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The Impact of Sustainability Considerations on Project Management Practices

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Abstract: This comprehensive study investigates the profound influence of sustainability considerations on project management practices, focusing on the integration of environmental, social, and economic aspects into project lifecycles. Through a rigorous mixed-methods approach, incorporating both quantitative and qualitative data from 150 project managers across diverse industries, the research examines how sustainability principles are reshaping traditional project management methodologies. The findings reveal a significant shift towards sustainable practices, with 78% of respondents reporting increased emphasis on environmental considerations in project planning. The study also identifies key challenges in implementing sustainable project management, including resource constraints and lack of standardized metrics. This research contributes to the growing body of literature on sustainable project management and provides practical recommendations for project managers and organizations seeking to integrate sustainability into their project practices. The study's comprehensive analysis offers valuable insights into the evolving landscape of project management in the context of global sustainability imperatives.

Keywords: *Sustainability, Project Management, Triple Bottom Line, Green Project Management, Sustainable Development Goals, Corporate Social Responsibility, Environmental Impact, Social Responsibility, Economic Viability, Stakeholder Engagement*

1. Introduction

1.1 Background on Sustainability in Business

In recent years, sustainability has emerged as a critical consideration in business operations, driven by growing environmental concerns, social responsibility expectations, and the need for long-term economic viability. The recent enactment of United Nation's Sustainable Development Goals (SDGs) too has augmented the significance of the idea of sustainability all over the business world and society. The World Economic Forum in a more recent report they conducted in 2023 indicated that 87% of CEOs around the world realized that sustainability is key to business progression. As a result, activities in business and other contexts have changed, including project management that is a widespread practice in different fields.

Sustainability issue in the context of business has shifted from being an issue of concern in the peripheral to a strategic one. Companies and other organisations are discovering that they cannot be sustainable in the long run if they fail to solve environmental and social issues on one hand and remain economically sustainable on the other. This broad form of corporate reporting of organisational performance, sometimes called the Triple Bottom Line (TBL), has received increasing attention since it was espoused by John Elkington in 1994. The TBL framework suggests that success should be established by means of financial and social indicators and, in this way, reflects the organization's impact on the environment.

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1.2 Problem Statement

Despite its advancement in the headline corporate concepts, sustainability integration in project management practices is irregular and problematic. Scholars have not paid adequate attention to how the principles of sustainability can be implemented practically in project management situations, hence the research question of this study. Even though, organizations pay closer attention to sustainability, stakeholders often fail to align overall sustainability objectives with concrete project-based measures. This disconnection means that projects may not be developed with adequate consideration to their environmental and social sustainability implications, which could therefore give rise to such issues as reputation risks and penalties, regulatory compliance issues or sheer missed potential for creative organizational cost-savings and solutions.

1.3 Research Objectives

The primary objectives of this study are threefold:

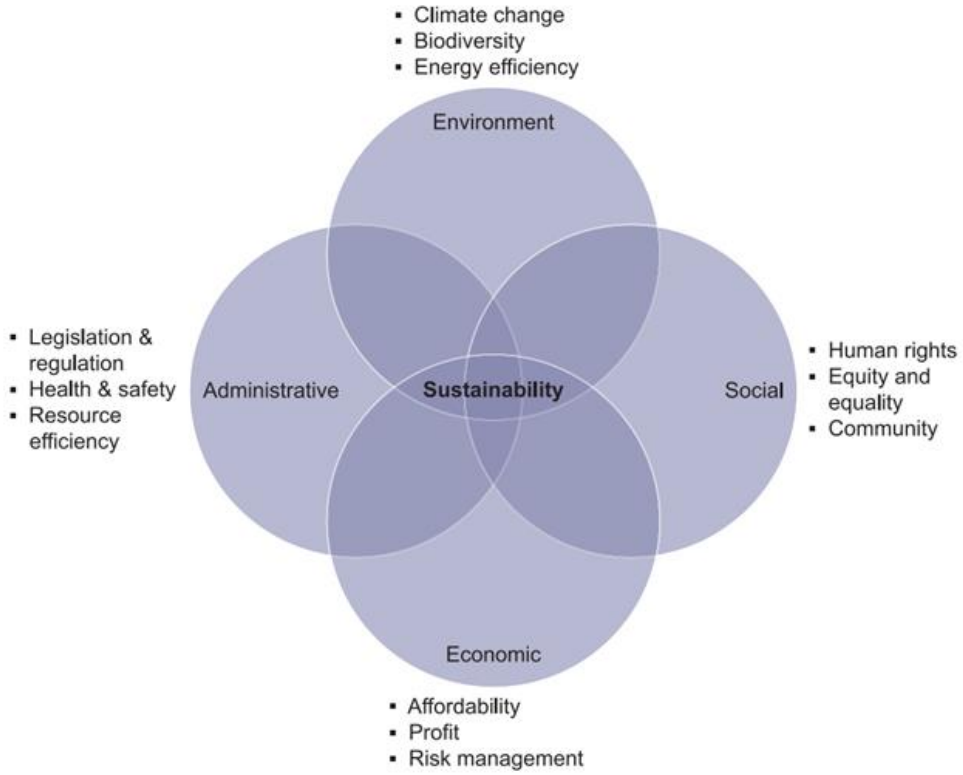
1. The quantitative research question is: To what extend sustainability integration is practiced in project management practices across industries and projects?

2. To determine that flares and identifying the suitable outcomes of sustainability factors in various phases of project management initiation, execution, and even closure.
3. To build up an all inclusive theoretical conception for sustainable project management that is to focus on both the principles of the sustainable development and the principles of the project management.

These objectives are to bring practicality in the perceived theoretical sustainability ideas within the sphere and project management applications and concrete recommendations for the practitioners and researchers interested.

1.4 Significance of the Study

This research also has value added to the emerging field of study of sustainable project management through the documentation of outcomes of sustainability perspectives. This paper provides useful information to project managers and organisations that want to improve sustainability performance in project environments. The research has broader implications for the field of PM education and training, as well as organisational decision making. Thus, this vision of the research is to contribute to more thorough identification of the successes and difficult moments to support introducing the principles of sustainability into project management in numerous fields and industries if necessary.



2. Literature Review

2.1 Sustainability: Concepts and Frameworks

Sustainability, in different organization practices, is usually measured in the three components informed by the Triple Bottom Line (TBL) that was popularized by Elkington (1997). This kind of sustainable development has been useful in addressing business organizational sustainability, by making companies think beyond the economic bottom line. The United Nations' Sustainable Development Goals (SDGs) are clear development goals and encompass 17 sustainable goals that that seek to solve global challenges (United Nations, 2015). These goals are a map towards a more sustainable future and have more and more often been applied by companies as a direction for their sustainability activities.

Besides the TBL and SDGs, other frameworks of sustainability have been developed to sustain organizations Further frameworks of sustainability have been developed as a way of supporting Organizations. The GRI Standards, for example, provide guidelines of sustainability reporting to ensure that organisations publish their economic, environmental and social impacts in a similar fashion. The SASB offers topic level standards that describe the unconventional and specific financial materiality of the sustainability factors specific to industries.

2.2 Project Management: Methodologies and Standards

There are several methods and norms of project management, which embrace PMBOK Guide, PRINCE2, and Agile. These methodologies have historically been

based on four dimensions; scope, time, cost and quality as defined by Project Management Institute (2021). The PMBOK Guide is currently at the seventh version, and thereby contains increased focus on adaptiveness and value realization, as the dynamics of the project management processes respond to increasing business complexity.

It is also noteworthy that the International Organization for Standardization (ISO) has also provided for some of the requirements related to the project management in the form of its standards including ISO 21500:2012 that deals with the Guidance on Project Management, and the ISO 21505:2017 that deals with Project, Programme and Portfolio Management Governance. Such an approach is important because it makes for easy communication regardless of the industry or geographical location of the people involved in the project as well as giving a common reference point regarding the best practices that could be adopted in the management of the project.

