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KNOWLEDGE MANAGEMENT AND TECHNOLOGICAL INNOVATION AS DRIVERS OF SUSTAINABLE DEVELOPMENT IN UK CONSTRUCTION PROJECT MANAGEMENT

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Abstract

The construction industry lags behind peer sectors such as manufacturing, aviation, and pharmaceuticals in its digital transformation, despite its substantial environmental footprint. The built environment is responsible for an estimated 40% of global carbon emissions, intensifying the urgency for evidence-based, technology-enabled approaches to deliver sustainable outcomes (Yoon and Arshid, 2025). This study examines how knowledge management (KM) and technological innovation (TI) can accelerate sustainable development (SD) in UK construction projects and close the gap between theory and practice. This research study adopts a mixed methods design that integrates systematic literature review, semi-structured interviews with industry professionals, and a survey of practitioners. The research findings indicate that KM and TI are widely recognized as enablers of efficiency, profitability, carbon reduction, and ESG compliance. However, adoption of technology is this industry is constrained by cultural resistance, leadership styles, and manpower skills. This research study classifies supportive and inhibiting factors and proposes an actionable governance and capacity-building framework to advance digital reformation and sustainability performance across the sector. The study highlighted the strategic drive for digital reformation and technological innovation, including BIM, AI, IoT, Big Data, Digital Twins, AR, and robotics in project management practices for advancing sustainability goals. This research contributes to the body of knowledge by classifying key supportive and preventive factors towards technological integration while proposing an actionable strategy for industry-wide digital reformation. This research study concludes by recommending a governance framework and capacity-building initiatives to enhance environmental, social, and economic outcomes in the UK construction sector.

Keywords: *Technological innovation, Knowledge Management, Project Management, Construction Industry, Sustainable Development*

1. Introduction

The construction industry is a knowledge-intensive sector where project success increasingly depends on effective data management and technological integration. Despite its economic significance, the industry lags behind manufacturing and other sectors in digital transformation. This research manuscript explores how Knowledge Management (KM) and Technological Innovation (TI) can bridge such a gap while enabling sustainable development through advanced tools such as Building Information Modelling (BIM), Artificial Intelligence (AI), and Modern Methods of Construction (MMC). The study also investigates barriers to technological adoption, including cultural inertia and financial constraints.

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1.1 Sustainable Development and Technological Innovation Trends

Worldwide, the construction industry accounts for approximately 40% of carbon emissions, underscoring its significant environmental impact (Mostly, 2025). Despite this, the sector has been slow to embrace digital transformation, often constrained by perceived economic risks and limited return on investment (Wang et al., 2024). This study aims to examine the underlying resistance to technological adoption and identify the tangible benefits of integrating KM and TI in the UK construction projects to achieve sustainability development while ensuring stakeholder value realization.

However, the global construction output was projected to reach $12.7 trillion in 2022; this productivity growth has remained stagnant at around 1% over the past two decades, largely due to inadequate digitization (McKinsey, 2020). Industry surveys reveal a fragmented approach to digital transformation: while 46% of firms report progress toward digital maturity, 41% remain in the early stages of adoption (White and Clarkson, 2024). Environmental imperatives further emphasize that achieving net-zero carbon emissions by 2030 will require widespread implementation of advanced technologies and knowledge-driven strategies throughout the project lifecycle (Markkanen, 2023).

Among such technologies, BIM stands out as a transformative tool, enabling integrated design, planning, and lifecycle management. These technologies are coupled with modern methods of construction (MMC), AI, machine learning (ML), augmented reality (AR), and robotics. The digital transformation (DT) and technological innovation (TI) offer significant potential for reducing carbon footprints, improving efficiency, and enhancing project outcomes (Bassir and Chang, 2023; Datta et al., 2024; Samadder et al., 2025). However, the UK construction sector continues to exhibit cautious engagement with these technologies, particularly in large-scale projects, due to cultural inertia and skill shortages (Ibrahim and Aliu, 2025). Encouragingly, recent trends indicate a gradual shift toward digital adoption, supported by growing awareness among senior executives of the strategic benefits of KM and TI for sustainable development.

This highlights that the construction industry is inherently information-intensive, and its ability to achieve sustainable development goals depends on effective knowledge sharing and timely access to critical real time data. Modern project management increasingly requires the integration of advanced technologies and data analytics to address complex challenges and deliver sustainable outcomes (Blak Bernat et al., 2023; Biswas et al., 2025). Consequently, KM and TI have emerged as key enablers of performance improvement, driving the adoption of digital tools such as Building Information Modelling (BIM) and Artificial Intelligence (AI) for design optimization and resource efficiency (Akinradewo et al., 2025). However, looking ahead, the convergence of KM and TI will not only redefine construction project delivery models but also shape future research agendas focused on digital transformation, sustainability metrics, and collaborative knowledge ecosystems within the construction sector in the UK and worldwide.

