

**A COMPARATIVE ANALYSIS ON EFFECTIVENESS OF TRADITIONAL AND
PRISM APPROACH IN PROJECT MANAGEMENT ON BUILDING
CONSTRUCTION: CASE OF ENABEL UGANDA**

BY

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DECLARATION

I, Bikey Francis Xaviour-21/U/GMET/14091/PE, hereby affirm that this dissertation is entirely my own original work and, to the best of my knowledge, contains no previously published materials for the award of any degree from a university or other higher education institution, with the exception of those instances where appropriate citations have been made in the text and reference list.

Sign..... Date.....

APPROVAL

The under signed, approve that they have read and hereby recommend for submission to the Directorate of Research and Graduate training of Kyambogo University a proposal titled “Comparative analysis on the effectiveness of PRiSM approach in project planning and management on building construction projects: case of projects implemented by Enabel in Uganda” in fulfillment of the requirements for the award of Master of Science in Construction Management and Technology Degree of Kyambogo University.

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Sign.....

Date.....

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DEDICATION

I dedicate this dissertation to my Mum and Dad for the unwavering belief and support they rendered to me during this endeavor.

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LIST OF ACRONYMS

BDA:	Belgium Development Agency
CO ₂ :	Carbon dioxide
GDP:	Gross Domestic Product
GHG:	Greenhouse Gas
GWPs:	Global Warming Potentials
ISO:	International Standards
UDC:	Nationally Determined Contribution
UN:	United Nations
UNEP:	United Nation Environment Program
UNFCCC:	United Nations Framework Convention on Climate Change
UNGA:	United Nation General Assembly
WMO:	World Meteorological Organization

ABSTRACT

Projects integrating Sustainable Methods (PRiSM) approach is critical in successful achievement of sustainability in project management on building construction projects. Building projects face complex challenges of balancing economic, social and environmental factors in their lifecycle for sustainability in constructions. Traditional approach caters majorly economic aspects neglecting social and environmental which are undertaken by PRiSM which is adopted by ENABEL necessitated this study to determine its effectiveness. The study establishes the environmental, social, and economic contribution of the PRiSM and traditional approaches on building construction projects. The descriptive research design with both quantitative and qualitative approach was adopted. The questionnaires were administered to 279 respondents to identify critical factors for Traditional and PRiSM approaches where Spearman was applied. The study interviewed 25 participants to identify strategies for improvement of PRiSM. SPSS version 24.0 developed mean where ranking was done to determine the critical factors using factor analysis. Results indicated that PRiSM approach ensured that employees and suppliers are satisfied with timely completion of project which cater for economic motive with two critical factors of stakeholders' involvement and time management as well as quality design, environmental aspect was realized through harvesting of rainwater and protection of ecosystem to control pollution, social factors involved uptake of government intervention to prevent HIV/AIDs and provision of good working conditions. Traditional approach emphasizes profits, environment consider occupation management and social factors support use of local material and protection of ecosystem. Other findings indicated that PRiSM and traditional have moderate sign relationship ($r= 0.571$) on economic motives and negative relationship for environmental and social factors. Construction projects should adopt PRISM with inclusive participation of stakeholders in decision making, monitoring and evaluation and compliance on eco-system conservation regulations under an institutional framework. PRiSM approach emphasizes sustainability throughout project lifecycle with potential shift to reduce risk which lead to long-term value creation in construction industry.

Key words: PRiSM Approach; Traditional Approach; Building construction Projects; Project management; Sustainability.

CHAPTER ONE: INTRODUCTION

This chapter presents the background to the study, statement of the problem, purpose of the study, research objectives, research questions, conceptual framework, significance of the study, justification of the study and scope of the study. The study evaluated the comparative analysis on effectiveness of PRiSM approach in project planning and management on building construction projects with projects implemented by Enabel in Uganda specifically in Mubende, Kaliro, Unyama and Muni.

1.1 Background

In this era of universal scale changes, human behavior and activities are outstanding as a result of our ability to alter the ecosystem with an aim of meeting our needs dubbing this era the “Anthropocene,” also known as the Age of Man. This outstand is causing alteration with implications as management of construction projects endeavor to create an ecological balance. For instance, abnormal consumption of fossil fuels to power cars, homes, and industry has led to fortuitous consequences for instance change in climate patterns, shifting coastlines, and acidifying oceans which is ideally termed as Global warming (IPCC, 2022). In many places and during many seasons, we are already seeing temperatures that are higher than the global average, with land temperatures being higher than ocean and sea temperatures. The world's population at 20% - 40% have lived in areas already warmed by more than 1.5° Cover pre-industrial levels for at least one season between 2006 and 2015 (IPCC, 2022) . The fact that many of the countries in Sub-Saharan Africa and Southeast Asia greatly suffering from the negative effects of climate change yet they produce the smallest quantities of green gas emissions. In addition, droughts among other negative effects of climate change are particularly dangerous to the populations (Sawyer, 2022). The East African Community (EAC) as a region for instance is gifted with a very conducive climatic environment and various resources shared across borders that are the drivers of local

livelihoods, national and regional economic development which makes her a fundamental destination of many immigrants. The climate change aggravated by the increasing average global temperatures of which the construction industry is a great contributor constrain sustainability of projects.

Many companies include the concept of sustainability into their mission statements and strategies. Project planning and management in the construction industry play pivotal roles in ensuring the successful delivery of projects on time, within budget, and with minimal environmental and social impacts. As the global community increasingly recognizes the importance of sustainability, project management methodologies that integrate environmental, social, and economic considerations have gained prominence.

One such approach is the Projects Integrating Sustainable Methods (PRiSM) approach, which places sustainability at the forefront of project planning and execution. In the context of building construction projects in Uganda, the adoption of sustainable project management practices is becoming imperative. Balancing the economic benefits of construction with its potential environmental and social consequences requires a nuanced and comprehensive approach. The PRiSM approach offers a promising framework for addressing these challenges. The integration of sustainability principles into every phase of a project's lifecycle, from conceptualization to post-construction evaluation. By emphasizing stakeholder engagement, resource efficiency, and long-term sustainability goals, PRiSM sought to transform traditional project management practices, which often prioritize short-term economic objectives.

ENABEL, the Belgium Development Agency charged with carrying out Belgium's foreign development strategy, organized a symposium in February 2019 to promote climate-responsive design in East Africa. They created a manifesto that examines how East African

environmental challenges could be lessened through architecture. With reference to case study examples from the Democratic Republic of the Congo, Uganda, Rwanda, and Malawi, it serves as a manual for the specific climate and cultural setting of East Africa. The Manifesto's guiding ideas, however, can be interpreted and used in a variety of global contexts and climate zones. It should be noted that ENABEL also focuses on creating a sustainable society where women and men can live in freedom and under the rule of law while engaging strategically and with policy influence to support sustainable development by having climate responsive designs implemented. These initiatives are examples of a new generation of architecture that demonstrates how the built environment may lessen the effects of climate change and biodiversity loss.

By examining the experiences and outcomes of building construction projects implemented by ENABEL in Uganda, this research aims to provide valuable insights into the applicability and effectiveness of the PRiSM approach in a developing country context as compared to the traditional approach. Through an in-depth exploration of existing literature and empirical data, this study seeks to contribute to the growing body of knowledge on project management practices, ultimately guiding the advancement of the construction industry in Uganda towards greater sustainability and effectiveness.

In the subsequent sections, the study delved into a comprehensive literature review, drawing from relevant academic sources and research studies, to provide a more in-depth understanding of the PRiSM approach and its implications as compared to those of the traditional approaches for building construction projects in Uganda.

1.2 Problem Statement

The ecosystem is supposed to remain diverse and indefinitely reproductive and productive over time without threat of extinction or distortion. However, building construction which

is a key facilitator to industrialization and economic development is causing global warming which is a threat to future generations. According to a Global Statistical analysis by the International Green Building Council (2017), buildings and construction alone are responsible for roughly 36% of global energy usage and 40% of global carbon emissions. This mentioned percentage offers us a good indication of the potential environmental impact of development and hence the quest for sustainable practices has hence become paramount in recent years. Sustainable construction not only addresses environmental concerns but also encompasses social and economic aspects. Building construction projects in Uganda, like in many other regions, face complex challenges in balancing these sustainability dimensions throughout their lifecycles. Traditional project management approaches prioritize short-term cost efficiency, often neglecting the long-term environmental and social impacts of building construction projects. While the Projects integrating Sustainable Methods (PRiSM) framework offers a promising approach for achieving sustainability in construction, though its application in Uganda remains limited. Hence, there is a growing interest in evaluating the effectiveness of innovative approaches such as PRiSM.

1.3 Research Objectives

1.3.1 Main Objective

The main objective was to compare the effectiveness of traditional and PRiSM in ensuring sustainability of construction projects.

1.3.2 Specific Objectives

- i.** To establish the environmental, social, and economic contribution of the PRiSM approach on building construction projects in Uganda.
- ii.** To establish the environmental, social, and economic contribution of the traditional approach on building construction projects in Uganda.

- iii. To suggest areas of improvement in the PRiSM strategy to enhance project management on construction sites in Uganda.

1.4 Research questions

- i. To what extent have building construction projects that have been implemented using the PRiSM approach benefitted the environment, society and economy?
- ii. To what extent have building construction projects that have been implemented using the traditional approach benefitted the environment, society and economy?
- iii. What improvements should be made to improve the PRiSM approach on building construction projects?

1.5 Significance

The significance of this research lies in its potential to inform construction project stakeholders, including government agencies, policy makers, contractors, developers and environmentalists, about the benefits and limitations of adopting the PRiSM approach. By comparing PRiSM with traditional project management methods, this study seeks to identify areas of improvement in the PRiSM strategy, offering practical insights that can enhance its implementation. Furthermore, the findings of this research may guide policy formulation and industry practices related to sustainable construction in Uganda and other similar contexts. Ultimately, this research strives to contribute to the achievement of more sustainable and environmentally responsible construction practices, aligning with global sustainability goals. Knowing where this strategy needs to be improved and how to use it most effectively is hence determined by how well it has been implemented as has been recommended from the research results and hence have the following benefits:

- i. Growth, efficiency, and stability as economic goals.
- ii. Employment, justice, safety, education, health, participation, and cultural identity are

among the social benefits.

