toolbox talk and tea or coffee discussions' (P2). Respondents emphasize that informal discussions during breaks, lunch hours, or over coffee are valuable opportunities for spontaneous knowledge sharing. The casual nature of such conversations provides a conducive environment for stakeholders to exchange concepts, share experiences, and discuss project-related matters in a relaxed setting. Additionally, respondents recognized that shared offices encourage collaborative thinking and sharing of insights. The proximity of team members within a shared workspace facilitated quick exchanges of concepts, brainstorming, and impromptu discussions, contributing to enhanced project understanding and outcomes. One of the respondents from the contractor group mentioned, '… we discuss the weekly updates in our shared office' (P8). Moreover, engaging in social events was identified as another approach for enhancing knowledge sharing. For instance, a design consultant further explained their perspective, namely that social events such as playing sports together enabled individuals to build relationships with others, noting '… social events such as football matches and team dinner enable individuals to share each other's concerns informally' (P15). Furthermore, a supplier noted that the involvement of internal and external teams is the most optimal method of obtaining a quick solution to emergent scenarios and enables them to avoid the *'… blame game and develop collective understating' (P22).* One-third of the subcontractors emphasized that a team's willingness to provide support in resolving problems is crucial; they stated, 'all parties are eager to contribute and assist within projects' (P17).

The outcomes of the matrix coding query (see Table 4) sourced from interview data analyzed through NVivo12 indicate that several approaches, including training or international visits to access information, peer collaboration, computer-based platforms, face-to-face discussions, informal meetings, documents or reports, emails, social messaging apps, and databases as a knowledge source, facilitate the management of emergent events.

Table 4. Matrix coding query.

Descriptions	Clients	Consultants	Contractors	Sub-Contractors	Suppliers
Training or international visits	3	4	2	0	2
Computer-based platforms	1	2	2	1	1
Discussions/meetings	4	5	3	5	5
Documents or reports	2	3	4	3	1
Emails	4	4	3	5	4
Social messaging apps	2	4	5	5	5
Database	3	3	1	3	3

4.2.3. Application of Innovative Techniques and Best Practices

The construction industry is progressively embracing innovation, albeit cautiously owing to perceived risks and costs associated with implementing novel practices. The pace of adoption is apparently gradual. Clients emphasized the importance of incorporating best practices (Figure 2). One client noted the application of lean thinking, stating that 'lean thinking, a cost-efficient solution, assisted customers' (P3). Another client highlighted their organization's adoption of a critical incident learning approach referred to as 'post-incident review' (P5). Contractors expressed their commitment to enhancing designs and supporting clients by implementing concepts such as value engineering to provide

cost-effective solutions (P9). Consultants exhibited similar sentiments, emphasizing the enhancement of design through 3D BIM collaborative models. One client mentioned, 'we utilize the BIM model for clash detection through BIM–REVIT software simulations' (P12).

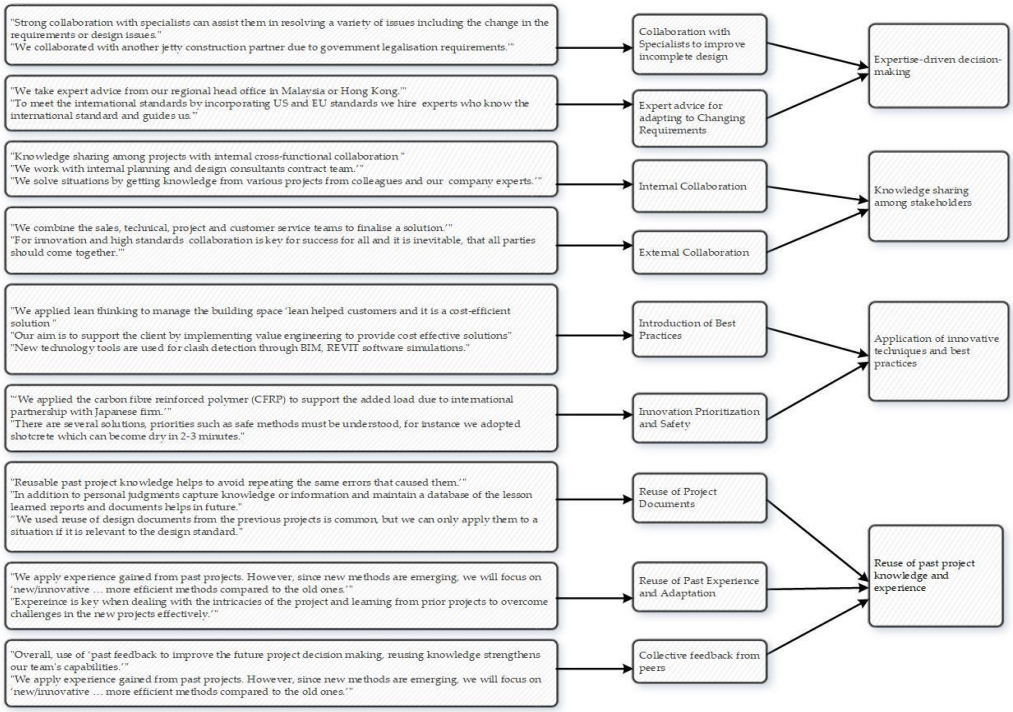


Figure 2. Thematic analysis of KM practices applied to solve emergent events.