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1.2 Opportunities and Challenges: KM and TI in Construction Projects

In recent years, the pace of digital disruption is accelerating across industries worldwide. However, despite being one of the fastest-growing sectors globally, the construction industry has historically lagged in embracing digital transformation (Chathuranga et al., 2025). In the UK, construction firms have increasingly adopted Management Information Systems (MIS) supported by emerging technologies such as Building Information Modelling (BIM), Artificial Intelligence (AI), and Machine Learning (ML) since 2010 (White and Clarkson, 2024). Yet, these innovations remain underutilized, particularly during critical phases of the construction project management lifecycle such as conceptualization, initiation, planning, design, and execution, where BIM engagement is often limited or constrained (Doan et al., 2025).

Beyond BIM, advanced technologies such as Augmented Reality (AR), Robotics, and Modern Methods of Construction (MMC) are gaining traction in contemporary practices (Dagou et al., 2025). Nevertheless, the industry continues to face challenges in achieving widespread adoption and integration across all project stages. To fully realize technology-driven and knowledge-based sustainable development, the sector must foster continuous innovation and accelerate adoption rates throughout its core processes. Evidence from the KPMG Future-Ready Index reveals that technological innovations exhibit the highest adoption rates among the top 20% of companies. This is recognized as innovation leaders underscoring the need for broader industry engagement (KPMG, 2019) as shown in the graphical illustration below, Figure 1.

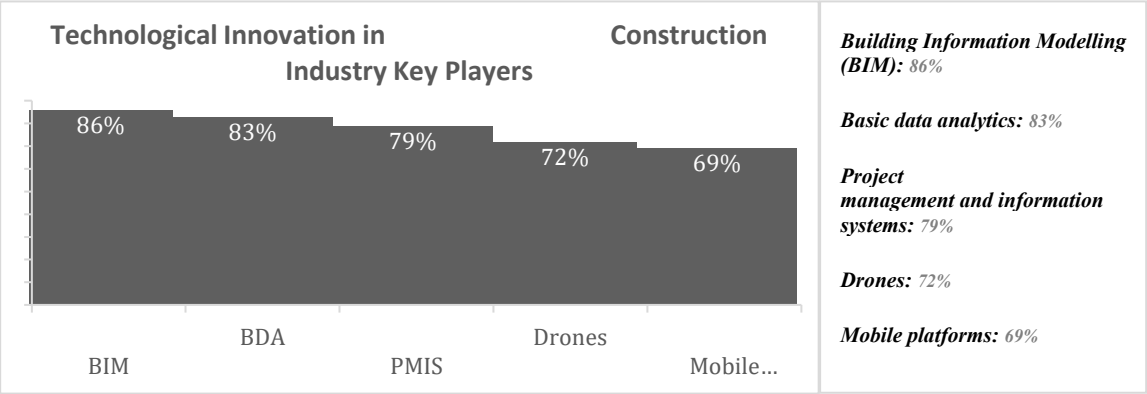

Figure 1: Technological Innovation in the Construction Industry (KPMG, 2019)

1.3 Strategic Role of Knowledge Management

Construction projects generate extensive experiential knowledge. KM integrates lessons learned into structured repositories and workflows, enabling analytics, classification, and continuous improvement. Effective KM systems such as lessons-learned platforms, data archives, and collaborative information environments facilitate organizational learning and, in turn, support innovation (Haider et al., 2023). In this study, KM is defined as the generation, transfer, and application of knowledge to improve scope, cost, time, quality,

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safety, and team effectiveness. Digital technologies provide the infrastructure for these KM practices in UK projects (Romero-Ochoa et al., 2025). Once organizational learning occurs and knowledge is systematically applied to project management practices, it can drive innovative construction initiatives and contribute to long-term sustainable development (Travis et al., 2023).

In this context, KM can be defined as the set of activities involved in generating, transmitting, and applying knowledge to improve project management performance in terms of scope, cost, time, quality, and team efficiency (Liu et al., 2021). However, the underscores KM's significance for sustainable construction development requires being continually addressing various challenges such as resource scarcity, limited eco-friendly materials, and financial constraints (Hui et al., 2024). Ultimately, KM enhances individual and organizational capabilities to take effective action supported by technological innovation (Panda, 2025). In essence, KM is the process of capturing, distributing, and utilizing knowledge effectively, with underlying digital technologies playing a critical role in supporting KM practices in UK construction projects (see Figure 2).