- iii. Environmental goals include preserving non-renewable resources while ensuring that humans live in a clean environment.
- iv. Being still a novel area for researchers will also broaden awareness of sustainability principles and real-world performance hence a source of reference and knowledge.
- v. Successful publication will also lead to the award of a master degree in construction management and technology.

1.6 Justification

The buildings that exist now will make up around two thirds of the world's building stock in 2040. (Architecture, 2018) without broad global decarbonization of existing buildings, these structures will continue to produce CO₂ emissions in 2040, preventing realization of the Paris Agreement's 1.5°C objective. The choice of project management approach hence significantly influences the outcomes of building construction projects. There is increasing global emphasis on sustainability, and limited existence of research on the effectiveness of PRiSM in the specific context of Ugandan construction projects. Understanding how PRiSM compares to traditional approaches in this context is crucial for promoting sustainable construction practices in the country.

This study focuses on projects implemented by ENABEL, a Belgian development agency actively promoting sustainable construction in Uganda. By analyzing ENABEL's projects, the research can provide valuable insights into the real-world application and effectiveness of PRiSM within the Ugandan construction industry.

The findings can contribute to the existing body of knowledge by providing empirical evidence on the contribution, benefits and recommendations of the PRiSM approach in integrating environmental, social, and economic considerations into building construction

projects. Such evidence is vital for informed decision-making in the construction industry, ultimately leading to more sustainable and resilient built environments.

1.7 Scope of study

1.7.1 Content scope

The projects covered full life cycle, from conception to closeout, meaning that they have been started and finished. It also involved separately assessing the sustainable impacts of both the PRiSM and traditional approaches from which comparisons were drawn. Additionally, it comprehensively applied to construction building projects carried out by Enabel actively promoting sustainable construction in Uganda. but implemented by Excel construction, Ambitious construction and Prisma limited. These companies have been chosen specifically because they have implemented project using both the PRiSM and traditional approaches of project management in Uganda hence the results obtained from their responses become more reliable.

1.7.2 Geographic scope

The proposed project was limited to four educational institutions across the country that is National teachers' college Unyama in Gulu district, National teachers' college Mubende, National teacher's college Kaliro and National Teachers College Muni. These were chosen since it's in these institutions that Ambitious construction, Prisma construction and Excel construction have implemented projects funded by ENABEL and have also independently used the PRiSM approach and traditional approach.

1.7.3 Time scope

The proposed duration of the project was one academic year that is from October 2022 to May 2023. Literature review mainly covered a period of five to ten years to capture sustainable development principles with generally accepted project management practices

and readily available relevant data.

1.7.4 Sustainability Dimensions

The research was delved into the environmental, social, and economic contributions of PRiSM compared to traditional project management approaches. Environmental considerations include energy efficiency, waste management, and the use of environmentally friendly materials. Social aspects encompassed factors like improved working conditions for construction workers, respect for local communities impacted by the project, and potential contributions to social development. Economic considerations analyzed the cost-effectiveness of PRiSM compared to traditional approaches, considering both short-term and long-term project costs and benefits.

1.7.5 Comparison Approach

The study employed a comparative approach, analyzing data from ENABEL projects that implemented PRiSM and comparing these findings with data from similar projects that used traditional project management approaches. This comparison helped identify the distinction of each approach.

1.7.6 Limitations

The research acknowledges limitations, such as the focus on ENABEL projects, which might not represent the entire Ugandan construction practices. Additionally, the timeframe selection might not capture historical trends in project management approaches.

1.7.7 Exclusions:

The study excluded the design phase and focused on the impact of PRiSM in achieving sustainability goals.

1.8 Conceptual Framework

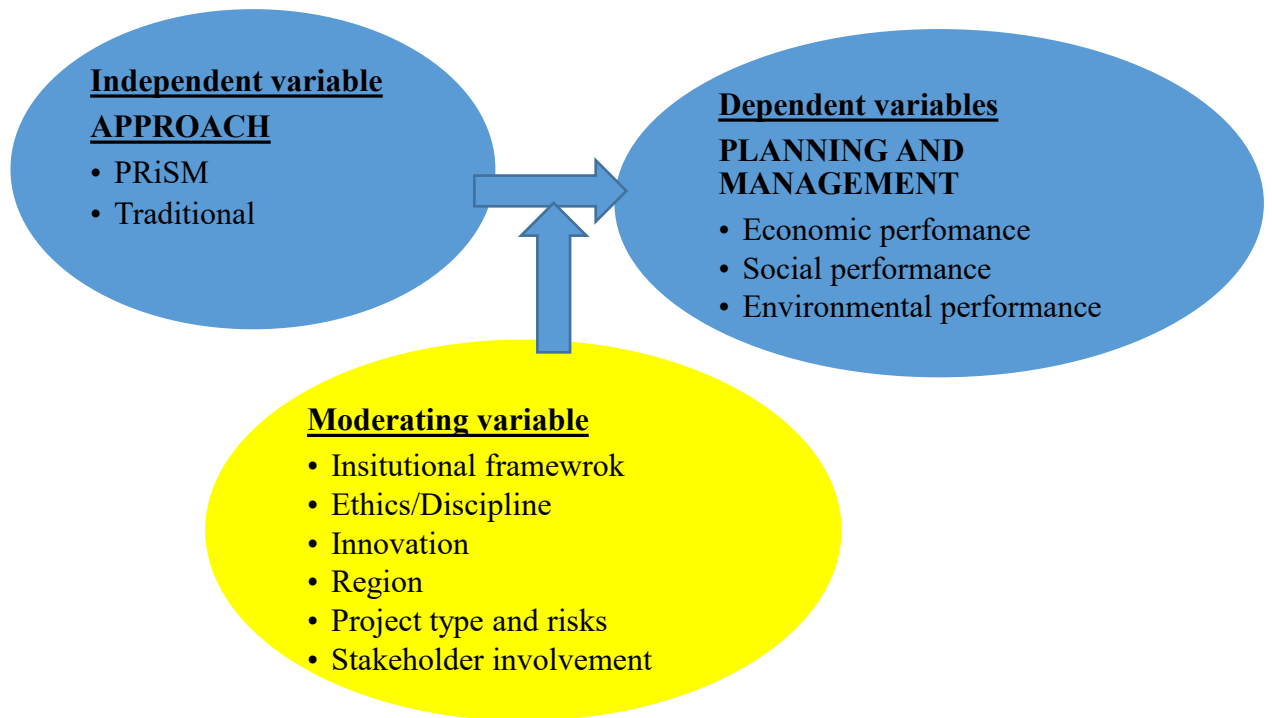


Figure 1.1: Conceptual framework

Independent Variable: This involves PRiSM and Tradition approach with the following considerations.

Integration of environmental considerations in project planning and management and Measured through environmental impact assessments, resource utilization, and sustainable practices.

Integration of social factors, including stakeholder engagement and community benefits and Measured through stakeholder involvement, social impact assessments, and community development initiatives.

Integration of economic factors, including cost-effectiveness and financial sustainability and Measured through cost-benefit analysis, financial performance, and economic viability.

Dependent Variables. This involves project planning and management with the following considerations.

Environmental Performance which is the extent to which the project achieves environmental sustainability goals and Measured through reduced environmental impacts, resource conservation, and adherence to environmental regulations.

Social Performance which is the extent to which the project positively impacts the social aspects of the community and Measured through stakeholder satisfaction, community development, and social harmony.

Economic Performance which is the extent to which the project achieves economic objectives and Measured through cost control, financial sustainability, and return on investment.

Moderating variables: These act as intermediary factors that influence the relationship between the independent and dependent variables. In the context of sustainable construction project management, these variables can strengthen or weaken the impact of how well environmental, social, and economic factors are integrated (independent variables) on the project's overall sustainability performance (dependent variables). They could include Project types and the risks involved, government regulations and extent of stake holder participation.

Relationships: The research investigated the relationships between the project management approach (independent variable) and the environmental, social, and economic performance (dependent variables). Moderating variables were considered to analyze how project characteristics, government regulations, and stakeholder involvement influence the effectiveness of PRiSM in achieving sustainable outcomes.

Expected Outcomes: The research aimed to identify if PRiSM leads to better environmental performance, improved social outcomes, and comparable or potentially superior economic performance compared to traditional approaches in Ugandan construction projects.

1.9 Chapter summary

The chapter provided an oversight of the research to the readers about reason for the study and choice of emphasis on PRiSM than traditional approach as a sustainable approach to building construction project planning and management, the benefits as well as the specific objectives that guided the proposed research. This chapter also discussed the background for the research and how it intended to contribute to the ecosystem literally clearly indicating the relationship between the independent, dependent and moderating variables of the PRiSM approach.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The construction industry is a major contributor to global environmental impact, consuming vast resources and generating significant waste. To address this challenge, sustainable construction practices are gaining traction worldwide.

This chapter defines project planning and management as well as sustainability. It equally provides detailed reviews on the project planning and management approaches that are practiced in the construction industry. It also provides an account of the history of sustainability in the construction industry as well as the current paradigm based on the sustainable development goals. The literature review is presented in line with the defined objectives of this study as well as the research gaps. While there is abundance of sources on project management or sustainability by itself, there is only a few authors that aboard sustainability and project management.

2.2 Project planning and management

According to Miao, project planning is a decision-making process used to methodically establish project targets, identify tasks, create project relationships, plan timelines, determine project completion dates, compare project schedule objectives constantly, and ensure that resources are available to meet project requirements. This allows for the achievement of various stakeholder objectives through shared, acceptable goals and lines of action (Miao, 2018). The resources that are handled include both human capital and financial capital. Project management normally consists of just one project as opposed to being a continuous process. As engineering projects entail a complicated set of components that must be completed and linked in a certain way to deliver a functional conclusion, project management is frequently intimately related to engineering projects.

