



**EXPLORING THE IMPACT OF
PROJECT MANAGEMENT SYSTEMS ON SUSTAINABILITY OUTCOMES
WITHIN DUBLIN'S CONSTRUCTION PROJECTS**

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SUBMITTED TO THE NATIONAL COLLEGE OF IRELAND, AUGUST 2025

ABSTRACT

The research investigates how Project Management Systems (PMS) affect sustainability performance results in Dublin Ireland construction projects. The research evaluates sustainability performance through environmental operational and social dimensions while studying how PRINCE2 PMBOK Agile and Lean formal PMS frameworks support their integration. A quantitative survey reached 124 Dublin-based construction firms from the Construction Industry Federation (CIF) members directory which represents 35% of the total 355 firms in the region (CIF, 2022). The research shows that organizations using formal PMS frameworks implement sustainable practices at higher rates than organizations without these systems. The implementation of formal PMS leads to better environmental performance because organizations implement energy efficiency measures and reduce waste and use sustainable procurement methods. The implementation of PMS leads to better operational performance because it helps organizations manage costs and maintain schedules and quality standards. The implementation of PMS leads to better social performance because it enhances stakeholder engagement and community involvement and health and safety outcomes. The integration of sustainability faces major obstacles because organizations lack sufficient resources and skilled personnel and face internal opposition. The research demonstrates that formal PMS systems function as strategic instruments which help construction projects adopt sustainability practices. The research recommends organizations to provide specialized training programs and develop stronger stakeholder partnerships while expanding PMS performance indicators to include sustainability metrics together with conventional cost–time–quality metrics. The research delivers useful knowledge for Irish construction sector professionals and policymakers through its findings which link project management and sustainability studies.

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ACKNOWLEDGEMENTS

I extend my deepest appreciation to my supervisor Daisy Odunze because they provided essential guidance and constructive feedback and continuous encouragement throughout this research process. Their expertise together with their patience played a crucial role in developing this dissertation while assisting me through the obstacles I encountered. The Master of Science in Entrepreneurship program at the National College of Ireland received my appreciation for their academic resources and supportive environment which enabled this work. The successful completion of this study depended on the time and insights provided by Dublin construction firms who participated in my survey.

I am personally grateful to my mother Dilek Sönmez for her complete support and to my sibling Deniz Cemre Karahan for being my constant companion and to my dear friend Meriç Göker for his academic backing and motivational words which maintained my focus and determination. Your faith in me provided continuous motivation throughout this entire academic journey.

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ABBREVIATIONS

PMS Project Management System

CIF Construction Industry Federation

PRINCE2 Projects IN Controlled Environments

PMBOK Project Management Body of Knowledge

GDP Gross Domestic Product

SMEs Small-to-medium-sized enterprises

BREEAM The Building Research Establishment Environmental Assessment Method

LEED Leadership in Energy and Environmental Design

PMI The Project Management Institute

ESG Environmental, social, and governance

BIM Building Information Modelling

KPIs Key Performance Indicators

EMS Environmental Management Systems

ANOVA Analysis of Variance

GDPR General Data Protection Regulation

1. INTRODUCTION

Exploring The Impact of PMS on Sustainability Outcomes Within Dublin’s Construction Projects

1.1 Background and Context

The construction industry in Ireland serves as an essential component of national economic operations by generating significant Gross Domestic Product (GDP) and creating employment opportunities. The construction sector produced €15.3 billion in gross value added during 2023 while representing 4.3% of Ireland's economic output (CSO, 2024). The Irish government focuses its strategic investment plans on infrastructure projects which include roadways bridges utilities and public facilities. The National Development Plan 2021–2030 serves as a strategic framework which tackles housing deficits while improving transportation networks and building public facilities to meet expanding population numbers and urban development needs (Government of Ireland, 2021).

Project management methods of high complexity and scale must be used in infrastructure development to achieve deadlines and budget goals and quality standards and sustainability requirements. Public infrastructure spending in Ireland has received an exceptional increase due to the nation's strong fiscal state and will continue growing according to Financial Times (2025) projections. The sector faces multiple difficulties because of its expanding opportunities that result in workforce shortages and the requirement for sustainable project delivery methods. Sustainability stands as a vital industry priority for Irish construction since it fulfills both EU climate objectives and the national Climate Action Plan 2023. Project managers now recognize sustainability principles as vital elements for achieving lasting infrastructure performance because they combine environmental, social and economic considerations (FIEC, 2025). Despite the Irish sector employing PMS (PMS) such as PRINCE2, PMBOK, Agile and Lean Construction there is limited research about their effects on sustainability outcomes in Ireland.

The research evaluates sustainability performance in Dublin construction projects through the analysis of formal PMS implementation. The study analyzes system application methods to determine sustainability pillar effects so it can establish evidence-based recommendations for both policy creation and industry operational improvements.

1.2 Research Problem

The Irish government created strong sustainable infrastructure delivery policies through the National Development Plan 2021–2030 (Government of Ireland, 2021). The actual implementation of these standards faces challenges according to recent evaluations because it fails to achieve predicted sustainability outcomes (Government of Ireland, 2021). The Dublin construction sector including small-to-medium-sized enterprises (SMEs) faces ongoing delays and cost overruns and weak stakeholder engagement which threatens to undermine sustainability goals (Construction Industry Federation, 2022). The PMS frameworks aim to boost project performance yet there is not enough empirical research showing their ability to reach specific sustainability targets (Silvius & Schipper, 2014; Martens & Carvalho, 2017).

The main challenge arises from the lack of defined procedures which show how PMS frameworks generate sustainability results in real-world applications. The Office of Government Commerce (2009) notes that PRINCE2 provides structured governance and risk management principles yet these tools need deliberate customization to include environmental and social performance metrics. Construction settings face uncertainty regarding how Agile and Lean methods support long-term sustainability despite their ability to promote efficiency and continuous improvement (Conforto et al., 2014).

1.3 Significance of the Study

The research findings are important at this time because of the following reasons. Dublin is currently experiencing rapid urban development with increased investments in housing, transportation and energy infrastructure. It is important for economic and environmental resilience to manage these projects efficiently and sustainably. Secondly, as construction firms in Ireland especially SMEs adopt a variety of PMS frameworks, there is a need to evaluate how these methodologies impact sustainability-related decision-making and project performance. The studies that have been done are either theoretical or based on single case analyses, and therefore, they do not have generalizability (Aarseth et al., 2017). Few have used empirical methods such as surveys or structured data collection to assess the practical relationship between PMS adoption and sustainability outcomes. This study aims to fill this gap by collecting and analyzing primary data from professionals working in Dublin's construction sector.

By examining how different PMS frameworks affect environmental, operational and social sustainability, the study will contribute to the academic understanding of sustainable project governance and provide practical insights for project managers, policymakers and educators.

1.4 Aim and Objectives

The main purpose of this research is to determine the effect of formal project management systems on quantifiable sustainability results in infrastructure projects within Dublin's construction industry.

The specific objectives are:

- To investigate the current implementation status of different PMS frameworks in Dublin construction projects.
- To evaluate how these systems affect environmental sustainability through their impact on energy consumption, and material waste management.
- To assess how these systems influence operational success metrics, including timely delivery, budget adherence, and long-term performance.
- To investigate the degree to which social sustainability elements, including worker safety and stakeholder involvement, are integrated into PMS usage.
- To identify sustainability integration gaps and obstacles, and to explore successful methods for embedding sustainability within existing project management frameworks.

1.5 Research Question

Main Question:

To what extent do PMS contribute to measurable sustainability outcomes—environmental, operational, and social—in Dublin's infrastructure construction projects?

Sub-questions may include:

The current PMS used in Dublin construction projects along with their selection criteria need identification.

The PMS affect environmental sustainability through their influence on energy usage and carbon footprint reduction and waste material control.

These systems influence operational success metrics through their effects on project delivery timelines and budget control and long-term operational performance.

The extent to which social sustainability elements such as worker safety and stakeholder involvement are incorporated into project management system applications.

The current sustainability integration gaps in PMS need identification along with methods to enhance their effectiveness.

1.6 Research Methodology Overview

The research design of this study uses quantitative methods to analyze how PMS affect sustainability performance in Dublin's construction sector. The quantitative research method allows data collection of structured information that researchers can analyze statistically to detect quantifiable patterns and relationships (Creswell & Creswell, 2018). The primary data collection method involves an online survey because it represents an effective way to gather information from a specific professional group located in a confined area within a short period (Bryman, 2016).

The survey will reach out to both SMEs and large construction firms which work on infrastructure projects in Dublin. The research applies purposive sampling to select firms that have ongoing or finished infrastructure projects because these participants possess the needed expertise for study contributions (Etikan, Musa & Alkassim, 2016). The survey will obtain information about PMS frameworks and implementation steps and sustainability outcome perceptions that align with the three-pillar sustainability framework which construction management research frequently employs (Elkington, 1999).

The analysis will employ descriptive statistics to present results while comparative analysis will evaluate the differences between firms using standardized PMS frameworks and those without formal systems. The analytical methods help researchers understand how performance changes between different organizational settings (Saunders, Lewis & Thornhill, 2019). The research design aims to establish empirical evidence about how PMS adoption helps Irish construction companies reach specific sustainability targets.

1.7 Structure of the Dissertation

This dissertation is structured into six chapters. Following this introductory chapter:

- Chapter 1: Literature Review presents a critical analysis of the theoretical and empirical literature on PMS and sustainability in construction.
- Chapter 2: Methodology outlines the research design, including data collection tools, sample selection, and analysis strategies.
- Chapter 3: Findings provides the results of the primary data collected via surveys, supported by descriptive statistics and visual interpretation.
- Chapter 4: Discussion compares findings with existing literature to derive key insights and implications.
- Chapter 5: Conclusion and Recommendations summarizes the main findings, outlines limitations, and proposes practical and academic recommendations.

2. LITERATURE REVIEW

The chapter conducts a critical evaluation of academic research about sustainability and PMS which focuses on their implementation in infrastructure and construction projects. The text starts by explaining project delivery sustainability through its evolution from basic cost-time-quality models to comprehensive frameworks that combine environmental goals with social and economic targets. The review investigates how project success definitions have shifted toward embracing long-term effects and stakeholder value while analyzing how PRINCE2, PMBOK, Agile and Lean Construction frameworks have responded to these expanded expectations.

The following sections analyze theoretical frameworks which connect PMS to sustainability before presenting empirical research that evaluates their practical effectiveness. The chapter reveals two main gaps in existing research which include the absence of empirical data from small and medium enterprise construction sites and the restricted use of sustainability indicators in conventional PMS tools.

The literature review combines these findings to validate the research questions in this study while justifying the need for survey-based primary data collection in the Irish construction sector.

2.1 Understanding Sustainability in the Context of Project Management

Sustainability transformed from environmental focus into an essential project goal for public and private sector development. The Brundtland Commission defined sustainable development in 1987 as a method which fulfills present requirements without compromising future generations' capacity to fulfill their needs (WCED, 1987). Construction projects together with infrastructure development utilize the triple bottom line framework (Elkington, 1999) to translate sustainability into three fundamental dimensions: environmental, economic and social sustainability.

Environmental sustainability aims to decrease detrimental impacts that humans have on natural resources and ecosystems. Construction projects need to minimize energy consumption while reducing waste output while controlling carbon emissions to achieve resource efficiency throughout their entire life cycle (Charles J. Kibert (2022)). Economic sustainability requires both current financial efficiency and future-oriented value development and resistance to market

volatility and supply chain interruptions (Martens & Carvalho, 2017). The less commonly examined social sustainability element consists of worker protection measures together with stakeholder participation and community preservation along with promoting fairness and social inclusion (Silvius et al., 2012). Research shows that project sustainability needs assessment in both output and delivery process elements according to Opoku and Ahmed (2014). The delivery of outputs requires effective management of procurement operations along with team management and risk handling systems and stakeholder communication protocols. Project sustainability functions as an operational capability which governance tools particularly PMS enable organizations to develop as a process-oriented capability according to Silvius & Schipper (2015).

The practical implementation of sustainability faces difficulties because this concept remains difficult to define precisely. Many organizations fail to define sustainability at the project level which leads to uncoordinated efforts between teams and makes measurement inconsistent according to Aarseth et al. (2017). Several companies adopt BREEAM and LEED rating systems, but others use their own performance indicators and corporate social responsibility targets. The absence of standardized sustainability measurement systems creates difficulties when evaluating projects across different initiatives and organizations while hiding how project management frameworks contribute to sustainability goals.

Scholars have worked to develop specific definitions for sustainability within project management frameworks to resolve these discrepancies. According to Silvius and Schipper (2015) project sustainability evaluation requires analysis of long-term effects as well as stakeholder inclusivity and objective balance between economic and environmental and social aspects while ensuring project goals match organizational sustainability strategies. Martens and Carvalho (2017) suggest that sustainability indicators should become essential elements in project success metrics by adding additional dimensions to time, cost and scope in the "iron triangle". The 7th edition of the PMBOK Guide published by the Project Management Institute (PMI) demonstrates this transformation by including environmental and social and governance (ESG) expectations as essential factors for project success evaluation (PMI, 2021). The discipline experiences a fundamental transformation because sustainability has evolved from being a secondary consideration to becoming a fundamental requirement for successful project execution.

The institutionalization of sustainability standards through procurement frameworks and funding rules and stakeholder demands pushes project managers to show how their project management approaches lead to sustainable results. The National Development Plan (2021–2030) for public infrastructure development in Ireland makes sustainability along with digitalization and resilience essential principles (Department of Public Expenditure and Reform, 2021). Project sustainability represents an essential requirement for obtaining approval and maintaining project legitimacy.

The primary obstacle in the path of growing interest in sustainability is the lack of effective measurement methods. The research of Martens and Carvalho (2017) indicates that project managers who support sustainability lack established methods to monitor performance metrics except for financial measures. PMS require integration of sustainability elements throughout all phases including planning and risk management and reporting and evaluation to address the gap between project intentions and actual implementation.

Project management sustainability exists as a complex and developing concept which spans multiple dimensions. Project success requires organizations to transition away from output-based definitions toward outcome-focused strategies with long-term perspectives. The current frameworks and guidelines have not resolved the operational challenges that sustainability presents when implementing project management tools and practices. The current project management systems including PRINCE2, PMBOK, Agile, and Lean require examination for their practical usage to determine their effectiveness in achieving sustainability targets across environmental and operational and social aspects.