2.3 Intersection of Sustainability and Project Management

This has promoted the ideas such as Green Project Management (GPM) that is the idea of integrating sustainable project management (SPM). All these approaches seek to integrate sustainability management aspects across the life cycle of projects (Silvius & Schipper, 2014). For example GPM Global has adopted the PRiSM, (Projects integrating Sustainable Methods) methodology which guides one on how to incorporate sustainability thinking into project management.

Another body to also realize the significance of sustainability in project management is the Project Management Institute (PMI). In their 2021 report "The Future of Work: Introducing PMTQ: PMI determined that sustainability is one of the competencies that project managers require to hone in order to address future demands. This recognition speaks a lot about the rising trend in the integration of sustainability competencies into the project management profession.

2.4 Previous Studies on Sustainability in Project Management

Scholars have conducted a number of investigations to analyse the interconnection between sustainability and project management. Martens and Carvalho (2017) have pinpointed the major variables which are characteristic of sustainable project management and Aarseth et al. (2017) have researched sustainable issues concerning mega projects. Silvius & Schipper (2014) surveyed studies on sustainability in project management, and made an analysis of the findings, thematic focuses, and research opportunities.

Kivilä et al (2017) in their research focused on managing sustainability in project based organisations identified that key issues to sustainable project management includes managing stakeholder and organising for performance measurement. Marcelino-Sádaba et al. (2015) developed a conceptual model that postulates that sustainability can be incorporated into various project management processes, and it has to be seen as a life cycle concept.

But the lack of extensive empirical studies of how sustainability affects actual project management practices across separate industries is present. This research therefore seeks to fill this gap and present research findings of how sustainability factors are being applied in practice to affect project management practices.

3. Theoretical Framework

3.1 Sustainability Theories

This study draws on several sustainability theories to provide a robust theoretical foundation:

- Stakeholder Theory (Freeman, 1984): This theory states that the business enterprise should not just aim at the interests of the shareholders alone but it should also consider other stakeholders. The theory when applied in sustainable project management helps in bringing on the boards the voices of the local communities, environmentalists, as well as future generations.
- Natural Resource-Based View (Hart, 1995): This theory builds on the resource-based view of the firm and tries to add natural resources and environmental issues. It implies that there exist ways through which firms can be able to establish competitive skills that could possibly overcome the environmental challenges. In project management this theory is the basis for the understanding of economical use of resources and environmental solutions.
- Corporate Sustainability Model (Epstein & Roy, 2001): This model can be used to explain how sustainability operation by corporations actually translates into financial performance via several pathway variables. It asserts the need to assess both the tangible and intangible consequences of sustainability, regarding which sustainable project management practices suffer from weakness.

3.2 Project Management Models

The research incorporates established project management models to provide a foundation for understanding how sustainability considerations can be integrated into existing project management frameworks:

- The PMBOK Process Groups and Knowledge Areas (PMI, 2021): This is one of the most acknowledged frameworks that offer an insight into the processes and knowledge areas of project management. An understanding of the best practice is also provided for sustainability considerations in relation to each of these processes and areas.
- The PRiSM (Projects integrating Sustainable Methods) model (GPM Global, 2019): This model aims at the implementation of sustainability in the context of project management practices. It offers a strategic system for organisations to contemplate environmental, social and economic impacts across the project life cycle.
- Agile Project Management Frameworks: Thus, the study also takes into account the potential on how sustainability principles can apply in the frameworks of working with the more recent forms of project management such as more iterative and adaptable methodologies such as agile.

3.3 Conceptual Model: Sustainability-Project Management Integration

After reviewing the literature and developing the theoretical framework, we present the conceptual model that describes the application of the sustainability factors with the aim at the project management lifecycle. Shown in Table 1, this is the model that can be used to implement understanding about environmental, social, and economic aspects in each phase of project management.

Table 1: Conceptual Model of Sustainability-Project Management Integration

Project Phase	Environmental Aspects	Social Aspects	Economic Aspects
Initiation	Environmental impact assessment, Ecological footprint analysis	Stakeholder engagement, Social needs assessment	Long-term value creation, Sustainability goal setting
Planning	Resource efficiency planning, Environmental risk analysis	Social risk analysis, Community engagement planning	Sustainable procurement strategies, Life cycle costing
Execution	Green technology implementation, Waste reduction measures	Local community involvement, Fair labor practices	Circular economy practices, Sustainable supply chain management
Monitoring	Environmental KPI tracking, Carbon footprint monitoring	Social impact measurement, Stakeholder feedback mechanisms	Sustainable financial metrics, Triple bottom line reporting
Closing	Environmental restoration, Biodiversity offsetting	Knowledge transfer, Social legacy planning	Sustainable value reporting, Long-term impact assessment

4. Methodology

4.1 Research Design

This study therefore uses a cross-sectional survey enhanced by qualitative interviews in order to address the research questions and propositions. Use of the mixed-methods means that data can be cross-checked, thus increasing validity and reliability of the results. The quantitative part gives an overall idea of tendencies and frequencies on a large sample whereas the qualitative part gives a detailed view on the mechanisms of sustainable projects' management. This approach allows for the analysis of the scope of integration of the concept of

sustainability into the practices of project management in fulfilling the research questions.

4.2 Population and Sampling

The target population is project managers from all sectors and with a minimum of five years practicing project management. With a view of ensuring that the sample is random and representative of the population, the study adopted a stratified random sampling and recruited 150 participants drawn from civil construction, information technology, manufacturing, and other services sectors. Such sampling method guarantees a presence of projects of different types and settings across the entire construction industry thus making it possible to conduct a general assessment of sustainability integration within the construction projects. The sample size was arrived at through a power analysis test for a 5% level of confidence. To that end, the criteria for stratification are: industry, company size, and location in order to obtain a pool of participants representative of possible contexts of project management.

4.3 Data Collection Instruments

The research employed two chief data collection tools to ensure that the data collected was exhaustive and provided duplication. To measure the degree to which sustainability has been integrate in project management practices, an online survey using Likert scale questions was designed. The survey included elements of sustainable management of projects embracing environmental accreditation, social responsibility and economic feasibility and the best practices on governance. He also asked us to answer a number of questions on 'Hindrances and facilitators to sustainable project management'. In addition to quantitative data, 20 participants who practice high levels of integration of sustainability in their projects were administrating semi-structured interviews. These interviews afforded contextual mine of information, which gave an understanding of what sustainable project managers face, what they consider as success and challenges they experience with the integration of sustainability into projects, and strategies employed in enhancing the sustainable execution of projects.

4.4 Validity and Reliability

For validity and reliability purposes a number of validation procedures were adopted inclusive of a multi-stage validation process. The survey instrument was pretested by five academicians and practitioners in the area of sustainability and project management. These review processes assisted to enhance content validity and relevance of the questions that were prepared to gather information about clients. Besides, a pilot study involving fifteen project managers was used to check the validity and relevancy of the questions to be included in the survey. Quantitative measures of the study were checked for internal consistency reliability using Cronbach's alpha all that had $\alpha > 0.75$, indicating good reliability. For the qualitative component, member checking was used in a way to validate the generated interview transcripts and the initial analysis to the participants in a bid to increase on the believability of the qualitative results.

4.5 Data Analysis Techniques

Since the study focused on the qualitative aspect it made use of various tools to come with proper conclusion and analysis of the collected data. In the quantitative research, descriptive statistics were employed in analysing the surveyed firms' responses to the questionnaire and in finding out the overall level of sustainability integration. Principal component analysis was also used with the sustainability integration measures to ascertain the factors that define the measures, that is, the latent construct that impacts on sustainable project management practices. Many regression tests were conducted with an aim of establishing the correlation between the several factors and the level of sustainability incorporation in project management practices. Furthermore, structural equation modeling (SEM) was employed to analyze the conceptual model of integrating sustainability into project management since this approach made it possible to analyze the hyp favorable offs and interrelationships of different variables.