However, challenges related to market readiness were acknowledged, underscoring the need to identify suitable partners and the resulting time implications. An example pertaining to the application of carbon-fiber-reinforced polymer (CFRP) in addressing load issues was shared. Additionally, suppliers highlighted the importance of understanding priorities in problem-solving; they stated, '… we adopted shotcrete which can become dry in 2–3 min' (P6). The findings underscore a discernible trend in which organizations incorporate innovative methods, particularly benefiting transnational projects.

4.2.4. Reuse of Past Project Knowledge and Experience

The existing literature highlights the significance of leveraging past knowledge and personal experiences acquired from previous projects to address similar scenarios in current or future projects [114]. Participants belonging to the consultant group emphasized the importance of explicit knowledge and efficient documentation management, especially when 'the reuse of design documents from the previous projects is common' (P11); however, this reuse is contingent upon the relevance of the design standard utilized in the previous project. Additionally, a few respondents from the client and contractor shareholder groups cited past learning as a reference point for addressing change-related issues. Two contractors further elaborated that in addition to explicit knowledge and documents, they utilize experiences from past projects; a contractor stated, 'past project feedback enhances future project decision-making' (P8). Echoing the experiential learning-related sentiments, nearly one-third of consultants, contractors, and clients emphasized that 'experience must involve managing details and avoiding repeating the same errors' (P7, P11).

Despite the widespread application of past experiences and judgments, a notable observation was the lack of a well-established formal process for capturing knowledge into repositories. A participant from the contractor group emphasized the need for companies to 'capture and effectively utilize this type of knowledge or information, and to maintain a database of lesson-learned reports and documents' (P8).

5. Discussion

This study investigated KM practices associated with the emergent events context and focused on construction projects. The thematic analysis considered stakeholders, major emergent issues in the Vietnamese construction projects (e.g., design issues), supply management issues, health and safety issues, and poor workmanship. Lack of knowledge on project planning and on the impact that this deficiency exerts on the construction delays in Vietnam is an established challenge affecting the client party [31,115–117]. This study identified a routinely emergent, prominent issue, namely site safety; the existing literature noted that these issues lead to conflicts among project stakeholders and negatively affect construction project performance [110,118,119]. Previous studies also observed that safety issues often emerge due to poor knowledge on safe construction methods and behavioral shortcomings, and that a lack of awareness among workers often leads to injuries and further impacts project performance [21,116,119]. Supply-related issues can exhibit an exceedingly negative effect on project delivery [120]. By conducting a cross-case analysis, it was observed that emergent scenarios necessitate crucial discussions owing to the cost and time impact of the projects and conflicts among stakeholders.

While the industry increasingly embraces practices such as PDCA, concurrent engineering, and value management to address project-related issues, the primary approach to managing unforeseen changes is continually becoming reliant on experiential knowledge. These findings are consistent with previous construction industry-related research, emphasizing the sector's reluctance to swiftly adopt and integrate novel methodologies [31]. Past research has consistently highlighted that team meetings are an effective platform for resolving conflicts; the observations indicate that with the exception of internal team collaboration, feedback and engaging with external stakeholders are an optimal approach for addressing emerging issues, providing valuable opportunities to offer and receive feedback related to the aforementioned concerns [121].

The Vietnamese construction industry is experiencing changes occasioned by the emergence of several FDI projects and international clients [79]. Thus, besides learning from past experiences, Vietnamese organizations frequently tap into collective knowledge and seek expertise from external sources to effectively resolve issues [22,49]. In complex scenarios such as design change, technical experts or consulting organizations are hired to overcome the lack of expertise. The findings of the cross-case analysis are consistent with previous studies on the Vietnamese construction industry and have highlighted the role of international and external collaboration in enhancing team efficacy [122]. These practices are also consistent with previous studies that indicate the role of expert advice and learning from other partners and team members [22]. It is observed that the strategy that entails learning from change events or emergent events is not widespread at the Vietnamese industry level: only a fraction of organizations that participate in international projects conduct frequent lesson-learned or post-project sessions [22,47,123].

Effectively harnessing lessons learned is a crucial aspect of KM within organizations. For Vietnamese project shareholder organizations, despite the effective development of knowledge-sharing practices, efficiently harnessing lessons learned during unforeseen scenarios remains challenging [124,125]. In conformance with past studies, the results reveal that poor participation of team members in the knowledge-sharing events leads to the repetition of mistakes. Addressing the challenges of multiple project engagements and time constraints that hinder participation in workshops and lesson-learned sharing sessions necessitates the development of tailored strategies; thus, the specific obstacles can be overcome [22,126].

It is essential for Vietnamese construction organizations to develop project status meetings; reporting mechanisms can facilitate an effective capturing process [6,125]. To overcome the issues pertaining to participation in the KM sessions and workshops, organizations should develop a flexible approach that entails offering ample time and incentives [6,47]. Furthermore, organizations should foster a culture of open communication,

encouraging all team members to voice concerns and identify potential changes as soon as they arise [32].