2.2 Evolution of Project Success Criteria

Project success in construction has traditionally relied on the "iron triangle" concept which measures cost against time against quality standards (Atkinson, 1999). The limited approach concentrated on fundamental elements while disregarding crucial aspects such as stakeholder contentment and enduring effects and value enhancement. The traditional metrics for project success often resulted in initiatives that satisfied requirements yet failed to deliver substantial social value or preserve environmental health.

Academics and practitioners have since acknowledged that traditional success models do not encompass the complete definition of project success. Turner and Zolin (2012) explain that project success evaluation should incorporate long-term value delivery to clients and users through operational efficiency and sustainability along with adaptability. The change represents a transition from fulfilling project promises to delivering essential long-term value.

The changing landscape of project success has led to the development of new frameworks which present success as a multifaceted concept. The model developed by Shenhar and Dvir (2007) assesses success through four main dimensions which include project efficiency and three additional aspects: impact on the customer and business success and future preparation and stakeholder satisfaction. The management models that emerged first in general contexts have increased their application to infrastructure and construction projects because of growing scrutiny about long-term environmental and social effects.

Sustainability has emerged as a primary addition to the success framework during this period. Silvius et al. (2012) argue sustainability must transition from its current external position to become a vital element of project achievement. They suggest that successful projects need to manage economic, environmental and social aspects through stakeholder-driven open decision-making systems. This perspective follows sustainable development principles to provide an extended strategic view of project success.

PMI includes stakeholder value and organizational strategy alignment as essential components for defining project success in the PMBOK Guide (7th ed.) (PMI, 2021). Project managers should focus on continuous business justification and benefits realization through PRINCE2 because this framework supports long-term thinking beyond immediate delivery goals (Office of Government Commerce, 2009). The adoption of expanded success concepts in established PMS frameworks appears in their modernization yet their practical execution shows inconsistent results.

The process of applying new success criteria to real-world situations proves difficult to execute. Research evidence indicates project managers tend to rely on traditional metrics because these measures are easy to understand, and clients expect immediate quantifiable outcomes (Martens & Carvalho, 2017). The theory-practice gap results in unclear methods through which PMS frameworks are used to pursue sustainability-related success metrics.

The diverse nature of construction projects creates difficulties because their sizes differ widely along with their range of responsibilities and stakeholder engagement levels. The success evaluation for public infrastructure projects requires assessment of community effects and climate change resistance yet commercial buildings focus on financial gains and customer happiness. Different project management approaches need evaluation regarding their handling of diverse stakeholder expectations because there exists no single definition of success. The construction industry tends to prioritize short-term operational efficiency above enduring sustainability goals. Zuo & Zhao (2014) along with Charles J. Kibert (2022) show that lifecycle performance metrics such as time-based energy consumption and maintenance expenses and environmental effects represent vital indicators to evaluate project success. Thoughtful project planning and system design enable project teams to anticipate and influence these long-term factors which remain difficult to measure during project execution.

Project success requires organizational culture transformation to integrate sustainability principles. According to Müller and Turner (2010), leadership style, team competence, and governance structures influence which success metrics are prioritised and how rigorously they are pursued. Project teams will not adopt sustainability as a fundamental success factor unless their organization or policy framework demonstrates leadership support for this principle.

This issue has significant importance in the Irish context. The National Development Plan together with other strategic frameworks stress sustainable infrastructure yet the actual delivery process relies on short-term goals because of high costs and restricted expertise and ambiguous sustainability standards. The evaluation of PMS framework effects on Dublin construction project success criteria represents a critical requirement for making policy match real-world practice.

Project success has evolved from its original focus on time and cost and quality to encompass a wider range of factors that include stakeholder value together with long-term performance and sustainability. Theoretical frameworks together with institutional guidelines demonstrate a growing acceptance of these values yet their practical execution remains unpredictable. This research seeks to determine how PMS frameworks in Dublin infrastructure projects affect the modern understanding of project success while evaluating their capacity to quantify and value sustainability as a success criterion.

2.3 Overview of PMS

PMS establish organized frameworks that provide methodologies together with tools and best practices to direct project planning and execution and monitoring activities. These systems exist to enhance operational efficiency while maintaining accountability and achieving project results that meet stakeholder requirements. The construction industry requires PMS frameworks as a critical tool to achieve project success and sustainability because it faces frequent complexity and uncertainty and risk (Kerzner, 2009).

Multiple PMS frameworks exist worldwide because each framework possesses unique advantages and constraints and varying levels of structure. The most widely recognized project management frameworks include PRINCE2 and PMBOK and Agile methodologies and Lean Construction and Building Information Modelling (BIM). The different frameworks have distinct origins and structural approaches and focus domains yet they work together to achieve controlled value-driven project delivery.

2.3.1 PRINCE2

PRINCE2 (Projects IN Controlled Environments) is a process-based methodology developed in the UK and widely used in Europe. It stresses structured governance, clear roles and responsibilities, and continuous business justification throughout the project lifecycle (Office of Government Commerce, 2009). PRINCE2 divides projects into manageable stages, each with defined outputs, quality expectations, and decision gates. Its strength lies in providing a clear hierarchy of control and an emphasis on documentation and accountability.

However, one critique of PRINCE2 is its relative inflexibility, particularly in dynamic project environments. In construction, where scope changes and stakeholder demands may evolve quickly, PRINCE2 may struggle without significant customisation. Furthermore, while it offers tools for risk, quality, and change management, it does not directly integrate sustainability metrics unless tailored by the project team (Aarseth et al., 2017).

PMBOK (Project Management Body of Knowledge)

PMI developed the PMBOK Guide which serves as a worldwide standard for project management best practices and knowledge areas and process groups (PMI, 2021). The guide

provides flexibility to different industries including construction because it functions as a guide rather than a prescriptive method.

The PMBOK framework consists of ten knowledge areas including scope and time and cost and quality and procurement and stakeholder management which are organized into five process groups: initiating, planning, executing, monitoring and controlling, and closing. The framework provides a complete system which enables project managers to match their tools and techniques to their project requirements. The latest version of PMBOK places greater importance on stakeholder engagement and organizational value and benefits realization which supports sustainability goals. The framework lacks built-in environmental or social sustainability criteria but practitioners can incorporate these elements through their own initiative (Martens & Carvalho, 2017).

2.3.2 Agile Methodologies

Agile project management emerged from software development before its adoption in construction for managing designs and coordinating stakeholders and implementing iterative development approaches (Conforto et al., 2014). Agile functions through adaptive planning methods which combine team collaboration with continuous feedback. Scrum stands as the most popular framework among Kanban and Extreme Programming (XP) and other Agile frameworks.

The construction industry uses Agile principles to support early-stage design development through iterative prototyping and fast decision-making and stakeholder engagement. The implementation of Agile principles leads to better change adaptability and higher client satisfaction rates. Large-scale infrastructure projects with complex contractual and regulatory requirements face risks because Agile lacks sufficient structure (Almeida et al., 2021).

The core principles of Agile do not contain sustainability elements but its focus on client value and waste reduction and stakeholder collaboration creates opportunities to achieve sustainability outcomes mainly in social and operational aspects.

2.3.3 Lean Construction

The Toyota Production System has inspired Lean Construction to become a project delivery philosophy. The system aims to eliminate waste while creating maximum value through ongoing process enhancement (Koskela, 2000). The Last Planner System and value stream mapping and pull scheduling represent fundamental tools in Lean implementation. The construction industry benefits significantly from Lean principles because they help minimize delays and material waste and improve coordination between teams. Lean improves both efficiency and predictability through its methods of workflow reliability enhancement and variability reduction and participant-based planning engagement (Ballard & Howell, 2003).

The implementation of Lean principles leads to sustainability through decreased resource usage and enhanced safety standards and increased transparency. The lack of formal governance structures in Lean makes it challenging to implement in project environments that require strong bureaucratic control or regulatory compliance. The explicit inclusion of environmental and social sustainability depends on leadership or client direction for implementation.

2.3.4 Building Information Modelling (BIM)

BIM functions as a digital process which enables information sharing across project lifecycles instead of being a traditional project management methodology. BIM provides capabilities for 3D modeling as well as clash detection and cost estimation and facility management integration according to Eastman et al. (2011). Modern construction projects especially large-scale infrastructure developments require BIM as their essential tool. BIM supports sustainability through its capabilities to predict energy consumption and select materials efficiently and extend project life cycles. BIM provides stakeholders with necessary information to make decisions during design development which minimizes future costly modifications. BIM integration with PMS frameworks leads to better collaboration and transparency while improving sustainability reporting capabilities. BIM adoption rates differ significantly throughout the construction industry particularly among small and medium-sized enterprises. The implementation of BIM faces three main barriers which include software expenses together with training requirements and employee reluctance to adopt new systems (Hardin & McCool, 2015).

2.3.5 Application in the Irish Construction Sector

The Irish construction industry in Dublin uses multiple PMS frameworks based on project dimensions and client types and contractor preferences. The use of formal systems such as PRINCE2 or PMBOK becomes necessary for public infrastructure projects because they need to meet compliance and reporting requirements. Private sector firms together with SMEs use Agile and Lean principles to enhance their flexibility and cost-effectiveness in operations.

The integration of sustainability into PMS frameworks shows inconsistent results based on both survey data and anecdotal evidence. Some organizations include environmental and social targets within their planning processes and reporting systems but other organizations view sustainability requirements as external obligations instead of fundamental performance indicators. The inconsistent implementation of PMS systems leads to doubts about their ability to produce quantifiable sustainability results.

The evaluation of system usage and implementation methods alongside their sustainability facilitation capabilities becomes vital for understanding. The research investigates these connections by collecting data from Dublin-based construction industry professionals.

2.4 Linking PMS with Sustainability: Theoretical Perspectives

PMS face both practical and theoretical challenges when integrating sustainability practices. Research has expanded to analyze how traditional and contemporary PMS frameworks enable sustainability goal achievement. Multiple theoretical frameworks explain this connection through systems theory and stakeholder theory and value management and institutional theory (Silvius & Schipper, 2014; Martens & Carvalho, 2017).

2.4.1 Systems Theory Perspective

Systems theory defines projects as open systems which function inside bigger organizational and social and environmental frameworks (Turner & Müller, 2003). The management of projects requires consideration of external factors which affect their inputs and processes and resulting outcomes according to this perspective. Sustainability functions as a systemic property which needs to be integrated throughout the entire project lifecycle according to this perspective.

The approach matches well with PRINCE2 and PMBOK frameworks because they promote integrated processes and risk management and stakeholder alignment. The

operationalization of sustainability into measurable actions through PMS tools remains limited unless the tools specifically include this functionality according to Gareis et al. (2013). The theoretical potential of PMS for systemic sustainability remains unproven because standard PMS tools lack specific metrics and feedback loops and stakeholder engagement mechanisms.

2.4.2 Stakeholder Theory

Stakeholder theory serves as a fundamental theoretical base which indicates that project success and sustainability emerge from satisfying all stakeholder requirements beyond client or sponsor needs (Freeman, 1984). The stakeholders in construction projects consist of local communities together with regulators and employees and suppliers and end users. The stakeholder management approach in PMS frameworks such as PMBOK's stakeholder knowledge area and Agile's iterative feedback loops provides effective ways to integrate sustainability especially its social dimension. The involvement of communities during initial decision phases leads to better project acceptance and decreases future risks according to Silvius and Schipper (2015). Stakeholder engagement functions as a strategic sustainability mechanism but organizations typically use it as a communication tool which diminishes its long-term effectiveness (Aarseth et al., 2017).

2.4.3 Value Management and Benefits Realisation

The current approach to connect PMS with sustainability uses value management and benefits realization methods. These concepts concentrate on guaranteeing that projects produce enduring value which supports organizational strategy and stakeholder expectations (Zwikael & Smyrk, 2011). Sustainability becomes a long-term benefit which can be integrated into project planning and success metrics.

The principle of “continued business justification” in PRINCE2 and PMI’s focus on benefits realisation support this alignment. The practical application of value management remains limited because sustainability does not need to be included in contractual requirements for short-term cost-driven projects. Research indicates that sustainability will remain marginalized in decision-making unless it becomes directly connected to project value perceptions and tracked through PMS tools (Silvius et al., 2012).

2.4.4 Institutional Theory and Organizational Context

Organizational behavior together with Performance Management Systems and sustainability practices gets shaped by regulatory pressures and normative and cultural influences according to DiMaggio and Powell (1983). Companies operating in Ireland must implement sustainability features because government policy now requires green procurement and sustainable infrastructure (Department of Public Expenditure and Reform, 2021) to gain legitimacy and meet funding criteria.

The adoption of institutional practices does not automatically result in faithful implementation. A company might adopt sustainable practices externally to fulfill outside expectations yet maintain its standard business operations internally. The practice of presenting false environmental commitments through superficial compliance is commonly known as greenwashing. The implementation of PMS tools becomes more effective at risk reduction through traceable indicators and stage-based accountability mechanisms (Martens & Carvalho, 2017).

2.4.5 Theoretical Gaps and Challenges

The theories offer useful frameworks, yet multiple challenges persist. The multiple dimensions and conflicting definitions of sustainability create difficulties when attempting to establish standardization across PMS tools. The majority of PMS frameworks existed before sustainability became a primary project concern and their adaptation has been performed reactively instead of being integrated (Silvius & Schipper, 2014). The current research lacks empirical studies which demonstrate how theoretical models produce measurable sustainability results in actual construction sites particularly within SMEs.

Theoretical models establish general frameworks yet they do not provide sufficient direction for everyday project decisions. Systems theory promotes comprehensive thinking yet it fails to provide specific guidance about how project managers should handle time limitations against carbon reduction targets and community requirements. The absence of practical implementation guidance restricts the real-world effectiveness of theory-based PMS improvement strategies.

Silvius et al. (2012) propose that sustainability integration needs two simultaneous approaches which combine PMS tool adaptation for sustainability processes with cultural development of

project professionals toward extended thinking. The translation of theory into meaningful practice requires this combined approach.