2.3 Project planning and management approaches

Project planning and management techniques in the construction industry are critical for ensuring successful project delivery. Traditional approach had been regularly used over the years although various approaches and methodologies like PRiSM, Lean, Scrum have been developed to enhance the effectiveness and success of projects as listed in the table below.

Table 2.1: Project planning and management approaches

Traditional project planning and management approach	Hybrid project planning and management approach
Critical Path Method (CPM)	Agile
Critical Chain Project Management (CCPM)	Scrum
Waterfall Methodology	PMI / PMBOK
Six Sigma	Lean
PRINCE2	PRiSM
Programme Evaluation and Review Technique (PERT)	

The agile technique integrates project management (PM) requirements, discovery, and solution improvement through the collaborative effort of self-organizing and cross-functional teams on construction sites for long-term development (Antunes et al., 2015). Engineers consider SCRUM to be one of the available project management methodologies in the construction industry with a high ISO/IEC 29110 compliance level; however, an enhanced PM process is required for SCRUM methodologies with full compliance and support from Electronic Process Guidelines. Lean enables construction companies to improve process efficiency and quality while minimizing waste, with a focus on economic and social factors, in order to achieve continuous sustainable improvements throughout the project life cycle. Hence, this research is an initial roadmap for researchers and developers interested in and requiring a better understanding of the relationships between standards (the ISO/IEC 29110 in particular) and agile methods.

2.4 Sustainability

2.4.1 Reflection

Sustainable development is frequently considered to involve both passing on natural resources to future generations through development while also utilizing them in a way that keeps them from degrading, running out, or becoming nonrenewable (Malingaka Maoeng, 2020). Sustainability in project management is defined as the integration of environmental, social, and economic issues throughout the project lifetime in order to accomplish long-term sustainability objectives (Schexnayder & Anderson, 2018). In the context of construction projects, sustainability entails minimizing environmental impact, fostering community engagement, and optimizing resource utilization (Sebastian et al., 2020). Considering the influence of the construction industry on the content and process of a project, some authors concluded that embracing sustainability required a shift in project management from time, budget, and quality management to social, environmental, and economic impact management (Silvius, 2014). However, more evidence is required to support this finding as there are too few relevant empirical studies in the literature (Amin, 2020). The global building sector consumes 40% of all energy produced, 40% of all raw materials, 25% of all wood, 16% of all water used, 30% to 40% of all solid waste created, and 35% to 40% of all CO₂ emissions, creating a demand for guidance from industry experts on how to reduce the environmental impact of building operations. (Aigbavboa1, 2020).

Sustainability is hence becoming more crucial due to resource scarcity and population growth (Brundtland World Commission Report, 1987). The environmental and non-environmental components of sustainability show that economic activities in both developing and industrialized economies have a substantial impact on project management (Kotob, 2011). This is further demonstrated by the fact that economic issues were covered by 68% of the 250 global businesses that produced sustainability reports on the trio include

social economic and environment concern in project life cycle of construction industry. Kasych and Rowland (2020) stated that PRiSM as sustainable development methods combines the requirement of economic, social and environment to support project success while utilizing the renewable and non-renewable resources.

2.4.2 Sustainability history

John (1994) introduced the Triple Bottom Line (3BL) in the book of Cannibals with Forks which has since become a well-known model developed for sustainable development of project. The 3BL considered in project management include;

- Profit (Economy): The first bottom line is the traditional way to gauge a company's financial performance. Traditional approach emphasizes economy in project management unlike PrRiSM. It shows how responsible the business has been in ensuring its competitive prosperity.
- People (Society): The second bottom line measures a company's social responsibility, or how much of an impact it has on the people it affects and how their quality of life is affected.
- Planet (Environment): The third bottom line measures how ecologically responsible the company has been in terms of its influence on the environment. The project management framework caters for the 3BL to inform the society, environment and economic requirement throughout the entire project life cycle. The United Nations General Assembly (UNGA) (1988) approved the establishment of the Intergovernmental Panel on Climate Change (IPCC) by the United Nations Environment Programme (UNEP) and the World Meteorological Organisation (WMO), which is related to the 3BL on project management. According to UNGA Resolution 43/53 dated December 6, 1988, the organization's initial task was to prepare a comprehensive assessment and recommendations on the current state of knowledge in climate change science, the social and economic impacts of climate change,

and potential response strategies and elements for inclusion in a potential future international climate convention. (United Nations, 2022). The United Nations Framework Convention on Climate Change (UNFCCC) was established in 1992 as a first step towards addressing the issue of climate change following the United Nations (UN) Earth Summit. The ultimate purpose of the Convention was to prevent dangerous human involvement in the climate system. Unlike traditional methods, PRiSM elevates projects to a strategic level, leveraging existing organisational systems to ensure comprehensive benefits are realized horizontally and vertically while considering the environment, economics, and society. Participating nations urged for widespread action to create an ecologically, economically, and socially sustainable future in 2012 at the Rio Conference on Sustainable Development. As a result, in 2015, leaders from 193 nations came together in Paris for the Sustainable Development Summit, where they recognized that billions of people around the world shared the same hope for a better future, based on the principle of equity and the larger goals of eradicating poverty and promoting sustainable development.

The Paris Treaty also resulted in a judgment that provides a solid framework for guiding the global effort for many years to come. It served as a starting point for the shift to a world with no emissions. Without the Agreement's implementation, it would be impossible to achieve the Sustainable Development Goals. The Paris Agreement requires states to take increasingly strong climate action over a five-year period. Every five years, each country must provide an updated Nationally Determined Contribution (NDC), often known as a national climate action plan. Countries' NDCs explain the steps they plan to take to reduce greenhouse gas emissions in order to reach the Paris Agreement's goals. Nations also cooperate in their attempts to build NDCs. These policies also created a need for the development of a project management methodology that could successfully combine sustainability with the field of project management, resulting in the projects integrating

Sustainable Methods (PRiSM) project management strategy as one of the strategies to combine sustainable development principles for goal achievement.

In 2013, PRiSM was developed by the American company GPM (Green Project Management) with aim to increase implementation of sustainable development practices with business goals, ethical standards and international norms. The integration of sustainability throughout the entire project lifecycle and post-project stage indicates green project management to accommodate the economic, social and environment (Kasych & Rowland, 2020). The PRiSM approach provides an innovative, principles-based and sustainable project management of construction contracts. The adoption to PRiSM intended to follow “Ten Principles of the UN Global Compact” and ISO International Standards while putting the final two into practice.

2.5 Sustainability assessment frameworks for project management portfolio

The Global Reporting Initiative (GRI), the United Nations Commission for Sustainable Development (UNCSD), the Institute of Chemical Engineers (IChemE), and the Wuppertal Institute established traditional reference frameworks for evaluating sustainability. They all include economic, environmental, and social elements, with the UNCSD and Wuppertal Institute adding an institutional dimension to create a comprehensive framework for evaluating sustainability. (Rajesh Kumar Singh, 2009)

i. Global Reporting Initiative (GRI).

In 1997, the United Nations Environment Programme (UNEP) and the US non-governmental organisation Coalition for Environmentally Responsible Economics (CERES) launched the GRI with the objective of "enhancing the quality, rigour, and utility of sustainability reporting" As a result, the guidelines are primarily concerned with reporting. The GRI uses a hierarchical framework to address three key areas: social, economic, and

environmental. The hierarchy consists of categories, aspects, and indicators. The guideline has over 100 indications. However, not all of the indications are easy to evaluate, and no guidance is offered on how to choose between the indicators. The Global Reporting Initiatives' guideline on the three bottom line principles of economic, social, and environmental performance promotes stakeholder inclusion, materiality, completeness, and sustainable development in construction projects (Haddara & Elragal, 2015). The GRI has picked the following indicators.

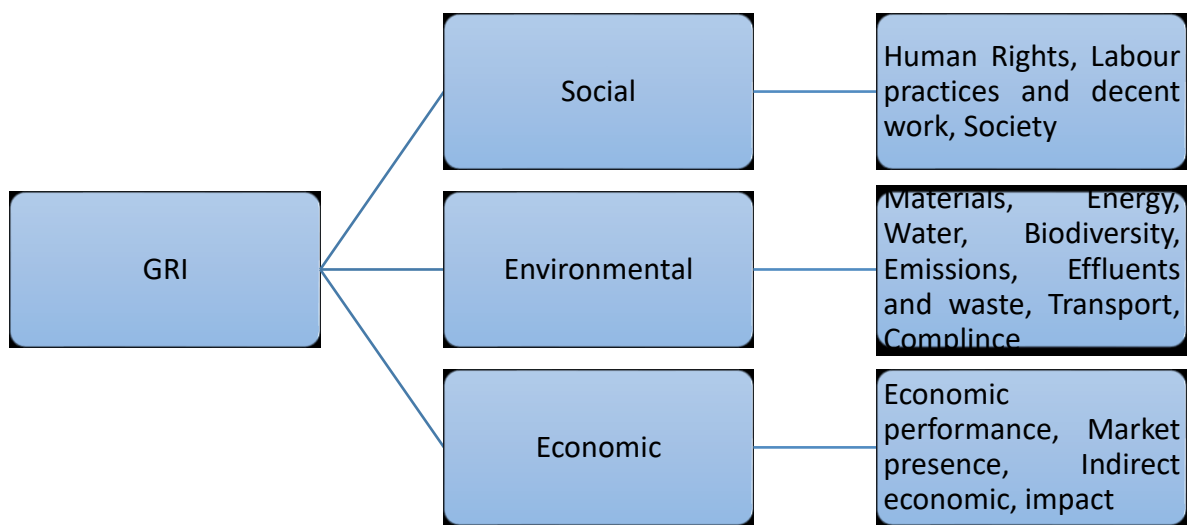


Figure 2.1: The hierarchical structure of the Global Reporting Initiative (GRI) framework

ii. United Nations Commission on Sustainable Development Framework.