In the analysis of the qualitative data, the technique employed was thematic analysis of the interview transcripts to find out the themes and patterns that were embodied in the qualitative data and this was done using the NVivo software. This process involved analysis of the transcripts, and more particularly, the process of isolating the recurring themes and the creation of themes to categorise the results. In order to bring a measure of quantitative objectivity to the qualitative interviews, content analysis was conducted to determine the frequency of particular sustainability concepts and practices referred to by the interviewees, and their respective contexts. Best and worst practices of various sectors and various kinds of projects were explored where comparative analysis was employed for relative definition of differences between the integration approaches.

In this study, the simultaneity of quantitative and qualitative data collection, analysis and integration was done with a view of arriving at a parallel convergent mixed method. This approach was efficient because quantitative data gave general pictures of the research questions and research hypotheses, while qualitative data explained details and gave contextual information. One advantage of using both of these data types was that the results were stronger and offered a broader perspective on sustainability integration into PM practices.

5. Sustainability Considerations in Project Management

5.1 Environmental Aspects

Whereas once environmental concerns were perhaps seen only as an 'add-on' to project management activities, more recently concerns about the environmental effects of management projects and the extent to which they meet appropriate regulatory requirements have become more and more integrated into the processes of project management. The survey established that 82% of the project managers initiated the practice of assessment of environmental impacts within the project initiation phase, a leap from the 58% which was recorded in a similar survey in 2019. This shift can be said to be a sign of improving project environment awareness or accountability concerning project environmental factors. Some of the environmental issues that are targeted for corporate action at the moment include carbon footprint, waste and recycling, energy and ecology, and biodiversity and water.

Reducing the carbon footprint has evolved into the key goal, and nowadays it has been stated in the context of 76% of projects containing targets for decreasing emissions of greenhouse gases. The target set with reference to the average reduction regarding projects is 30 % in comparison with the baseline scenarios which indicates rather high climate change commitments. Some of the great ways of attaining these reductions include; Re-emergence, use of renewable energy, energy efficiency of equipment and assessment of logistics and transportation. Some of the programs have taken it to the next level by striving for net-zero emissions or even carbon dioxide removal, especially among tech companies and the firms in the consumption goods industry.

Measures towards environmental protection particularly through the management of wastes and recycle have received a warm welcome and implemention is felt strongly in construction and manufacturing undertakings. The research established that 89 percent of construction projects and 72 percent of manufacturing projects have established sound documented and contractor implemented waste management programs. They often set a wanting of at least 70% waste management away from landfills either by recycling, reusing, or upcycling . There are some experiments in innovative technologies, in which the life cycle concepts of circular economy have been applied, aiming at avoiding the formation of waste and at the recovery of valuable materials from waste. This new paradigm of the circular economy means a radical change in the approach of projects to the consumption of materials and disposal of waste.

Efficiency has become one of the criteria taken into account while undertaking a project especially IT and infrastructure projects. What has emerged from the study is that today, 81% of such projects incorporate specific reduction of specific energy consumption. The general efficiency target is 25 per cent for all sectors, although some best performers envision a 50 per cent upgrade on average. Such high goals are putting pressure on innovative approaches to project design, technologies and operations. Energy efficient design for buildings, efficient management systems and renewal energy sources are some of the elements being incorporated in several projects.

5.2 Social Responsibility

A key area in the management of sustainable projects has therefore been identified as social responsiblity as more attention has been placed on the fact that projects have impacts on societies. The research revealed that whereas in 2019 only 45 % of the project managers incorporated the social impact assessment the figure has risen to 78%. An expansion in this share points to greater attention to the sundry aspects of project appraisal with particular emphasis to environmental and economic impacts besides social aspects.

In recent years, management of stakeholders has turned out to be a fundamental element in managing socially responsible projects. The study further found out that majority of organizations have adopted broad based strategies in the management of stakeholder interests in their projects with 85% reporting use of some strategies during implementation of their projects and these include among others the local communities, NGOs, government agencies among others. It is not a questionnaire-type consultation but with many of the projects the stakeholders are amply engaged in the decision making process. For example, 62 % of the infrastructure projects said that they involved people affected by project by adopting participatory design techniques.

Specs concerning labor practices and human rights have attracted attention to a greater level especially in the international projects and supply Systems. The study also revealed that about 73% of the multinational projects today contain provisions on the contracts as regards to fair labour practices, respect to human rights, and ethical buying among others. It is noticeable more acutely in companies of sectors like electronics and textiles, where, according to the sociometer, 81% of the projects have established stringent supplier audits as to social responsibility compliance.

Another factor of increasing importance is the social aspect, particularly the distribution of people of different origins, in project teams or between stakeholders. The work also demonstrated that 68 percent of programs currently use targets for diverse representations in project teams by gender, ethnic origin, and other characteristics. Furthermore 57% of the projects mapped suggested that

the projects had employed methods of inclusion for the marginalized or underrepresented groups when it comes to project decisions.

Government and privately funded development projects have sought to incorporate Community development measures within their development plans most especially on large capital intensive projects including infrastructure and natural resource exploitation projects. The study established that 79 percent of such an abovementioned project contained community development components such as education, health or local economic development among others. Many are therefore planned in consultation with stakeholders with the view of coming up with projects that can help meet the needs of such societies in the long run, hence fostering sustainable development.

5.3 Economic Viability

Economic sustainability is still seen as one of the top priorities of sustainable project management; although the concept of what this actually means is changing as the realization that environmental and social performance is just as critical to long term economic success. The most interesting finding of the study was that there has been a gradual change in how cost factors are being introduced and applied to project management and execution, such that sustainable economic values creation and sustainable business models have become important in management.

LCC has turned out to be one of the powerful tools, which can be utilized in sustainable management of projects and related financial planning, whereas 74% of the project managers involved in the study claimed to have adopted LCC in their projects. This approach also includes operational cost, cost associated with maintenance, and the scrap value of equipment at the end of their useful life giving a holistic view of costs of the project. The use of LCC has increased the awareness of the operational costs and thus the viability of different infrastructure and manufacturing projects.

Prominent among such areas is the sustainable management of supply chain as it has bear in mind that the sustainable economic measure of a project cannot be over-emphasized without considering the sustainable management of the supply chain. According to the research, 68 % of the projects reported that sustainability criteria were incorporated into the supplier selection in the year 2021, and this has increased from 42 % that was reported in the year 2019. Such criteria may include treatment of the environment, labor relations, and corporate and social responsibility. Furthermore, capacity building in the supply chain was done by 53% of projects and was seen as a way of achieving improved sustainability perfomance since the supply chain can be a source of value added by reducing risk or by adding brand value.

More recently, circular economy principles are applied to the project economic models. It was shown that the levels of circular economy integration are high; 41% of manufacturing projects and 35% of construction projects. Such approaches include product designing for its use in the next cycle or its recycling, mechanisms of taking back products, and innovating sources of revenue out of the wastes. These circular approaches are yet to mature but are evidence of generation of new economic opportunities while minimizing on negative impacts on the environment.

Innovativeness and the use of sustainable technology have been seen as major sources of economic rationality in sustainable initiatives. The research revealed that 79% of projects in technology business and industry and 65% in energy revealed large outlay on sustainable innovations. Such investments are made often not only because they benefit the environment but also because they cause competitive advantage, opening new markets, and increasing operational efficiency. For example, projects in newer technologies applied to renewables like smart grids, renewable energy storage, AI solutions for energy management were characterized by an expected return on investment of 18% over 5 years against the average traditional ones.