2.4.6 Relevance to the Current Study

The research extends existing theoretical work to assess how PMS frameworks in Dublin's construction sector promote sustainability results. The research uses systems theory and stakeholder theory to assess sustainability integration in current PMS practices while evaluating their ability to create enduring value beyond compliance. The research examines institutional factors including national policy and industry norms which affect PMS adoption and sustainability integration. The research adds theoretical value through its empirical findings about a particular geographic area and industry sector. The research addresses a literature need for studies that connect project theory to sustainability performance in real-world practice.

2.5 Empirical Evidence on PMS and Sustainability Outcomes

Theoretical discussions about integrating sustainability into project management systems are extensive but empirical evidence remains relatively limited especially in the construction sector. The existing research indicates conflicting outcomes about how PMS frameworks affect environmental and social and operational sustainability results in real-world applications (Martens & Carvalho, 2017; Silvius & Schipper, 2015). This section examines essential empirical research findings to identify recurring patterns and obstacles which demonstrate the necessity for additional investigation.

2.5.1 Environmental Sustainability Outcomes

Construction projects achieve environmental sustainability through methods which decrease carbon emissions while reducing resource consumption and enhancing energy performance from start to finish. Various research studies have tried to determine how PMS tools help achieve these sustainability goals. Silvius et al. (2012) conducted a cross-industry survey which revealed that project managers recognized environmental sustainability's importance, yet they had not integrated PMS tools such as risk management or procurement processes to directly address this issue.

The research conducted by Zuo and Zhao (2014) studied green building projects in China and Australia which demonstrated that sustainability outcomes resulted from client requirements and

certification schemes (e.g., LEED, BREEAM) instead of PMS frameworks. The alignment of PMS tools with green building standards led to better environmental results when projects scheduled energy-efficient installations and tracked material origins. The projects lacked consistent integration of sustainability practices because they relied on leadership dedication and supply chain coordination.

The research by Aaltonen et al. (2015) analyzed large infrastructure projects in Nordic countries to find that PMS frameworks produced minimal long-term environmental results unless sustainability key performance indicators (KPIs) were incorporated during project initiation. The success of converting PMS processes into measurable sustainability outcomes depends on both early-stage planning and system customization.

2.5.2 Social Sustainability Outcomes

Social sustainability includes stakeholder inclusion together with labour practices and health and safety and community engagement. The research conducted by Martens and Carvalho (2017) demonstrated that stakeholder management processes in PMBOK and Agile methods produced superior social results through local community involvement during project initiation.

The research conducted by Ochieng et al. (2014) on international construction projects demonstrated that project teams which used structured communication plans supported by PMS documentation maintained stakeholder trust and reduced resistance. The effectiveness of these tools depended on cultural elements together with organizational development levels and project manager autonomy.

Aarseth et al. (2017) conducted research in the UK which revealed that social sustainability received less attention than environmental and economic targets. Project managers stated that social aspects proved challenging to measure and were only included in official reports when funders or regulators required it. The insufficient nature of PMS frameworks becomes apparent because they need external incentives or standards to be effective.

2.5.3 Operational and Economic Sustainability Outcomes

Operational sustainability describes the capability of a project to maintain its effectiveness through time while using resources efficiently and remaining resistant to disruptions. Lean Construction practices demonstrate strong potential in this area. Ballard and Howell (2003) showed that Lean principles implemented through planning tools and workflow systems decreased waste and enhanced long-term operational efficiency.

The research conducted by Ulubeyli et al. (2020) on Turkish construction firms demonstrated that using PRINCE2 and PMBOK tools led to better documentation and reduced errors and improved coordination which resulted in better lifecycle cost management. The advantages became more apparent in organizations with larger size and staff who had project experience. SMEs encountered difficulties in sustaining these advantages because they did not receive formal PMS training.

The economic aspect of sustainability manifests through benefits realization and value creation. Zwikael and Smyrk (2011) state that PMS systems which monitor benefits throughout time instead of concentrating on delivery will better support sustainable economic results. Many construction projects stop tracking benefits after the handover process ends according to empirical evidence. The assessment of sustainability objectives achievement and maintenance after delivery becomes impossible because of this limitation.

2.5.4 Combined Outcomes and Integrated Frameworks

Multiple research studies investigate the integration of PMS tools with sustainability standards and digital technologies including BIM. The research by Lê and Bröchner (2021) examined Scandinavian infrastructure projects which implemented BIM alongside Lean and PRINCE2 methodologies. The research revealed that projects implementing this combined approach achieved superior results in energy modeling and lifecycle planning and stakeholder transparency.

The Crossrail project in London serves as an example where PMS tools operated alongside environmental management systems (EMS). The project sustainability strategy established specific targets for carbon reduction together with waste minimization and workforce diversity goals. Project leaders used regular audits together with dashboard reporting to monitor progress while making necessary adjustments (Crossrail Ltd, 2018).

These examples function as exceptions because they do not represent standard practice. Most empirical research indicates that PMS frameworks need explicit sustainability indicator inclusion along with leadership support and policy backing to achieve meaningful influence (Martens & Carvalho, 2017).

2.5.5 Contextual Evidence from Ireland

The Irish data collection on PMS and sustainability shows limited growth but increasing numbers. The National Development Plan (2021–2030) includes sustainability as a priority for infrastructure delivery yet organizations show different levels of implementation. The CIF conducted a 2020 survey which showed that sustainability ranked as a top priority for 78% of firms yet only 39% used formal tools to measure sustainability outcomes.

SMEs in Ireland encounter three main obstacles when implementing PMS frameworks for sustainability because they lack training and standardization and face unclear client requirements. The findings of this study demonstrate that policy goals do not match actual project implementation thus requiring research to evaluate PMS usage in real-world projects and its effectiveness in supporting sustainability.

2.6 Identified Gaps and Research Justification

The previous sections have reviewed an increasing number of studies which examine the relationship between PMS and sustainability performance in construction. The theoretical foundations of systems theory, stakeholder theory and value management provide a strong rationale for integrating sustainability into PMS frameworks, but empirical findings remain fragmented and inconclusive. These inconsistencies, particularly in relation to measurable sustainability outcomes, expose critical gaps in knowledge and practice.

2.6.1 Theoretical Gaps

The academic literature shows that multiple frameworks including PRINCE2 and PMBOK and Agile and Lean recognize sustainability principles, yet they fail to provide clear conceptual integration of sustainability within PMS structures. The academic literature demonstrates that stakeholder engagement and risk management and long-term value delivery align theoretically with sustainability goals according to Silvius & Schipper (2015) and Martens & Carvalho (2017). The translation of theoretical constructs into systematic tools and processes for actual

project environments remains poorly demonstrated in existing research. The literature shows inconsistent definitions of sustainability while project success metrics rarely use sustainability as their main performance indicator (Turner & Zolin, 2012). The theoretical models face challenges in operationalization because of this disconnect between different contexts. The literature fails to provide integrated conceptual frameworks which link PMS functionality to environmental social and operational sustainability outcomes in a unified and verifiable way.

2.6.2 Empirical Gaps

The current lack of empirical research about PMS effectiveness in achieving sustainability results creates a major research deficiency. Research on sustainability performance in green building projects and infrastructure delivery exists (Zuo & Zhao, 2014; Lê & Bröchner, 2021) but most studies focus on large-scale or government-funded projects. The research findings from these studies lack applicability to the general construction sector because SMEs dominate the Irish construction industry.

Empirical studies primarily concentrate on specific sustainability elements such as carbon reduction or stakeholder engagement instead of using a comprehensive sustainability framework. The current fragmented perspective fails to evaluate how PMS frameworks perform when considering all sustainability dimensions including environmental, social and operational aspects. Research on sustainability outcomes from the perspective of PMS tool implementers such as project managers, engineers and contractors remains scarce.

2.6.3 Contextual Gaps in the Irish Construction Sector

The National Development Plan (2021–2030) of Ireland together with the Climate Action Plan establish clear national targets for sustainable construction and low-carbon infrastructure development. The project-level execution shows inconsistent results. The Construction Industry Federation (2020) reports that sustainability receives broad industry recognition, yet organizations lack established systems to monitor and incorporate sustainability throughout project delivery.

The majority of Irish construction companies including SMEs fail to use standard PMS like PRINCE2 or PMBOK in a regular fashion. The project management practices in these organizations follow either informal procedures or established organizational protocols which do

not provide sufficient structure to monitor sustainability performance. The lack of alignment between national policy targets and project-level operational methods results in performance gaps that emerge between planning objectives and actual delivery.

Research on Irish construction primarily examines technical advancements such as BIM adoption and offsite manufacturing alongside regulatory compliance instead of studying how management systems impact sustainability performance. Research studies must investigate how PMS frameworks function in real-world Irish construction projects to determine their effectiveness in supporting sustainability outcomes.

2.6.4 Gaps in Measuring Sustainability Impact

The implementation of PMS lacks dependable sustainability impact evaluation tools and performance metrics. Project management tools track cost and time and scope but sustainability-related KPIs such as carbon footprint and energy use and workforce diversity and lifecycle maintenance are rarely included unless external certification schemes require them (Silvius et al., 2012; Aarseth et al., 2017).

The absence of integrated measurement tools hinders project teams from making data-driven choices and showing the sustainability benefits of PMS implementation. The absence of standardized metrics makes it challenging to evaluate project performance differences and validate PMS training and implementation expenses. Sustainability initiatives face the risk of becoming superficial or short-term because they lack measurable outcomes and extended tracking systems.

2.6.5 Research Justification and Contribution

The research fills these knowledge gaps by studying how PMS frameworks affect sustainability performance in infrastructure projects that operate within Dublin's construction sector. The research investigates three sustainability dimensions through an analysis of how PMS tools (scheduling, stakeholder management, documentation, planning, reporting) affect sustainability goals.

2.6.6 The justification for this research rests on several factors:

- **Relevance to policy:** Ireland's commitment to sustainability in public infrastructure requires a better understanding of whether and how PMS frameworks support policy delivery.
- **Practical application:** By focusing on construction professionals working in Dublin, the study provides empirical evidence of PMS usage and sustainability integration from the practitioner's perspective.
- **Academic contribution:** The study contributes to the literature by bridging theoretical models with real-world practices and highlighting challenges in operationalising sustainability through PMS.
- **Sector-specific insights:** Construction projects face unique challenges, such as fragmentation, subcontracting, and site-specific risks. These are rarely captured in broader project management studies but are central to understanding sustainability delivery in practice.

The research design combines a literature review with survey data from industry professionals through a mixed-methods approach. The research methodology provides a solid foundation for understanding PMS frameworks in practice while assessing their ability to produce measurable sustainability results.

The research investigates sustainability-oriented PMS practices in the Irish construction sector to develop effective methods for improving sustainability outcomes. The research findings will help develop policy recommendations and project training modules and organizational strategies to bridge the sustainability gap between project ambitions and realities.

3. METHODOLOGY

3.1 Introduction

The research uses quantitative methods to study how PMS affect sustainability performance in Dublin's construction industry. The research employed deductive reasoning to evaluate empirical data against relationships which literature established. The research follows a post-positivist approach because it supports the use of structured tools and observable data to explore patterns and generalize findings.

The researcher created a structured online questionnaire which they distributed to Dublin-based infrastructure project professionals. The questionnaire contained both multiple-choice questions and Likert-scale questions to measure respondents' views about PMS implementation and its effects on environmental sustainability and social and operational aspects.

This chapter outlines the research philosophy, approach, and methodology employed to achieve the study's objectives. It explains the rationale for adopting a structured questionnaire as the primary data collection method, the sampling strategy, and the analytical techniques used. The chapter also highlights the measures undertaken to ensure validity, reliability, and adherence to ethical guidelines, aligning with best practices in research design (Saunders et al., 2019; Creswell & Creswell, 2018).

3.2 Research Philosophy and Approach

PMS and their impact on sustainability outcomes in infrastructure projects require philosophical support to establish structured inquiry and real-world observation relationships. Post-positivism serves as the research philosophy of this study because it supports empirical data collection for knowledge development while acknowledging human knowledge remains imperfect within context-specific boundaries (Creswell & Creswell, 2018).

The research requires post-positivism because it verifies objective reality (PMS effects on sustainability performance) while understanding that data interpretation provides only approximate results. Post-positivism differs from pure positivism because it allows researchers to use their judgment while performing contextual interpretation alongside flexible data tools that include surveys. The research methodology suits social

construction projects since multiple actors and project-specific dynamics influence their outcomes (Saunders, Lewis & Thornhill, 2019).

The research methodology follows a philosophical framework informed by positivism, adopting a deductive research approach. The deductive method starts with pre-existing theories including stakeholder theory and PMS models and sustainability in project success to validate them through empirical data analysis (Bryman, 2016). The literature review exposed repeated statements showing how PMS frameworks enable sustainability through planning functions along with stakeholder engagement tools and documentation capabilities and reporting features. The claims about PMS effectiveness in sustaining practices need verification through everyday evidence especially in the Irish construction sector.

3.3 Research Method

The research adopts a quantitative research paradigm which matches the philosophical approach of post-positivism and the deductive method of reasoning. The collection of measurable data from a big sample through quantitative research methods allows scientists to discover patterns along with connections and possible cause-and-effect relationships. The research method proves beneficial for this situation because it helps establish general findings about PMS adoption effects on sustainability performance across multiple Dublin infrastructure projects.

3.4 Research Design and Strategy

The research design defines the entire study plan by explaining the research type and data collection structure while specifying methods for answering research questions. The study design combines descriptive methods with cross-sectional approaches to investigate PMS framework effects on sustainability outcomes in Dublin's infrastructure projects. A descriptive design was appropriate for this research because it enables the observation of existing practices and attitudes and conditions in a particular population which consists of construction project management professionals. The research aims to reveal the existing connections between PMS tools and their frequency of application together with their alignment to sustainability targets in environmental, social and operational aspects. Descriptive studies work best with survey research methods to collect information from big samples according to Saunders, Lewis & Thornhill (2019).

The study employed a cross-sectional research design because it gathered data at one specific point instead of spanning multiple time periods. The research employed this methodology because it satisfied time limitations while serving the exploratory nature of the study. The dissertation's scope did not allow for tracking changes through longitudinal designs, so the researchers selected this approach. This strategy gives important insights about current practices and perceptions which can steer future research and organisational strategies.

