

Received: 30 May 2026, Revised: 05 June 2026, Accepted: 30 July 2026, Published: 18 August 2026

DOI: <https://doi.org/10.55640/corr-v04i04-07>

The Impact of Project Management on Project Sustainability in the Construction Industry of the UK

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ABSTRACT: This research investigates the impact of project management practices on project sustainability within the UK construction industry, with particular emphasis on waste management and energy efficiency. The construction sector represents a significant contributor to the UK economy, comprising approximately 6% of GDP and employing 2.2 million individuals, yet it also generates substantial environmental, social, and economic impacts. Through a qualitative research approach grounded in interpretivism, this study employed semi-structured interviews with five industry professionals, including construction site managers, sustainability consultants, construction engineers, project managers, and project leads. Thematic analysis of interview data revealed that sustainable project management practices significantly enhance project outcomes across multiple dimensions. Findings demonstrate that effective waste management strategies, including segregation, recycling programs, and waste tracking systems, reduce disposal costs, minimize environmental impact, and streamline site operations. Similarly, energy efficiency measures such as Building Information Modeling (BIM), energy audits, smart metering, and renewable energy integration contribute to reduced operational costs, improved building performance, and enhanced regulatory compliance. The research identifies both opportunities and challenges in implementing sustainable practices, including initial investment costs, training requirements, and organizational commitment. The study concludes that sustainability integration within project management frameworks improves productivity, client satisfaction, and market competitiveness while delivering long-term economic and environmental benefits. Recommendations include enhanced policy support, increased investment in sustainable technologies, and comprehensive training programs to develop sustainability competencies among construction professionals.

KEYWORDS: Project Management, Sustainability, Construction Industry, Waste Management, Energy Efficiency, UK Construction, Sustainable Development, Qualitative Research.

1. Introduction

1.1 Background Information

The construction industry constitutes a fundamental pillar of the global economy, serving as a primary driver for infrastructure development, economic growth, and employment generation. In the United Kingdom, this sector assumes particular significance, representing approximately 6% of the gross domestic product and providing employment to 2.2 million individuals (Office for National Statistics, 2022). The industry demonstrated remarkable resilience and growth in 2022, with the value of new projects experiencing a substantial 15.8% increase, reaching a total of £132,989 million. This expansion was predominantly fuelled by a £14,093 million increase in the private sector and a £4,068 million increase in the public sector (Hossain et

al., 2023). The sector encompasses diverse sub-sectors, including residential, commercial, industrial, and infrastructure development, each contributing uniquely to the nation's economic fabric.

However, the economic advantages provided by the construction sector are accompanied by significant environmental challenges. Construction activities substantially impact natural resource utilization and contribute considerably to environmental pollution (Office for National Statistics, 2022). The industry is responsible for a substantial portion of global energy consumption and greenhouse gas emissions, prompting increased scrutiny and demands for sustainable practices. This dual nature of construction—as both an economic driver and an environmental concern—has created an imperative for the integration of sustainability principles within construction project management.

Historically, construction project management has predominantly focused on achieving the traditional project constraints: time, cost, and quality (Albert et al., 2017). These three parameters, often referred to as the "iron triangle" of project management, have served as the primary metrics for project success. However, the growing global awareness of environmental degradation, climate change, and the urgent need for sustainable development has necessitated a paradigm shift in how construction projects are conceived, planned, executed, and evaluated. Sustainable development has gradually been integrated into construction project management, recognizing that projects must deliver not only immediate value but also long-term environmental and social benefits.

Green construction, also known as sustainable construction, seeks to minimize the adverse effects of construction activities on the natural environment while simultaneously improving the quality of life for occupants and ensuring the economic viability of projects throughout their lifecycle (Kibert, 2016). This holistic approach acknowledges that construction projects exist within complex socio-ecological systems and that their impacts extend far beyond the immediate project boundaries. The concept of sustainability in construction encompasses three interconnected dimensions: environmental, social, and economic sustainability, collectively forming what is commonly known as the triple bottom line.

Environmental sustainability in construction focuses on minimizing the ecological footprint of construction activities through the use of sustainable materials, waste minimization, energy conservation, water efficiency, and pollution prevention (Dani et al., 2022). Social sustainability addresses the human impacts of construction projects, including worker safety, fair labor practices, community engagement, and the creation of inclusive, healthy built environments (Winston, 2022). Economic sustainability ensures that construction projects remain financially viable throughout their lifecycle, contributing positively to economic growth through employment generation, infrastructure enhancement, and the creation of long-term value for stakeholders (Purvis et al., 2019).

The integration of sustainability principles into construction project management represents a significant evolution in professional practice. Sustainable project management involves the application of knowledge, skills, tools, and techniques to project activities to achieve project objectives while considering environmental, social, and economic factors (Sholarin & Awange, 2016). This approach requires a fundamental rethinking of traditional project management methodologies, incorporating lifecycle thinking, stakeholder engagement, and long-term

impact assessment into every phase of the project (Opoku et al., 2024).

Recent years have witnessed the emergence of various frameworks and standards to support sustainable project management in construction. The Building Research Establishment Environmental Assessment Method (BREEAM) has become one of the most widely adopted sustainability assessment methods in the UK, providing a comprehensive framework for evaluating the environmental performance of buildings (BRE, 2016). Similarly, the increasing incorporation of recycled and renewable materials, advanced waste management systems, and energy-efficient technologies reflects the industry's growing commitment to sustainability (Cabeza et al., 2014).

Despite these advancements, significant barriers to sustainability integration persist within the construction industry. These include higher initial costs for sustainable materials and technologies, limited awareness and knowledge among professionals, regulatory complexities, technical challenges, and organizational resistance to change (Misnan et al., 2024). Overcoming these challenges requires strong leadership, effective communication, enhanced stakeholder engagement, and a deeper understanding of the business case for sustainability (Gunduz & Almujaeb, 2020).

The evolution of the construction sector toward greater sustainability is contingent upon the successful integration of sustainability principles into project management practices. This research aims to investigate the impact levels of project management on project sustainability within the UK construction industry, contributing to the knowledge base that will enable practitioners, policymakers, and other stakeholders to develop more effective sustainable project management approaches.

1.2 Research Aim and Objectives

Aim:

To investigate the impact of sustainability practices on project management within the UK construction sector, focusing on waste management and energy efficiency.

Objectives:

1. Identify the existing project management practices in the UK construction industry concerning sustainability, primarily focusing on waste management and energy efficiency.
2. Analyse the impact of these identified sustainability practices on project outcomes, emphasizing how waste management and energy efficiency influence project success, timelines, and cost-effectiveness.
3. Evaluate the effectiveness of current sustainability

practices in achieving project management goals, considering the long-term benefits and challenges faced in implementing these practices in the UK construction sector.

1.3 Research Question

The primary research inquiry that guides this study is:

To what degree do project management methods influence the sustainability of projects in the UK construction industry?