6. Conclusions

Emergent events disrupt the progress and on-time completion of construction projects. The inherent complexity of such activities requires a persistent commitment to learning and adaptability; thus, project performance can be optimized. The theoretical stance supported by the literature underscores KM and learning as essential components of managing events and changes. By applying thematic analysis, this study identified eleven (11) different scenarios and categorized them into four main categories. Furthermore, the study linked the relevant KM approaches applied by the experts to overcome these scenarios and clustered them in the identified studies.

This study observed that Vietnamese construction organizations have affected significant strides in handling the emergent situation through effective KM. However, there is a critical need to enhance the capture and dissemination of lessons learned, particularly during emergent/unforeseen scenarios to organizations. Since the main approaches are knowledge sharing and collaboration for problem solving, organizations should overcome these hurdles and foster a culture of continuous improvement. Establishing a formalized process for capturing and documenting lessons learned is fundamental. Furthermore, seamlessly integrating lessons learned into project workflows and prioritizing these activities requires organizational commitment and human resources.

This study is limited to the Vietnamese construction industry, focusing on exploring KM practices in managing unforeseen events during the construction stage. This specific context could impact the transferability of identified KM strategies to other diverse industry domains. Furthermore, the exclusive utilization of thematic analysis, though insightful, might not encompass the entire spectrum of details involved in KM practices during emergent events. Future studies could adopt mixed-method approaches to develop a more comprehensive understanding of KM practices and performance outcomes when managing unexpected events. Another limitation of this study is its focus on the construction stage, and future studies could explore the phenomena considering other stages of construction projects.

Author Contributions: Conceptualization, I.U. and M.K.; methodology, I.U.; software, I.U.; validation, T.M., T.L. and M.K.; formal analysis, I.U.; investigation, I.U.; resources, T.M., T.L. and M.K.; data curation, I.U. and T.M., writing, I.U.; writing—review and editing, I.U. and A.R.; visualization, I.U. and A.R.; supervision, T.M., M.K. and T.L.; project administration, T.M., T.L. and M.K. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: Data are unavailable due to ethical constraints.

Acknowledgments: This article is an output from a PhD research study completed at the School of Property, Construction and Project Management, funded by a scholarship from the RMIT University, Australia. Human ethics approval for this research study is A-21062-08-17. The authors acknowledge the leadership of RMIT University's School of Property, Construction, and Project Management for the awarded scholarship. The authors appreciate the management of the Business School, RMIT University, Vietnam for provision of a flexible working arrangement and other resources to support the successful completion of this doctoral study.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Bjorvatn, T.; Wald, A. Project complexity and team-level absorptive capacity as drivers of project management performance. *Int. J. Proj. Manag.* **2018**, *36*, 876–888. [CrossRef]
2. Maylor, H.; Turner, N. Understand, reduce, respond: Project complexity management theory and practice. *Int. J. Oper. Prod. Manag.* **2017**, *37*, 1076–1093. [CrossRef]