The research design enables data collection from Irish construction practitioners through descriptive cross-sectional surveys in a logical and operational way. The research design connects academic standards to real-world data collection that serves the research goals.

3.5 Data Collection Method

The research investigates PMS effects on sustainability results in construction projects by using primary survey data collection through an online structured survey. The survey method provided the best solution because it enabled researchers to contact participants across different locations and generated uniform data for quantitative evaluation (Creswell & Creswell, 2018).

The survey method served as the main instrument for data collection through which the research employed. Research studies that use surveys as their primary data collection method achieve successful results in gathering organized data from large groups of people (Bryman, 2016). The research team distributed the survey through Google Forms to make data collection easier while reaching participants spread across multiple construction sites and firms in Dublin.

The survey instrument consisted of closed-ended questions alongside Likert-scale questions that measured respondents' perceptions and PMS usage frequency as well as sustainability practice integration into project workflows. The research goal to evaluate specific PMS tools and their perceived effectiveness in supporting sustainability outcomes is supported by this structured approach.

3.5.1 The survey includes four main sections

The survey begins by asking about professional and demographic information which includes job role and years of experience and organization type and sustainability project involvement. The

survey examines PMS framework implementation by asking about specific frameworks (PRINCE2, PMBOK, Agile, Lean) and their practical application in the field.

The survey contains Likert-scale items (1–5) that evaluate participants' opinions about PMS tool support for environmental sustainability and social sustainability and operational sustainability. The survey contains questions about sustainability implementation barriers through PMS and asks participants to provide recommendations for enhancement.

The survey contains mostly closed-ended questions with multiple choice and scaled items which enable structured data analysis and facilitate comparison between responses. The survey duration is estimated to be between 2 to 3 minutes which makes it suitable for professionals who have limited time.

Three industry professionals participated in a pilot test of the survey to evaluate the question clarity and relevance and question flow. The pilot survey feedback resulted in small changes to question wording and layout which enhanced the user experience. The survey questions demonstrate face validity because they show logical connections to their measurement concepts and are easily understood by the target audience (Saunders, Lewis & Thornhill, 2019).

The survey reached participants through email and LinkedIn while providing a summary of the academic research goals. The survey requires voluntary participation from participants who confirm their consent by checking a box at the beginning of the form. All data is collected anonymously.

The data collection process remains active at the present time. The collected responses are currently being evaluated for their completeness and relevance. The final data analysis will begin after receiving enough responses and obtaining ethical approval. The data collection approach establishes both practical and academic standards to study PMS practices together with their sustainability connections in the Dublin construction sector.

3.6 Sampling and Respondent Profile

The research used non-probability purposive sampling to collect data from Dublin professionals who work directly on infrastructure projects. The research required professionals who have experience with project delivery or planning or supervision in construction to participate in the study because it focused on PMS and sustainability integration.

The researcher selected purposive sampling because it enables the selection of participants who have the required knowledge and context to answer the research questions (Etikan, Musa & Alkassim, 2016). The research method works best for studying specialized populations and obtaining information from specific groups including project managers and engineers who understand PMS frameworks such as PRINCE2, PMBOK, Agile, or Lean.

3.6.1 The inclusion criteria for participants were as follows

The participants have worked on construction projects in Dublin during the present time or have done so in the recent past. Experience with any formal or informal project management system, Familiarity with sustainability principles or project-level environmental, social, or operational practices.

The survey invitation was distributed to participants through their professional networks including direct emails and LinkedIn messages. This approach helped to reach a diverse group of professionals who work as site managers and architects and quantity surveyors and sustainability consultants and contractors.

At the time of writing, data collection is still in progress. The initial responses show that the participants are diverse in terms of their professional roles and the types of projects they are involved in. Most of the respondents are working on medium to large scale public and private infrastructure projects including roadworks, housing developments, utilities and commercial construction. The minimum number of responses that will be targeted is 20-30 in order to ensure that the data is sufficient for meaningful analysis while being aware of the constraints of the dissertation level research. A summary table of participant demographics will be presented in the Findings chapter when the data collection is finalised.

The purposive sampling method used in this study limits the generalizability of the findings to the Irish construction industry as a whole. However, the objective of this study is to provide detailed context specific information, not statistical generalizations. The selection of participants based on their relevance to the research topic enhances the validity and applicability of the findings to real world project management practices in Dublin's infrastructure sector.

This sampling strategy, which is targeted, combined with a well-structured survey instrument, ensures that the data collected is directly relevant to the research objectives and can effectively inform conclusions about the relationship between PMS frameworks and sustainability outcomes.

3.7 Data Analysis Techniques

The research methodology for data analysis followed a quantitative post-positivist approach, which was appropriate for the collected structured survey data. The first step of data analysis involved the use of descriptive statistics such as frequency distributions, percentages, means, and standard deviations to describe Likert-scale and closed-ended question responses (Pallant, 2020). The first step in this process enables the identification of patterns within the dataset by describing the central tendencies and variability.

However, while descriptive statistics are helpful in summarizing data, they are not enough to conduct in-depth inferential analysis at this academic level (Field, 2018). Therefore, additional statistical tests will be performed to examine both relationships between variables and differences across groups in order to get more robust and generalizable findings. The following analytical techniques are planned:

3.7.1 Chi-square Test for Independence

To study the association between two nominal variables, for example, whether the use of formalized sustainability strategies (Yes/No/Partial) is related to the type of projects undertaken (Infrastructure, Residential, Commercial, Industrial). Spearman's Rank Correlation: To assess the direction and strength of relationships between two ordinal variables, for example, the relationship between "openness to modifying PMS frameworks" (1–5 Likert scale) and "consistency of PMS application" (1–5 Likert scale). Independent-samples t-test: To check if there is a statistically significant difference in the mean "openness to modifying PMS frameworks" scores between organizations with and without sustainability strategies.

3.7.2 One-way ANOVA

To test for differences in mean "PMS application consistency" scores between more than two groups, such as different project types, followed by post-hoc tests (Tukey) when necessary. The inferential analyses will be carried out using IBM SPSS Statistics software since it provides more powerful features than Microsoft Excel for hypothesis testing and statistical modeling. SPSS

enables the thorough analysis of ordinal and nominal data from the survey in order to fulfill the research objectives and to support the findings with empirical evidence. The use of descriptive and inferential statistics enhances the reliability and validity of findings as they address both the need for summarizing data and the need for deeper statistical testing in line with postgraduate research standards (Bryman & Bell, 2015).

3.8 Reliability, Validity and Ethical Considerations

Research instruments need reliable and valid measurement methods to maintain the quality and trustworthiness of findings. The study employed a structured online survey and implemented multiple measures to boost both data collection reliability and validity.

3.8.1 Reliability

The reliability of measurement refers to its ability to produce consistent results both in the long term and under different circumstances. The survey achieved internal reliability through its standardized language and its use of closed-ended questions and uniform Likert scales. The survey design provided uniform constructs to participants which reduced interpretation-based variability (Saunders, Lewis & Thornhill, 2019).

Three construction professionals participated in a pilot test of the survey. The survey participants' feedback resulted in small modifications to question clarity and flow which decreased the chance of misinterpretation and enhanced the instrument's internal consistency. The lack of software capability to perform Cronbach's alpha reliability testing did not prevent the logical grouping of Likert-scale items and clear expression of their content.

3.8.2 Validity

The instrument demonstrates validity when it successfully measures its intended variables. The research examined multiple validity types. The survey underwent review by industry professionals during the pilot stage to ensure face validity through their assessment of question relevance to the topic.

The survey items achieved content validity through their development based on themes and frameworks which emerged from the literature review about stakeholder involvement and process documentation and sustainability dimensions.

The survey structure aligns with fundamental theoretical elements of PMS and sustainability which enables logical interpretation of results according to established models.

The study aims to understand Dublin infrastructure projects specifically rather than create findings that apply universally because it uses purposive sampling which restricts external validity.

3.8.3 Ethical Considerations

The research implemented all ethical standards specified in the National College of Ireland Research Ethics Guidelines (2024) while following the principles of the Declaration of Helsinki (2013) for academic investigations. The ethical standards were implemented through particular procedures which guaranteed both participant privacy protection and voluntary participation and informed consent.

The survey started with a direct consent statement for participants to read:

“By clicking ‘Next,’ you confirm that you are over 18 years old, currently work in the construction sector in Ireland, and voluntarily agree to participate in this research.”

The participants received complete information about eligibility requirements along with their freedom to participate voluntarily and their ability to leave the study at any time without facing any consequences. Participants received details about the research goals and data handling procedures before starting the questionnaire.

The research protected anonymity by not requesting any personally identifiable details including names or email addresses or company information. The collected data received anonymization immediately after collection while tracking features remained disabled. The researcher maintained exclusive access to password-protected encrypted files containing the data which served only academic purposes.

The research followed GDPR requirements by preventing data sharing with external parties while maintaining storage duration only until research completion before performing secure data deletion. The research received ethical oversight through the research supervisor's approval before starting data analysis. The research procedures followed ethical standards to achieve reliability and validity and maintain academic investigation integrity.

4. FINDINGS & ANALYSIS

4.1 Introduction to Findings

The survey results show that PMS adoption exists in most of the sampled firms, but the type of systems used varies. The survey results show that PMBOK (18.5%) and In-house/Custom frameworks (16.9%) and Lean (16.1%) are the most used methodologies. The other methodologies used are Agile (12.9%), PRINCE2 (12.1%), and Waterfall (11.3%). The survey results show that 12.1% of the respondents indicated that their organizations do not use any formal PMS. This distribution shows that there is a diverse methodological landscape in Dublin's construction industry where both internationally recognized frameworks and internally developed systems coexist.

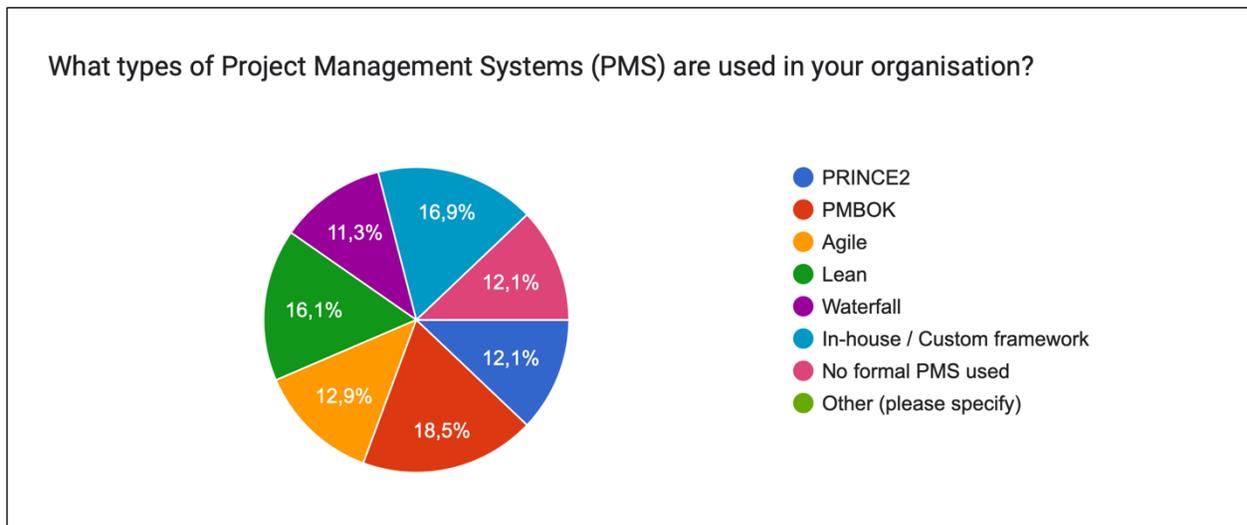


Figure 1 Types of PMS (PMS) used in the organisations

The high number of in-house/custom frameworks indicates that many firms modify their project management practices to suit their operational requirements because of project-specific needs or cultural expectations or client requirements. The fact that some firms do not have a formal PMS is also interesting, as it suggests that some organisations may be using informal or ad hoc processes to manage their projects. This finding is consistent with the literature, which suggests that in industries with diverse project sizes and complexities, organisations tend to use a combination of formal and informal approaches to achieve flexibility and control (Turner & Huemann, 2019).

These results are compared to previous industry surveys (PMI, 2021; McHugh & Hogan, 2011) and show that PMBOK and Lean methodologies are widely adopted globally, while the high number of in-house/custom frameworks indicates a localised adaptation strategy in Dublin’s construction sector. The fact that over 12% of firms do not have a formal PMS may indicate a lack of process standardisation, which could have implications for project sustainability performance—a relationship that is explored in the following sections of this chapter.

4.2 PMS Implementation Consistency

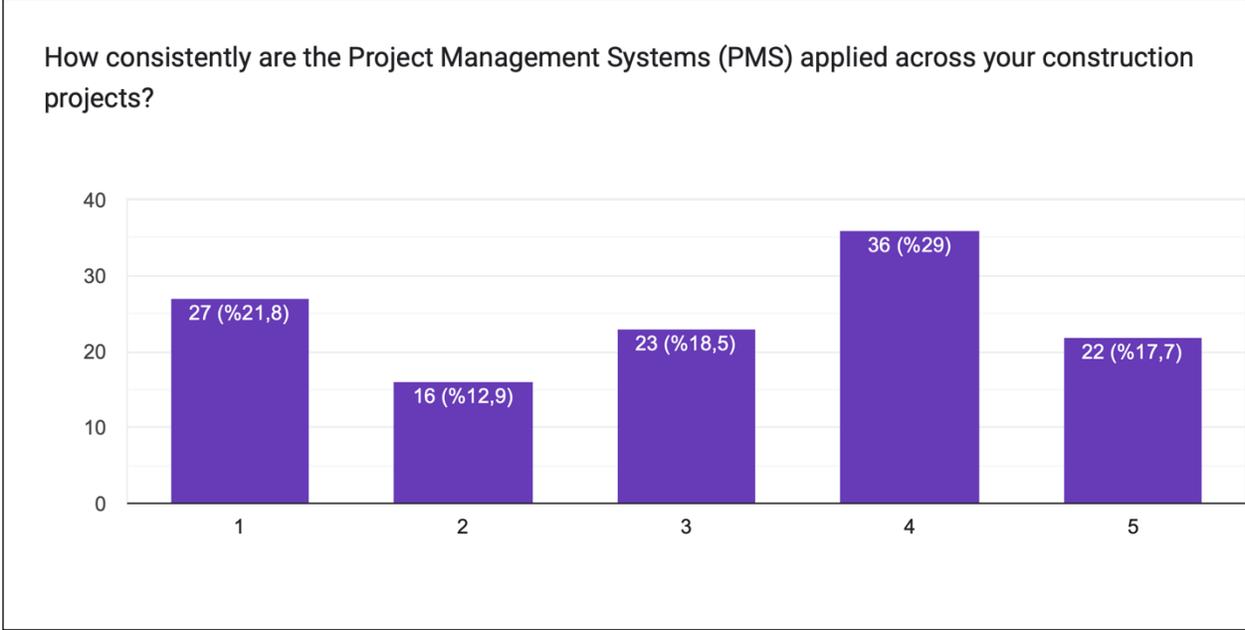


Figure 2 Consistency of Project Management System (PMS) implementation across construction projects (n=124)

The figure 2 displays the responses to the question of how consistently PMS are used in construction projects across different organizations, based on a 5-point Likert scale where 1 stands for “rarely applied” and 5 stands for “always applied.” Among the 124 responses, the largest proportion of participants (29%) chose 4, which implies that PMS is frequently implemented in many organizations, but not in every project. This is followed by 21.8% selecting 1, indicating that a notable segment applies PMS only sporadically. Lower consistency levels (2 and 3) were chosen by 12.9% and 18.5% of respondents respectively, while 17.7% reported full consistency (5).