1.4 Rationale for the Study

As concern for sustainable construction intensifies, certain areas remain relatively underexplored, particularly regarding the role of project management in achieving sustainability outcomes. The first significant shortcoming is the limited understanding of how project management methods affect the three facets of sustainability—environmental, economic, and social—within the construction industry context. Prior research has typically addressed sustainability in terms of individual components, such as environmental impacts (Darko et al., 2017; Zuo & Zhao, 2014) or economic benefits, but these studies have not sufficiently integrated these dimensions into a comprehensive framework.

Additionally, there is a notable lack of studies examining the practical implementation of sustainable project management specifically within the UK construction industry. While numerous general studies on sustainable construction methods exist (Kibert, 2016; Dani et al., 2022), limited research focuses on the UK context with its distinct climate conditions, regulatory frameworks, and market characteristics. This constraint limits the applicability of findings from cross-sectional

studies conducted in other contexts, emphasizing the importance of country-specific research.

The existing literature on construction project management also exhibits significant gaps regarding social sustainability aspects, including worker safety, employee rights, and community relations (Winston, 2022; Gasa, 2012). Understanding how project management practices influence these social dimensions is essential for achieving comprehensive sustainable development goals.

Furthermore, the threats and challenges to establishing sustainable project management practices deserve special attention. Difficulties such as high initial costs, limited awareness, and resistance to change continue to hinder the adoption of sustainable practices (Gunduz & Almuajebh, 2020). Despite discursive discussions of these difficulties, there are relatively limited extensive empirical studies examining these challenges in the current academic literature. Such research is highly important for offering valuable recommendations to construction industry stakeholders and policymakers to improve the efficacy of sustainable management practices in the UK construction industry.

This study is particularly relevant as it influences the advancement of sustainable construction in its capacity. By describing how project management practices influence sustainability performance, the research provides the contemporary state and issues about implementing sustainable management in building projects. Essentially, the outcomes will allow for developing suggestions and guidelines for efficiently overseeing projects with an emphasis on sustainability. By resolving these deficiencies, the study makes a valuable contribution to attaining sustainable development in the construction industry.

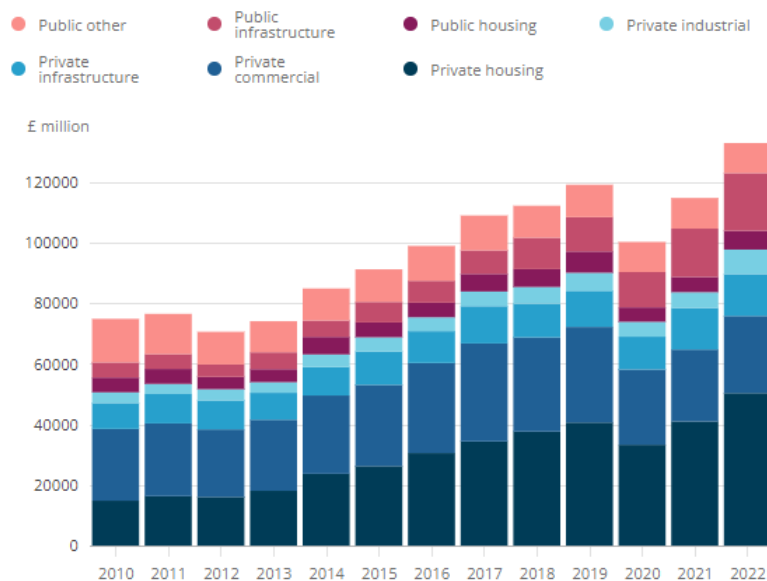


Figure 1: Construction Statistics - Office for National Statistics, 2022

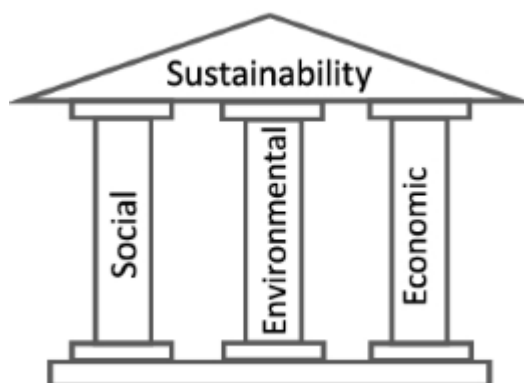


Figure 2: Sustainability Pillars - Purvis et al., 2019



Figure 3: BREEAM Categories - BRE, 2016

2. Literature Review

2.1 Introduction

The literature review analyses the research on project management and sustainability in the construction industry within the United Kingdom. It is structured around primary themes essential for discussing prior literature, identifying key concepts, and determining the research gaps addressed in subsequent empirical studies. This review examines project management fundamentals, construction industry applications, sustainability integration, waste management practices, and energy efficiency measures.

2.2 Project Management

Project management is the application of methods, tools, and actions to ensure that project goals are met and that all stakeholders' needs are satisfied (Manjo, 2021). According to Manjo, project management comprises four main processes: risk management, human resource management, communications management, and procurement management. Risk management involves identifying, evaluating,

analysing, responding to, and controlling project risks. Human resource management focuses on optimizing the use of project personnel resources, including sponsors, stakeholders, partners, and team members. Communications management ensures that project information reaches the right people at the appropriate time. Procurement management involves acquiring goods and services for the project from external organizations.

Bhandari et al. (2022) highlight a fundamental distinction between project management and general management: project management is characterized by a defined end product and time constraints, whereas management is a continuous process. Consequently, project professionals require a broad spectrum of competencies, including technical expertise, people management skills, and business acumen. Mishra (2020) describes project management as the totality of competencies and resources required to identify, plan, and successfully implement projects. Project management provides a method for performing specialized, often unprecedented activities required for implementing organizational strategy while maintaining

separation from routine operations.

Mishra (2020) noted that project management typically relates to relatively short-term projects, though scope and duration vary considerably. Engineering or construction projects can range from six months to five years, while complex projects like designing and commissioning a nuclear power plant may extend to ten years. In smaller companies, projects are often accomplished within three to twelve months, as they are essential to organizational strategy and delays could threaten company survival. Ika and Pinto (2022) emphasized that project managers must be wary of potential project scope creep, which can result in significant variances in project timeline and cost. Five project management process areas apply to most projects: initiating, planning, executing, controlling, and closing processes.

Rowe (2020) noted that project management is a core activity through which organizations can achieve their goals and objectives most efficiently. The advantages of project management include enhanced communication, improved consumer satisfaction, enhanced risk management, and increased productivity. Nicholas and Steyn (2020) further noted that through project management methodologies, businesses can ensure projects are completed within stipulated time, resources, and quality requirements.

2.3 Project Management within the Construction Industry

Project management is a systematic process of initiating, planning, executing, controlling, and closing projects, particularly relevant in the construction business (Fewings & Henjewe, 2019). Project management helps achieve the timely delivery of construction projects within set cost and specified quality parameters. The construction industry is large

and diverse, involving numerous stakeholders, including architects, engineers, contractors, subcontractors, and clients. Coordinating these diverse teams, managing resources, and implementing risk management are critical for successful project outcomes. Sherratt et al. (2020) emphasized that the role of project management in construction is impossible to overstate, as it assists in managing the field's complexities and guarantees that all tasks correspond to client demands and legal norms.