The United Nations Commission on Sustainable Development (CSD) created a sustainability indicator system to track government progress towards sustainable development goals. The hierarchical framework splits indicators into 38 subthemes and 15 main themes, which correspond to the United Nations' four sustainable development components (CSD, 2019). The primary difference between this framework and the GRI is that it focuses on institutional aspects of sustainability. The assessment of social, environmental, economic, and institutional effects is an important indicator of long-term economic development for project

management. (Haddara and Elragal, 2015). Several developing countries have used this concept. The framework's aspects are not entirely applicable to the business community, especially at the operational and project levels. However, the framework clarifies what sustainability entails at the national level, as well as areas where corporations may help.

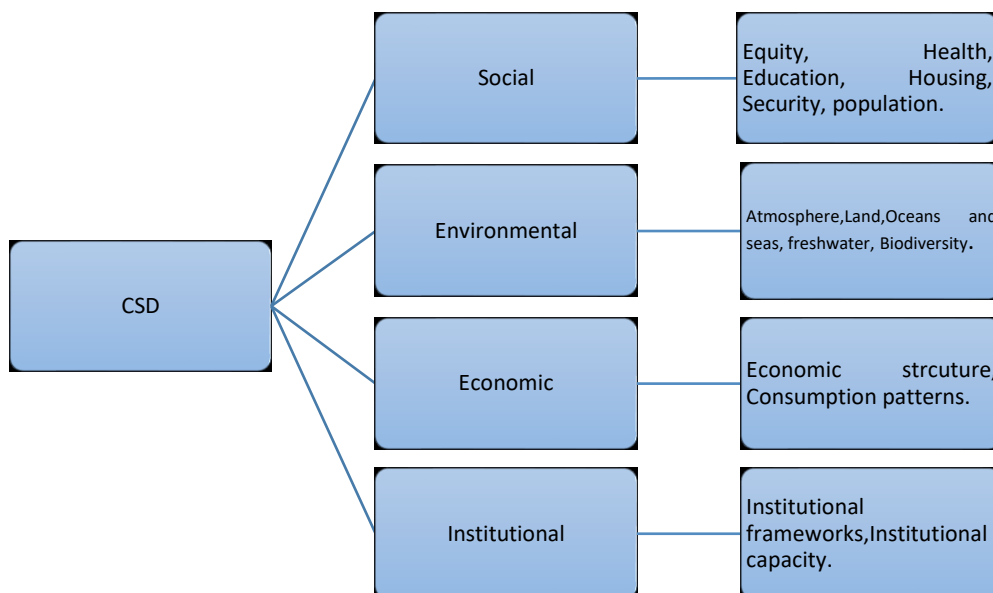


Figure 2.2: The United Nations Commission for Sustainable Development (CSD) theme indicator framework

iii. Sustainability Metrics of the Institution of Chemical Engineers.

In 2002, the Institution of Chemical Engineers (ICHEME) released a set of sustainability indicators to evaluate the environmental impact of process industry operations. The ICHEME provides standardized report formats and conversion tables. This worldview is less complicated and emphasizes impact. However, the framework prioritizes open environmental aspects and measurable indicators, which may not be relevant in all operational operations, particularly in the early stages of a project's life cycle. Stakeholder involvement helps to ensure compliance with ISO 14001, EMAS, and Responsible Care for monitoring the sustainability performance of suppliers, contractors, and outsourced project management activities. The balanced view of sustainable performance includes the triple

bottom line components of environmental responsibility, economic return (wealth creation), and social development, indicating acceptance of PRiSM (IChemE, 2002; Galvan et al., 2015). The IChemE Sustainability Metrics is illustrated below.

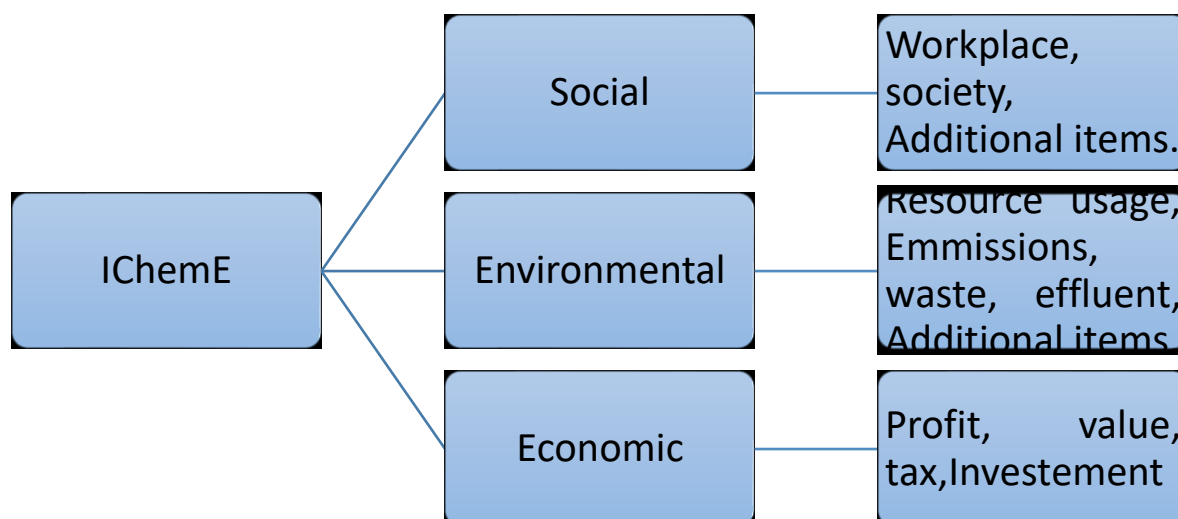


Figure 2.3: The Institute of Chemical Engineers (IChemE) sustainability matrices

iv. Wuppertal Sustainability Indicators.

The Wuppertal Institute offered indicators for the four pillars of sustainable development as defined by the United Nations Commission on Sustainable Development, as well as indicators that show how these dimensions are linked. These indicators are important on both the macro (national) and micro (business) levels. The approach chosen to address corporation social sustainability is significant; the United Nations Development Programme (UNDP) Human Development Index has been transformed into a Corporate Human Development Index (HDI). The Corporate Human Development Index is divided into three basic components: the quality of industrial relations and work conditions, education, human capital input and maintenance, and income levels and distribution. The income disparities associated with HDI is intensified with Wuppertal Sustainable Development Indicator Framework integrated economic indicators such as GDP, growth rate, international and

cooperation; institutional indicators like participation, justice and gender bias, social indicator in terms health care, housing, social security and unemployment are vital considerations in project management in construction industry.

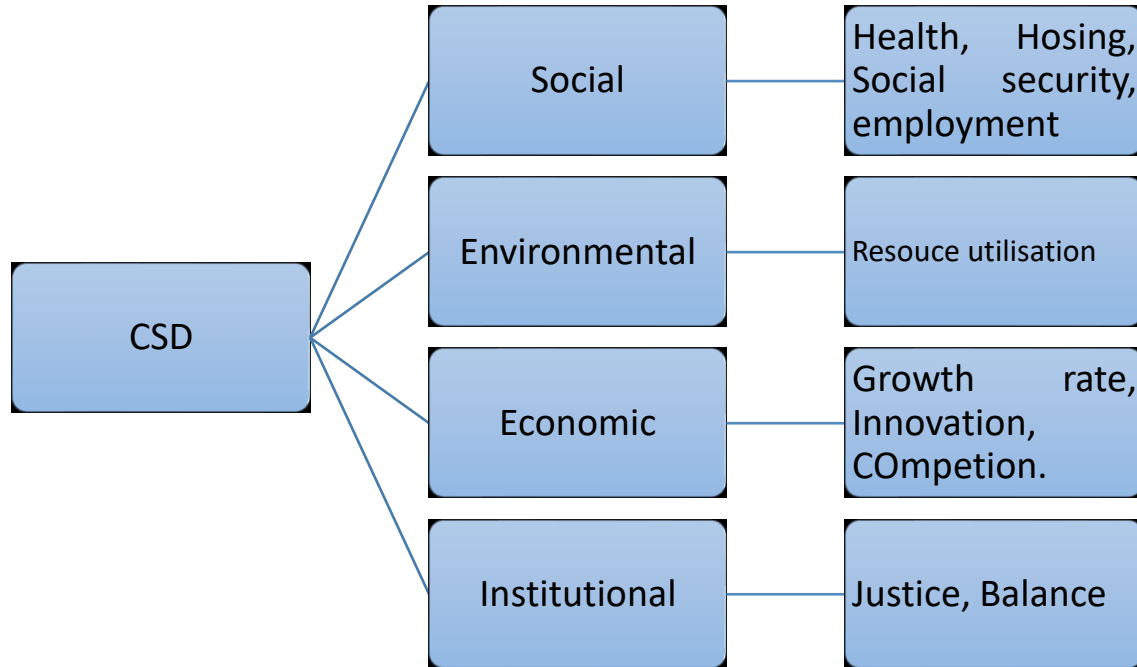


Figure 2.4: The Wuppertal Sustainable Development Indicator Framework

Project sustainability checks have been developed for specific project types such as facility and infrastructure projects in various researches hence a wide range of methods coming up. Research into evaluations of the success of sustainability in construction projects includes (Wen-der Yu, 2018) in which a multi-level assessment system model based on the three core pillars of sustainability was proposed though it was found to be too narrow and the effectiveness of this assessment method was yet to be studied. Furthermore, a research by (unien, 2016) approached this by examining the importance of 15 types of sustainability criteria within construction using a composite sustainability index of a project (CSIP) which was created following a review of existing literature and a pilot research study in Lithuania. However, this method emphasized the client side of the project rather than the broader community stakeholder side, as represented in modern definitions of sustainable project management. (Ferenc Bognár, 2022) created the combined AHP-PRISM method for

strategic assessments based on pairwise comparisons. This method provides exceptional visual decision assistance and control characteristics that make it useful in practical issue solving and supports the ideal best and worst analysis of the alternatives without losing its capacity to focus on discovering hidden risk. It was utilized by (Rajesh Kumar Singh, 2007) to determine the weight of sustainability indicators and sub indicators at different levels. They apply it to the steel industry.