The results show that there is a mixed picture of how PMS are integrated in Dublin's construction sector. This figure reveals that a significant portion of the respondents (46.7%) fall within the upper consistency range (4 and 5), yet a considerable number of respondents (34.7%) are in the lower range (1 and 2), indicating the uneven commitment of organizations to standardized project management practices. Such variation may be attributed to differences in company size, resources, project complexity, or leadership priorities, as mentioned in previous studies (Kerzner, 2017; Joslin and Müller, 2015).

These findings are in line with the literature which highlights that consistent application of PMS is linked to better project outcomes (PMI, 2021). PRINCE2 and PMBOK, for example, advocate for standardization to improve predictability and control, but the observed inconsistency may indicate that some organizations do not have formal governance systems or cultural issues with adoption. Similar gaps have been found in other European construction markets, where dispersed application reduces potential gains in efficiency (Turner, 2016).

From a sustainability viewpoint, the inconsistency in PMS usage may impede the ability to incorporate environmental and social performance indicators across the project life cycle. Research has shown that sustainability integration is most beneficial when supported by standardized management approaches (Silvius and Schipper, 2014). Therefore, the mid-to-low consistency levels observed here require further investigation in the analysis, particularly in investigating the relationship between PMS consistency and sustainability performance outcomes.

4.3 Duration of PMS Usage

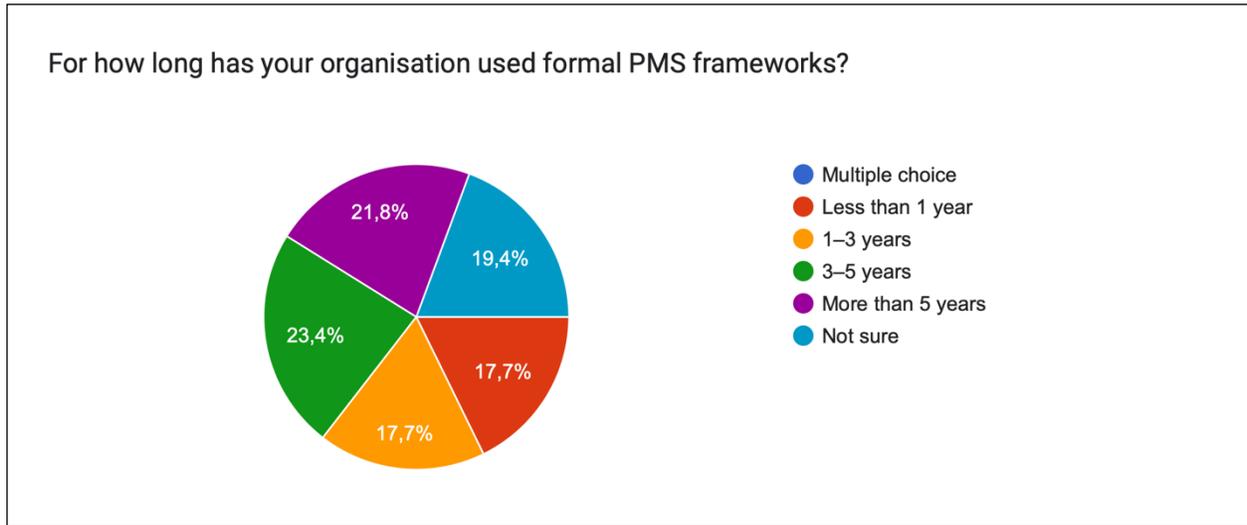


Figure 3 Duration of formal Project Management System (PMS) usage among surveyed organisations (n = 124).

The survey results show that Dublin's construction sector has experienced different patterns of formal PMS adoption throughout its history. The survey results show that 23.4% of respondents used formal PMS frameworks for 3–5 years followed by 21.8% who used them for more than 5 years. The survey results show that 19.4% of respondents were unsure about the duration of their PMS framework usage possibly because they used it sporadically or their organization did not track its implementation. The adoption duration of respondents who used PMS frameworks for less than one year matched the duration of those who used them for 1–3 years at 17.7% each.

The survey results show that many organizations in the sector have gained extensive experience with PMS frameworks yet numerous organizations either recently started using these systems or remain uncertain about their implementation duration. The study by Müller et al. (2019) shows that PMS usage maturity affects sustainability practice integration because organizations with more experience demonstrate better procedural consistency and data-based decision-making. The long-term implementation of sustainability-focused project management practices faces challenges when organizations have limited or unclear PMS adoption periods according to PMI (2021).

4.4 Environmental Sustainability Outcomes

The construction sector faces growing importance for environmental sustainability because its operations create substantial environmental impacts through energy usage and waste production and carbon dioxide emissions (Kibert, 2016; Ding, 2008). PMS serve as essential tools to reduce environmental impacts through their ability to incorporate sustainability targets throughout project planning and execution and monitoring processes (Silvius & Schipper, 2014). The survey results about environmental sustainability practices include data on waste reduction methods and energy efficiency measures as well as monitoring approaches and the implementation of environmental targets within project documentation and planning processes. The analysis assesses the consistency of these practices while detecting patterns between different PMS types and verifies the results against existing research findings.

4.4.1 Reduction of Material Waste

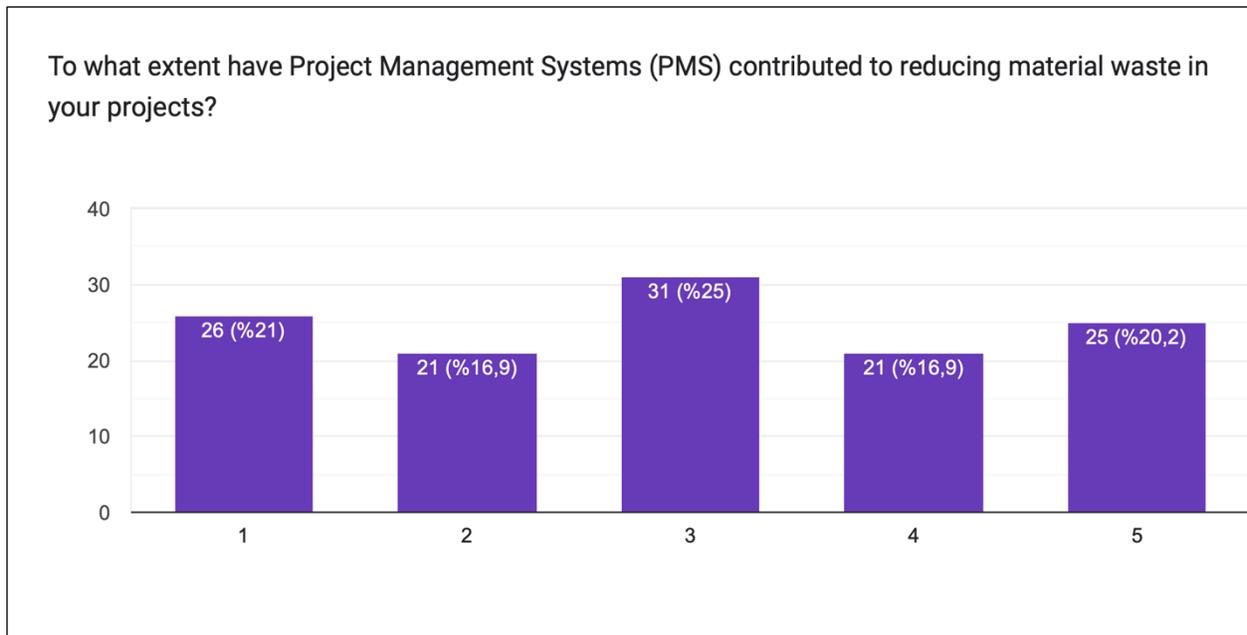


Figure 4 Survey results on material waste reduction.

The survey asked participants to assess how their organization's PMS system affected material waste reduction in construction projects. The survey results (Figure 4) show that most participants recognized positive effects from their PMS system which they rated as moderate to high. The literature supports this finding because formal PMS frameworks help organizations manage

resources systematically which leads to reduced inefficiencies and waste (Ajayi et al., 2015). Organizations that implemented Lean and PRINCE2 frameworks demonstrated higher waste reduction perceptions according to studies which show Lean principles effectively minimize non-value-adding activities (Ohno, 1988).

4.4.2 Contribution to Energy Efficiency

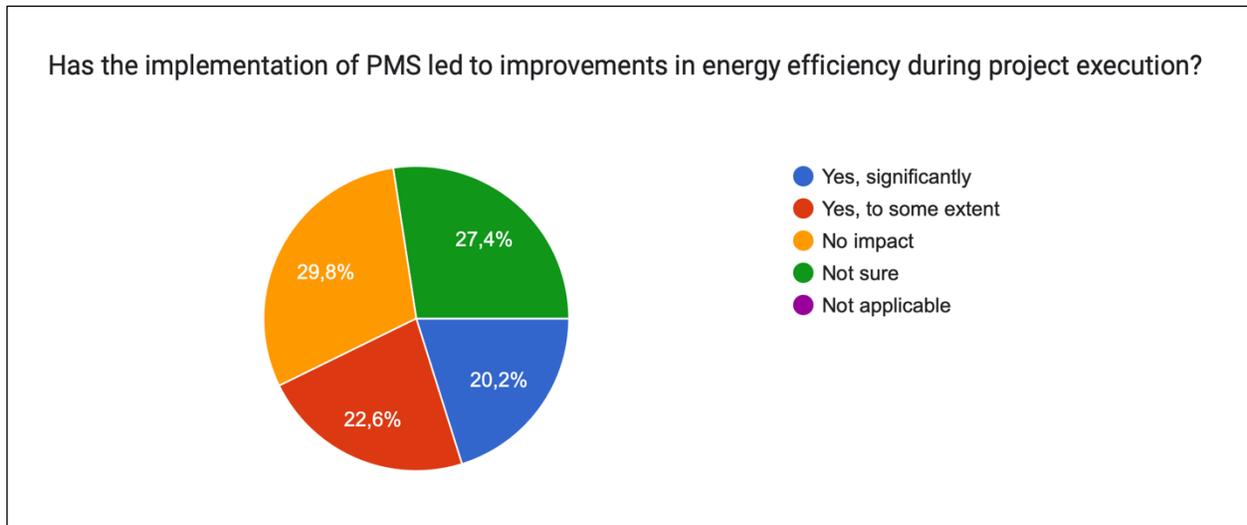


Figure 5 Survey results on energy efficiency contribution.

The survey evaluated how PMS implementation affected energy efficiency throughout construction activities (Figure 5). The survey results showed less consistency regarding energy efficiency improvements compared to waste reduction because fewer participants reported significant contributions. The literature shows that PMS provides a framework for energy management yet achieving quantifiable improvements demands supplementary tools including BIM or Life Cycle Assessment integration (Maqsood et al., 2021). The energy efficiency gains were less frequently linked to Agile frameworks because these frameworks place less emphasis on standardized sustainability checkpoints.

4.4.3 Monitoring of Material Waste

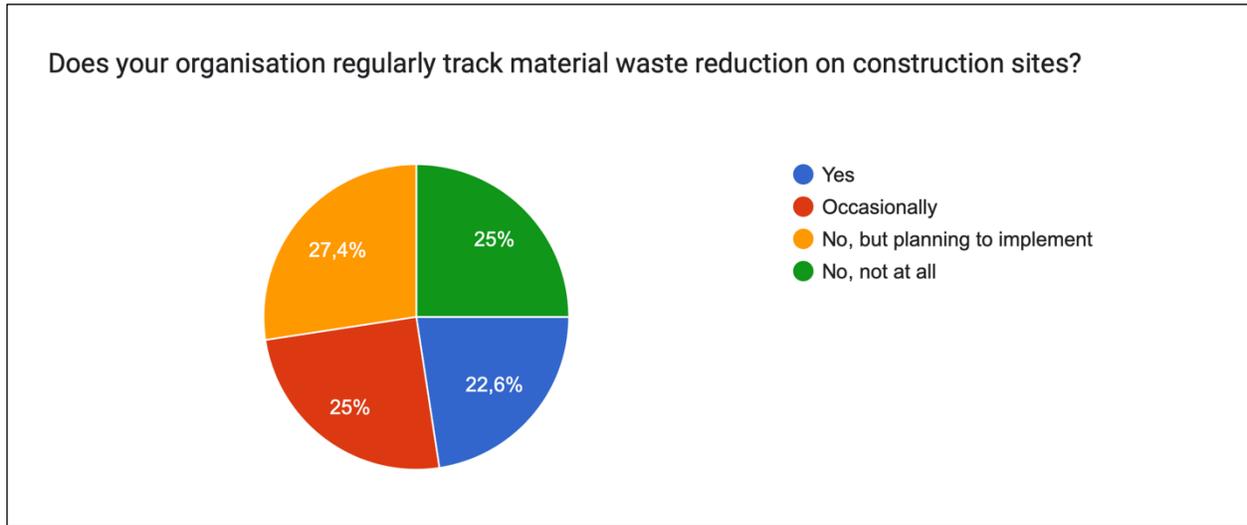


Figure 6 Monitoring of material waste

The measurement of material waste production and waste disposal serves as a fundamental indicator for environmental performance assessment. The survey results (Figure 6) show that numerous organizations monitor their waste levels yet their tracking methods differ substantially. Organizations that implement PMBOK and PRINCE2 frameworks showed better consistency in monitoring activities which indicates that structured frameworks help organizations track data systematically. The survey revealed that about one-third of organizations maintained either no formal tracking system or minimal tracking practices which shows a discrepancy between their sustainability goals and actual operational practices. Previous research by Osmani et al. (2008) has identified this gap as a major obstacle for achieving substantial waste reduction.