According to Jackson (2020), a project manager serves as the focal person in construction projects, responsible for coordinating all project activities from planning to implementation. Project managers' tasks include scheduling, estimating costs, allocating resources, and adhering to legal and regulatory frameworks. Stakeholder management is another critical responsibility, involving diverse parties such as clients, architects, engineers, contractors, government agencies, and the public. Prebanic and Vukomanovic (2021) noted that stakeholder management is crucial to developing positive relationships and guaranteeing proper project development.

Shah et al. (2023) stated that the construction project life cycle typically consists of five phases: Initiation, Planning, Execution, Monitoring and Controlling, and Closure. The Initiation phase includes identifying the scope, goals, and project feasibility. A detailed project plan is formulated in the planning phase, covering timelines, resources, risk management, and costs. The Execution phase entails project construction as planned, proper resource utilization, stakeholder reporting, and quality compliance. The Monitoring and Controlling phase involves evaluating project progress against the plan using tools such as Gantt charts and performance measures. The Closure phase entails final inspection, project delivery, post-project evaluation, and archiving of project records.



Figure 4: Four Stages of a Project

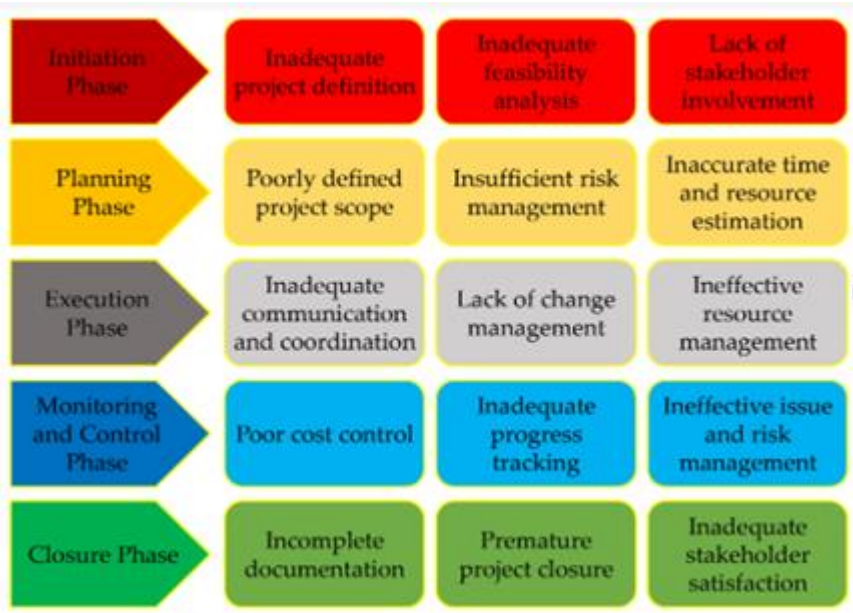


Figure 5: Project Phases - Shah et al., 2023

Walker (2015) noted that construction project management has become more complex due to technological advancement and globalization. Walker pointed out that aligning project goals to client objectives is critical for success, often involving multiple stakeholders. Walker also noted that leadership and power relations are very critical to project management and the accomplishment of project objectives.

2.4 Project Management in the Construction Industry in Relation to Sustainability

The construction sector has always been known for significant environmental, social, and economic effects, making sustainability a critical factor in managing construction projects. Sustainability in construction project management can be described as integrating environmental, social, and economic factors into each stage of the project life cycle (Stanitsas et al., 2021). According to an SLR conducted by Stanitsas et al., there are 82 sustainability indicators categorized as economic, environmental, and social sustainability. These indicators help project managers incorporate sustainable practices into their projects.

Table 1 lists common sustainability targets: energy conservation, curbing emissions, minimum waste generation, water conservation, and sustainable resource utilization (Shah et al., 2023).

Table 1: Targets for Achieving Sustainability in Construction Projects

Target Category	Specific Objectives
Energy Conservation	Reduce energy consumption, implement renewable energy
Emissions Reduction	Minimize greenhouse gas emissions

Ershadi and Goodarzi (2021) categorized 42 capabilities into execution capabilities and product capabilities. Life Cycle Assessment (LCA) and Life Cycle Costing (LCC) are essential for assessing project sustainability. This study also highlighted that capabilities linked to economic sustainability were not well captured in existing practices.

Leadership is a critical factor defining sustainability in construction projects. Tabassi et al. (2016) found that leadership competencies, such as intellectual competence, influence sustainable building project outcomes. Transformational leadership competencies among project managers are most likely to facilitate sustainable outcomes.

However, various factors impede sustainable practices in the construction industry. Zuofa and Ochieng (2016) opined that sustainability is still not mainstreamed, with deficiencies in sustainability application across the project cycle. This is particularly acute in developing regions where economic factors are more prominent than environmental and social considerations.

Target Category	Specific Objectives
Waste Management	Reduce, reuse, recycle construction waste
Water Conservation	Reduce water consumption, implement water recycling
Sustainable Resources	Use recycled, renewable, and sustainable materials

Challenges in implementing sustainability include lack of information, inadequate planning, resource scarcity, conflict of objectives, leadership support limitations, budget constraints, and time pressures. Lack of awareness, availability of sustainable technologies, and resistance to change affect adoption (Lin et al., 2018).

[Figure 6: Effective Project Management Practices to Avoid Cost Overrun - Shah et al., 2023]

Table 2 outlines sustainable approaches for successful construction projects, including green building principles, energy-efficient designs, sustainable materials, and renewable energy systems.

Table 2: Sustainable Approaches for Successful Construction Projects

Approach	Key Elements
Green Building Principles	Sustainable design, construction, and operation
Energy-Efficient Designs	Passive solar design, high-performance insulation
Sustainable Materials	Recycled content, renewable resources, low-VOC materials
Renewable Energy Systems	Solar panels, wind turbines, geothermal systems
Water Conservation	Low-flow fixtures, rainwater harvesting, greywater reuse
Building Certifications	BREEAM, LEED certification

2.5 Sustainability Practices in Waste Management

Much research has been conducted on waste sources to identify reduction strategies (Roggema & Roggema, 2020; Hassan et al., 2015; Formoso et al., 2015; Polat et al., 2017). Polat et al. note that identifying primary waste sources is the first step in managing waste in building projects. According to Roggema and Roggema, waste causes include workers, planning, storage, materials, ordering, weather, and design changes. Direct causes include workers' lack of knowledge, off-cuts from poor design, rework, and contract changes. Secondary causes include lack of legal and contractual stimuli.

Eze et al. (2017) state that construction and demolition waste comes from off-site and on-site

building construction activities. Off-site operational activities include planning, designing, manufacturing, and transporting materials. On-site operational tasks include the building process, including groundwork and roofing. According to Rahim et al. (2017), waste comes from poor management and supervision, lack of experience, poor planning and scheduling, and design and construction errors. Chellappa et al. (2023) found that mistakes, missing information, ambiguity, and unfair risk in contractual documents waste time and money.