SAAD (2010) identified the strongest drivers leading to pursuing a sustainable project which formed the basis of development of the research questionnaire. Antunes et al. (2015) also presented a list of societal concerns, stakeholders, and related elements on which the questionnaire will be based. It stated that the primary sources comprised both construction and non-construction related materials such as journals, research papers, trade, and government literature used to generate lists of the issues, stakeholders, systems, and scales significant to the sustainability of infrastructure. The UN Commission on Sustainable Development (UNCSD) from its working list of 134 indicators derived a core set of 58 indicators for all countries to use (Rajesh Kumar Singh, 2009). A research by (Julius-Semanda, 2008) provided a list of indicators; economic, environment and social consideration that guide in sustainability assessment within the construction industry in Uganda.

Furthermore, Thornton et al. (2015) state that a proposed ontology can be combined with project social, environmental, and economic aspects to assist developers and other stakeholders in gaining a more comprehensive understanding and assessment of the long-term issues associated with construction and urbanization. According to Ferenc Bognár (2022), when dealing with such a huge number of features in an ontology, it is vital to research an appropriate tool for analysing and extracting information. This PRiSM approach promote a strategic sustainable task project completion with significant conservation of environment. The PRiSM and Tradition approaches have positive significant [Spearman

correlation, $r= 0.56$) consideration of economic and social impact of the construction project (Costa, 2019). The project management team prioritizes economic and social value effect of the building construction.

2.6 Sustainability Situation in Building Construction

Today's vast construction business affects almost every other industry on the planet. Its economic impact is evidenced by the fact that it represents 13% of global GDP. Furthermore, urban zones around the world are seeing population increases of nearly 200,000 people each day, necessitating a continuous demand for new housing and infrastructure (Mavi, 2021). These statistics demonstrates how difficult it is for the building sector to lessen its social-environmental impact.

According to the graphic below, the first-order state represents economic, social, and environmental components separately. Historically, construction projects have regularly explored a single state's sustainability in the economic dimension. The second order state suggests a partial overlap of two dimensions, for example, economic and environmental optimizations at the expense of social optimizations. Its broad meaning includes optimizing any two dimensions at the expense of the third. The third level of sustainability involves the optimization of all three dimensions: economic, environmental, and social. This is an unusual occurrence in most urban development projects, showing a lack of implementation of the PRiSM strategy. Ferenc (2022) stated that applicability of traditional has a significant relationship on the how PRiSM approach optimize the economic and social dimension at 95% level. However, PRiSM extends the construction consideration to preserve the environment. The ability to construct third-order optimization is dependent on an understanding of the challenges and dominating requirements that exist in each of the primary dimensions within both a generic and specific spatial environment.

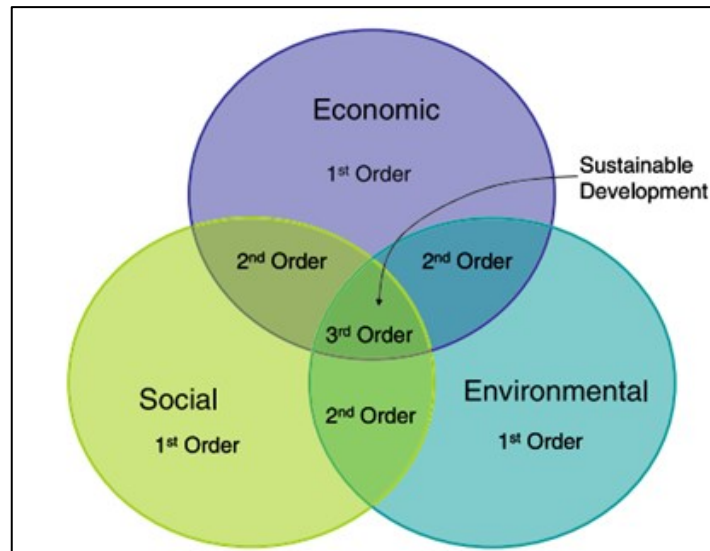


Figure 2.5: Underlying Concepts of Sustainable Development in SUE-MoT

Figure 2.1, profiled that implementing sustainable construction concepts and approaches to produce a responsibly built environment, results in the development of high-performance green buildings and systems. Galvan et al. (2015) emphasizes that sustainable construction with PRiSM approach is important methodology to reduce greenhouse gas emissions, conserving resources, and improving the long-term durability of built environment.

Research into sustainability in the construction sector has yielded several research subjects and themes, with some studies focusing on a specific component of sustainability while others seeking to address all three domains. These studies vary from value management for sustainability in construction and analyzing the sustainability performance of construction projects to social sustainability concerns during the planning and design phases of construction projects, as well as policy influences on infrastructure projects.

A recent review of two decades of research on the integration of sustainability in project management and delivery processes identified broad themes such as motivations, stakeholder orientation, organizational context, temporal orientation, benefits, barriers, and risks up to 2018. According to IBM's 2008 global survey, “47%” of organizations have

begun to incorporate sustainable practices into their construction projects and business models, seeing sustainable development as a new source of innovation, cost savings opportunity, and mechanism for gaining a competitive advantage (Pianttini, 2015).

This also means that the roles of government as a facilitator of sustainability, and society as affected stakeholders, is more pronounced especially in construction projects (Mauro Luiz Martens, 2013). The motivations of a broader range of stakeholders, both internally and externally, which include: sustainability integration at the strategic levels of organizations; behavioral barriers to sustainability integration, rather than just economic and technical, as well as project performance on sustainability aspects, as projects are regarded as an essential tool for achieving sustainability in organizations and globally. (Schipper, 2014), (Carvalho, 2014). Taken together, this literature indicates that research on sustainability in building projects is still dispersed across multiple research fields and themes. Using PLS, Roland (2014) stated that economic and social impacts are significantly recognize by traditional and PRiSM approach in the building construction at 99% level. As a result, assessing and evaluating sustainability performance when sustainable project management principles are used remains an understudied area; thus, evaluating the effectiveness of PRiSM would aid in the management of sustainable construction projects by identifying areas for improvement and alternative models for measuring sustainability success. As a result, evaluating the success of the PRiSM approach in project planning and management on building construction projects is unavoidable in order to create an environment with projects implemented by Enabel in Uganda. Traditional approaches are appropriate for projects with well-defined scope, low complexity, and a high degree of predictability, whereas the PRiSM method is appropriate for projects with high complexity, unpredictability, and the requirement for sustainability and adaptation. This is supported as a gap identified in (Reza Kiani Mavi, 2021). Other gaps are indicated below.

Table 2.2: Aspects for the research agenda for construction projects

Aspect	Further research
Sustainability strategy	Experiments on how to transfer a strategy tied to sustainability to specific projects.
Social	Developing tools that we might call social-design, helping to include social aspects in the project.
Project management areas.	Identification of the most affected and influential project management areas for sustainable project management.
Project processes	Development of techniques that include sustainability in the different project processes: stakeholders, life cycle, assessment, decision, procurement, etc.
Competence from the organisation tackling the project	Identification and characterization of a set of sustainability competences that a company must acquire and develop.
Project team competences	Identification and characterization of a set of sustainability competences that project managers must acquire and develop.

The PRiSM framework is implemented across four distinct delivery phases:

Definition (discovery): Stakeholder participation is critical for setting the project's long-term parameters and alignment with organizational values.

Design (sustainability orientation): Sustainable design concepts are used, and eco-friendly materials, energy efficiency, and social implications are all carefully studied. A sustainable project design strategy is developed, prioritizing sustainability while satisfying all other project goals.

Delivery (organizational orientation): The project is carried out in accordance with the sustainable design plan and closely monitored for resource efficiency, waste reduction, and environmental effect.

Handover (closure): Once completed, the project is put into operation, sustainability achievements (benefits) are documented, and final reporting to stakeholders is presented.

This is where sustainable objectives established at the start of the project are demonstrated to have been met and sustained throughout time.

Uganda's construction industry has substantial sustainability difficulties, such as resource constraint, environmental degradation, pollution, low awareness, and socioeconomic inequities. An assessment was undertaken by (Tutesigens, 2016) on whether the consideration of Embodied Carbon in the development approval process (DAP) could enhance sustainable construction showed that construction professionals were highly aware of sustainable construction (SC), suggesting that initiatives of enhancing sustainable construction could be easily appreciated. However, the concept of sustainable building was discovered to be largely defined in terms of environmental sustainability, implying that approaches that greatly enhance environmental sustainability may be applied. The report also advised initiating a pilot plan in a specific site in Uganda, as well as doing more research to gain feedback from stakeholders other than construction specialists. Tutesigensi (2016) in a study to investigate whether considering embodied carbon in the approval process in Uganda could enhance sustainable construction established a number of sustainable drivers that guided the choice of sustainable indicators in construction as listed below.

Table 2.3: Sustainable indicators for construction project

Environmental	Economic	Social
Reduce the consumption of resources such as electricity, water, and materials during building.	Financial affordability for the targeted recipients	Poverty alleviation
Optimise lifecycle energy use (i.e. embodied and operating energy) in buildings.	Using labor-intensive building can help create jobs.	Operations of a development to be compatible with local needs
Recycling of products	Competitiveness through improving sustainable practices	Education and training to increase awareness
Reuse of products	Choosing environmentally responsible suppliers/contractors that show environmental performance	Corporate social responsibility (CSR)
Use of renewables in preference for non-renewables	Incentives for those using a sustainability measure (e.g., cheaper interest rates, tax exemption, etc.) and vice versa	Health and safety at workplace
Minimise pollutants that cause environmental degradation	Use of local resources (e.g., materials and labour) in construction.	Developing capacity and skills
Environmental labelling and voluntary rating schemes	Inflow of resources	Sourcing materials from the community

According to Carvalho (2011) in a study on systematizing a conceptual framework of sustainability in project management oriented to success provided a list of variables that should be included in sustainable project management.