4.4.4 Monitoring of Energy Use

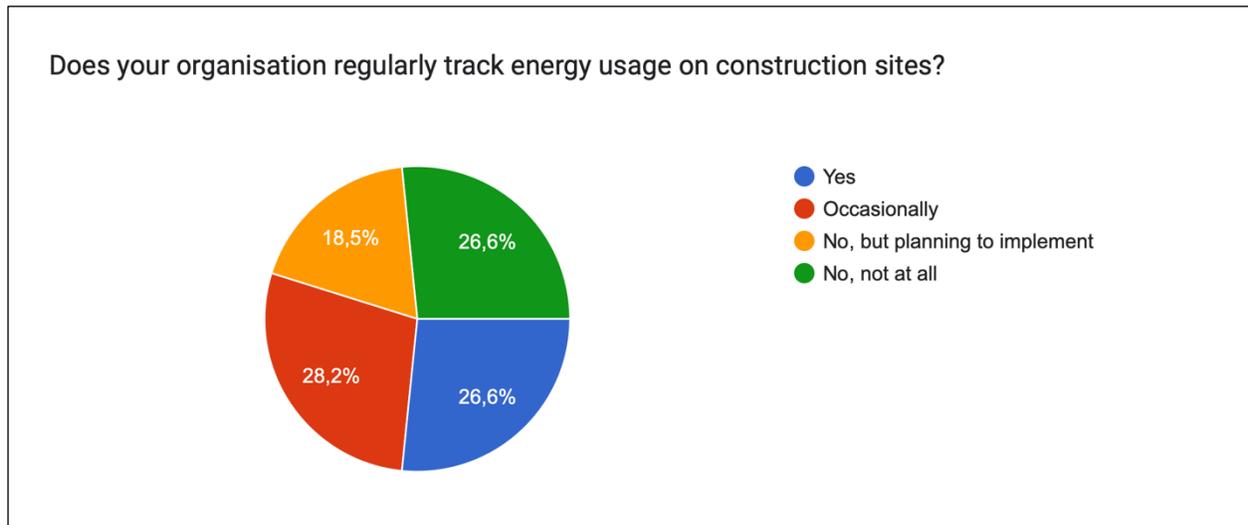


Figure 7 Monitoring of energy use.

The data on energy use monitoring (Figure 7) showed even lower adoption rates than waste monitoring, with a notable share of respondents indicating rare or no formal tracking. Literature suggests that energy monitoring in construction is often hindered by the perceived complexity of measurement and lack of clear accountability mechanisms (Azhar et al., 2011). In contrast, projects that incorporated environmental KPIs directly into their PMS documentation demonstrated more consistent energy tracking.

4.4.5 Integration of Environmental Goals into PMS Documentation

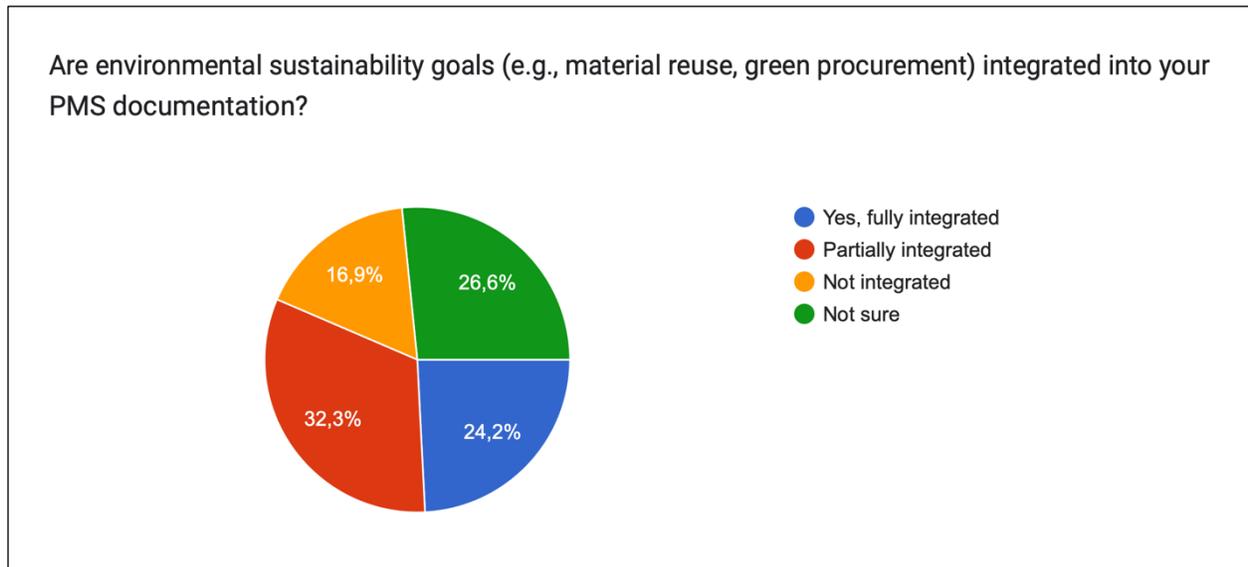


Figure 8 Integration of environmental goals into PMS documentation.

The survey results (Figure 8) showed that many organizations included environmental goals in their PMS documentation, but a significant number did not. The documentation of sustainability objectives was more common in frameworks that include business case and quality management components such as PRINCE2. The practice of embedding sustainability into project documentation aligns with Silvius et al. (2017) who state that this approach ensures accountability and organizational strategy alignment.

4.4.6 Integration of Environmental Goals into Project Plans

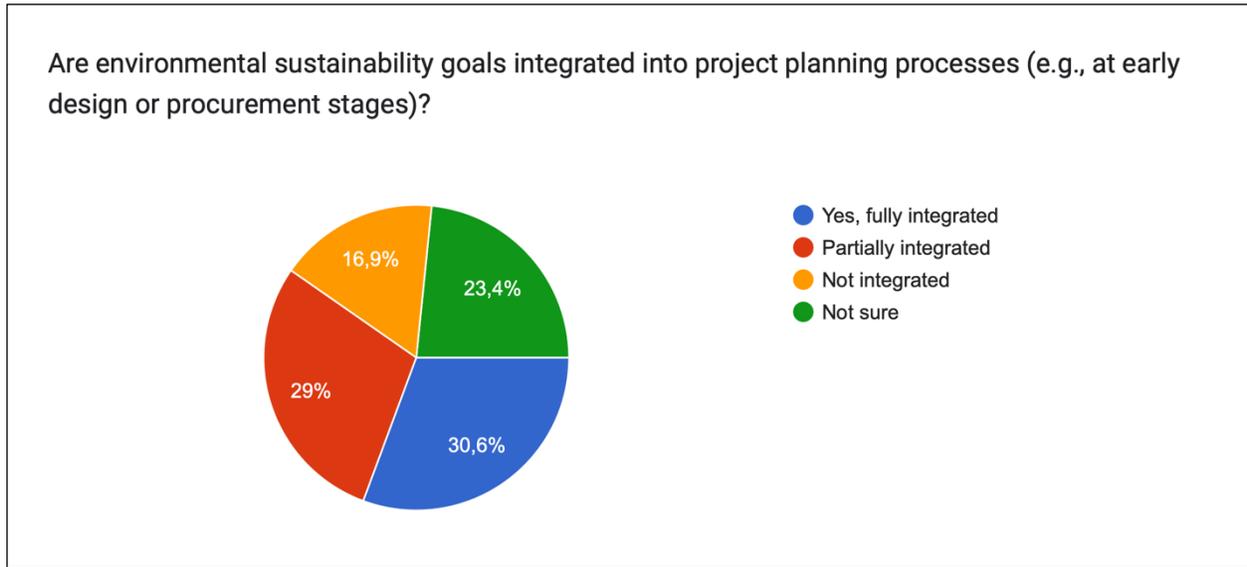


Figure 9 Integration of environmental goals into project plans.

The survey asked participants if environmental goals appear in project plans (Figure 9). The results show that more respondents integrated environmental objectives into their work than those who only documented them. This indicates that some teams implement environmental objectives in their work even though they are not required to do so by the PMS framework.

4.4.7 Comparative Analysis and Interpretation

The research indicates PMS frameworks have sustainability potential but their actual impact depends on the framework type and the level of sustainability integration in operational activities. The frameworks Lean and PRINCE2 demonstrated the strongest connection to active waste reduction and monitoring practices while Agile showed weaker links to formal environmental practices. The difference between documentation and monitoring practices indicates that policy intentions do not always produce quantifiable environmental results.

The research supports previous studies which demonstrate that Performance Management Systems enable environmental performance when sustainability metrics become part of project governance frameworks (Silvius & Schipper, 2014; Martens & Carvalho, 2017). The environmental benefits remain restricted because there are no established measurement systems and accountability procedures in place.

4.5 Operational Sustainability Outcomes

Construction projects achieve operational sustainability through their ability to deliver projects on time and budget while meeting quality standards and sustaining long-term operational performance. The survey data revealed essential information about Dublin construction companies' performance in these areas.

4.5.1 Budget Adherence

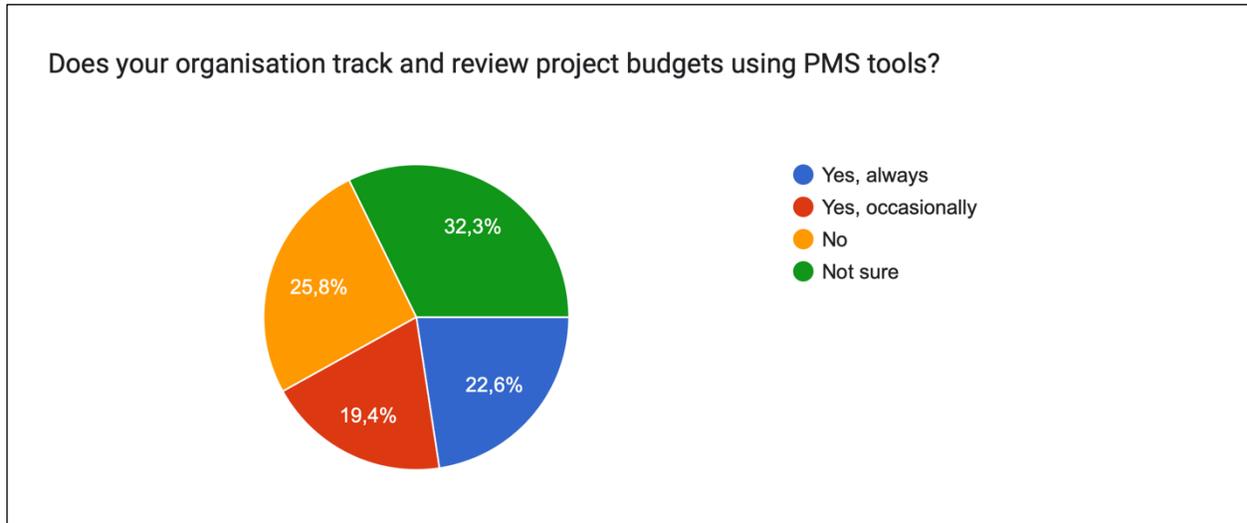


Figure 10 Frequency of delivering projects within budget

The data in Figure 10 demonstrates that organizations use PMS tools in different ways to monitor and evaluate their project budgets. The survey results show that 22.6% of respondents track budgets always and 19.4% track them occasionally. The survey results show that 25.8% of respondents do not track project budgets and 32.3% are unsure about budget tracking practices. The survey results show that some organizations maintain consistent cost management practices but a large number of organizations either do not track budgets or are unaware of budget tracking practices. The findings demonstrate that organizations need to improve their financial oversight and cost control processes which supports Kerzner's (2017) argument that structured PMS help organizations follow budgets better and minimize cost overruns.

4.5.2 Timely Project Completion

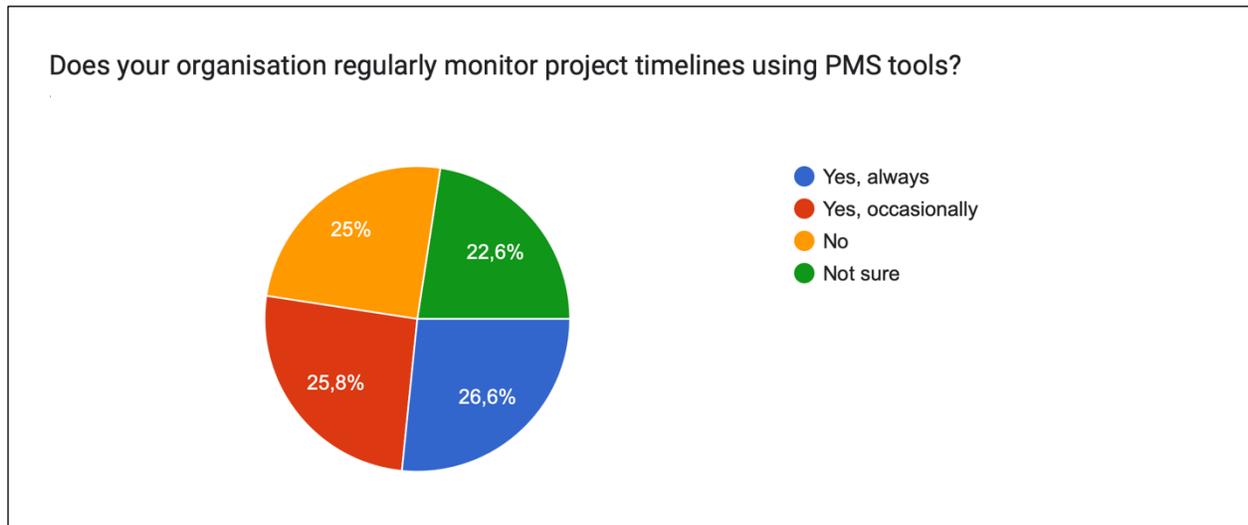


Figure 11 Frequency of delivering projects on schedule

The Figure 11 shows that the responses are fairly evenly distributed in the use of PMS tools for monitoring project timelines. It is observed that 26.6% of the respondents said they “always” monitor project timelines, while 25.8% said they do so “occasionally.” Additionally, 25% of the respondents said they do not monitor such schedules, and 22.6% said they were “not sure.” These findings indicate that while some organizations are consistent in their time management, there are many that do not monitor schedules regularly or are not aware of such practices. This finding is consistent with previous studies (PMI, 2021), which highlight that formal project management frameworks, such as PRINCE2 or PMBOK, can improve schedule predictability by setting clear timelines, milestones, and monitoring procedures.