Ajayi (2017) defines construction waste as materials used for building, demolition, rebuilding, designing, land acquisition, site clearing, and road construction. Kabirifar et al. (2020) noted that Malaysia's building industry has shown high growth rates, which should

produce significant waste. Construction waste has several adverse effects on a country's environment, society, and economy (Imimole, 2018; Khaleel & Al-Zubaidy, 2018).

[Figure 7: Sustainable Waste Management Hierarchy - Mohammad et al., 2020]

Sustainable waste management indicators can improve construction waste management. Stanitsas et al. (2021) pointed out factors including eco-efficiency, sustainable consumption of natural resources, and environmental management systems that help reduce waste and improve resource utilisation. Sustainable waste management construction projects focus on impact and results. Project managers should reduce waste, optimize material usage, and recycle, improving environmental status, reducing costs, and satisfying stakeholders.

According to Spisakova et al. (2021), sustainable waste management helps eliminate waste dumping in landfills, protecting the environment and enabling proper utilisation of natural resources through waste reduction and material recycling. This has the consequence of decreasing carbon emissions and controlling construction impacts on the environment. Othman and Abdelrahim (2020) define sustainable waste management as a technique to minimize costs. Recycling and reusing materials helps cut expenses for raw materials and waste disposal. Lima et al. (2021) pointed out that authorities and organisations continue to embrace sustainability; proper implementation of sustainable waste management enables construction organisations to adhere to legal aspects and reduce penalties. Al-Ghouti et al. (2021) noted that sustainable waste management entails proper material utilisation to minimize new material consumption and natural resource exploitation.

2.6 Sustainability Practices in Energy Efficiency

The construction industry contributes to environmental pollution through energy consumption and greenhouse gas emissions. The global construction sector contributes 36% of total energy and 8% of global CO₂ emissions (González-Torres et al., 2022). Developed countries show high energy wastage percentages, Europe with 42%, and the USA with 50%, leading to high GHG emissions (Salari et al., 2021; Alqaralleh, 2021).

Energy Management Practices (EMPs) are essential in minimizing energy use and environmental impact. Iqbal et al. (2022) identified factors influencing EMP implementation in Pakistan's construction industry: raising taxes on energy-consuming construction companies, encouraging subsidies for energy-efficient products, and enhancing government energy policy

implementation.

The advantages of EMPs in construction are manifold, including environmental benefits like decreased greenhouse gas emissions and conservation of natural resources, and economic benefits like decreased costs and increased profitability. Modern and advanced technologies help improve energy utilisation, minimize costs, and increase market size (Iqbal, 2022). EMPs also affect society through employment and economic development (Jacobs & Forst, 2017; Qarnain et al., 2021).

Challenges in EMP implementation include high implementation costs, lack of technical skills, limited access to efficient technologies, and missing government incentives (Matosović & Tomšić, 2018; Trotta, 2020). To solve these problems, governments should expand involvement in promoting EMPs through subsidies and tax exemptions and pass legislation mandating technology use.

Energy efficiency of construction also involves efficient energy use in construction activities, minimizing energy wastage, and using energy-consuming materials and technologies efficiently (Dasović & Klanšek, 2022). Optimization-based scheduling methods can meet construction sustainability goals, searching for optimal schedules to achieve energy goals alongside cost, time, and quality objectives.

According to Rodriguez et al. (2023), energy management in construction projects significantly cuts down energy use through new technologies, efficient insulations, and proper building construction. Yeaths et al. (2017) posited that energy conservation is in the long-run interest of developers and building users. Although implementing energy-efficient materials and technologies may be initially expensive, total energy costs can be relatively low. Zhao et al. (2017) confirmed that energy use reduction is proportional to reducing greenhouse gas emissions.

2.7 Summary

Based on the literature review, emphasis is placed on examining trends in implementing sustainable practices in project management in the UK construction industry with specific reference to waste management and energy efficiency. Managing projects to be sustainable for environmental, social, and economic reasons was evident. Key conclusions include the importance of leadership, communication with stakeholders, and applying new technologies in sustainability. High fixed costs and lack of technical know-how, especially in underdeveloped regions, limit sustainability practices. Waste management is a fundamental pillar of sustainable measures to minimize environmental effects, costs, and project performance. Energy efficiency is a focus area because the construction industry has high energy

demand and emission of greenhouse gases. Sustainability practices offer numerous benefits, but successful implementation requires a comprehensive approach integrating project management strategies with sustainability goals across all construction project phases.

3. Methodology

3.1 Introduction

This chapter explains the methodology employed in this study on the impact of project management on project sustainability in the UK construction industry. The chapter covers research philosophy, research method, research approach, sampling technique, data collection technique and procedure, thematic analysis, data validation, limitations, and ethical considerations (Saunders et al., 2015). The research method is qualitative as it facilitates identification of experiences and perceptions of industry professionals on sustainable project management.

3.2 Research Philosophy

This research adopts an interpretive epistemology, describing reality and occurrences in the social world, including the construction industry. Interpretivism is grounded on the assumption that reality is socially created and that knowledge is developed from meanings people give to their experiences (Creswell & Creswell, 2017). The interpretive approach is appropriate because this study seeks to understand the impact of project management on sustainability in the UK construction industry. Interpretivism is useful because sustainability in construction is not just a technical issue but a social one encompassing different stakeholders, cultures, and perceptions of success.

Interpretivism is used because the research is qualitative, aiming to generalize results and provide specific information on instances and experiences. The most appropriate data collection method is qualitative data collection, such as semi-structured interviews, since these provide detailed accounts of participants' experiences and perceptions (Su, 2018). This method enables the researcher to appreciate the nature of sustainability in project management in its richness.

The interpretivist epistemology explains the inductive research method employed. This involves formulating theories and understanding from field data obtained. This is important for a study where existing theories may not explain the specifics of sustainability issues and practices in the UK construction industry. According to Ryan (2018), interpretivism is most appropriate when the researcher wants to understand factors affecting people's behavior. In this study, it is essential to understand how project management

methodologies are regarded concerning sustainability and why certain practices are adopted or not.

3.3 Research Method

This research uses the qualitative research method to assess the effects of project management methods on sustainable construction in the UK. The qualitative paradigm is appropriate for this research since it allows analysis of contextual and complex factors influencing the implementation of sustainable project management practices. This method enables collection of more elaborate data to enhance representation of sustainability in construction.

The reason for selecting a qualitative research method is that the research question centered on the perceptions, beliefs, and actions of professionals involved in sustainable construction. Qualitative research is especially helpful in establishing thick description necessary when studying complex, scenario-based experiences. Unlike quantitative methods that may measure such experiences, qualitative research makes it possible to understand how sustainability is incorporated into project management practices.