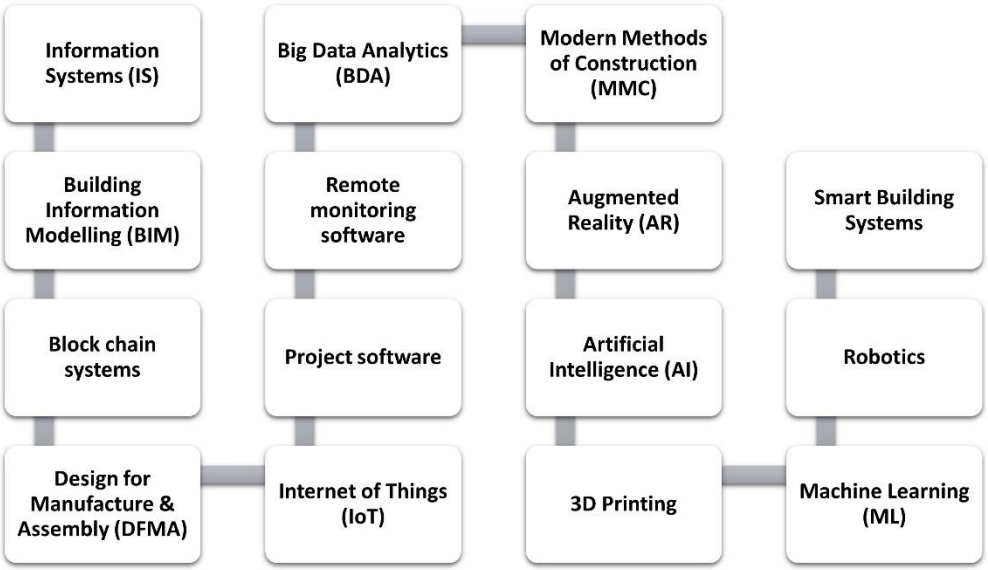

Figure 2. Emerging digital technologies supporting KM in construction projects (Liu et al., 2021)

1.4 Strategic Imperatives in the UK Sustainable Development Construction

There is persistent uncertainty surrounding the implementation of digital technologies in the UK construction industry to support sustainable development, whereas the social, economic, and environmental benefits of sustainability are widely acknowledged, which require greater attention from stakeholders to ensure effective integration (Wang et al., 2024). A lack of awareness regarding these benefits often acts as a barrier to digital transformation and

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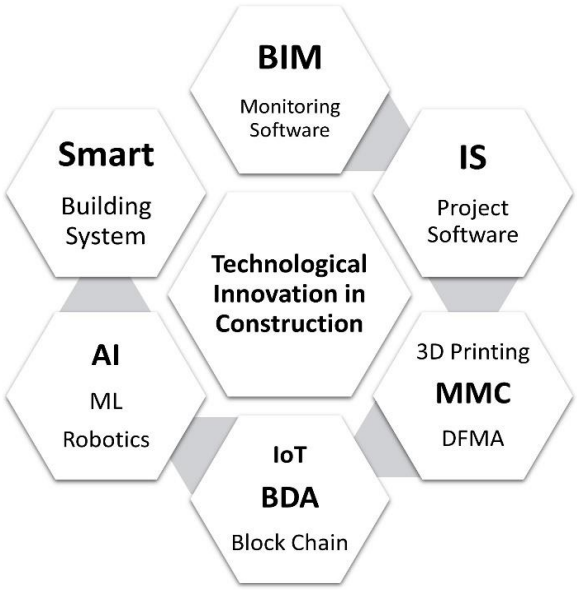
knowledge management adoption. To achieve meaningful progress toward sustainability, construction firms must prioritize agility, operational efficiency, financial optimization, and robust planning processes (Harsono et al., 2025).

Sustainable development in the construction industry can be defined as the delivery of projects through planning, monitoring, and control arrangements that embed environmental, economic, and social considerations throughout the project lifecycle (Lin et al., 2024). The social, economic, and environmental benefits of sustainability are widely acknowledged, but uncertainty persists around how best to implement digital technologies to support these goals. However, the prerequisites and the need to implement the concept of KM and digital transformation in construction organizations while analyzing the obstacles and stages of digital strategy formation, require various digital technologies in the construction industry (Emelianova et al., 2025).

This means, lack of awareness and capability can act as barriers to the adoption of KM and TI. To make meaningful progress, firms must prioritize agility, operational efficiency, financial optimization, and robust planning, supported by coherent frameworks (e.g., the RIBA Plan of Work) that align decisions across the lifecycle. This means, through the use of the prioritized digital technology evaluation and formulated strategy framework of KM, the construction industry successfully adopts digital solutions. Furthermore, corporate social responsibility (CSR) initiatives provide a foundation for aligning economic, social, and environmental objectives, enabling stakeholders to leverage emerging technologies effectively (see Figure 3).