4.5.3 Meeting Quality Standards

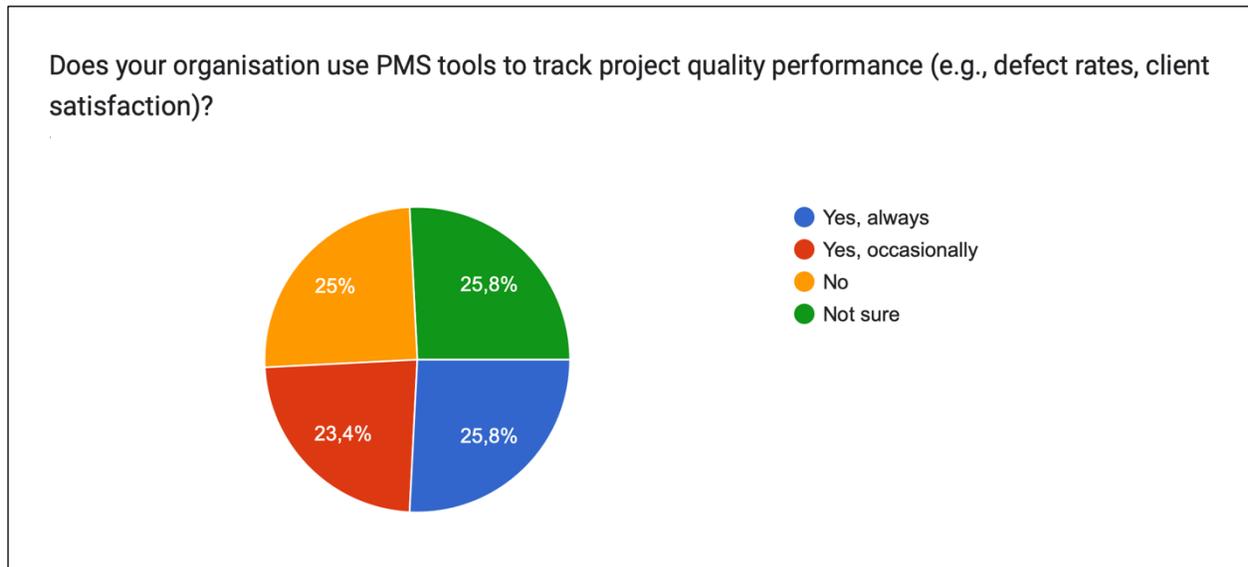


Figure 12 Frequency of meeting quality standards

The distribution of responses about using PMS tools to monitor project quality performance appears equal in Figure 12. The survey results show that 25.8% of respondents track quality performance always while 23.4% do it occasionally and 25% do not track quality performance and 25.8% are unsure about the tracking process. The data shows equal distribution between organisations that track quality performance consistently and those that do not track it or are uncertain about their tracking practices. The results indicate an opportunity to enhance project management through the implementation of continuous quality monitoring processes. The research findings support Demirkesen and Ozorhon (2017) who demonstrated that regular quality control implementation leads to better project results.

4.5.4 Long-term Maintenance Planning

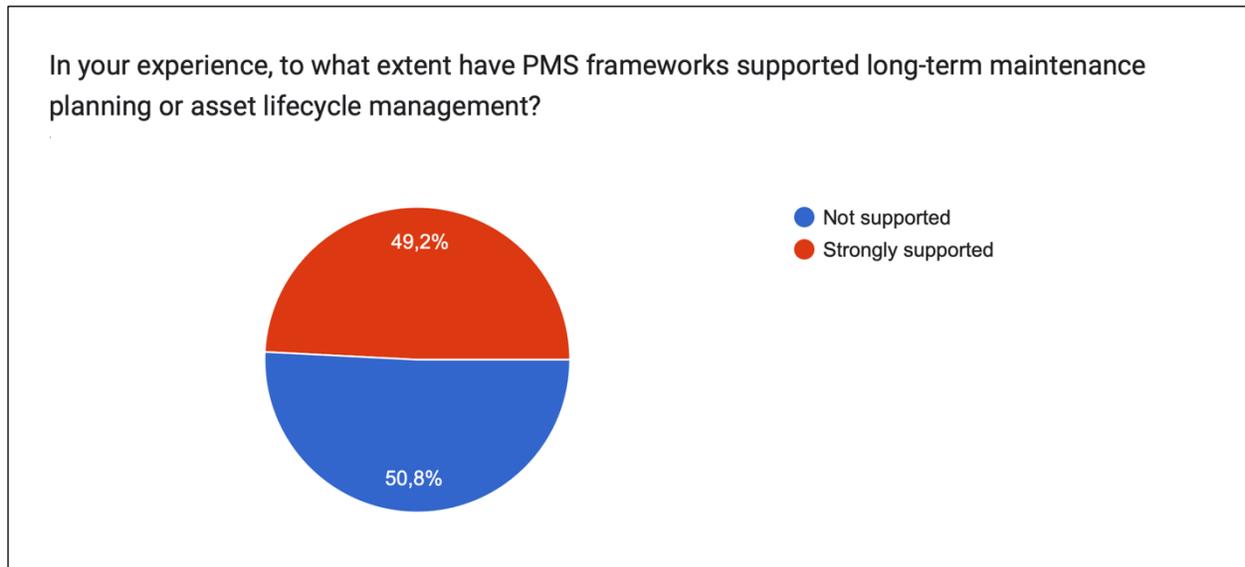


Figure 13 Long-term Maintenance Planning

The survey results about PMS framework support for long-term maintenance planning and asset lifecycle management showed equal distribution among respondents (Figure 13). The survey results show that PMS frameworks receive strong support from 49.2% of respondents yet 50.8% of respondents indicate these frameworks do not provide substantial assistance. The equal distribution between these two groups demonstrates a significant difference between industry practices and industry perceptions.

The survey results show that organizations either use PMS frameworks to integrate early maintenance planning and lifecycle management or they do not use these tools effectively or lack structured processes for this purpose. The literature shows that asset lifespan extension and lifecycle cost optimization and operational resilience improvement become possible when maintenance considerations are integrated into design and planning phases (Liu et al., 2020).

The results show that Dublin's construction sector demonstrates strong capabilities in budget adherence and schedule compliance and quality delivery through formal PMS. The mixed maintenance planning responses indicate a need to enhance PMS application in this domain to improve long-term asset performance and minimize total lifecycle costs.

4.6 Social Sustainability Findings

4.6.1 Worker Health and Safety Integration into PMS



Figure 14 Worker Health and Safety Integration into PMS

Survey results show that responses about integrating worker health and safety practices into PMS (PMS) are distributed fairly evenly. The survey revealed that 21.8% of participants confirmed complete integration of such practices yet 25% indicated partial integration. The survey results show that 27.4% of participants indicated their PMS lacks health and safety measure integration. The survey results indicate that 25.8% of respondents remained uncertain about safety protocols in their organizations because of unclear or insufficient information. The survey results demonstrate that some organizations have started integrating safety measures completely yet many projects still lack consistent safety measure implementation.

4.6.2 Effectiveness of PMS in Monitoring Worker Safety

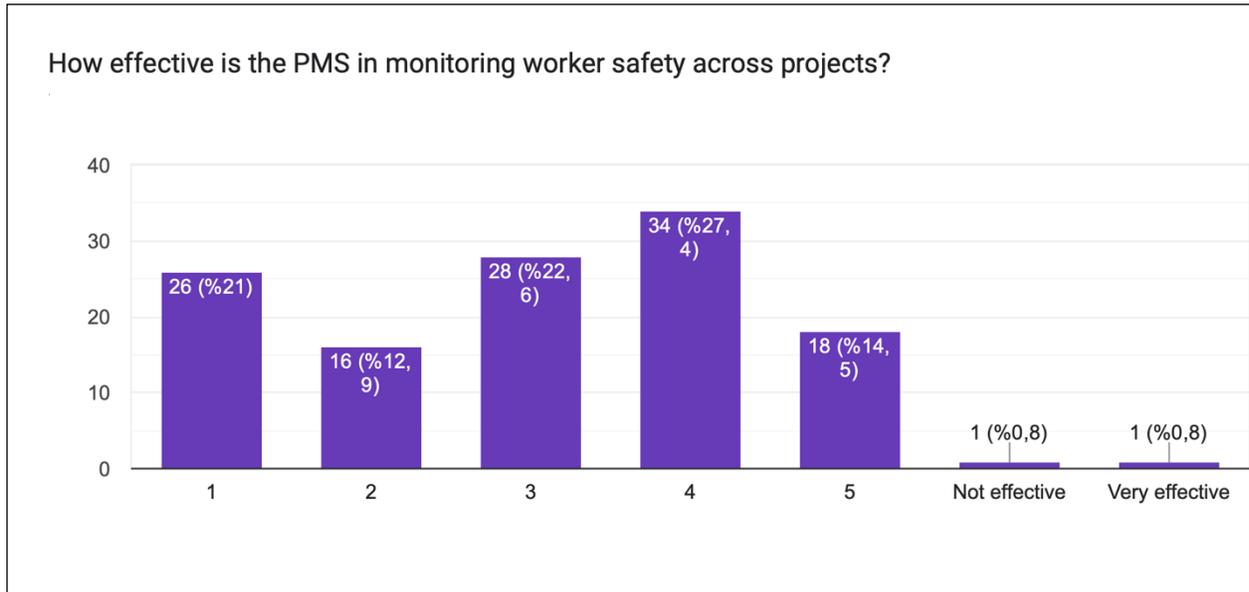


Figure 15 Effectiveness of PMS in Monitoring Worker Safety

The survey participants expressed diverse opinions regarding PMS effectiveness in worker safety monitoring. The majority of respondents chose rating "4" out of 5 (27.4%) followed by "3" (22.6%) and "1" (21%). The highest rating of "5" was given by 14.5% of respondents while only 0.8% of participants considered their PMS to be "very effective." The results indicate that PMS tools offer some monitoring capabilities yet their implementation effectiveness differs between organizations while real-time tracking and proactive hazard identification need improvement.

4.6.3 Effectiveness of PMS in Managing Worker Safety Risks



Figure 16 Effectiveness of PMS in Managing Worker Safety Risks

The distribution of worker safety risk management ratings showed a similar pattern. The rating of “4” was the most frequent at 27.4% followed by “3” at 24.2% and “5” at 17.7%. The low ratings of “1” (16.1%) and “2” (14.5%) show that a significant number of respondents believe there are major weaknesses in risk management practices. The distribution of ratings between high and low scores indicates inconsistent risk management practices across the sector because different organizations have different cultures and resource levels and follow best practices to varying degrees.

4.6.4 Frequency of Stakeholder Engagement in Project Planning

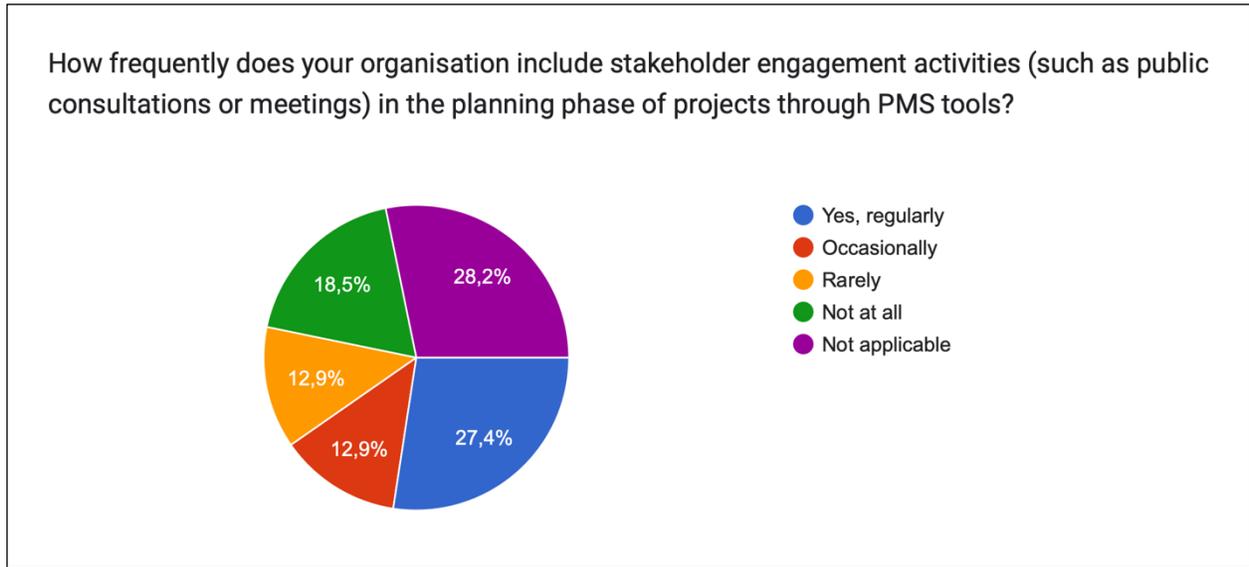


Figure 17 Frequency of Stakeholder Engagement in Project Planning

The data on stakeholder engagement reveals a polarised trend. The survey shows that 27.4% of respondents include stakeholder engagement activities in project planning on a regular basis but 28.2% of respondents do not include such activities in their projects. The survey shows that 12.9% of organisations include stakeholder engagement activities occasionally and 12.9% include them rarely while 18.5% do not engage stakeholders at all. This shows that stakeholder engagement is not yet a standard practice in project planning across the surveyed organisations