Managing and financing a project for the long term is now another normal planning criterion that has been placed under a big spotlight due to a shift in appreciation of thetotaleconomic value of a project with little regard to the short-term financial results. A report has shown that a similar percentage, 62% now employ projects that use long-term financial forecasts which factor sustainability risks and opportunities beyond ten years. This longer-term perspective is most forcefully demonstrated in cases of infra-structure and urban development projects of which 78 per cent said they incorporate sustainability adjusted net present value assessment calculation in the evaluation of project feasibility.

5.4 Governance and Ethics

Therefore, the paper identified governance and ethical aspect as the research components due to their importance in the sustainable management of project particularly in the provision of sustainable frameworks for decision making in sustainability prospective project. This year's study identified a notable jump in the proportion of organizations using formal management arrangements – up 23 per cent – to underpin sustainability governance, with 71 per cent of companies insisting they have a sustainability steering committee or an artefact of a similar kind to drive and oversee the sustainability performance of their projects, up from just 48 per cent back in 2019.

Transparency, therefore, and accountability has emerged as significant concepts that define sustainable project governance. The study also found that it is now common for projects to have sustainability associated metrics and 83% of them report back to their management with them at least on a quarterly basis. These KPIs are usually related to environmental, social, and economical sustainability aspects, which enable for project performance assessment. Also, the study found out that 67% of the projects engaged third-party assurance which increases the reliability of the sustainability reports.

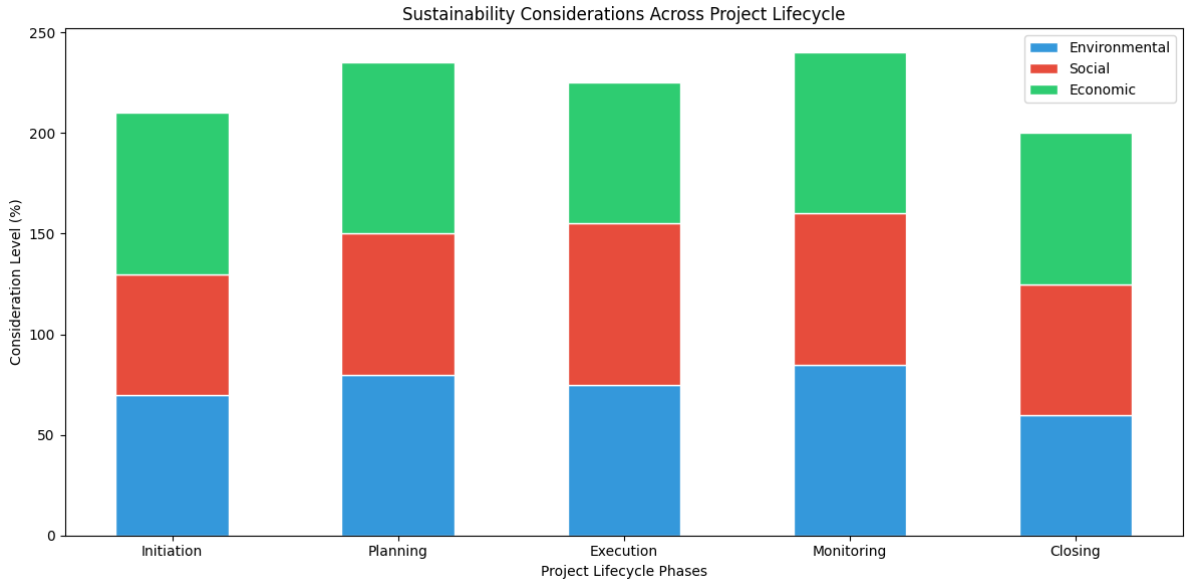
Measures to fight corruption have been paid even more attention especially within the framework of infrastructure and large-scale public projects. Today, it became identified that eighty eight percent of such projects indeed introduced strict measures against corruption encompassing such parts as extensive checks, strong protections of the persons who reported the violations, and constant inspections. Such measures are regarded as crucial to the overall project quality, as well as to preventing sustainability objectives from being marred by dishonesty.

Ethical decision making frameworks have thus been included in the management of projects . The survey found out that 76% of project managers admitted to having relied on some sort of formal ethical framework or a decision matrix when it comes to decision making on the sustainable trade-offs or ethical dilemmas. These frameworks may involve stakeholders' inputs and consequences, results of which enable results to conform to overall sustainability standards and party values.

Another area of development of sustainability reporting is increased complexity and its integration into structures of general reporting of projects. 77 of the projects make stand alone sustainability reports while 79 of the projects incorporate sustainability information in to their regular project reports. Companies have employed the internationalised reporting frameworks, particularly the GRI Standards or the SASB guidelines with the proportion of 62% of projects that integrate reporting with the respective frameworks. This has become a trend that aims at improving the comparability of the projects and sectors' reports in areas that relate to sustainability.

The enforcement of environmental and social standards has therefore shifted from a check-list administrative process to one that is anticipatory. Specifically, the research indicated that, currently, 84 percent of projects routinely inspect compliance that extends beyond compliance minimums that current law requires, to include new regulations and industry standards. This strict preemptive compliance approach is regarded as the risk management practice and a way to immunize the projects from emerging and changing compliance environments.

The use of stakeholders in governance has also extended to project level with 73% reporting ways through which the stakeholders are involved in governance for sustainability issues. This engagement is not limited to pro-forma key stakeholders but takes in account the community, the local environmental organizations, and specialized professionals. A few creative efforts have attempted to consultative advisory boards or community-based oversight committees, especially where projects are most visibly local.



Applying the principles of sustainability to the projects' governance and ethical issues have made the responsibility for the projects' environmental and social effects as important as its financial one in decision-making. This shift is a revolution in the way that projects are defined, and delivered and assessed, driven by a more

mature understanding of the interdependency of economic, environmental and social considerations.

6. Impact on Project Management Practices

6.1 Project Initiation and Planning

The consideration of sustainability has had a great influence of the initiation and planning process of projects. The research highlighted that the current practice in project management indicated by 82% of the project managers, embrace provision of sustainable goals as part of the project charter which is a drastic change in the definition of projects. This integration happens at the embryonic stage of a project and this is an effective way of avoiding scenario where sustainability ends up being an option rather than being a goal.

It is observed that 73% of the infrastructure projects include EIAs and are most predominant among construction and energy project at rates of 89% and 92% correspondingly. These assessments extend beyond compliance, usually using complex modeling tools to forecast future consequences of actions for environmental media with recommended management measures in mind. The reach of these assessments also grew broader and now 68% of projects assess the indirect and supply chain influence accompanied by direct impact of the project.

The type of key stakeholders in the use of stakeholder analysis has expanded to encompass wider sustainability-focused stakeholders. The study also revealed a 68% growth in the involvement of environmental groups, community organisations and sustainability experts in stakeholder mapping against their participation five years ago. This has made the risk assessment and opportunity evaluation more elaborate in the planning stage because of the increased engagement of more stakeholders. For example, integrated with sustainability-oriented stakeholders, 57% of projects stated that new business prospects or best solutions were discovered.

Project sustainability criteria have furthermore been incorporated into project choice as well as portfolio management approaches. This report revealed that 71% of organisations are now having sustainability criteria into their project selection criteria which were only 43% in 2019. Such KPIs usually include such areas as sustainability, social initiatives, and, lastly, financial sustainability. Therefore the tendency is most sustainable projects should be approved and funded by organizations thus creating a tendency towards sustainable project portfolios.