3. Nachbagauer, A. Managing complexity in projects: Extending the Cynefin framework. *Proj. Leadersh. Soc.* **2021**, *2*, 100017. [CrossRef]
4. Pauget, B.; Wald, A. Relational competence in complex temporary organizations: The case of a French hospital construction project network. *Int. J. Proj. Manag.* **2013**, *31*, 200–211. [CrossRef]
5. Vahabi, A.; Nasirzadeh, F.; Mills, A. Assessing the impact of project brief clarity using project definition rating index tool and system dynamic. *Eng. Constr. Archit. Manag.* **2023**, *30*, 697–713. [CrossRef]
6. Yap, J.B.H.; Shavarebi, K.; Skitmore, M. Capturing and reusing knowledge: Analysing the what, how and why for construction planning and control. *Prod. Plan. Control* **2021**, *32*, 875–888. [CrossRef]
7. Fang, J.; Le, Y. Organizational Culture and Knowledge Sharing in Construction Project Organization: A Review. *Adv. Inf. Sci. Serv. Sci.* **2012**, *4*, 122–131.
8. Ling, F.Y.Y.; Bui, T.T.D. Factors affecting construction project outcomes: Case study of Vietnam. *J. Prof. Issues Eng. Educ. Pract.* **2010**, *136*, 148–155. [CrossRef]
9. Dang, C.N.; Le-Hoai, L. Critical success factors for implementation process of design-build projects in Vietnam. *J. Eng. Des. Technol.* **2016**, *14*, 17–32. [CrossRef]
10. Maemura, Y.; Kim, E.; Ozawa, K. Root causes of recurring contractual conflicts in international construction projects: Five case studies from Vietnam. *J. Constr. Eng. Manag.* **2018**, *144*, 05018008. [CrossRef]
11. Ling, F.Y.Y.; Pham, V.M.C.; Hoang, T.P. Strengths, weaknesses, opportunities, and threats for architectural, engineering, and construction firms: Case study of Vietnam. *J. Constr. Eng. Manag.* **2009**, *135*, 1105–1113. [CrossRef]
12. Dang, C.N.; Chih, Y.-Y.; Le-Hoai, L.; Nguyen, L.D. Project-Based A/E/C Firms' Knowledge Management Capability and Market Development Performance: Does Firm Size Matter. *J. Constr. Eng. Manag.* **2020**, *146*, 04020127. [CrossRef]
13. Kim, S.-Y.; Tuan, K.N. Delay factor analysis for hospital projects in Vietnam. *KSCE J. Civ. Eng.* **2016**, *20*, 519–529. [CrossRef]
14. Long, N.D.; Ogunlana, S.; Quang, T.; Lam, K.C. Large construction projects in developing countries: A case study from Vietnam. *Int. J. Proj. Manag.* **2004**, *22*, 553–561. [CrossRef]
15. Ebekozien, A.; Aigbavboa, C.O.; Ramotshela, M. A qualitative approach to investigate stakeholders' engagement in construction projects. *Benchmarking Int. J.* **2023**. [CrossRef]
16. Hällgren, M.; Maaninen-Olsson, E. Deviations, ambiguity and uncertainty in a project-intensive organization. *Proj. Manag. J.* **2005**, *36*, 17–26. [CrossRef]
17. Tatikonda, M.V.; Rosenthal, S.R. Technology novelty, project complexity, and product development project execution success: A deeper look at task uncertainty in product innovation. *IEEE Trans. Eng. Manag.* **2000**, *47*, 74–87. [CrossRef]
18. Tan, H.C.; Anumba, C.J.; Carrillo, P.M.; Bouchlaghem, D.; Kamara, J.; Udeaja, C. *Capture and Reuse of Project Knowledge in Construction*; John Wiley & Sons: Oxford, UK, 2009; p. 208.
19. Dosumu, O.S.; Aigbavboa, C.O. Impact of Design Errors on Variation Cost of Selected Building Project in Nigeria. *Procedia Eng.* **2017**, *196*, 847–856. [CrossRef]
20. Love, P.E.; Edwards, D.J.; Watson, H.; Davis, P. Rework in civil infrastructure projects: Determination of cost predictors. *J. Constr. Eng. Manag.* **2010**, *136*, 275–282. [CrossRef]
21. Love, P.E.; Smith, J.; Teo, P. Putting into practice error management theory: Unlearning and learning to manage action errors in construction. *Appl. Ergon.* **2018**, *69*, 104–111. [CrossRef]
22. Carrillo, P.; Ruikar, K.; Fuller, P. When will we learn? Improving lessons learned practice in construction. *Int. J. Proj. Manag.* **2013**, *31*, 567–578. [CrossRef]
23. Schindler, M.; Eppler, M.J. Harvesting project knowledge: A review of project learning methods and success factors. *Int. J. Proj. Manag.* **2003**, *21*, 219–228. [CrossRef]
24. Yap, J.B.H.; Skitmore, M. Investigating design changes in Malaysian building projects. *Archit. Eng. Des. Manag.* **2017**, *14*, 218–238. [CrossRef]
25. Barney, J.B. Resource-based theories of competitive advantage: A ten-year retrospective on the resource-based view. *J. Manag.* **2016**, *27*, 643–650. [CrossRef]
26. Goh, E.; Loosemore, M. The impacts of industrialization on construction subcontractors: A resource based view. *Constr. Manag. Econ.* **2017**, *35*, 288–304. [CrossRef]
27. Grant, R.M.; Baden-Fuller, C. A Knowledge-Based Theory of Inter-Firm Collaboration. *Acad. Manag. Proc.* **1995**, *1995*, 17–21. [CrossRef]
28. Fong, P.S.W. Knowledge creation in multidisciplinary project teams: An empirical study of the processes and their dynamic interrelationships. *Int. J. Proj. Manag.* **2003**, *21*, 479–486. [CrossRef]
29. Nonaka, I. A Dynamic Theory of Organizational Knowledge Creation. *Organ. Sci.* **1994**, *5*, 14–37. [CrossRef]
30. Maqsood, T.; Finegan, A.; Walker, D. Applying project histories and project learning through knowledge management in an Australian construction company. *Learn. Organ.* **2006**, *13*, 80–95. [CrossRef]
31. Yap, J.B.H.; Shavarebi, K. Enhancing project delivery performances in construction through experiential learning and personal constructs: Competency development. *Int. J. Constr. Manag.* **2019**, *22*, 436–452. [CrossRef]
32. Yap, J.B.H.; Abdul-Rahman, H.; Chen, W. Collaborative model: Managing design changes with reusable project experiences through project learning and effective communication. *Int. J. Proj. Manag.* **2017**, *35*, 1253–1271. [CrossRef]