Table 2.4: Economic, Social and Environmental Dimension for the project

Economic Dimension	<ul style="list-style-type: none"> • Financial performance • Financial benefits of good practices • Business ethics • Cost management • Management of the relationship with customers • Participation and involvement of stakeholders • Innovation management • Economic performance • Culture of the organisation and its management • Environmental accounting and economy • Management of intangibles • Internationalization • Investments and improvements in services and installations
Environmental Dimension	<ul style="list-style-type: none"> • Natural resources • Energy • Water • Biodiversity • Management of environmental policies system • Management of impacts on the environment and the life cycle of products and services • Eco-efficiency • Environmental justice • Environmental education and training • High risk projects, climate strategy and governance • Environmental reports
Social Dimension	<ul style="list-style-type: none"> • Labor practices and working conditions • Labor practices and relations with employees • Relationships with the local community • Engagement of stakeholders • Financing and construction of social action • Society, competition and pricing policies • Concepts of social justice • Relationships with suppliers and contractors • Products and services • Human rights • Social reports

Four European attempts were examined to determine sustainable building key indicators: the Sustainable Building Challenge 2011 and 2013 key indicators, the Sustainable Building

Alliance, SuPer Buildings, and the OPEN HOUSE project. These efforts were chosen because they were European programmes that had just finished work on developing key measures for sustainable construction. When selecting the indicators, the following aspects were taken into consideration: All metrics with subjective judgements were excluded, as were all indicators whose performance cannot be changed by design options or whose assessment goes outside the building's boundaries, and all indicators whose performance is difficult to translate into economic terms. Furthermore, the key indicator list was meant to be comprehensive enough to capture the primary sustainable building impacts while simultaneously being concise enough to make the evaluation possible (Vilnītis, 2019).

Table 2.5: Least three initiatives in construction projects

DIMENSION	CATEGORIES	SELECTED INDICATORS	
ENVIRONMENT	Energy and Emissions	Non-renewable primary energy	
		Renewable primary energy	
		Green House Gases emissions	
	Water	Water consumption	
	Materials and Waste		Materials embodied energy
			Ozone depletion potential
			Acidification potential
			Eutrophication potential
			Photochemical oxidation potential
			Reused and recycled materials
Responsible sourcing materials			
SOCIETY	Users health and comfort	Waste production	
		Indoor air quality	
		Lightning	
		Thermal comfort	
		Acoustic comfort	
ECONOMY	Economy	Process quality	
		Commissioning	
		Life Cycle Costs	

Adopted from OPEN HOUSE project by Vilnitis 2019

2.7 Comparison between Traditional and PRiSM sustainability Project Life cycle

a) Traditional Project Lifecycle

In this setting, the project starts with an initiation or formulation phase resulting from a need or a want (Need for public projects and want for private projects) leading to an articulation of the project parameters initiating its charter, leading to a decision of go / no go.

Upon receiving a go decision, the following phase is the design phase where the Client / Owner needs are further defined and presented through a design package including drawings, specifications, and conditions of a contract (Bracco, 2019). Design is usually followed by the procurement phase resulting in the procurement for the services of a competent constructor to convert the project documents into a physical construction, and this phase in turn is followed by the construction or execution phase witnessing the actual project materialization (Haddara & Elragal, 2015).

Reza, Kiani and Mavi (2021) established that both approaches (Traditional and PRiSM) have a positive significant concern on budget and social impact of the construction project at 95% level. The environment aspect is undertaken under PRiSM approach unlike Traditional. Upon completion of construction, the project undergoes the commissioning and handing over, followed by startup, operation and maintenance, and finally disposal upon conclusion of the project service life. This project lifecycle can follow the traditional project delivery system (Design Bid-Build) or a consolidation of the design and construction responsibilities in the same entity (Design-Build) including some fast tracking features.

The nature of this traditional approach leads to an adversarial relationship between the Client and the Contractor, with major design decisions, later affecting construction, made in the absence of the most experienced party, the contractor. Scope changes or unexpected conditions are dealt with through claims and change orders, thus further straining the

relationship between the two main contract parties. Value Engineering ideas are introduced at a late stage through Value Engineering Change Proposals (VECP), decreasing their effect because of the late introduction of these ideas. In many cases, this translational contractual relationship results in risks not being properly allocated, such as to the party best equipped to deal with them, which results in a cost increase in the form of hidden contingencies and insurance costs. The classic model depicts the institutional structure of the building and real estate sectors as divided into phases, each with its own set of actors, rules, and markets. As a result, decision-making is decentralised and influenced substantially by professional codes and cost-effectiveness objectives. (Ihab & Saad, 2020). The traditional project lifecycle flow is set out below.

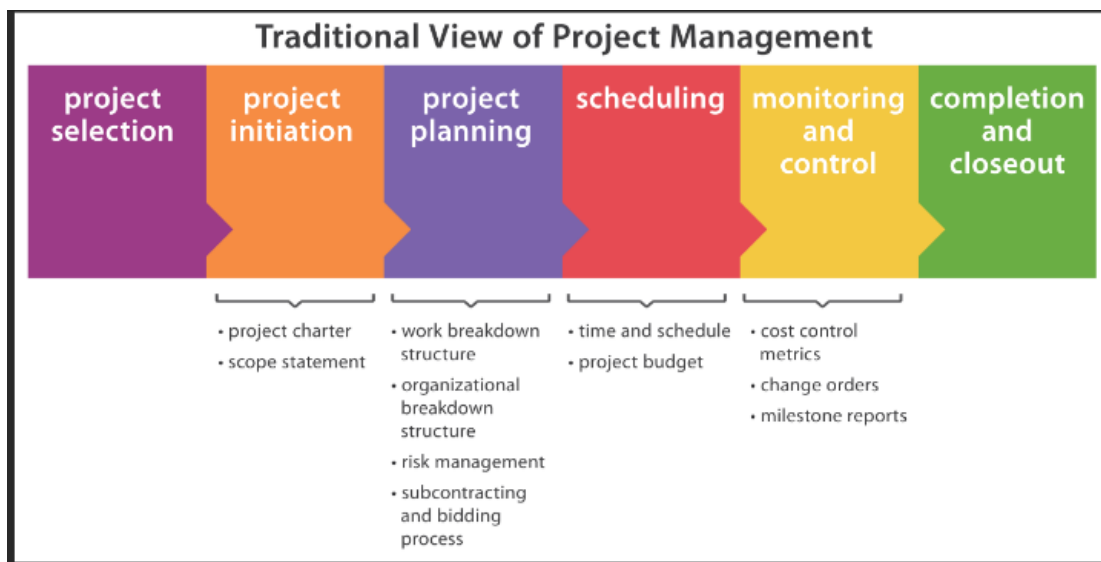


Figure 2.6: Traditional project lifecycle flow

b) PRiSM sustainable project lifecycle

Although many sustainable projects follow a project lifecycle similar to traditional projects, the main difference between the two approaches ‘Traditional and PRiSM’ lies in the timing of interaction among project team members, and the types of contractual arrangements governing the relationship among the key players (Ihab & Saad, 2020). Designing, constructing, or renovating high-performance buildings require a whole building approach.

In order to achieve the sustainability goals of a project, its Owner follows several strategies making use of best practices in traditional project management. Such practices include:

- Adopting a Whole Building Design through a Design Charette (DOE 2008). This technique differs from the usual design/build process in that the design team investigates the integration of all building components and systems to identify how they may effectively collaborate to save energy and reduce environmental impact. A design charette is a workshop for developing and discussing ideas during the planning and design process, particularly when individuals need to collaborate on a major project. Participants in the design charette, including the Owner, Designers, Contractors, Suppliers, and commissioning agents, make early decisions about the project's location and microclimate; orientation and envelope; interior spaces; fenestration, daylighting, and artificial lighting; energy and water needs; heating, ventilating, and air-conditioning (HVAC) equipment; landscaping and exterior spaces; and monitoring equipment and controls; as well as the social impact of the project. Such early analysis will result in the selection of the best appropriate choices for various project requirements.
- Sustainable initiatives typically use relational contracts; as traditional approaches create a zero-sum game for all parties involved. Relational contracts are those in which the connection takes on the characteristics of a mini-society, with a diverse set of standards that extend beyond the trade and its immediate processes. Such contracts include Integrated Project Delivery (IPD), Early Contractor Participation (ECP), and Design Assist (DA), in which the contractor is hired around the same time as the designer and major construction input is sought from the contractor as the design

progresses, thereby eliminating the possibility of excessive change orders and fraudulent claims.

- Performance requirements enable contractors to share their experience and achieve project goals in more creative ways, while remaining primarily accountable for the results and meeting the project's energy and sustainability goals.
- Utilise Building Information Modelling (BIM), including energy modelling and simulations, to estimate project performance and assist with commissioning.
- Public-Private Partnerships (PPPs) are a developing trend in sustainable projects, demonstrating private commitment to public projects through combined financing and ownership.
- Early implementation of Value Engineering (VE) during project formulation and design can ensure sustainable project development.
- • Life Cycle Costing (LCC) is a cost-effective approach for project selection and development. Tangible benefits like energy savings, as well as intangible benefits like increased health and performance, have resulted in more accurate project planning.
- General principles of Lean Construction, which were demonstrated to be efficient in delivering sustainable projects with a minimum, if any, cost premium. The Sustainable Project Management Tools are set out below.