4.6.5 Use of PMS Tools to Document and Manage Stakeholder Feedback

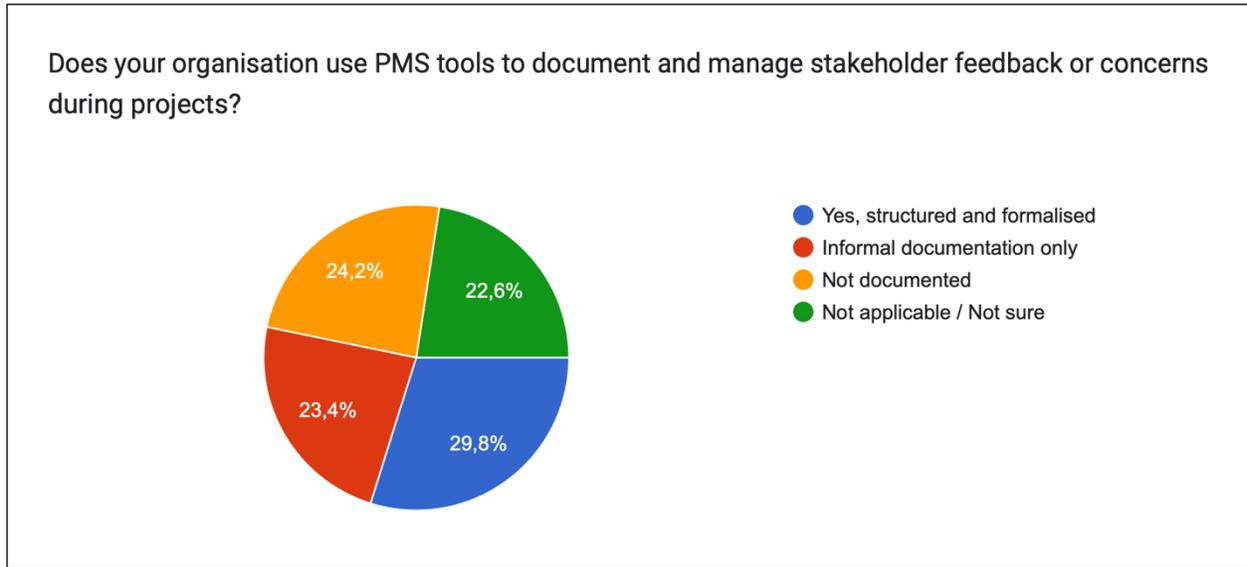


Figure 18 Use of PMS Tools to Document and Manage Stakeholder Feedback

The survey examined how organizations use PMS tools to document and handle stakeholder feedback. The survey results indicate that 29.8% of organizations use formalized documentation methods while 23.4% use informal documentation methods. The survey revealed that 24.2% of respondents did not document stakeholder feedback and 22.6% either found the question irrelevant or were uncertain about the answer. The low rate of formal documentation makes it difficult to track and evaluate stakeholder concerns which restricts the ability to respond effectively and improve social sustainability outcomes continuously.

4.6.6 Overall Analysis

The research data indicates that social sustainability elements lack standardization in PMS frameworks because worker health and safety practices and stakeholder engagement receive inadequate integration. The survey results indicate that organizations either implement these measures with structured approaches or they do not apply them at all while a substantial number of organizations fail to implement them consistently. The findings indicate a critical need for organizations to develop better policies and training programs and establish industry-wide best practices to achieve standardized social sustainability principle implementation.

4.7 Challenges and Best Practices in Integrating Sustainability into PMS

The survey results reveal both significant challenges and promising practices regarding the integration of sustainability goals into PMS usage.

4.7.1 Key Integration Challenges



Figure 19 Key Integration Challenges

The survey data shows multiple obstacles and organizational methods which affect the implementation of sustainability targets into PMS. The survey results indicate that client demand was the most common challenge at 19.4% followed by budget limitations at 18.5% and time constraints at 16.9%. The main barriers to sustainability integration included unclear sustainability guidelines (17.7%), insufficient training or awareness (16.1%) and inflexible PMS structures (11.3%). The research supports Silvius and Schipper (2014) who state that stakeholder demand and financial limitations are the main challenges for implementing sustainability in project management processes.

4.7.2 Current Best Practice Implementation

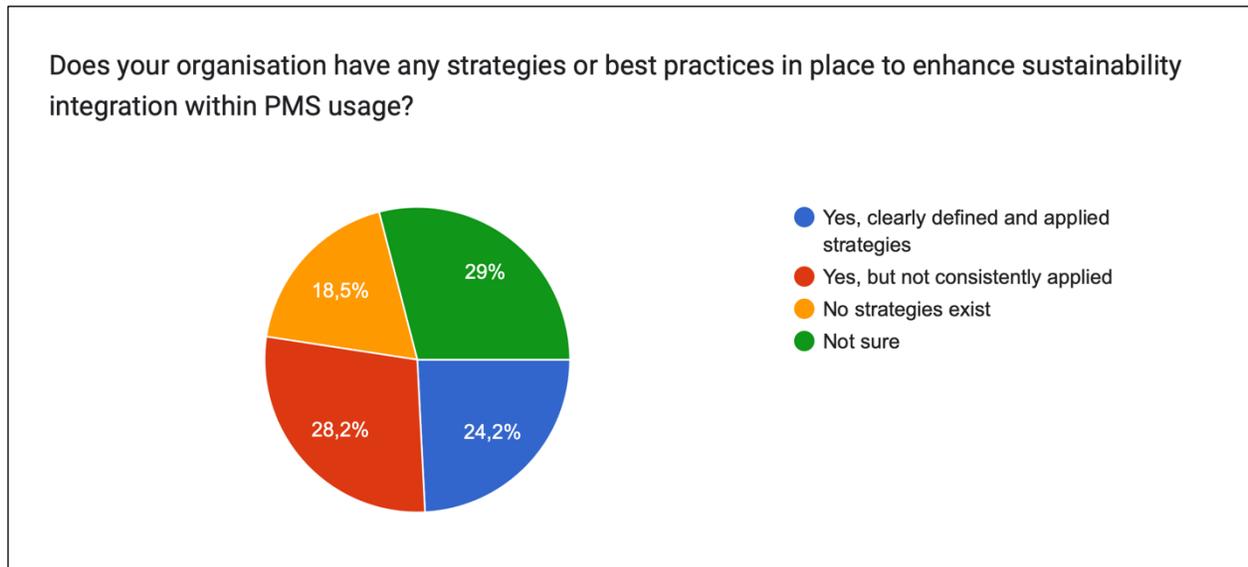


Figure 20 Current Best Practice Implementation

The survey revealed that 24.2% of respondents confirmed their organizations had established sustainability strategies yet 28.2% admitted these strategies existed but were not consistently followed (Figure 20). The survey revealed that 18.5% of respondents had no strategies in place and 29% remained uncertain about their organization's sustainability approach. The absence of standardized sustainability integration frameworks in PMS remains a challenge because Martens and Carvalho (2017) stress that formal sustainability guidelines are essential for maintaining consistent application.

4.7.3 Organisational Openness to PMS Adaptation

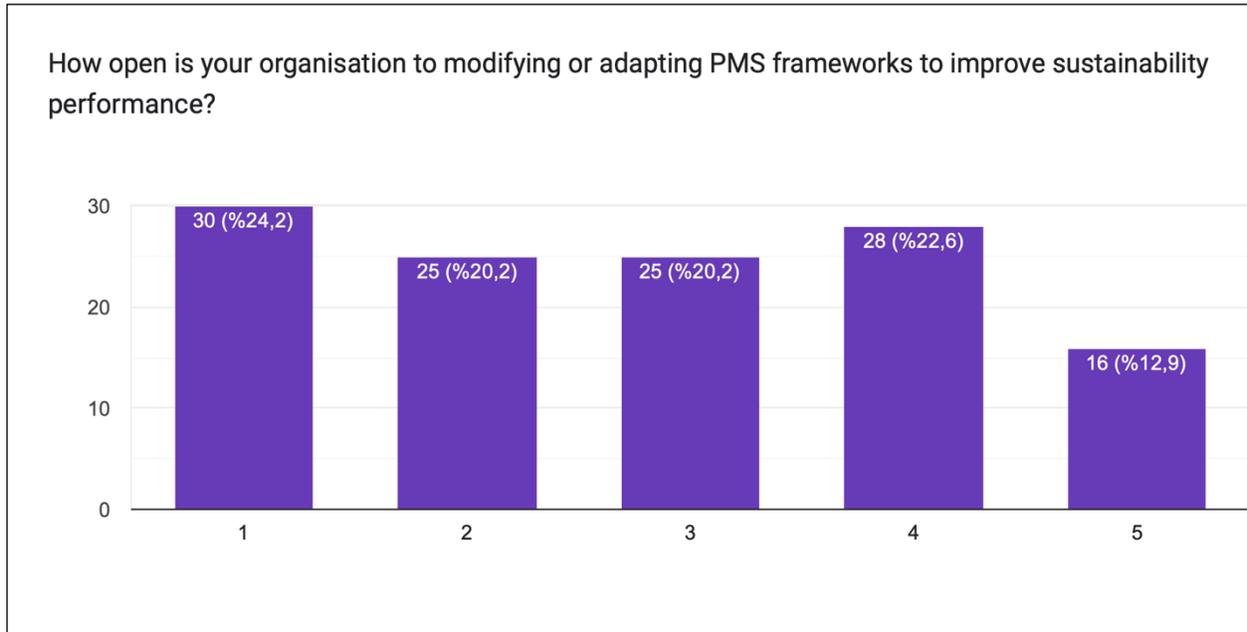


Figure 21 Organisational Openness to PMS Adaptation

The degree of willingness to modify PMS frameworks for sustainability performance improvement showed different levels (Figure 21). The survey results showed that 24.2% of respondents rated their organisations as highly open to change (score 1) and 22.6% as moderately open (score 4) while 12.9% expressed low openness (score 5). The mixed readiness indicates organisational inertia and risk aversion which is consistent with Carvalho and Rabechini (2017) who argue that adaptability in PMS design is critical for aligning with evolving sustainability requirements.

4.7.4 Observed Effective Practices



Figure 22 Observed Effective Practices

The survey results showed that 51.2% of respondents observed specific sustainability practices improving through PMS use but 48.8% did not observe such improvements (Figure 22). The equal distribution of responses indicates that some organizations achieve sustainability benefits through PMS but most organizations have not achieved widespread adoption or measurable results. The Project Management Institute (2021) supports the idea that sustainability integration into project processes needs both strategic alignment and ongoing monitoring and knowledge-sharing to establish organizational norms from individual successes.

4.7.5 Implications

The survey results showed that 51.2% of respondents had seen specific practices improve sustainability through PMS use but 48.8% had not (Figure 22). The equal distribution of responses indicates that some organizations have achieved concrete sustainability advantages, but broad implementation and measurable outcomes are not widespread. PMI (2021) supports the idea that sustainability integration into project processes needs both strategic alignment and ongoing monitoring and knowledge-sharing to establish organizational norms from individual successes.

5. CONCLUSION & RECOMMENDATIONS

5.1 Summary of Key Findings

The research examined how PMS affect sustainability results in Dublin's construction industry across environmental aspects and operational and social dimensions. Survey responses from 124 firms revealed several consistent patterns. Most survey participants indicated their use of formal PMS frameworks with PRINCE2, PMBOK and Agile being the most frequently used systems. Organizations that implemented formal systems achieved better sustainability integration throughout their project planning and execution processes than organizations without structured management systems (Turner, 2016).

Organizations with advanced PMS adoption showed better implementation of environmental sustainability practices including energy efficiency and waste reduction and sustainable procurement according to Silvius & Schipper (2019).

The literature supports operational sustainability outcomes improvement in PMS-oriented firms because structured project governance leads to efficiency gains (APM, 2021).

Organizations that applied PMS frameworks demonstrated better social sustainability practices through their stakeholder engagement and community involvement and health and safety compliance. The implementation of PMS frameworks faced integration challenges because of insufficient training and resource constraints and resistance to change as Martens and Carvalho (2017) identified.

5.2 Conclusions in Relation to Research Objectives

The sustainability performance of infrastructure projects in Dublin's construction sector depends on systems.

Objective 1: Identify the prevalence and types of PMS in use. The data shows that PMS are widely used in the construction industry with PRINCE2 and PMBOK being the most popular frameworks.

Objective 2: Assess the impact of PMS on environmental, operational, and social sustainability.

The results show a positive relationship between PMS usage and sustainability performance, as reported in previous studies (Silvius et al., 2017; Turner, 2016).

Objective 3: Explore integration challenges and best practices. The findings show that the challenges faced are similar to those reported in the literature on sustainability integration, such as skills gaps, resource limitations, and organisational resistance (Martens & Carvalho, 2017).

5.3 Implications for Practice

The research indicates that Dublin construction firms should achieve better sustainability results through:

The implementation of specific training programs should focus on integrating sustainability principles into Performance Management System frameworks.

PMS should serve as a tool for complete sustainability monitoring which extends beyond traditional cost and schedule control to track environmental and social performance.

Stakeholder engagement needs to be strengthened to verify that sustainability targets match both community needs and regulatory standards.

5.4 Limitations of the Study

The research obtained responses from 124 firms, yet the sample size constitutes only a small portion of the total 355 registered construction companies in Dublin (CIF, 2025). The study depends on self-reported survey data which creates response bias risks while the lack of qualitative interviews restricts the ability to explore implementation challenges in detail.

5.5 Recommendations for Future Research

Future research should increase participant numbers while using qualitative approaches to understand better the real-world difficulties of implementing sustainability within PMS. Research that compares different regions and sectors would help determine if the observed trends exist only in Dublin. The research should investigate how emerging technologies like AI-driven project monitoring contribute to better sustainability outcomes in PMS.

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