33. Ajmal, M.; Helo, P.; Kekäle, T. Critical factors for knowledge management in project business. *J. Knowl. Manag.* **2010**, *14*, 156–168. [CrossRef]
34. Liu, G.; Tsui, E.; Kianto, A. Knowledge-friendly organisational culture and performance: A meta-analysis. *J. Bus. Res.* **2021**, *134*, 738–753. [CrossRef]
35. Argote, L. *Organizational Learning: Creating, Retaining and Transferring Knowledge*, 2nd ed.; Springer Science & Business Media: London, UK, 2012.
36. Davenport, T.H.; Prusak, L. *Working Knowledge: How Organizations Manage What They Know*; Harvard Business School Press: Boston, MA, USA, 1998; p. 199.
37. Pan, S.L.; Scarbrough, H. Knowledge management in practice: An exploratory case study. *Technol. Anal. Strateg. Manag.* **1999**, *11*, 359–374. [CrossRef]
38. Polanyi, M. Knowing and being. In *Knowing and Being: Essays*; Grene, M., Ed.; University of Chicago Press: Chicago, IL, USA, 1969; pp. 123–207.
39. De Long, D.W.; Fahey, L. Diagnosing cultural barriers to knowledge management. *Acad. Manag. Perspect.* **2000**, *14*, 113–127. [CrossRef]
40. Tahir, M.B.; Khan, K.I.A.; Nasir, A.R. Tacit knowledge sharing in construction: A system dynamics approach. *Asian J. Civ. Eng.* **2021**, *22*, 605–625. [CrossRef]
41. Alavi, M.; Leidner, D.E. Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues. *MIS Q.* **2001**, *25*, 107–136. [CrossRef]
42. Bhatt, G.D. Knowledge management in organizations: Examining the interaction between technologies, techniques, and people. *J. Knowl. Manag.* **2001**, *5*, 68–75. [CrossRef]
43. Argote, L.; Ingram, P. Knowledge transfer: A basis for competitive advantage in firms. *Organ. Behav. Hum. Decis. Process.* **2000**, *82*, 150–169. [CrossRef]
44. Zhao, S.; Liu, X.; Andersson, U.; Shenkar, O. Knowledge management of emerging economy multinationals. *J. World Bus.* **2022**, *57*, 101255. [CrossRef]
45. Dohale, V.; Ambilkar, P.; Gunasekaran, A.; Verma, P. Supply chain risk mitigation strategies during COVID-19: Exploratory cases of "make-to-order" handloom saree apparel industries. *Int. J. Phys. Distrib. Logist. Manag.* **2022**, *52*, 109–129. [CrossRef]
46. Stock, G.N.; Tsai, J.C.-A.; Jiang, J.J.; Klein, G. Coping with uncertainty: Knowledge sharing in new product development projects. *Int. J. Proj. Manag.* **2021**, *39*, 59–70. [CrossRef]
47. Shokri-Ghasabeh, M.; Chileshe, N. Knowledge management: Barriers to capturing lessons learned from Australian construction contractors perspective. *Constr. Innov.* **2014**, *14*, 108–134. [CrossRef]
48. Anumba, C.J.; Egbu, C.; Carrillo, P. *Knowledge Management in Construction*, 1st ed.; Blackwell Publishing Ltd.: Oxford, UK, 2005.
49. Mueller, J. Formal and Informal Practices of Knowledge Sharing between Project Teams and Enacted Cultural Characteristics. *Proj. Manag. J.* **2015**, *46*, 53–68. [CrossRef]
50. Papadonikolaki, E.; Verbraeck, A.; Wamelink, H. Formal and informal relations within BIM-enabled supply chain partnerships. *Constr. Manag. Econ.* **2017**, *35*, 531–552. [CrossRef]
51. Di Vaio, A.; Palladino, R.; Pezzi, A.; Kalisz, D.E. The role of digital innovation in knowledge management systems: A systematic literature review. *J. Bus. Res.* **2021**, *123*, 220–231. [CrossRef]
52. Marandi Alamdari, A.; Jabarzadeh, Y.; Samson, D.; Sanoubar, N. Supply chain risk factors in green construction of residential mega projects—Interactions and categorization. *Eng. Constr. Archit. Manag.* **2021**, *30*, 568–597. [CrossRef]
53. Hansen, M.T.; Nohria, N.; Tierney, T. What's your strategy for managing knowledge? *Harv. Bus. Rev.* **1999**, *77*, 106–116, 187.
54. Yang, Y.; Brosch, G.; Yang, B.; Cadden, T. Dissemination and communication of lessons learned for a project-based business with the application of information technology: A case study with Siemens. *Prod. Plan. Control* **2019**, *31*, 273–286. [CrossRef]
55. Hansen, M.T. Knowledge Networks: Explaining Effective Knowledge Sharing in Multiunit Companies. *Organ. Sci.* **2002**, *13*, 232–248. [CrossRef]
56. Kasvi, J.J.; Vartiainen, M.; Hailikari, M. Managing knowledge and knowledge competences in projects and project organisations. *Int. J. Proj. Manag.* **2003**, *21*, 571–582. [CrossRef]
57. Aaltonen, K.; Kujala, J.; Lehtonen, P.; Ruuska, I. A stakeholder network perspective on unexpected events and their management in international projects. *Int. J. Manag. Proj. Bus.* **2010**, *3*, 564–588. [CrossRef]
58. Söderholm, A. Project management of unexpected events. *Int. J. Proj. Manag.* **2008**, *26*, 80–86. [CrossRef]
59. Gatitu, J.N.; Kabubo, C.K.; Ajwang, P. Approaches on Mitigating Variation Orders in Road Construction Industry in Kenya: The Case of Kenya National Highways Authority (KeNHA). *Eng. Technol. Appl. Sci. Res.* **2020**, *10*, 6195–6199. [CrossRef]
60. Miller, R.; Hobbs, B. The complexity of decision-making in large projects with multiple partners: Be prepared to change. In *Making Essential Choices with Scant Information*; Springer: Berlin/Heidelberg, Germany, 2009; pp. 375–389.
61. Snowden, D.J.; Boone, M.E. A leader's framework for decision making. A leader's framework for decision making. *Harv. Bus. Rev.* **2007**, *85*, 68–76, 149.
62. Suresh, S.; Olayinka, R.; Chinyio, E.; Renukappa, S. Impact of knowledge management on construction projects. *Proc. Inst. Civ. Eng.-Manag. Procure. Law* **2017**, *170*, 27–43. [CrossRef]
63. Love, P.E.D.; Smith, J.; Ackermann, F.; Irani, Z.; Teo, P. The costs of rework: Insights from construction and opportunities for learning. *Prod. Plan. Control* **2018**, *29*, 1082–1095. [CrossRef]