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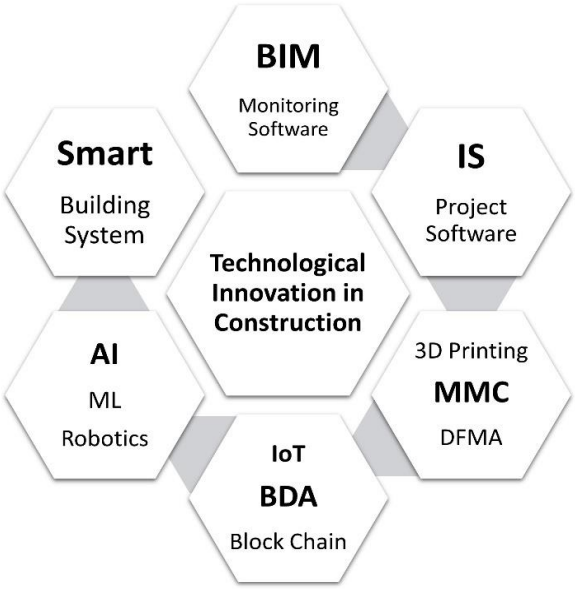

Figure 3: Key technological innovations in the UK construction Industry (Emelianova et al., 2025)

1.5 Integrating KM and TI in the UK Construction

The primary objective of this study is to evaluate knowledge management (KM) and technological innovation (TI) as key enablers for continuous improvement in the knowledge-based economy towards intensive areas of sustainable construction projects. These practices include quadruple challenges such as scope, quality, schedule, and cost through effective project management practices (Chenchu et al., 2025). This approach emphasizes the identification of supportive and inhibiting factors in large-scale construction projects, requiring evidence-based directives. For instance, the Delphi method, widely recognized for its robustness in qualitative research, is employed to capture expert insights on these multifaceted issues (Xiahou et al., 2025). While the complexity of contractual arrangements is significant, sufficient data exists to inform a comprehensive review.

To integrate KM and TI in the UK construction project management, this research directs attention toward four fundamental considerations for contractor appointment in alignment with UK construction requirements. This study acknowledges the diversity of expertise within the industry to encompass varying levels of knowledge, skills, and academic backgrounds, which is influenced by contractual models and project outcomes. Findings indicate that technologies such as Building Information Modelling (BIM), Digital Fabrication, and Design for Manufacturing and Assembly (DfMA) play a pivotal role in shaping contract processes, particularly during the brief and preliminary design stages where accuracy and integration are essential to project success (Montazeri et al., 2025; Ibrahim and Aliu, 2025).

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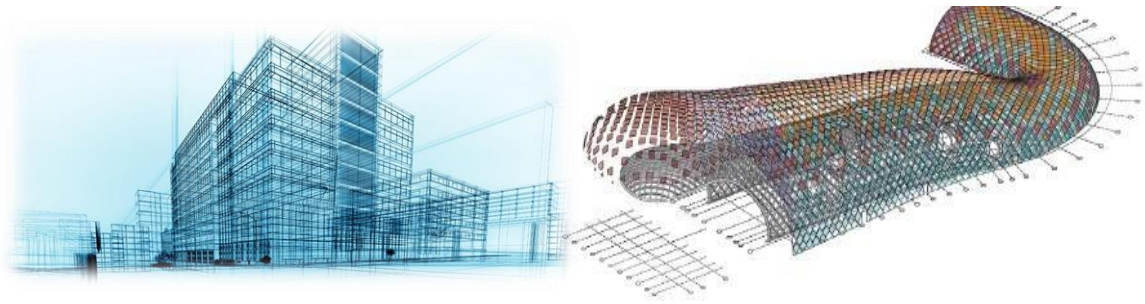

Figure 4: Visual of Digital Representation in Civil Engineering System (Facade, 2022)

Expert perspectives gathered in this study reinforce the strategic value of incorporating KM with TI applications into predetermined frameworks, delivering tangible benefits for stakeholders as outlined in project initiation documents in this sector. The evidence from the literature review suggests that leveraging digital technologies and knowledge systems enhances project performance from conception through execution, as illustrated in the computer-aided visual models presented in Figure 4. This reaffirms that the Building Information Modeling (BIM) can optimize modular construction processes by enhancing design accuracy, improving coordination, and streamlining logistics. This also means that BIM's capabilities, ranging from 3D visualization and clash detection to time, cost, scope, and quality in the project lifecycle integration, make it a powerful tool for managing modular workflows across the project lifecycle (Kalantzis, 2025). Contemporary construction methods offer a possible workable solution to the environmental issue through the force of its expenses in respect to the ability to reduce the consumption of materials as well as the formation of waste (Waqar et al., 2025).

2. Methodological Approach

A mixed-method approach was employed, combining a systematic literature review, semi-structured interviews with 15 industry professionals, and an online survey of 87 participants. The literature review focused on publications from 2019 to 2025, while interviews and surveys targeted project managers, architects, and contractors in London-based firms. Data were analyzed thematically to identify patterns in TI and KM adoption and their impact on sustainability. This study investigates the role of knowledge management and technological innovation in advancing sustainable development within the UK construction industry. To achieve this, a mixed-methods research design was adopted, combining qualitative and quantitative approaches to ensure comprehensive data collection and analysis.