Semi-structured interviews are chosen as the primary data collection type. Adeoye-Olatunde and Olenik (2021) endorse this decision because the researcher has flexibility in focus areas while specific discussion areas are predetermined. This flexibility is crucial when analysing various aspects of sustainability in project management, enabling exploration of related areas of interest as identified from interviews. Semi-structured interviews ensure all issues are investigated systematically while allowing participants to voice opinions in their own words. This method is particularly effective in identifying participants' perceptions of sustainability, essential in assessing the effectiveness and acceptance of sustainability in construction.

Quantitative research tools such as questionnaires or experimental research designs do not apply to the objectives of this research. Quantitative research methods are more variable-centered and involve hypothesis testing; therefore, they may not capture the context and processes that underline sustainability in project management.

3.4 Research Approach

The research method is qualitative and interpretive, involving the inductive research approach to determine the impact of project management practices in the UK construction industry (Thompson et al., 2021). Although this study does not aim to develop new hypotheses due to the small sample size, it provides a deeper insight into current practices and implications using detailed and context-specific data.

Inductive reasoning is applied to generalize collected information. This is suitable for this research since it identifies unknown and contextually relevant factors of sustainable project management. Unlike quantitative studies with formulated and examined hypotheses, this study is exploratory, with the purpose of discovering patterns, themes, and categories latent in collected data.

The data collection approach is inductive, meaning patterns, themes, and categories are identified based on collected data. These are employed to develop hypotheses about the social environment and people's conduct. This bottom-up approach is helpful because it concentrates on the effects of sustainability on the UK construction industry from the field level of project management practitioners.

The justification for the inductive method is: First, the subject of research, sustainability in project management, is a general and extensive topic requiring a relatively large-scale method to reveal influencing factors and interconnections. Inductive research allows new concepts to be created, helpful in studying a subject affecting a large population and constantly evolving. Second, the inductive approach is suitable for the study's epistemological stance of interpretivism because it focuses on participants' meanings. Theories are derived from data collected from participants' natural settings, improving study validity.

A deductive approach would not apply to this research, where the primary purpose is to verify theories or hypotheses. Deductive research is comparatively more formalized and may not encompass all facets of the problem as it is based on theory.

3.5 Sampling

The research uses purposive sampling, in which participants are chosen based on their experience and knowledge of sustainable project management in the UK construction industry. Purposive sampling is a non-probability sampling technique in which participants are selected to provide adequate and heterogeneous data (Rai & Thapa, 2015).

Participant Selection Criteria:

- Participants must have adequate knowledge of the environment to obtain sufficient information on market forces to develop and implement appropriate strategies.
- Participants should be engaged in practical practices concerning sustainable issues, including Project Managers, Sustainability officers, Architects, and contractors managing project sustainability.
- Participants should possess professional certifications, experience managing sustainable projects, and awareness of BREEAM, LEED, or other project management standards.
- Representative samples are taken from each construction project sector, including planning, executing, and controlling.
- Participants are recruited from different regions in the UK to ensure regulatory, market, and operating conditions differ.

The sample comprises five participants: project managers, sustainability consultants, construction engineers, project managers, and project leads. Selection criteria include experience in construction, involvement in sustainable construction projects, and positions that influence project management.

Table 3: Participant Demographics

Approach	Key Elements
Green Building Principles	Sustainable design, construction, and operation
Energy-Efficient Designs	Passive solar design, high-performance insulation
Sustainable Materials	Recycled content, renewable resources, low-VOC materials
Renewable Energy Systems	Solar panels, wind turbines, geothermal systems
Water Conservation	Low-flow fixtures, rainwater harvesting, greywater reuse

This sample size is justified by the fact that the study is qualitative, focusing more on depth than width. Five interviews offer sufficient variation concerning participants' perceptions while making data collection and analysis manageable. The goal is to achieve theoretical saturation, where no new themes and ideas emerge.

3.6 Data Collection Methods

The primary data-gathering method is semi-structured interviews applicable to the selected qualitative interpretive research approach. Semi-structured interviews are less rigid than unstructured interviews but more rigid than structured interviews since the interviewer has a list of questions while being free to ask other questions (Osborne & Grant-Smith, 2021).

This study uses purposive sampling, interviewing 5 participants. Interviews are conducted and recorded through MS Teams following university protocols, and each interview is transcribed. Transcripts are incorporated in the dissertation's appendices for reviewers to see gathered data. This method guarantees a comprehensive and unambiguous interpretation of participants' views on sustainable project management in the UK construction industry.

Semi-structured interviews are used because: This method allows participants to express views and report experiences in their own words, resulting in qualitative data collection. Semi-structured interviews are less rigid than structured ones. The researcher can ask probes to specific questions that may elicit responses interesting or unusual. Second, semi-structured interviews are not formal; instead, they are approachable. This allows participants to express views and opinions as they are, especially when discussing complex and possibly controversial topics such as sustainability and project management.

Data collection techniques such as structured questionnaires or focus group discussions were considered and dismissed. Structured questionnaires are not appropriate because they are not very elaborate and are rigid; focus groups might not be appropriate because group effects can influence information obtained, while individual interviews provide more detail.

3.7 Data Collection Procedure

The data collection procedure follows systematic and ethical steps. First, the target population is chosen based on contacts with specialists, organisations, and recommendations.

An e-mail invitation is sent to potential participants, containing a participant information sheet and consent form. These documents guarantee participants all required information about the study, its purpose, their rights, and anonymity and confidentiality of their data.

Once consent is given, interviews are scheduled at participants' most convenient time. Depending on availability, interviews are either face-to-face, online, or telephone. The interview typically takes 30 to 45 minutes to allow enough time to probe issues.

Besides general introduction of the study, participants are given a brief on the study's purpose, interview process, subjects' rights, and ability to withdraw at any time. Interviewees are asked for consent to record the interview for transcription and analysis.

In the interviews, a guide with semi-structured questions is applied, ensuring study of all important topics and allowing respondents to provide additional information. The interviewer uses probe questions to ask about new or interesting issues.

After interviews are recorded on tape and transcribed verbatim, information is depersonalized to preserve participants' identities. Subsequently, written transcripts are read to see if any parts need explanation.

Data collection considers ethical issues like participants' rights to privacy and permission and any risks involved. These steps are necessary to ensure the study is reliable and does not give biased results.

3.8 Thematic Analysis

Semi-structured interviews are used to collect study data, and thematic analysis is used to examine the data. This method works best for qualitative research because it lets the researcher look for patterns, themes, and meanings in the data (Terry et al., 2017).

The specific steps for thematic analysis are:

- Familiarization: The first step is to learn about all the data used. Interview records are listened to get a general idea. In this step, first results and possible trends are found.