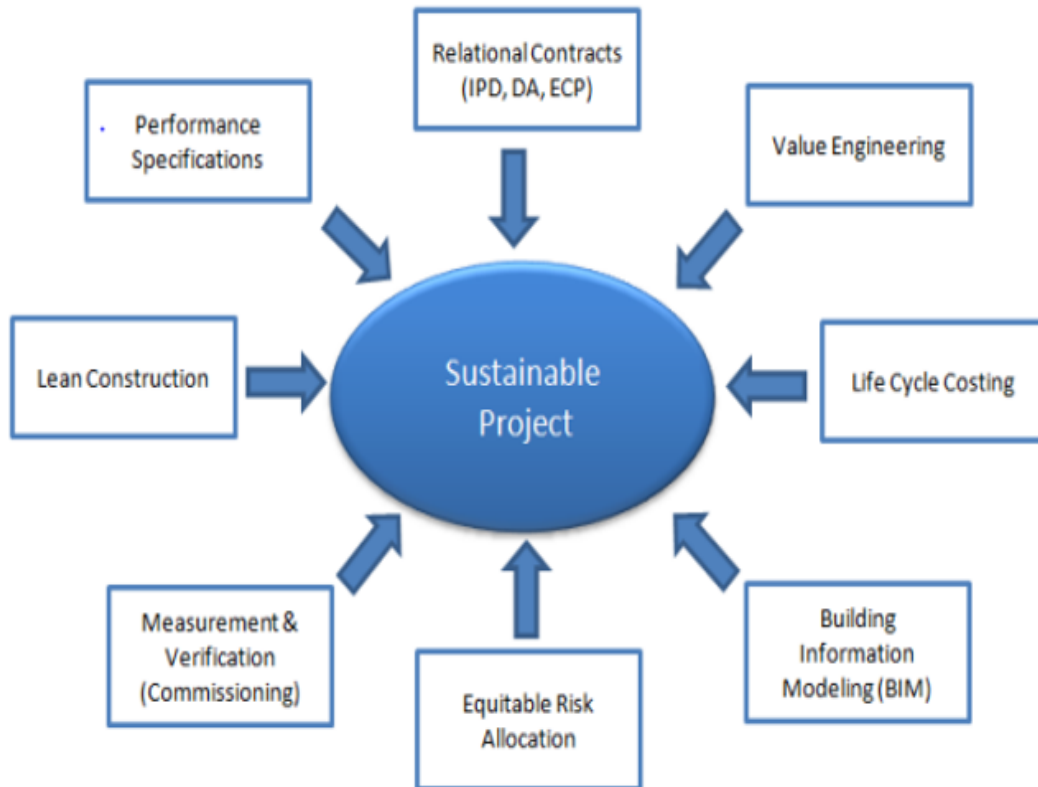


Figure 2.7: Sustainable Project Management Tools

The use of lean production principles, tools, and strategies for improving the high productivity of construction projects in general leads to the sustainable delivery of building construction projects (Wahab, 2022). Lean construction aims to boost production, revenues, and innovation in the building business (Sormunen, 2022). Lean Project Delivery is an organised implementation of Lean principles and tools that allows a team to work together to produce flow, as seen below.

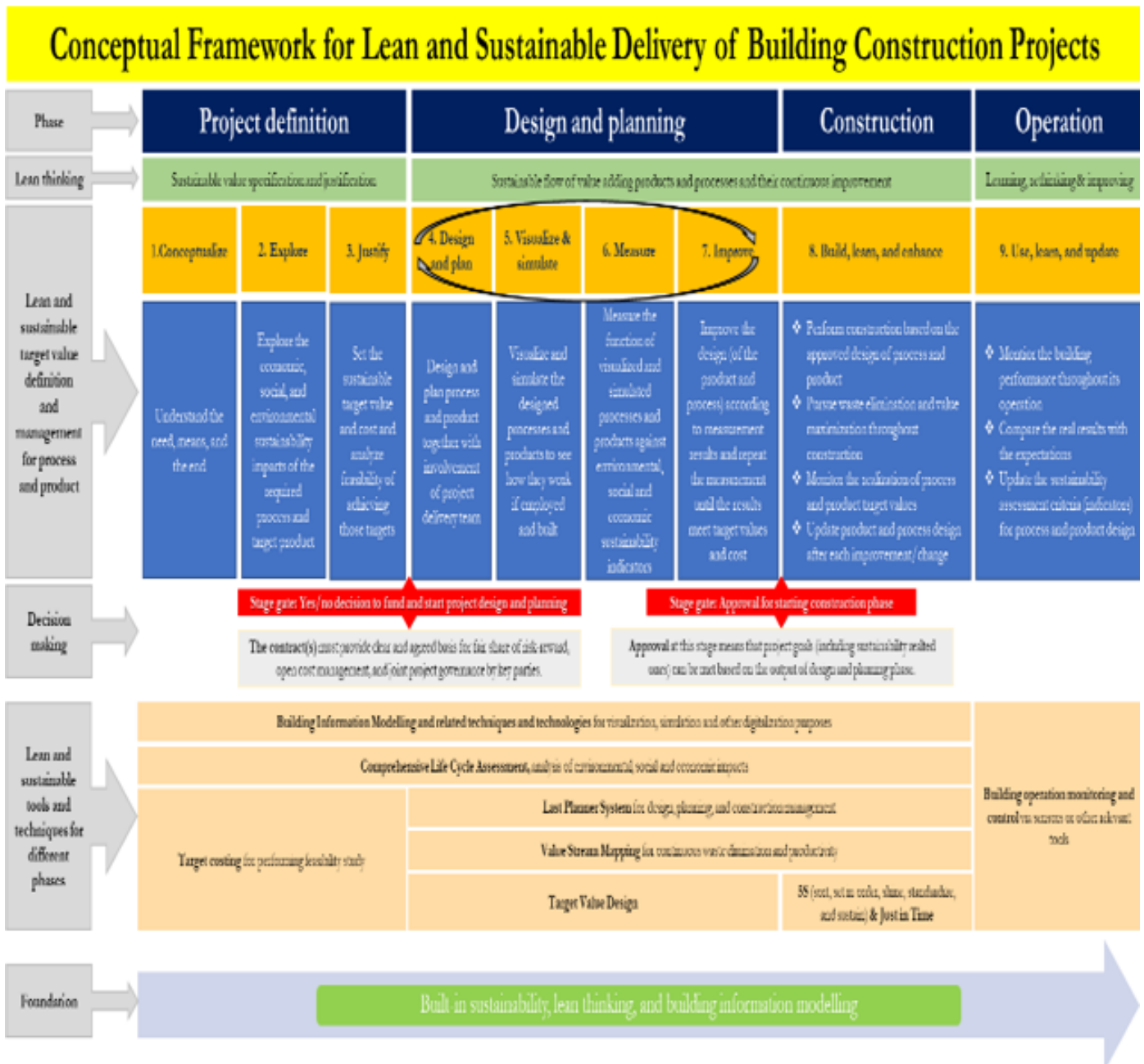


Figure 2.8: Conceptual framework for lean and sustainable delivery of building construction projects

Building cycle and a sustainable construction project. The building cycle includes building services such as fuel, system type, plant control, plant efficiency, and operations; building envelopes such as size, build form, shape, materials, ventilation, location, team orientation, human factors in terms of comfort requirements, occupancy regime, management and maintenance, and access to material control to ensure efficient project management (Hu1, 2007). Sustainable design considers the building's energy and environmental performance

during its whole life cycle, which includes site selection, construction, operations and maintenance, restorations, demolition, and replacement. The building cycle and sustainable construction is set out below.

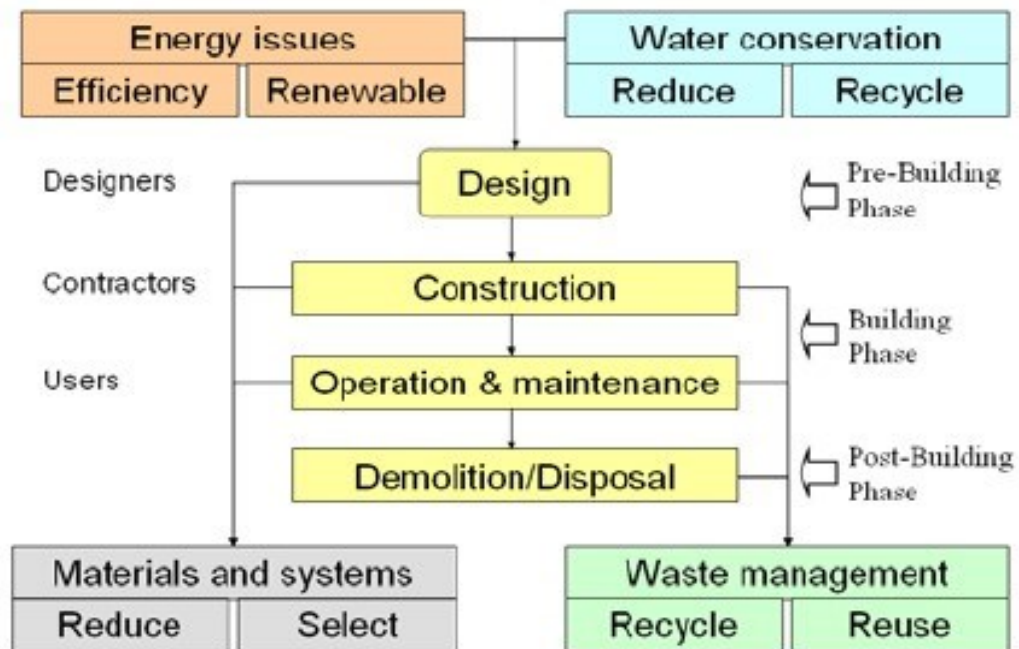


Figure 2.9: Building cycle and sustainable construction

Traditional Vs. PRiSM sustainable Project management practices

Traditional project management methodologies emphasize parameters such as time, cost, and scope, without considering environmental or social impacts but all approach has significant consideration on economic (Ihab- Saad, 2020). Contrary, sustainability in the project profession is an approach to business that balances the environmental, social, economic aspects of project management. The economic impact relates to the budget and cost implication on the project which both tradition and PRiSM collectively prioritize in the building planning and management.

Table 2.6: Traditional Vs. PRiSM Sustainable Project management practices

Delivery System	DBB, EPC, DB	IPD, PPP, EPC, DA
Design approach	Schematic/DD/CD, Isolated	Generative Design, BIM, Participative
Risk Allocation	Contractual, translational	Shared, relational
Specifications	Descriptive	Performance
Major Driver	Profit	Environmental Sustainability
Communication	Formal / Closed / Reserved	Open / Continuous / Shared
Warranties	Contractual	Shared Responsibility

Main factors for participating in a sustainable project.

Ihab, (2020) profile that projects have key drivers/ factors which influences their implementation and participation in a sustainable project as outlined below.



Figure 2.10: Adopted from Drivers for sustainable project Hab, (2020)

The survey analysis consideration factors range from economic, environmental and environment pursued in the sustainability of project. Traditional approach is still widely used, but PRiSM offers more sustainable and adaptable project management. Hab, (2020) provide that Traditional and PRiSM approach has positive significant uptake of the

economic impact and partly social consideration on the construction management. The environment conservation is remotely considered and fully listed under PRiSM approach on the building project.