The research study actually commenced with an extensive review of academic literature, applying grounded theory principles to synthesize insights from 12 core articles

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identified as most relevant to the study objectives. An additional 33 articles were examined for comparative analysis and citation support, focusing on publications from 2019 to 2025 to capture recent developments in terms of KM and TI applications in construction projects. The fieldwork involved semi-structured and in-person interviews with 15 industry professionals, including project managers, architects, consulting engineers, contractors, and technical specialists. These interviews provided a narrative of data on the practical implementation of knowledge and technological reformations in construction projects. Participants were drawn from five construction firms in and around London, selected from an initial pool of nine companies that were approached for participation.

To complement the qualitative insights, a questionnaire survey was administered to 87 staff members engaged in various construction projects. The survey aimed to quantify perceptions, adoption levels, and challenges associated with knowledge management and technological innovation integration. The mixed-method approach facilitated triangulation of findings from interviews, surveys, and literature review for data validation. The qualitative data analyzed thematically, while quantitative responses were examined using descriptive and comparative techniques to identify patterns and correlations. This integrated analysis provided a robust foundation for evaluating the impact of knowledge-driven and technological innovation towards the sustainable construction practices.

2.1 Research Analysis

Results indicated growing recognition of knowledge management and technological innovation as critical enablers of sustainable development across the sector. Approximately 80% of respondents acknowledged their importance for efficiency, profitability, and carbon reduction. However, barriers such as high initial costs, limited ROI visibility, and skill shortages persist. The analysis highlights the need for leadership commitment, collaborative frameworks, and targeted training to overcome these challenges. The integration of data from the online survey, in-person interviews, and systematic literature review provided a comprehensive understanding of the role of knowledge management and technological innovation in the UK construction industry.

The analysis revealed recurring terminologies and themes across participant responses, which were synthesized into conceptual categories to identify supportive and inhibiting factors influencing digital transformation. This process also clarified the constraints preventing the UK construction sector from achieving the level of digital adoption observed in industries such as manufacturing and automation. The construction industry continues to evolve in response to growing demands for speed, efficiency, and sustainability. Modular construction based on the off-site fabrication and on-site assembly of standardized building components has emerged as a promising solution.

However, its success depends on precise coordination, early planning, and seamless integration across disciplines. For this reason, the narrative insights from interviews were

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generalized into strategic concepts, enabling a deeper examination of industry-wide trends, whereas the research key findings are highlighted below to better understand how construction professionals perceive and engage with technological advancements:

- **Positive Attitude Toward Digital Technologies:** A majority of participants expressed strong interest in adopting digital tools, with 52% indicating the need for secured investment in the upcoming fiscal year, while 37% recommended increasing previous technology budgets.
- **Strategic Importance of KM and TI:** Respondents acknowledged that organizational success increasingly depends on KM and TI for efficiency, profitability, ESG compliance, carbon reduction, project safety, and competitive advantage.
- **High Priority for Technological Advancement:** Approximately 80% of participants affirmed that technologies such as AI, DL, AR, MML, and VR are more critical now than ever, positioning digital transformation as a top strategic priority.
- **Investment Constraints:** Key barriers to technology adoption include high initial costs, uncertain ROI, limited knowledge-sharing practices, lack of trust, and competitive pressures.
- **Skills Gap:** The most significant constraint identified was the shortage of skilled professionals, with 60% reporting difficulties in acquiring IT and digital expertise, particularly in areas such as ITIL-based resource management.
- **Role of Big Data Analytics:** Analysis of survey data and interview narratives underscores the potential of big data analytics to strengthen decision-making and accelerate KM and TI adoption, as illustrated in Figures 5 and 6.

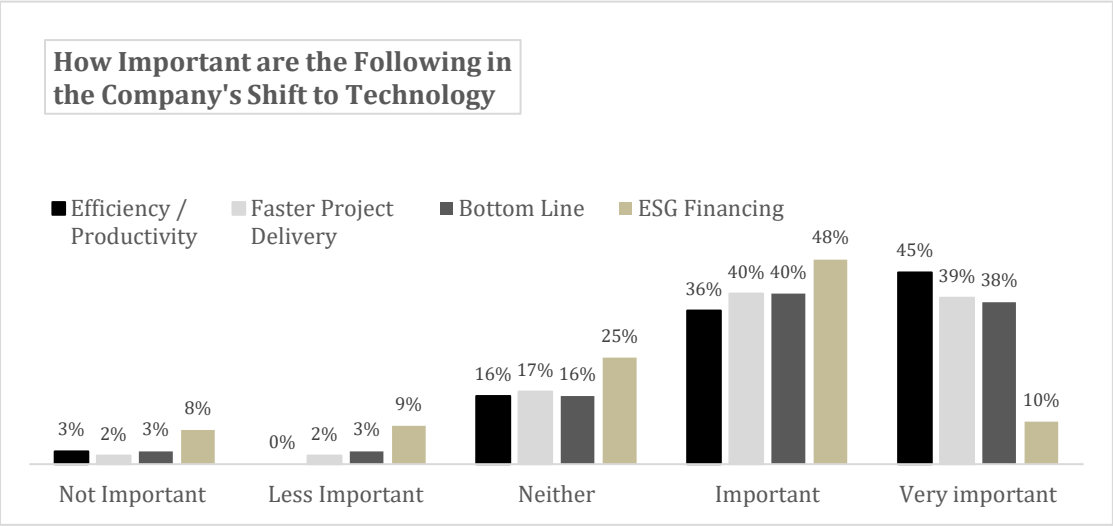

Figure 5: Survey results - Key factors to Construction Technology (Brown et al., 2022)