64. Zhong, S.S.; Elhegazy, H.; Elzarka, H. Key factors affecting the decision-making process for buildings projects in Egypt. *Ain Shams Eng. J.* **2022**, *13*, 101597. [CrossRef]
65. Wang, C.; Yap, J.B.H.; Wood, L.C.; Abdul-Rahman, H. Knowledge modelling for contract disputes and change control. *Prod. Plan. Control* **2019**, *30*, 650–664. [CrossRef]
66. Saoud, L.A.; Omran, J.; Hassan, B.; Vilutiene, T.; Kiaulakis, A. A method to predict change propagation within building information model. *J. Civ. Eng. Manag.* **2017**, *23*, 836–846. [CrossRef]
67. Kumar, V.; Lin, E.T.A. Conceptualizing "COBieEvaluator" A rule based system for tracking asset changes using COBie datasheets. *Eng. Constr. Archit. Manag.* **2020**, *27*, 1093–1118. [CrossRef]
68. Ilter, O.; Celik, T. Investigation of Organizational and Regional Perceptions on the Changes in Construction Projects. *Tek. Dergi* **2021**, *32*, 11257–11286. [CrossRef]
69. Kotnour, T. Organizational learning practices in the project management environment. *Int. J. Qual. Reliab. Manag.* **2000**, *17*, 393–406. [CrossRef]
70. Epley, N.; Gilovich, T. The anchoring-and-adjustment heuristic: Why the adjustments are insufficient. *Psychol. Sci.* **2006**, *17*, 311–318. [CrossRef]
71. Maqsood, T.; Finegan, A.; Walker, D. Biases and heuristics in judgment and decision making: The dark side of tacit knowledge. *Issues Informing Sci. Inf. Technol.* **2004**, *1*, 295–301.
72. Arif, M.; Egbu, C.; Toma, T. Knowledge retention in construction in the UAE. In Proceedings of the 26th Annual Conference of the Association of Researchers in Construction Management (ARCOM), Leeds, UK, 6–8 September 2010; pp. 887–896.
73. Egbu, C.O. Managing knowledge and intellectual capital for improved organizational innovations in the construction industry: An examination of critical success factors. *Eng. Constr. Archit. Manag.* **2004**, *11*, 301–315. [CrossRef]
74. Yap, J.B.H.; Lim, B.L.; Skitmore, M.; Gray, J. Criticality of project knowledge and experience in the delivery of construction projects. *J. Eng. Des. Technol.* **2022**, *20*, 800–822. [CrossRef]
75. Michelle, M.; Paul, W.; Kate, H. *2022 Engineering and Construction Industry Outlook*; Deloitte Consulting LLP: New York, NY, USA, 2022; p. 11.
76. GSO. *Press Release Social and Economic Situation in the First Quarter of 2018*; General Staistics Office: Hanoi, Vietnam, 2018; Volume 2018.
77. Nguyen Nhat, H.; Nguyen Tuan, N.; Vu Thi, H.; Dao Hong, Q.; Le Thi Thuy, D. *Vietnam Economic Situation*; FPT Securities: Hanoi, Vietnam, 2019; p. 64.
78. Nguyen, V. *Ready for the Leap*; FPT Securities: Hanoi, Vietnam, 2015; pp. 1–102.
79. Statista. *Statista Dossier on the construction industry in Vietnam*; Statista: New York, NY, USA, 2021; p. 43.
80. Le, N. Vietnam construction industry performance issues and potential solutions. *J. Adv. Perform. Inf. Value* **2017**, *9*, 7–20. [CrossRef]
81. Dinh, T.H.; Dinh, T.H.; Gotze, U. Roadworks design: Study on selection of construction materials in the preliminary design phase based on economic performance. *Int. J. Constr. Manag.* **2023**. [CrossRef]
82. Dao, Q.V.; Nguyen, T.Q. A Case Study of BIM Application in a Public Construction Project Management Unit in Vietnam: Lessons Learned and Organizational Changes. *Eng. J.-Thail.* **2021**, *25*, 177–192. [CrossRef]
83. Tam, N.V.; Toan, N.Q.; Phong, V.V.; Durdyev, S. Impact of BIM-related factors affecting construction project performance. *Int. J. Build. Pathol. Adapt.* **2023**, *41*, 454–475. [CrossRef]
84. Hai, N.L.; Tuan, N.A. Modeling of planning function management in Vietnam's public construction works. *Built Environ. Proj. Asset Manag.* **2023**, *13*, 201–216. [CrossRef]
85. Nguyen, H.T.; Hadikusumo, B. Impacts of human resource development on engineering, procurement, and construction project success. *Built Environ. Proj. Asset Manag.* **2017**, *7*, 73–85. [CrossRef]
86. Toan, N.Q.; Tam, N.V.; Hai, D.T.; Quy, N.L.D. Critical Factors Affecting Labor Productivity within Construction Project Implementation: A Project Manager's Perspective. *Entrep. Sustain. Issues* **2020**, *8*, 751–763. [CrossRef]
87. Nguyen, T.P.; Chileshe, N. Revisiting the construction project failure factors in Vietnam. *Built Environ. Proj. Asset Manag.* **2015**, *5*, 398–416. [CrossRef]
88. Vo, K.D.; Nguyen, P.T.; Nguyen, Q. Disputes in Managing Projects: A Case Study of Construction Industry in Vietnam. *J. Asian Financ. Econ. Bus.* **2020**, *7*, 635–644. [CrossRef]
89. Zuo, J.; Zhao, X.B.; Nguyen, Q.B.M.; Ma, T.; Gao, S. Soft skills of construction project management professionals and project success factors: A structural equation model. *Eng. Constr. Archit. Manag.* **2018**, *25*, 425–442. [CrossRef]
90. Van Thuyet, N.; Ogunlana, S.O.; Dey, P.K. Risk management in oil and gas construction projects in Vietnam. *Int. J. Energy Sect. Manag.* **2007**, *1*, 175–194. [CrossRef]
91. Khanh, H.D.; Kim, S.Y. Evaluating impact of waste factors on project performance cost in Vietnam. *KSCE J. Civ. Eng.* **2014**, *18*, 1923–1933. [CrossRef]
92. Dang, C.N.; Le-Hoai, L. Relating knowledge creation factors to construction organizations' effectiveness. *J. Eng. Des. Technol.* **2019**, *17*, 515–536. [CrossRef]
93. Do, S.T.; Nguyen, V.T.; Nguyen, N.H. Relationship networks between variation orders and claims/disputes causes on construction project performance and stakeholder performance. *Eng. Constr. Archit. Manag.* **2022**. [CrossRef]