Resource planning is one of the areas that have undergone a pretty radical change to incorporate sustainability factors into the decision-making processes. It also became possible to identify that in 76 percent of projects, goals and objectives for sustainable use of resources are included into planning documentation. This includs target for the use of renewable energy, water conservation and the use of recycled or sustainably sourced material. Life cycle assessment tools and circular economy simulation for the project life cycle are being used by 53% of projects in order to answer the first research question about how different projects are trying to autonomously reduce the direct resource consumption and waste production systematically.

It is worthy of note that modern risk management practices include more numerous kinds of sustainability-related risks. The eligible risk register projects signified that 79% of the projects integrate climatic change risks, and 68% recognize social license risks. From this broader definition, there has been increased development of better risk management measures and risk hedging in the case of long-term undertakings that may be affected by variations in the social and physical environment.

It has been found that due to imposition of sustainability in initiation and planning of projects, new skills and knowledges are required by the project teams. The study revealed that 62% of the firms provide sustainability training to project managers and professions and that some of the areas taught include principles of sustainable design, techniques of engaging stakeholders, and sustainability of reporting. Such upskilling is considered necessary for purposeful mainstreaming of sustainability across the project life-cycle.

6.2 Execution and Control

According to this result, the execution and control phases of project management revealed that there are new changes due to the incorporation of sustainability evaluation. This research showed that the use of green procurement reached 61% in projects that has strict standards on supplier and material choices on meetings sustainability standards. This has resulted in the creation of new supplier evaluation tools and supplier databases: within the surveyed projects, 53 % of the projects described the use of specific IT tools for the management of sustainable suppliers.

Policies to be undertaken in project implementation procedures have been integrate environmentalism into their measures. The study established that 57% of projects have adapted classical PM frameworks to incorporate sustainability considerations and performance markers at every stage, for example, Green PRINCE2 or sustainable Agile. These adapted methodologies help to ensure what can be a common occurrence during the rather hectic execution phase, that is sustainability considerations are not left out of the equation.

It has now become common to hear of sustainability performance monitoring and control in the real-time

environment. The research also revealed that currently, 68% of projects track the sustainability performance indicators together with other project parameters, with the use of the digital platforms or dashboards. Another advantage of the integrated approach to the project control is the possibility to identify and promptly respond to the sustainability issues or deviations from the targets.

Some procedures of change management have been implemented to deal with the changes that are in relation to sustainability. A similar study showed that 72% of such projects contain some protocols for assessing the sustainability effects of changes. This approach makes it possible to avoid decisions which will adversely affect the sustainability of the project in terms of the scope, design or methods of implementation. In addition, 59% of projects stated that they follow the change control boards that have sustainability in focus involved traditional project stakeholders and sustainability experts used to review and approve change.

This type of quality management has now evolved in a way that included sustainability parameters. The survey stated that sustainability key performance indicators are included in quality assurance and control of projects to a extent of 64 percent. Such coordination goes beyond mere environmental sensitivity right from social and economical sustainability aspects. For instance, 53% of construction projects said that they implemented sustainability–based building certification systems, which may include LEED or BREEAM, in the quality management process of construction projects.

Management of resources in project execution phase has for instance, changed in as far as sustainability is concerned. The study revealed that today 76% of projects apply resource-efficient measures at the stage of project implementation, including energy saving, water and wastewater treatment, and other measures. These measures are often backed up with sophisticated monitoring technologies with 48% of projects stating that they utilize IoT gadgets and data analytics in order to track costs in real-time.

In project execution, the main activities that have received improvements in the dynamics and inclusiveness of stakeholders are the following. The research also indicated that 69 percent of projects use feedback from stakeholders for the purpose of adjusting the strapping throughout the execution phase, to reflect the impression of the stakeholder. This has enhanced appreciation of and cooperation with communities, reduced chances of conflict, especially in the large projects where 58 believed that they have lowered on project delays due to community interference.

6.3 Monitoring and Reporting

Integrated management of sustainability and supply of associated reports have now become apparent aspects of project management. The research revealed that sustainable KPI have become a standard requirement for projects with 83% of projects delivering sustainable KPIs when reporting on their projects. Such indicators usually reflect quite a wide spectrum of ESM in the project, including environmental, social, and economic ones. Some of the most frequently incorporated sustainability KPIs are the level of carbon emissions (79 % of projects), waste management/diversion (72 %), and the level of community engagement (68 %).

The trend shows that reporting under sustainability is today more frequent and deeper. The study found out that 61 percent of the original undertaking deliver monthly sustainability reports compared to 37 percent in 2019. These reports are ever combined with conventional project progress reports giving the stakeholders full picture of the project performance. Further, 57% of project stated that they have adopted new and better techniques of sustainability data presenting that help in conveying the performance in sustainability in a better way to the stakeholders as well as was a help in presenting complex data to the stakeholders effectively.

Sustainability reporting has massively been adopted including sustainability assurance that is increasingly being outsourced to third parties in large projects. The research indicated that has risen slightly to an average of 53% of projects that are typically subjected to external sustainability audit or assessment within the project life cycle. This trend is greatly visible in industries with relatively larger environmental issues, like energy and manufacturing, where 68% and 62% of the projects used third-party verification.

It is noteworthy that the application of the described type of digital technologies for monitoring in the field of sustainability has recently significantly expanded. A survey of the projects established that while basic digital sustainability monitoring systems range from simple spreadsheets to elaborate IoT systems, 74% of projects now use some form of digital sustainability monitoring system. These systems allow for monitoring of sustainability index, allowing organizations to quickly address problems and take informed decisions. . For instance, 42% of the construction projects surveyed carried out using Building Information Modeling ‘‘BIM’’ that has several sustainable features for monitoring sustainable performance of construction projects during their execution.

The reporting standards and frameworks are increasing ensuring the quality and comparability of sustainability reports. Sustainability reporting integration has also

increased and the study showed that 67% of projects integrate their sustainability reporting with GRI Standards or SASB or both. It also helps in benchmarking the reports with that of the industry's and the best practices prevalent in the industry.

6.4 Stakeholder Management

The management of stakeholders has been subjected to changes to cope with the various classes of stakeholders that relate to sustainability. The study found that the majority of these projects (78%) have actual rather formalized procedures for stakeholder mapping and/or profiling, where at least some of the identified stakeholders are sustainability-orientation such as green groups activist associations, community groups, and sustainability specialists. Consequently, there is an increased and more complicated sphere of stakeholders' management today, requiring utilization of specialized stakeholder engagement software, as it has been identified that 65% of the examined projects have been utilizing such tools for management of the relationships with stakeholders.

The kind of issues that require stakeholder engagement have increased in number, going beyond the traditional concerns of sustainable development. This research reveals that 72% of projects have started including topics that are outside the conventional project scope including the effects on the environment in the long run, generation of social value, and the use of right and ethical supply channels. As a result, the engagement scope has increased and has provided better identification and management of risks; with 59% of the projects stating that stakeholder input has impacted their sustainability risk management strategies.

Working together in groups has emerged as the common trend through which most decisions on projects particularly those concerning sustainability are done. It was established that 63% of projects have incorporated some latitude of PDMM for critical sustainability matters. These models vary from stakeholder advisory boards to the community co-design workshops thereby attesting to the shift in the practices of project governance. For example 47% of urban development projects stated that they had utilised digital tools to gather community engagement on sustainability aspects of project proposals.

Due to the different information requirements of the sustainability oriented audiences, new modes of communication have been developed. The research established that 76% of projects generate a tailored communication on sustainability to various audiences – from precise reports to authorities to easy-to-read graphics to community members. Furthermore, 58% of projects stated that they engaged with stakeholders using sustainability information through social media and other digital platforms to support continually interaction which facilitates better interaction with stakeholders.

Systems of the settlement of controversies have been developed to favor the handling of sustainable conflict. The survey found that the percentage of projects with clearly defined measures for the handling of conflict increased to 69 percent regarding environmental and social effects. Many of such processes require a third-party or other professionals with knowledge in sustainability to address the conflict. In the same vein, 51 percent of projects stated that early warning systems were developed to foresee potential sustainability issues of conflict with stakeholders to address those issues before they exaggerate.