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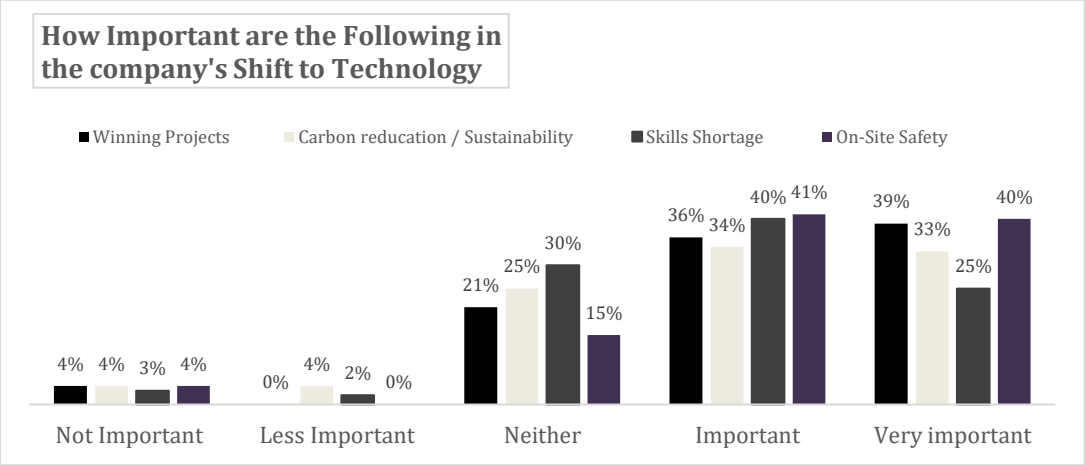

Figure 6: Survey results - Interview Dataset for Attitudes to Technology (Brown et al., 2022)

2.2 Research Findings

The literature review began with the identification of 127 academic publications related to knowledge management (KM) and technological innovation (TI) within the context of sustainable development in the UK construction industry. These sources were initially screened for relevance and quality, followed by a systematic process of collation and comparative analysis. Through iterative refinement, the review was narrowed to 79 papers that demonstrated significant alignment with the research objectives. A subsequent evaluation shortlisted 46 highly pertinent publications for detailed examination and data extraction. In the final stage, 23 papers were critically analyzed for thematic depth, with 12 core studies selected to form the foundation of the literature review and conceptual framework. This multi-stage approach ensured that the review captured both breadth and depth, integrating diverse perspectives while maintaining a strong focus on the core subject matter.

The literature review search employed a structured keyword strategy, incorporating terms such as *Technological Innovation*, *Knowledge Management*, *Project Management*, *Construction Industry*, and *Sustainable Development*. These were linked to related concepts including modern methods of construction, computer-aided design for manufacturing, and prefabrication, with a focus on sustainability dimensions such as carbon emission reduction, supply chain optimization, and waste management are all critical to the construction sector.

Keywords and statements extracted from interview transcripts were systematically cross-referenced with those identified in the reviewed literature. This triangulation approach was applied, which enabled the formation of thematic clusters that captured both procedural aspects of project delivery and the practical requirements for implementing knowledge management and technological innovation applications. The core coding method was applied,

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and through iterative coding and thematic synthesis, recurring concepts from qualitative and secondary data sources were consolidated into overarching themes, which informed the development of the study's conceptual framework. A summary of these frequently occurring terms is presented in Figure 7.

Sustainability has emerged as a core requirement for development across the construction industry, driven by stringent carbon emission targets and regulatory compliance. This underscores the necessity of integrating KM and TI to meet established standards and achieve project objectives from inception to completion. The approach emphasizes aligning project outcomes with end-user benefits while ensuring that deliverables meet client expectations and secure return on investment (ROI).