94. Nguyen, V.T.; Do, S.T. Assessing the relationship chain among causes of variation orders, project performance, and stakeholder performance in construction projects. *Int. J. Constr. Manag.* **2023**, *23*, 1592–1602. [CrossRef]
95. Vu, P.N.; Vu, L.T. Knowledge Management Model for Construction Design Consulting Companies. *Int. J. Sustain. Constr. Eng. Technol.* **2021**, *12*, 232–239. [CrossRef]
96. Tien, N.H.; Nhi, D. Comparative Analysis of Knowledge Management Software Application at E&Y and Unilever Vietnam. *Int. J. Multidiscip. Res. Dev.* **2019**, *6*, 22–27.
97. Nguyen, N.T.D.; Aoyama, A. Exploring cultural differences in implementing international technology transfer in the case of Japanese manufacturing subsidiaries in Vietnam. *Contemp. Manag. Res.* **2013**, *9*, 13–34. [CrossRef]
98. Nguyen, T.; Burgess, S. A case analysis of ICT for knowledge transfer in small businesses in Vietnam. *Int. J. Inf. Manag.* **2014**, *34*, 416–421. [CrossRef]
99. Tran, Q.H. Information technology competence, process management and knowledge management: A case of manufacturing firms of Vietnam. *Syst. Rev. Pharm.* **2020**, *11*, 763–773.
100. Ngoc-Tan, N.; Gregar, A. Knowledge management and its impacts on organisational performance: An empirical research in public higher education institutions of Vietnam. *J. Inf. Knowl. Manag.* **2019**, *18*, 1950015. [CrossRef]
101. Pham, Q.T.; Pham-Nguyen, A.-V.; Misra, S.; Damaševičius, R. Increasing innovative working behaviour of information technology employees in Vietnam by knowledge management approach. *Computers* **2020**, *9*, 61. [CrossRef]
102. Van, L.; Thi, C.H. Critical Success Factors In Knowledge Management: An Analysis of the Construction Industry in Vietnam. *J. Econ. Dev.* **2019**, 37–44.
103. Yin, R.K. *Case Study Research: Design and Methods*, 4th ed.; SAGE Publications: Thousand Oaks, CA, USA, 2009; Volume 5, p. 219.
104. Saunders, M.N. *Research Methods for Business Students, 5/e*; Pearson Education: Bangalore, India, 2011.
105. Nowell, L.S.; Norris, J.M.; White, D.E.; Moules, N.J. Thematic analysis: Striving to meet the trustworthiness criteria. *Int. J. Qual. Methods* **2017**, *16*, 1609406917733847. [CrossRef]
106. Braun, V.; Clarke, V. Using thematic analysis in psychology. *Qual. Res. Psychol.* **2006**, *3*, 77–101. [CrossRef]
107. Cruzes, D.S.; Dybå, T.; Runeson, P.; Höst, M. Case studies synthesis: A thematic, cross-case, and narrative synthesis worked example. *Empir. Softw. Eng.* **2015**, *20*, 1634–1665. [CrossRef]
108. Nguyen, T.H.D.; Chileshe, N.; Rameezdeen, R.; Wood, A. External stakeholder strategic actions in projects: A multi-case study. *Int. J. Proj. Manag.* **2019**, *37*, 176–191. [CrossRef]
109. Love, P.E.D.; Lopez, R.; Edwards, D.J. Reviewing the past to learn in the future: Making sense of design errors and failures in construction. *Struct. Infrastruct. Eng.* **2013**, *9*, 675–688. [CrossRef]
110. Love, P.E.; Teo, P.; Morrison, J.; Grove, M. Quality and safety in construction: Creating a no-harm environment. *J. Constr. Eng. Manag.* **2016**, *142*, 05016006. [CrossRef]