- **Initial Coding:** After familiarizing with data, first-level codes are created. Coding involves breaking data into different pieces to ensure the investigator can answer research questions. Codes are data-driven and encompass particular words, sentences, or text sections significant to research objectives and participants' narratives.
- **Theme Generation:** Initial codes are grouped into potential themes. Themes represent patterns in the data relevant to study questions, broader than codes and encompassing the data's ideas.
- **Theme Review:** Identified themes are discussed and can be altered. Themes should align with coded data and the entire research data set. Some themes can be combined, divided, or excluded depending on suitability and coherence. The purpose is to make themes comprehensible and accurate.
- **Theme Naming:** Themes are named after discovery. This step describes what each theme refers to and how it addresses study questions. Elaboration explains what themes are and represent. Finally, themes and research questions are analysed, combined to answer study questions and demonstrate how project management impacts sustainability in the building sector. Verbal expressions support study findings and explain identified themes.

3.9 Data Validation

Data validation ensures accuracy and increases reliability. They aim to increase study results' reliability and make them easily reproducible.

- **Triangulation:** Qualitative analysis compares data collected from different methods and sources. This involves comparing data from semi-structured interviews with different types of qualitative data, such as case studies, company reports, and literary works. Using three different ways to examine results makes data more reliable and gives a full picture of the study area.
- **Member Checking:** After interviews are transcribed, texts are returned to participants for review. This lets participants ensure transcriptions and interpretations of their answers are correct and provides an opportunity to explain or add to what they said.
- **Audit Trail:** Steps to gather, analyse, and make sense of data are carefully documented. Records of data analysis, trend identification, and decisions are kept. This clarifies the study and lets other researchers repeat it.
- **Reflexivity:** The researcher is reflexive throughout

the research process, understanding and appreciating biases, predispositions, and possible impact on data gathering and analysis. Reflexivity reduces researcher bias influence on findings, enhancing study validity.

3.10 Limitations

Several limitations of the proposed methodology must be mentioned. Since this is a qualitative study, results are not likely to be transferable to other contexts and groups (Gournelos, 2019). The number of participants is appropriate for qualitative research; however, it may not be large enough to include all views within the construction industry.

Moreover, using interview data based on respondents' perceptions might have limitations like socially desirable or recall bias. Nevertheless, the study offers useful and detailed information about sustainable project management practices, enriching the knowledge base.

3.11 Ethical Considerations

Ethical consideration is crucial in this study, especially since it involves human beings. Participants' consent is sought, and they are told the study's purpose, procedure, and their rights, including the right to withdraw at any time without explanation.

Participants' identities are kept anonymous by removing identifiers from transcripts and properly storing collected data. Ethical clearance is obtained from the corresponding institutional review board to enhance ethical consideration.

These measures help maintain research ethical standards and protect participants' rights and interests during the research process.

3.12 Summary

This chapter includes the research approach, paradigm, strategy, participants, data source and collection, and data analysis. The chosen methodology ensures that the study on the role of project management in sustainability in the UK construction industry is comprehensive and ethical.

4. Results and Discussion

4.1 Introduction

The findings chapter provides a detailed analysis of research findings and results from conducted interviews. This is organized to explain findings and research results according to designed themes, and the discussion explains the overall analysis of findings. Furthermore, it concludes the whole chapter, proceeding to the final chapter of the conclusion.

4.2 Research Results and Findings

4.2.1 Current Practices in Waste Management

This inquiry focuses on waste management practices within the construction sector, exploring how organisations incorporate sustainability into their waste management strategies. Responses to "What are the current practices your organisation uses specifically related to waste management?" revealed:

Shared Practices:

- Compliance with UK waste management policies requiring sorting waste into recyclable, hazardous, and general waste categories
- Colour-coded bins for waste segregation to differentiate and sort waste forms appropriately
- Waste management plans for each project containing measures to minimize, reuse, or recycle materials
- Regular training for site workers to ensure understanding of waste segregation importance
- Collaboration with waste management contractors specializing in recycling construction materials

A construction site manager stated: "We adhere to UK construction waste management regulation... which mandates segregation of waste into categories such as recyclables, hazardous materials and general waste... we use colour coded bins and significant facilities to segregation."

Differences in Responses:

- Application of technology in waste disposal varies; some organisations use waste tracking software to monitor and optimize waste management systems, while others focus on conventional measures
- Degree of waste management implementation differs; some focus on forecasting material requirements and reusing excess materials, while others conduct frequent audits
- Training frequency and coverage vary; some undertake frequent training while others do it occasionally

Aligning to Literature:

The practices identified align with existing literature on waste management in construction. Kurniawan et al. (2023) elaborate that to achieve better performance, waste management practices and technologies should be stepped up to address operational efficiency and environmental concerns. Fort and Cerny (2020) noted that proper waste management helps minimize adverse environmental effects while bringing cost savings. This

is consistent with responses revealing keen interest in reducing waste and enhancing recycling for environmental and economic gains.

4.2.2 Current Sustainability Practices in Energy Efficiency

This inquiry focuses on energy efficiency practices within the construction sector. Responses to "What are the current sustainability practices your organisation uses specifically related to energy efficiency?" revealed:

Shared Practices:

- Energy efficiency measures integrated into project design, including quality insulation, quality glass, and energy-friendly appliances
- Building Information Modeling (BIM) applied during design to model and enhance energy performance
- Regular energy audits conducted at project initiation and construction phases
- Training for teams on energy-saving practices, including turning off equipment and lights when not in use

A Sustainability Consultant stated: "We focus on integrating energy efficient solution from the design phase. This includes selecting high performance insulation and glazing to reduce energy needs."

Differences in Responses:

- Adoption of Energy Management Systems such as Smart Meters varies; some organisations use real-time monitoring while others focus on conventional approaches
- Utilisation of renewable energy sources varies; some integrate solar panels while others do not mention renewable energy use
- Level of energy efficient technologies applied on site differs; some adopt power tools consuming less power, while others focus on lighting and heating systems

A Project Lead noted: "Our team here uses the energy efficient LED lighting in our offices and job sites and we have installed motion sensors to ensure lights are only on when needed. Further, we utilise energy efficient power tools and equipment that consumes less electricity during operations."

Aligning to Literature:

The results align with current literature on energy efficiency and sustainability in construction. Adewale et al. (2024) note that organisations must adopt whole-of-energy-efficiency measures entailing innovative

technologies and practices. BIM helps in accurate simulation and analysis of energy consumption while smart meters provide real-time data for effective energy management. Seferlis et al. (2021) note that sustainable energy practices, including renewable energy sources and energy-efficient technologies, can reduce operational costs and assist in attaining environmental objectives.

4.2.3 Impact of Sustainable Practices on Project Outcomes

Responses to "How do these identified sustainable practices in your organisation impact the project outcomes?" revealed:

Shared Themes:

- **Increased Productivity:** Efficient machinery and materials, and energy conservation measures reduce construction time and rework
- **Enhanced Client Satisfaction:** Energy-efficient materials and systems improve building performance and reduce operational costs
- **Market Competitiveness:** Sustainable practices respond to increasing societal needs for environmentally friendly products

A Project Manager stated: "Sustainable practises often lead to improvement project efficiencies, for example using efficient machinery and materials, it can reduce the conception time and by minimising the need for rework and repairs."