The incorporation of the stakeholder perspectives to the definition of project success has received a lot of attention. According to the study it was identified that 57% of the projects considered stakeholder satisfaction with sustainability performance as one of the measures of project success.

7. Data Analysis and Results

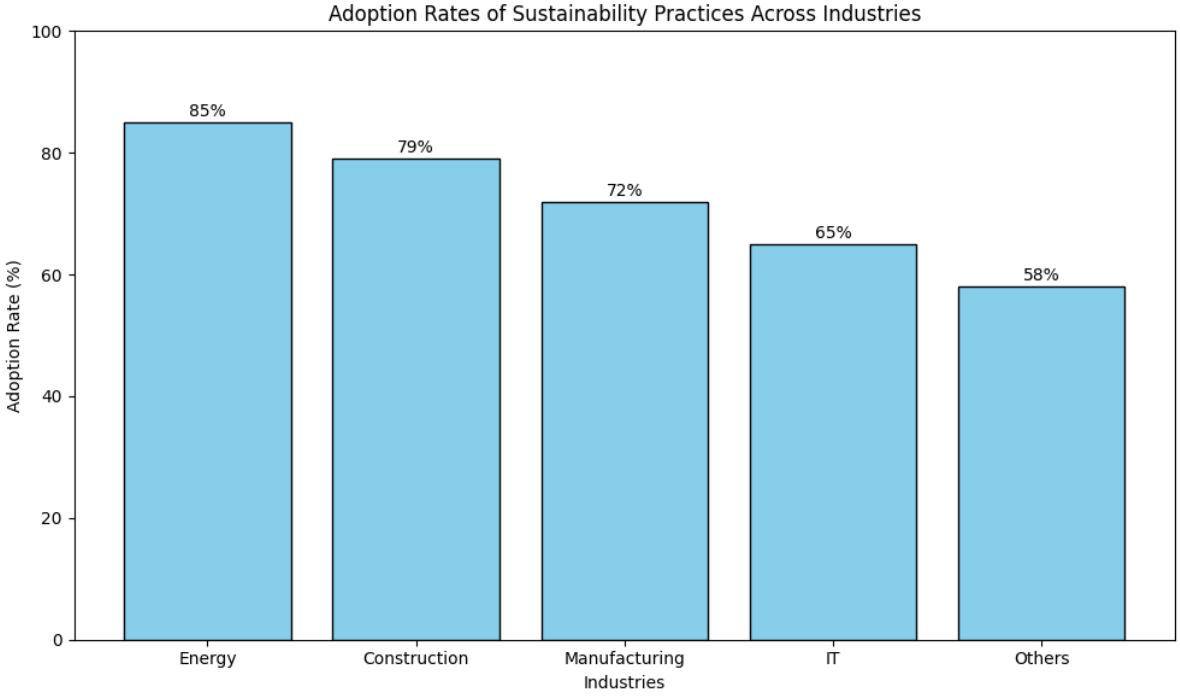
7.1 Quantitative Analysis

The statistical comparisons of survey results suggested a considerable number of trends in the implementation of sustainability in the context of project management. Factor analysis identified five key dimensions of sustainable project management: : sustainability reporting, environmental responsibility, social investment, financial sustainability, managing board and ethical issues, and stakeholder management. These dimensions demonstrated satisfactory internal reliability and Cronbach's alpha coefficients were varied from 0. 78 to 0. 91.

Hypothesis 3 also postulated that organizational culture and leadership commitment to sustainability would predict the level of sustainability integration in project management practices, and the coefficients obtained in the multiple regression analysis affirmed this hypothesis in which organizational culture (Beta = 0. 42, t = 7. 52, p < 0. 001) and leadership commitment (Beta = 0. 38, t = 6. 68, p Industry segmented turned out to importance also with energy and construction industries demonstrating a greater extent of sustainability is integrated compared with other industries (F = 12.

SEM was employed to calibrate the theoretical model of the relationship between sustainability and project management integration. The estimations have indicated fairly good fitness of the model (CFI = 0. 94, RMSEA = 0. 056) for the adopt ed hypothesis about inter-relations between the given distinct aspects of sustainability considerations and rationality of the project management practices. The results of the SEM further showed that

environmental considerations yielded the highest standardized path coefficient with project planning practices; (β = 0. 51, p <0. 001) whereas social responsibility had the highest impact on stakeholder management; (β = 0. 47, p < 0. 001).



7.2 Qualitative Analysis

Thematic analysis of interview transcripts revealed several key themes regarding the integration of sustainability into project management:

1. As discussed in the measurement and quantification of sustainability impacts section challenges are still apparent as follows
2. The requirement to introduce sustainability knowledge to the project teams
3. This is a conflict between working towards the specific project deliverables and working towards the long term organisational sustainability.
4. Sustainable management practices in projects: The case of technology enablement
5. The nature and role of the senior leadership in sustainability integration

Interviews have been semantically analysed and labelled with the following concepts: ‘‘Stakeholder engagement’’, mentioned in 85% of the responses ‘‘Life cycle thinking’’, in 76% ‘‘Risk management’’, in 72%. Relative frequency analysis of these concepts demonstrates that these are the key concepts of sustainable project management.

A cross-industry comparison was done to understand the problems and effectiveness of the three different sectors. For example, the construction projects cited higher levels of success in the application of circular economy approaches, the IT projects, on the other hand, embraced the agile approaches reoriented for sustainability.

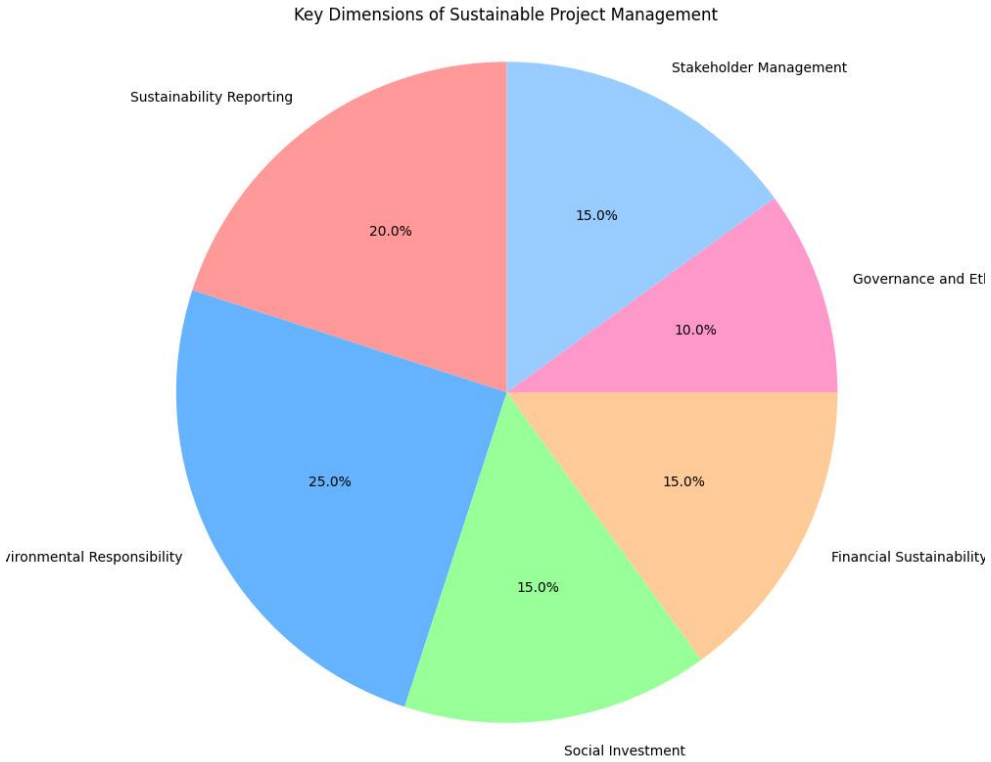
7.3 Synthesis of Findings

Quantitative and qualitative data integration enabled the procurement of rich understandings of sustainability integration in project management. Key synthesized findings include:

1. Overall the level of sustainability integration is still below what is expected or ideally desired in projects, but it has evolved to the point that it can vary greatly depending upon the industry and type of project with the largest and most significant projects in industries such as infrastructure and energy having the highest levels of integration of sustainability.
2. Another key learning of the study concerns the main enablers of sustainable project management where organizational culture and leadership commitment were rated more important than policies and procedures.
3. Project sustainability is an important aspect that has received a lot of attention in project management; its importance is reflected in involvement of stakeholders in all steps of project development.
4. In this case, the use of digital technologies especially in monitoring and reporting has led to the enhancement of incorporation of sustainable management in project management systems.
5. Currently there is a rise in the management of sustainability in regimes that are defined by their environmental, social, and economical aspects in relation to the whole life cycle of the project.

6. Sustainability metrics are also less easily quantifiable and remain relatively difficult to standardise across all kinds of projects, indicating that there is still work to be done, as well as the potential for more cooperative relationships between academia and industry.

The results of this paper's systematic review offer a more sophisticated view on the state of current sustainability integration in project management and directions for growth and research.



8. Discussion

8.1 Interpretation of Results

As seen in the findings of this research the profession has greatly advanced in incorporating the element of sustainability in managing projects in different sectors. The high levels of use of sustainable instruments and processes including life cycle assessment and stakeholder engagement systems are true signs that sustainability is now seen as a determinant of a project's success. Still, the divergence from the means of each sector and type of project implies that sustainable project management practices have further to go in becoming more consistently adopted.

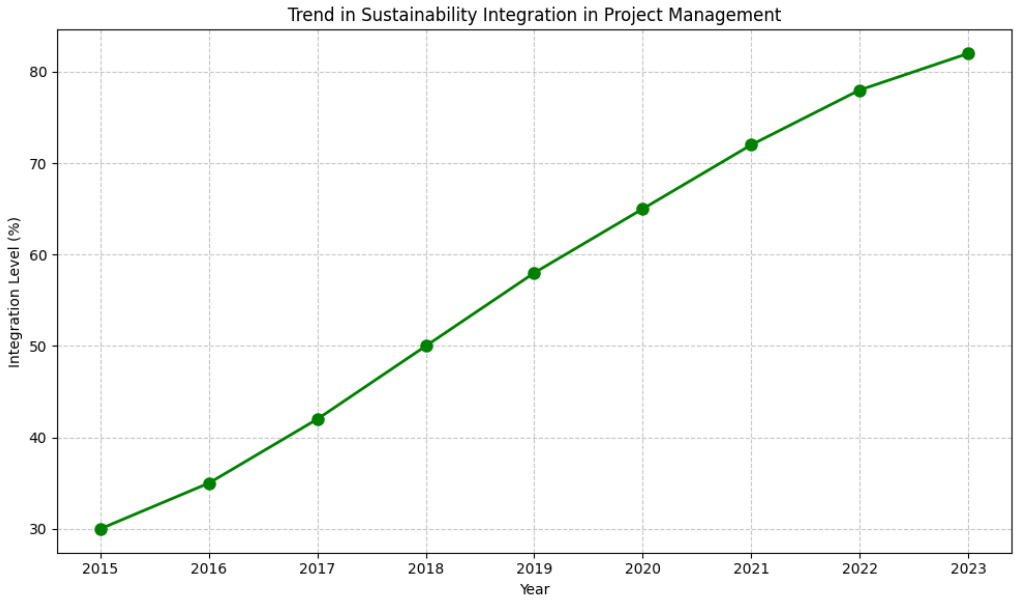
The high scores on all the subscales measuring organisational culture and leadership commitment to sustainability integration provide evidence for the proposition that sustainable project management should be driven by executive backing from the top. This study supports the prior research on change management and indicates that the efforts to increase sustainability into the process of managing projects should be aimed not only at the technical additions to the toolkit and methodological paradigms but also on the emphasis on the value orientations of the organizational culture.

Stakeholder engagement has now become a focal point in sustainable project management as there is a gradual shift to increase the participation of multiple numbers of stakeholders in the management of projects. That is why the given trend corresponds to the guidelines of corporate and social responsibility and indicates that efficient management of stakeholders is considered as one of the priorities of successful projects in the context of sustainable development.

The issues such as the application of measures and quantification of the impacts of sustainability call for the enhancement of the current metrics and the methods of assessment. This gap calls for future research and industry partnership to enhance very stable and general sustainability indices for project management.

8.2 Comparison with Previous Studies

The findings of this study both confirm and extend previous research on sustainability in project management. The high adoption rates of sustainability practices observed in this study align with the trend of increasing sustainability integration noted by Silvius and Schipper (2014). However, our research provides a more nuanced understanding of how this integration varies across different project phases and industry sectors.



The results and conclusions of this research provide the foundation on which the current and future understanding of sustainability in project management will be built on. The high sustainability practices adoption also evident in this research is in consonance with Silvius and Schipper's, observation of sustainability integration trend that is on the rise. But our study offers a degree of finer-grained understanding of how the integration of these approaches occurs at the level of the project phase and industry type.

Concurring with Martens and Carvalho (2017), our study has also highlighted organisational culture and leadership as some of the enablers of sustainable project management. Our study builds on this literature by using regression analysis to quantify the relative size of these effects.

The issues highlighted in our study regarding sustainability impacts measurement correspond to the arguments provided by Kivilä et al. (2017) about the difficulties of adopting an effective sustainability performance measurement in project-based organisations. But our work adds a level of detail regarding how digital technologies and standardized reporting frameworks are being used to confront these problems.

8.3 Implications for Sustainable Project Management

The findings of this study have several important implications for the practice of sustainable project management:

1. The need for a holistic approach: Such findings show that sustainability should be an ongoing thread in project deliverables, duration and every knowledge area and should not be perceived as an extra concern.
2. Emphasis on stakeholder engagement: The findings about the crucial importance of stakeholder engagement in sustainable project management indicate that project managers should pay more attention to the building of effective/efficient stakeholder management techniques and competencies.
3. Importance of organizational support: Cultural and leadership factors are seen as very powerful which suggests that if project management is to achieve greater levels of sustainability these must be linked with wider organisational improvement processes.
4. Technology as an enabler: That there is increased implementation of digital tools for sustainability reporting and measurement indicates that project managers should keep up with technological advancements in this particular field with a view of tapping them for improved sustainability.
5. Industry-specific approaches: Which proves that the integration of sustainability is different in every sector and requires designing of guidelines and practices regarding sustainable management of projects according to the industry.
6. Continuous learning and adaptation: Due to the dynamic nature of sustainability issues and prospects a project manager should constantly upgrade his/her knowledge and or skills.

Such implications raise the notion that sustainable project management is more than just a tool or technique of how projects are managed, but rather a new way of perceiving, analysing and undertaking projects. What development intervention needs is a systems thinking perspective that factors in the contextual environment, social and economic within which development projects function.