111. Egbu, C. Knowledge production and capabilities—Their importance and challenges for construction organisations in China. *J. Technol. Manag. China* **2006**, *1*, 304–321. [CrossRef]
112. Briscoe, G.H.; Dainty, A.R.; Millett, S.J.; Neale, R.H. Client-led strategies for construction supply chain improvement. *Constr. Manag. Econ.* **2004**, *22*, 193–201. [CrossRef]
113. Schraagen, J.M. How experts solve a novel problem in experimental design. *Cogn. Sci.* **1993**, *17*, 285–309. [CrossRef]
114. Love, P.E.; Li, H.; Irani, Z.; Faniran, O. Total quality management and the learning organization: A dialogue for change in construction. *Constr. Manag. Econ.* **2000**, *18*, 321–331. [CrossRef]
115. Yap, J.B.H.; Toh, H.M. Investigating the principal factors impacting knowledge management implementation in construction organisations. *J. Eng. Des. Technol.* **2020**, *18*, 55–69. [CrossRef]
116. Tran, D.H.; Long, L.D. Project scheduling with time, cost and risk trade-off using adaptive multiple objective differential evolution. *Eng. Constr. Archit. Manag.* **2018**, *25*, 623–638. [CrossRef]
117. Liu, J.Y.; Xie, Q.X.; Xia, B.; Bridge, A.J. Impact of Design Risk on the Performance of Design-Build Projects. *J. Constr. Eng. Manag.* **2017**, *143*, 04017010. [CrossRef]
118. Bakri, A.S.; Ab Razak, M.A.; Abd Shukor, A.S. Identification of Factors Influencing Time and Cost Risks in Highway Construction Projects. *Int. J. Sustain. Constr. Eng. Technol.* **2021**, *12*, 280–288. [CrossRef]
119. Li, C.Z.; Xu, X.; Shen, G.Q.; Fan, C.; Li, X.; Hong, J.K. A model for simulating schedule risks in prefabrication housing production: A case study of six-day cycle assembly activities in Hong Kong. *J. Clean. Prod.* **2018**, *185*, 366–381. [CrossRef]
120. Singh, P.J.; Power, D. Innovative knowledge sharing, supply chain integration and firm performance of Australian manufacturing firms. *Int. J. Prod. Res.* **2014**, *52*, 6416–6433. [CrossRef]
121. Senaratne, S.; Sexton, M.G. Role of knowledge in managing construction project change. *Eng. Constr. Archit. Manag.* **2009**, *16*, 186–200. [CrossRef]
122. Nguyen, S.N.; Islam, N. Knowledge Transfer from International Consultants to Local Partners: An Empirical Study of Metro Construction Projects in Vietnam. *Int. J. Knowl. Manag. (IJKM)* **2018**, *14*, 73–87. [CrossRef]
123. Wiewiora, A.; Murphy, G. Unpacking 'lessons learned': Investigating failures and considering alternative solutions. *Knowl. Manag. Res. Pract.* **2017**, *13*, 17–30. [CrossRef]
124. Aragao, R.R.; El-Diraby, T.E. Using network analytics to capture knowledge: Three cases in collaborative energy-oriented planning for oil and gas facilities. *J. Clean. Prod.* **2019**, *209*, 1429–1444. [CrossRef]

125. Tan, H.C.; Carrillo, P.M.; Anumba, C.J. Case Study of Knowledge Management Implementation in a Medium-Sized Construction Sector Firm. *J. Manag. Eng.* **2012**, *28*, 338–347. [CrossRef]
126. Duffield, S.; Whitty, S.J. Developing a systemic lessons learned knowledge model for organisational learning through projects. *Int. J. Proj. Manag.* **2015**, *33*, 311–324. [CrossRef]

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