Figure 7: Keywords correlation from 'INTERVIEW' and 'LITERATURE REVIEW' (Author, 2025)

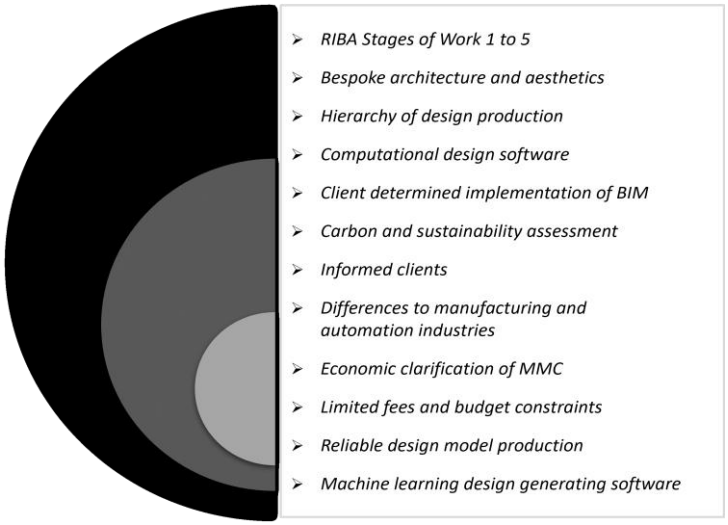

Figure 8. Keywords and statements from DESIGNERS' perspectives (Author, 2025)

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From the client's standpoint, investment in advanced technologies such as Building Information Modelling (BIM), big data analytics, and smart building systems leveraging Modern Methods of Construction (MMC) and Design for Manufacture and Assembly (DfMA) is increasingly viewed as a strategic necessity. Computational design tools, which have evolved significantly since the early 1990s, now offer enhanced visualization and modeling capabilities. The transition from 2D drafting to fully integrated 3D modeling accelerated post-2010, particularly in high-profile projects, supported by BIM, machine learning (ML), and artificial intelligence (AI) applications. Despite these advancements, 2D tools remain prevalent in architectural design workflows, where designers generate initial concepts and plans manually before integrating digital solutions. Data analysis revealed several recurring concerns among participants, often cited as reasons for hesitancy in adopting KM and TI-driven processes within client management systems. These constraints perceived high implementation costs, uncertainty regarding ROI, skill shortages, and resistance to organizational change, as summarized in Figure 8.

However, the early collaboration with contractors was consistently identified by engineering professionals as a critical factor in ensuring that project designs are both efficient and buildable. Historically, however, participants acknowledged that consultant-led design models were often underutilized due to poor coordination, resulting in contractors developing new models independently without leveraging intelligent systems or integrated components.

The analysis of interview data and supporting literature highlighted the status of incorporating adequate provisions for building access and installation during the design phase. Enhanced design consultation, supported by knowledge management (KM) and technological innovation (TI) applications, which could significantly reduce inefficiencies and mitigate additional costs during construction execution. These insights were reinforced by participants through recurring keywords and pragmatic statements, which have been synthesized and illustrated in Figure 9.

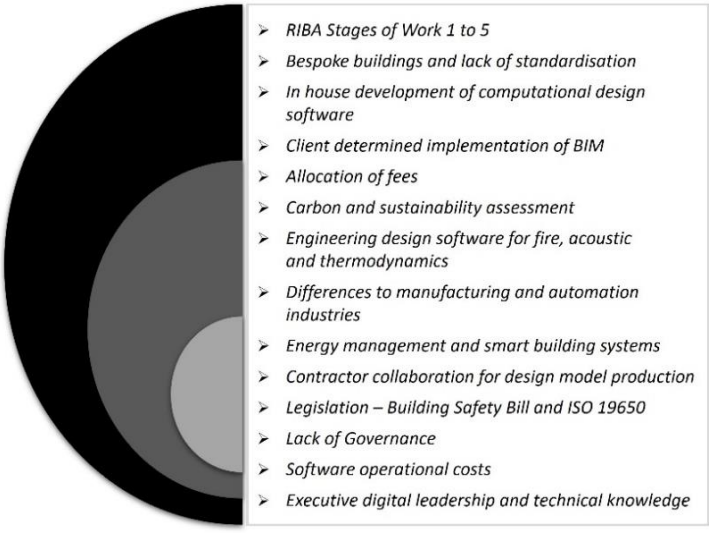

Figure 9: keywords and statements from ENGINEERS' perspectives (Author, 2025)

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Feedback from industry stakeholders included understandings and visions from a construction director at a Tier 1 main contractor, an operations lead for a Tier 1 mechanical and electrical contractor, and a project manager representing smaller-scale projects with lower turnover. Tier 1 contractors demonstrated a strong commitment to promoting Building Information Modelling (BIM) and Modern Methods of Construction (MMC). In contrast, participants noted limited interest among smaller firms operating within highly competitive markets and tight margins, where investment in advanced technologies is perceived as less feasible.

These research findings revealed a broader challenge about the shortage of consistent acceptance and adoption of digital technologies across the construction sector, compounded by insufficient regulatory enforcement. This underscores the need for strategic governance mechanisms and supportive frameworks to drive sustainable development initiatives. Regulatory instruments such as the Building Safety Act and ISO 19650 standards are expected to play a pivotal role in mandating the utilization of digital technologies.