Differences in Responses:

- Some respondents highlight tangible economic gains (15% decrease in project costs)
- Others focus on day-to-day changes such as lowered equipment failure risks and minimized project delays
- Some explain sustainability improves company image and client relations, while others focus on specific factors like efficient energy tools and waste disposal

Aligning to Literature:

Francis and Thomas (2020) noted that sustainability practices including efficient resource use and proper waste disposal benefit project performance and deliverables. Joseph (2023) posit that sustainability has emerged as a strategic business driver in the construction industry, providing competitive advantage and market standing. The correlation between sustainability and project performance confirms that sustainability is essential for achieving positive results in projects.

4.2.4 Influence of Practices on Project Timelines

Responses to "How do identified practices related to waste management and energy efficiency influence project timelines in your organisation?" revealed:

Shared Observations:

- Proper waste management and energy conservation contribute to eliminating project delays
- Sorting and recycling minimize time wasted in disposal
- Energy-efficient systems avoid last-minute changes or corrections
- Energy efficiency minimizes downtime, preventing project stalling

A Construction Engineer stated: "Effective waste management and energy efficiency always helps us streamline the project timelines by preventing potential disruptions. So proper waste segregation and recycling reduces the associated with the waste removal ensures smoother site operations."

Differences in Responses:

- Some respondents focus on waste management in delay reduction through enhanced disposal
- Others give more attention to overall effects of energy efficiency on project schedule
- Level of integration into project life cycle differs; some note sustainable practices may increase implementation period but benefits improve efficiency

Aligning to Literature:

Victar and Waidyasekara (2024) found that sustainable actions including proper waste management and energy conservation help improve project flow and minimize time inefficiency. Ismail (2020) identifies that sustainable practices especially incorporating lean process management enhance project delivery time. This aligns with lean principles noted by respondents as useful in optimizing project waste management and energy usage.

4.2.5 Cost-Effectiveness of Identified Practices

Responses to "Can you tell me how these identified practices related to energy efficiency and waste management influence cost-effectiveness?" revealed:

Shared Perspectives:

- Sustainable practices may require initial investment but greatly reduce overall costs in the future
- Waste management minimizes disposal costs and material expenses

- Recycling materials reduces disposal costs and provides savings through resale
- Energy efficiency measures lead to reduced energy expenditure and minimal maintenance costs
- Sustainable practices reduce maintenance and general running costs

A Project Lead reported: "Implementing energy efficient practises has reduced our utility cost by around 23% over the past year. By using recyclable materials, disposal fees is also cut by 30%."

A Sustainability Consultant stated: "Currently, sustainable practices reduce the cost of doing business in the long run through reducing on the operational costs. For instance, waste management costs are minimized by waste reduction while energy costs are saved through the use of energy efficient systems."

Revenue Generation:

- Sales of recycled materials generate additional income
- Financial incentives and rebates from energy-efficient projects
- Zero waste to landfill goals and improved waste diversion rates

Aligning to Literature:

Ekins and Zenghelis (2021) note that sustainable practices are usually characterized by costs in the beginning, but are followed by cost savings on energy and waste management. Alkaraan et al. (2023) add that sustainability improves overall operations' efficiency and increases project profitability. Johnsson et al. (2020) state that effective integration of sustainability means both financial and strategic levels are optimised for short-term cost savings and long-term environmental and economic performance.

4.3 Discussion of Findings

4.3.1 Current Practices in Waste Management

The construction industry has implemented general waste management policies due to regulation and increasing environmental concern. Measures include segregation, recycling, and improved tracking systems. Color-coded bins ensure wastes such as recyclables, hazardous wastes, and other wastes are well sorted in compliance with environmental requirements (Appiah, 2020).

However, these practices face operational and economic challenges. Recycling efficiency depends on changes in the market of recycled products (Roberts et al., 2023). Professional training and facilities to handle

waste increase start-up costs, which can be problematic for small businesses. Gunarathne and Lee (2021) state that waste management strategies are only effective when practiced and enhanced to the best level. Besides acquiring proper bins and separation facilities, organisations must spend considerable time and money educating employees on proper waste handling.

The application of advanced waste management practices is strategically important (Bui et al., 2020). Not only do they assist companies in becoming environmentally friendly, but they also cut down time spent on waste. This double benefit proves there is much to be achieved in waste management investment for economic and environmental sustainability.

4.3.2 Current Sustainability Practices in Energy Efficiency

Energy conservation in construction has been dynamic due to technological innovations and methods, with the primary purpose of minimizing energy usage and improving sustainability. Building Information Modeling (BIM) helps assess energy requirements at the design stage, enabling informed decisions about materials and construction methods (Durdyev et al., 2021).

Implementation of complex technologies has problems. The cost of implementing BIM and other energy-efficient technologies remains high, especially for small projects or firms. They also require higher skills, meaning more training or specialized staff, increasing project costs (Nnaji & Karakhan, 2020).

Many opportunities can be achieved through energy-efficient measures. Management of lighting and HVAC systems has been noted to help reduce buildings' energy consumption, operating costs, and carbon footprint (Ma et al., 2023). Legal regulations enabling energy-efficient buildings can help recover costs.

Energy efficiency has become a strategic tool, and organisations are implementing measures for business reasons, not just regulatory compliance or environmental concerns. Energy-related technologies and designs can market projects to 'green' clients and investors in a way consistent with industry trends.

4.3.3 Impact of Sustainable Practices on Project Outcomes

Waste management and energy efficiency are critical success factors determining project success, productivity, client satisfaction, and market share (Onubi et al., 2022). They assist in cutting down time wastage and building on resource usage, making it easier to accomplish project goals at lesser cost and time.

Sustainability and client satisfaction are linked in a

complicated manner. Many clients embrace green construction, but preferences may differ; others may be more inclined to cost or time (Shooshtarian et al., 2020). The durability and use of structures made from sustainable materials and techniques can influence client satisfaction. If materials are not sustainable, they may not meet required quality, resulting in dissatisfaction and repair costs.

Sustainability is seen as imperative for the construction industry. Not only do sustainable practices meet legal requirements and environmental objectives, but they also give competitive advantage regarding the rising trend of sustainable construction. Sustainability management in project planning and implementation is becoming a strategic imperative for companies to remain competitive.

4.3.4 Influence of Practices on Project Timelines

Sustainability in waste management and energy efficiency affects construction project duration. These practices can enhance workflow and minimize time wastage inherent in conventional construction practices. Waste management systems reduce time waste spends in facilities, while energy-saving measures reduce time equipment is out of use (Ismail, 2020).

Integration of sustainability can cause longer planning time because sustainable practices must be incorporated into project planning. This can initially escalate time to complete a project, especially where high sustainability targets are set. The problem of time management is to identify the correct ratio of time devoted to sustainability and results that are not only environmental but also effectiveness and cost-effectiveness (Carcamo & Peribaena-Niebles, 2022).

There are some costs in terms of time at the beginning of project implementation to apply sustainable practices; in most cases, sustainable practices positively affect project time in the long run. Projects can be made to run smoother and with less intervention because of the need for correction. These practices can improve reliability and sustainability image, potentially shortening time taken for project approval and reducing regulatory barriers.