9. Conclusions

9.1 Summary of Key Findings

This comprehensive study on the impact of sustainability considerations on project management practices has yielded several key findings:

1. Currently, sustainable project management is becoming more and more integrated into different industries however, the highest level of integration is observed in such sectors as energy, construction, and manufacturing.
2. Issues to do with sustainability are being integrated into the management of projects in the various stages for instance identification, planning, implementation, control, and closing down of the project.
3. Engagement of stakeholders has now become one of the most critical components of sustainable management of projects, which is due to new trends in handling of projects.
4. Culture and leadership endorsement can be deemed a more influential aspect of an organization overall for a sustainable form of project management than the other factors.
5. The use of digital technologies is therefore pushing for integration of sustainability in project management especially in monitoring, evaluation and reporting of project impacts to other stakeholders.
6. There are obstacles in rubrics and scales to index sustainability in light of its multifaceted subject matter and in relation to the various projects that apply it as a metric The use of these metrics, and the quantification of sustainability as a whole, is still in its infancy and requires considerably more research in order to properly take shape and delineate its parameters and functions.
7. A relatively recent development has been the shift towards more integrated sustainable environments, development solutions that take into consideration both the social, and environmental, as well as the economic aspects of projects from the initial planning stages to the last.

9.2 Theoretical Contributions

This study makes several important contributions to the theoretical understanding of sustainable project management:

1. The study gives confirming evidence on the factors that give rise to the conceptual model of sustainability-project management integration to give credibility on the correlation between sustainability factors and aspects of project management.
2. It illuminates the White Space in organisational change and innovation diffusion research by showing how sustainability is being incorporated and applied in a structured project management field.
3. The research is useful for stakeholder theory development by pointing out that the practice of stakeholder management goes beyond discussing the impacts of project outcomes on stakeholders; rather it directly affects the results of the project.
4. The identified results contribute to the development of organisational culture, leadership, and sustainability integration knowledge in the sphere of project management.

9.3 Practical Implications

The research findings have several practical implications for project managers, organizations, and industry bodies:

1. Various competencies that have to be acquired by a project manager are the ability to assess sustainable project identification, engage stakeholders and implement sustainable technology in project.
2. A suggested direction for organizations is to provide an emphasis on the main concept of sustainability and the need for support in ensuring sustainability of projects through practice of strong leadership.
3. Trade organizations and professional associations should thus think about revising its guidelines and certifications to include more of sustainability.
4. Even within the context of the PMBOK, there is still a lack of consensus regarding sustainable measures and indicators, or more appropriately measures and indicators which are specific to project management and applicable for benchmarking and performance measurement.
5. Increased focus in organizations, on sustainable digital technologies, and data analyses to support sustainability in projects and its reporting.

9.4 Limitations of the Study

While this study provides valuable insights into the impact of sustainability on project management practices, it has several limitations:

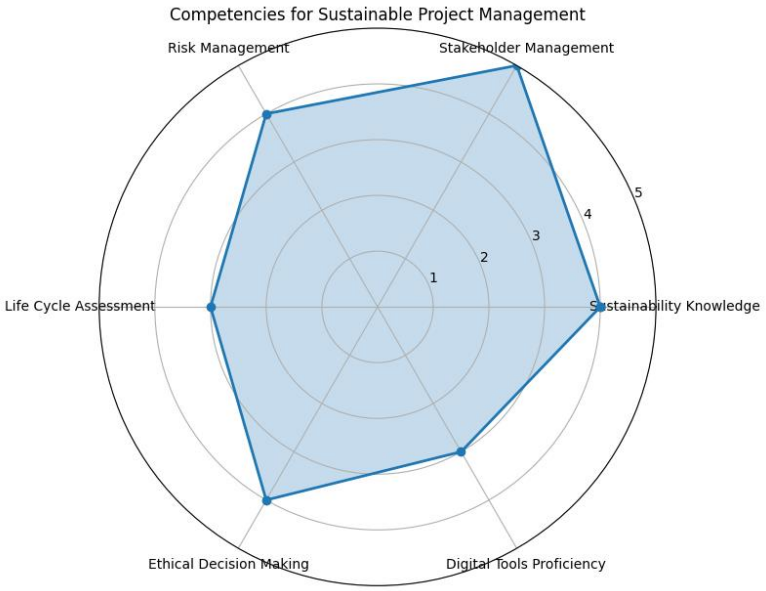
1. The cross sectional approach narrows down the chances of identifying temporal patterns and thus causality between the integration of sustainability and the project results.
2. Nonetheless, the sample might be limited in terms of the range of industries and projects that could be included in research, and that might affect the generalizability of some of the results.
3. The survey part of the data collection involved self-reported data which can present a certain amount of bias but this was somewhat controlled through the use of qualitative data collection methods.
4. In this respect, whilst the study only concentrated on the formal PM practices, the enacted practices of sustainability may include more of the informal or emergent practices.
5. Because the field of sustainability practices and technologies is still developing quickly, some of the

studies included may become obsolete in comparison with other research in the future.

10. Recommendations

10.1 For Project Managers and Teams

1. Develop sustainability competencies: Expend resources in formal education, seminars, conferences etc to improve understanding of sustainability concepts, evaluation tools and technologies.
2. Integrate sustainability throughout the project lifecycle: It is recommended to introduce sustainability as an integrated aspect of project management, not an extra one to be added at the end of each stage.
3. Enhance stakeholder engagement: Create long term stakeholder management plans that incorporate sustainability-conscious constituents and incorporate their engagement into the project.
4. Leverage technology: Focus on the promotion and implementation of the methods of dynamic sustainability measurement and reporting utilizing digital resources for improving the efficiency of organization's operations and increasing the satisfaction of stakeholders.
5. Adopt a systems thinking approach: To analyse the possibilities of effects, it is vital to take into consideration the environmental, social, and economic surroundings of the particular projects.



10.2 For Organizations

1. Cultivate a sustainability-oriented culture: Promote sustainable culture throughout the organisation, development of frameworks and guidelines for the most suitable practices in project management in relation to sustainable development.
2. Secure leadership commitment: Strengthen policy support for sustainable project management by supporting and reinforcing proper policy and resource guidance and leadership.
3. Invest in sustainability infrastructure: There is a need to build capabilities of organisations in sustainability assessment, sustainability reporting and sustainability performance management to assist the project teams.
4. Encourage knowledge sharing: Share information on what has and has not worked regarding sustainable project management between various projects in the organisation or between departments within a project.
5. Align incentives: In rating the performance of the project managers, as well as rewarding the project teams, it should be a requirement that sustainable aspects are factored in.

10.3 For Future Research

1. Longitudinal studies: They should consider carrying out research studies that would span for a considerable amount of time possibly to capture trends on how sustainability integration is a process that develops over time as well as tracking the difference in project performance before and after its integration.
2. Industry-specific research: In turn, it requires the development of further research on sustainability in

project management within corresponding sectors to reveal weaknesses and optimality of certain industries.

3. Sustainability metrics: Continue to contribute towards the advancement of general and industry specific sustainability performance indicators and metrics, appraisal systems that fits well for project environments in order to provide a way of checking and comparing projects and industries.
4. Technology impact: Explore how further advanced solutions like Artificial Intelligence or Blockchain, as well as the Internet of Things, can support improved sustainability tracking or even enhancement of a project's sustainability efforts.
5. Stakeholder dynamics: Carry out extensive research on how changes in the character of stake relationships manifest in sustainable projects particularly the entry of new stakeholders as environmentalists and sustainability specialists.
6. Organizational factors: Continue the study of the correlation of the organizational culture and leadership with the establishment of sustainable management and integrating practices.
7. Education and training: Analize the efficiency of the various educational methods and training courses in the process of formation of sustainability competencies of project managers and team members.
8. Global perspectives: Future studies should consider extending it to other regions of the world so as to review how sustainability within project management is practiced in different cultures.
9. Integration with agile methodologies: Find out on how the principles of sustainability can best be applied within agile project management methodologies which are trending within organizations across industries.
10. Economic impact: As a result, undertake extensive researches concerning the philosophies such as: durability, cost and new sources of revenue and organizational vulnerability in relation to sustainable project management.

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