Furthermore, the adoption of MMC and Design for Manufacture and Assembly (DfMA) currently offers significant benefits for workforce safety and well-being during project execution, while contributing to sustainability objectives such as carbon emission reduction. The study classifies such knowledge and insights into key themes illustrating how construction projects would have addressed sustainability challenges and relevant issues through technological innovation and knowledge management, as core findings are summarized in Figure 10.

Figure 10: Sustainability Development key practices of core findings (Author, 2025)

The collaborative research findings are grounded in four core areas, such as People, Process, Technology, and Knowledge, as identified through systematic data collection and analysis. These elements function as fundamental pillars for implementing innovative construction methods and achieving sustainable building outcomes. Collectively, a strategic framework was framed that emphasized the interdependence of human expertise, procedural efficiency, technological advancement, and knowledge integration.

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The study employed a convergent mixed methods design with methodological triangulation, integrating survey data, i.e., descriptive statistics, semi-structured interview data with coding-based thematic analysis and supported by a systematic literature review. In this research, the qualitative findings were developed through iterative coding and thematic synthesis, supported by keyword co-occurrence and correlation analysis to align interview and literature terms. The integrated evidence base informed the development of a conceptual framework around People, Process, Technology, and Knowledge.

3. Discussion

The findings point to uneven digitalization across disciplines, which directly affects coordination quality and project outcomes. While some specialist contractors (e.g., steelwork) are already exploiting advanced 3D modelling and off-site fabrication, many consultants and site teams still rely on 2D information, creating data gaps and constraining BIM-enabled workflows. This disparity explains recurrent coordination issues and limits the value that model-based delivery can generate during design integration, procurement, and installation.

Human-capital factors emerged as a pivotal barrier. A sizeable portion of experienced personnel have had limited exposure to newer tools and methods, reinforcing risk-averse behaviors and slowing the diffusion of knowledge-based practices. Rather than a purely technical deficit, this is a change management challenge that requires upskilling, role redesign (e.g., digital coordinators), and peer-to-peer enablement to bridge competency gaps and normalize data-driven decision-making across project teams. Process standardization offers a pragmatic route to scale adoption. Drawing lessons from manufacturing style approaches, greater use of standard components, repeatable detailing, and consistent information requirements would reduce rework and improve interoperability between design and delivery partners. Early contractor involvement is especially important to engaging fabricators and site teams at concept and scheme stages improves buildability, reduces duplication of models, and aligns assumptions before costly commitments are made. This means the recurring keywords identified during thematic analysis could be incorporated in project good practices as visualized in Figure 11.

Figure 11: Word Cloud – indication of key terms (Author, 2025)

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BIM should be treated as the backbone for collaboration rather than a stand-alone tool. Its value materializes when designers, contractors, and specialists co-develop and maintain shared, federated models with clear responsibilities and handover criteria. Combining this with knowledge management routines capturing lessons learned, curating reference details, and codifying decisions creates a reinforcing loop: better information underpins better decisions, which in turn produce better information for future projects. A hybrid management approach that blends structured stage gate governance with iterative, feedback rich practices can help teams adapt without losing control of scope, time, cost, and quality. Strategically, the sector's path forward is less about discovering new technologies and more about orchestrating people, processes, and knowledge to make existing technologies deliver consistent value. Priorities including (1) measurable capability building targeted at mid-career practitioners; (2) clear, project-level information requirements that reduce 2D/3D fragmentation; (3) early, cross-disciplinary planning to support off-site and modular strategies; and (4) embedding KM artefacts (standards, templates, playbooks) into day-to-day delivery. Taken together, these moves convert the themes identified in this study into actionable practices that enhance efficiency, safety, and sustainability outcomes.

4. Conclusion

This study demonstrates that knowledge management (KM) and technological innovation (TI) are essential drivers of sustainable development in the UK construction industry. Evidence from literature, interviews, and survey data confirms that digital technologies such as BIM, AI, IoT, Big Data, Digital Twins, ML, AR, and robotics significantly enhance project efficiency, carbon reduction, safety, and stakeholder value. KM practices further strengthen these outcomes by improving knowledge sharing, decision-making, and organizational learning across project phases. However, this study also highlights persistent obstacles, including cultural resistance, leadership constraints, fragmented collaboration, and shortages in both technical and managerial skills. These barriers continue to slow the sector's digital transformation and limit the full realization of sustainability benefits. Successful adoption requires committed leadership, structured governance, collaborative planning, and continuous workforce upskilling. The study concludes that integrating KM and TI is no longer optional but a strategic necessity for achieving long-term sustainability goals. Addressing systemic barriers through targeted investment, strong policy support, and cultural change will enable the construction sector to meet carbon-reduction targets, enhance operational performance, and deliver broader economic and societal value. Future research should develop and validate longitudinal frameworks that support the practical integration of KM and TI across construction project management environments.

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