4.3.5 Cost-Effectiveness of Identified Practices

In cost-benefit analysis of sustainable construction practices, both direct and indirect costs must be considered. First costs invested during application of such practices are usually high. However, money saved in the future is also usually high.

The first cost is implementing new technology, personnel, and integrating sustainable materials and practices into construction. However, these costs are

recovered by reducing energy use, lowering disposal charges, and the value of recycled materials that can be sold at higher prices, increasing operational cost (Amaral et al., 2020).

Sustainable practices have advantages including tax credit and compliance credit, making practice cheaper. However, these practices are lucrative for companies only if external factors such as energy prices and environmental law amendments are favorable (Ekins & Zenghells, 2021).

These difficulties can be compensated by many years of economic benefits traditionally linked with sustainable practices, recovering initial expenses. These practices meet regulatory and environmental objectives while enhancing sustainability and profitability. This makes them a factor needing consideration for any construction project to be economical and ecological.

4.4 Summary

Sustainable practices in waste management and energy efficiency in the construction industry have prospects and threats. Although these practices help in environmental conservation and compliance with the law, they have economic returns since they enhance efficiency and productivity in the long run. However, utilisation requires investments and proper plans to deal with possible difficulties connected with logistics and costs. Evidence points to benefits such as improvement of overall project results, client satisfaction levels, predictability of project duration, and cost-effectiveness. The construction industry needs to keep searching for and implementing sustainable practices congruent with business and environmental necessities, achieving a sustainable future for the construction industry.

5. Conclusion and Recommendations

5.1 Introduction

This chapter presents the conclusion of the research with reference to the effects of sustainable project management in the UK construction industry. It reiterates the main research questions to direct attention to the impact of sustainability practices on project management frameworks on project results in terms of efficiency, cost, and environmental standards. This reflection includes theoretical, practical, and policy implications, difficulties faced, and future research recommendations.

5.2 Discussion of the Overall Findings

This study found that integration of sustainability within project management frameworks improves project performance in the UK construction industry. The study confirmed that sustainable project management has benefits in environmental conservation, operations

productivity, and cost. Efficient waste management and energy-saving measures were incorporated on time and within cost estimates. Sustainable management projects were implemented with enhanced compliance with environmental standards. Results give basis for the research hypothesis that inclusion of sustainability practices into project management can improve project performance in many ways.

Organisations that implemented these measures could benefit from the growing market trend towards sustainable development if implementation is synchronized with corresponding market needs. This competitive advantage is valuable as more countries pay attention to environmental protection, indicating gradual industry shift to environmentally friendly products. Nevertheless, application extent is not the same in firms depending on firm size, project size, and manager attitudes toward sustainability.

These results advance knowledge of the place and role of sustainability in contemporary project management in construction. They offer backing to theoretical postulations in literature calling for incorporation of environmental considerations into project management to improve both project and environmental performance. The findings underscore the need for a strategic approach to sustainability encompassing adoption of specific practices and broader cultural shift within organisations toward valuing sustainability as a critical component of project success.

5.3 Implications of Overall Findings

Theoretical Implications:

This research enriches the existing body of knowledge by demonstrating that sustainable practices can be deeply integrated into project management with positive outcomes. It supports and extends arguments indicating sustainability as a characteristic of modern project management, proving sustainability's importance in enhancing project outcomes. The research provides empirical support for the proposition that conventional project management paradigms of time, cost, and quality are not inimical to sustainability but are in harmony with it.

Practical Implications:

The studies establish that sustainability yields financial benefits in construction companies. Findings recommend that sustainability be considered an element of project management by industry leaders and project managers because it positively impacts time, cost, and legal aspects of compliance with environmental standards. This shift can help firms meet growing market needs for green buildings and

sustainable development. Practitioners should incorporate environmental issues into all project implementation stages, from planning to delivery.

Policy Implications:

The study suggests that government and industry associations can offer further encouragement for sustainable construction. Regulation or funding optimization could enable more sustainable technologies and practices. The study gives real-life reference to policies regarding sustainability education and training as components of continuing professional development for project managers and construction people to develop competent human resources for practicing and advancing sustainable project management.

5.4 Limitations of this Study

- **Geographic and Sectoral Constraint:** The study is geographically and sectorally constrained, carried out in the context of the UK construction industry only. This enables deeper investigation but may prevent generalizing results to other parts of the world or industries where regulatory, environmental, and economic conditions differ significantly.

- **Scope and Quantitative Assessment:** The study has specific weaknesses in scope and quantitative assessment of effects. Conclusions are based on qualitative estimations only, bringing bias such as self-reporting bias where participants may perceive high commitment to sustainability standards. The sample size, though adequate for qualitative analysis, was relatively small and may not fully represent diversity within the UK construction industry.

- **Timing Limitation:** The construction industry is rapidly evolving in terms of technology and sustainability standards. Findings represent a snapshot based on the current state and may become outdated as new technologies, materials, and regulations emerge.

5.5 Recommendations for Further Studies

1. **Geographical Expansion:** Future studies should examine sustainability integration in project management in other geographical regions. Comparative studies across different regulatory and economic environments would provide broader understanding of how contextual factors influence adoption and effectiveness of sustainable practices.
2. **Longitudinal Research:** There is need for longitudinal research to track long-term impacts of sustainability practices on project outcomes, showing how first costs influenced later cost and value of construction projects.
3. **Quantitative Approaches:** Quantitative research approaches should be used to supplement qualitative

findings. Surveys and quantitative research could determine how often sustainable practices are employed and relationships between employment and factors such as compliance with budget, time, and client satisfaction.

4. Sector Diversification: Future research could examine how sustainability is being incorporated into project management in sectors other than construction, offering different experiences on how sustainability is implemented in various business settings.
5. Drivers and Impediments: Describe and categorize drivers and impediments to sustainability integration into project management, identifying 'enablers' and 'barriers' and how they may be overcome.
6. Technology Integration: Look at how innovation technologies, artificial intelligence, IoT, and green building materials can improve sustainability in project management.
7. Professional Development: Study the influence of professional development and training on promoting sustainability in project management, assessing current initiatives and suggesting curriculum improvements.

5.6 Summary and Contribution

This work has made quite a significant input to existing knowledge regarding how sustainability practices may be incorporated into project management in the UK construction industry. From the work, it is clear that sustainable project management is not merely about meeting environmental standards but also about enhancing efficiency and cutting costs, providing two-in-one value in construction firms. Presenting the benefits of sustainability encourages more application and development in construction projects.

Main Contributions:

- Theoretical: Adds to the literature on sustainable project management by showing that integration of environmental concerns into project management is not only a compliance matter but a strategic one.
- Practical: Offers advice that construction firms can use in management and enhancing their stance in a more environmentally conscious world.

This thesis supports use of a strategic approach to sustainability in construction project management as a way of achieving optimum economic, environmental, and organisational goals. It requires steady improvement and return to the idea of sustainability, with the belief that construction's future lies in optimizing integration into any given project.

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