2.9 Conclusion and Research Gap

In conclusion, the PRiSM approach offers a promising methodology for sustainable project planning and management in Uganda's construction sector. While existing research demonstrates its effectiveness in addressing environmental, social, and economic aspects, there is a need for in-depth analysis of its application in Uganda. The upcoming research aims to bridge this gap by evaluating the ENABEL projects and providing recommendations for enhancing PRiSM's effectiveness as compared to the traditional approach in the Ugandan context.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter defines approaches used in the project procedures, design and analysis of data.

3.2 Research design

The study used descriptive research design with both qualitative and quantitative methods. This was so since the information gathered from the field was both descriptive and inferential. It was done in a way that responses and information on respondents was gathered in numbers. The information gathered provided the real time opinions of the approach that were converted to statistics.

3.3 Area of study

The area of study was National Teachers College Muni-Arua, Unyama National Teachers College-Gulu and National Teachers College-Mubende. These were chosen since they are some of the areas in which Enabel has implemented and fully complete projects. The said projects have also been implemented by either Excel, Ambitious or PRiSM Limited construction limited. These companies had also executed projects that have been implemented using the PRiSM approach and the traditional approaches were used as benchmarks for reference.

3.4 Population

The population is determined from the host communities of the three projects. It should be noted that the National teacher's college Kaliro has the biggest population of 1100 beneficiaries, this is followed by National teacher's college Unyama with 700, National Teachers college muni with 700 and National teachers' college Mubende with 500 bringing the total population to 3000.

3.5 Sampling and sample size

Stratified type of sampling were used since data to be collected was from different categories of stake holders that is Client (Enabel, the Belgian Development Agency and Ministry of education and sports), Beneficiary (College and community) and executor (contractor and consultant) on the basis of common characteristics of the composition to be put in each stratum to ensure homogeneity. A confidence level of 95% was used since the approach is novel and hence need for high accuracy. Out of the target population of 3000, a sample size of 342 at 95% confidence level using Table of Krejcie & Morgan (1970) sample size determination was obtained.

The sample size of 342 respondents was allocated proportional to determine sample sizes of each stratum, Kaliro had 125 respondents, Unyama and Muni had 80 respondents each and Mubende 56 respondents respectively. Of the of the respondents in the respective institutions, 80% were locals who are the major beneficiaries of the projects, contracting and consulting team with 15% and the client team with 5%.

3.6 Data Collection tools

Data was collected through interviews with interview guide, questionnaires, surveys and project documents.

3.6.1 Interview guide

The study used interviews to collect data from key informants using an interview guide, particularly in areas that needed improvement as indicated by the factor analysis. The interview guide included open-ended questions to allow participants to have a broader perspective on the issues at hand and to engage in more interactions. These were done both formally and informally through face to face interactions with specific groups of respondents have adequate knowledge about the study.

3.6.2 Questionnaires

The close ended questionnaires were administered to respondents of the study. The structured questionnaires were checked for completeness to ensure quality and were created using acceptable guidelines indicated Creswell (2014). The questionnaires contained items of traditional and PRiSM approach in building construction projects.

3.6.3 Documents

Project documents as well as literature were reviewed and revisited to obtain information captured in progress reports that include durations, costs and quality control. Literature review provided guidelines and references especially on the economic, social environmental aspects like the carbon foot prints and credits. Quality was ensured by obtaining data only from accredited sources as well as recent official sources in line with variable for the study.

3.7 Data quality control

The data collection tools were pre-tested to the 6 respondents from the National Teachers Colleges; National Teachers College Muni-Arua (two participants), Unyama National Teachers College-Gulu (two participants) and National Teachers College-Mubende (two participants) who were excluded in this study to rate the relevance of items on questionnaire and interview guide for validation reasons. The pre-tested tools results enable the draft questionnaire to be adjusted in order to clear up any confusion. The procedure allowed researcher to determine if the responders comprehended since expect to gather information on how the strategy has impacted the stake holders and whether its living up to the expectations.

3.7.1 Validity

This is the extent to which a given data collection instrument is accurately able to measure what it is supposed to be measuring. The data was checked for both content validities by

assessing the extents to which the instruments for research provided adequate coverage of the study and criterion-related validity where some outcomes were expected, based on the current conditions. This was however free from bias. At least two subject-matter experts were utilized to measure the content validity, and the content validity index was calculated using their collective opinions (CVI). Each of them rated the items for relevance (R) and irrelevance (IR) on a two-point scale, with the average index calculated by dividing the ratings on either side of the scale by two (CVI). The deemed irrelevant elements were deleted or changed with ones that are pertinent. The correlation coefficient (r) was used to evaluate the criteria-related validity; the higher the correlation, the more valid the criterion. The questionnaires were pre-tested to 15 participants excluded in this study from another project. The Content Validity Index (CVI) for; traditional approach; economic was at 0.89, social was at 0.75 and environmental at 0.72 and PRiSM-economic was at 0.87, social at 0.89 and environment at 0.94, all were above the cut off of 0.7 to guarantee validity of the data as recommended by (Creswell, 2014). Statistical tests were conducted to ensure the data collected with tool is valid for this study. The items rated irrelevant were eliminated and some were rephrased in the final data collection tool for this study.

3.7.2 Reliability

This refers to the degree to which a given data collection instrument gives consistent scores when used under different conditions. Stability and equivalence aspects were improved by minimizing external sources such as boredom and fatigue and also broadening on the sample of items used. Once the data was collected, it was systematically checked for the identification and correction of errors. Cronbach Alpha, a standardized 0 to 1 scale, was used to assess quantitative data reliability. For Cronbach Alpha, higher values indicate greater agreement between items, with 0.7 serving as the reference value. At this level and higher, the items are consistent enough to indicate reliability. The Cronbach alpha on items of

traditional had high coefficient on economic was at 0.93 with low for social at 0.75 and environment at 0.76 and PriSM had coefficient beta on economic was at 0.85, social at 0.82 and environment at 0.89 were above 0.75 threshold which supported reliability of data collected for this study as recommended by Creswell (2014).

3.8 Scale Development

A precise measurement of this build is necessary in order to comprehend and use sustainable project design. The study employed the 5-point Likert scale in effort to create a valid and reliable assessment. This is so because the information gathered was based on respondents' opinions, and it offers the ideal method for gathering opinions that are specifically focused on a given subject. The scale range from 1 to 5 was assigned to the scale based on the degree of agreement and relevance. The Likert scale; Very low (1); Low (2); moderate (3); high (4); very high (5) was adopted on the administered questionnaire for this study.

The Cronbach's alpha, which was used to evaluate the internal consistency of the questions, shouldn't be lower than 0.75, if at all possible. Acceptable levels are those that are larger than 0.7. Nevertheless, Cronbach, alpha should ideally be less than 0.9, which denotes that the questions are "too similar" and you thus get the same answers to the questions. In this case, deleting the questions that correlate excessively would prevent information loss. The Cronbach's alpha for the Traditional and PReSM variable exceed the threshold of 0.7 as recommended by Creswell (2014).

Table 3.1: Cronbach's Alpha threshold for Interpretation

> 0.9	Excellent
> 0.8	Good
> 0.7	Acceptable
> 0.6	Questionable
> 0.5	Poor
< 0.5	Unacceptable

3.8 Data Analysis

The data gathered from participants was updated to ensure completeness, correctness, and consistency. It was then coded, classified, and imported onto a computer for analysis, with Microsoft software utilized to create tables to aid in the interpretation and analysis of the data. Following that, each respondent's true score was determined, and the different approaches were compared. The quantitative data were processed using the Statistical Package for Social Sciences programme (SPSS 24.0). This involved calculation of descriptive statistics for getting the frequency, mean, factor analysis as well as inferential specifically spear man rank correlation to compare and contrast the contribution of PRiSM and traditional methods on project. Factors with relatively high mean values greater than 0.5 are recognized as crucial for the effectiveness of both the PRiSM and traditional approaches to project planning and management on building construction projects. If two or more factors have the same mean value, the one with the lowest standard deviation is seen as more essential. However, there were factors with the same mean value for ranking. The average of each component for the PRiSM technique and the traditional approach was ranked to determine their level of importance in project planning and management for building construction in Uganda. The study emphasis was tailored on PRiSM approach since it undertakes all priorities in traditional and environment conservation on the construction project.

The sustainable pyramid was developed to summarize the way economic, environment and social factor fit into institution governance of the building construction projects with adoption of PRiSM approach. The pyramid was developed from the critical factors as well as association dimensions that foster applicability of PRiSM approach.

The factor analysis helped to categorize the data using matrix of association to inform the

study. The component factor analysis measures and examine their internal reliability of economic, social and environment dimensions in the traditional and PRiSM approach.

The data from questionnaires and interview guide were triangulated in the findings. The interview data and document review supplemented the questionnaire to answer the research questions on the applicability of PRiSM and tradition and PRISM on the management of building construction projects. The engineering team at ENABEL provided information on tradition approach which they knew before adoption of PRiSM in the building construction management in Uganda.

3.9 Ethical consideration

To ensure fruitful data collection, the researcher obtained an introduction letter from Kyambogo University's Graduate School and Research Directorate, which was delivered to Enabel, the various project consultants, contractors, and beneficiaries. Participants in the study were told that the information they provided would be kept secure and anonymous.

The researcher sought informed consent from the respondents. The participants gave their acceptance orally and only few ticked on the informed consent form which showed their commitment to voluntarily provide information regarding traditional and PRiSM approaches in construction project.

The privacy of participants was ensured by making appointment and requesting schedule from them. The participants were engaged at office/ workplace during official working hours. The interview questions were generic but not personnel to invite bias and emotions. This helped to ensure effective observation to privacy of the participants in this study.

The high level of integrity was exercised the researcher to ensure justice during data collection from the participants. The independence and objectivity were prioritized to

strengthen the applicability of integrity throughout data collection for this study.

3.10 Chapter summary

With a sample population of 342 respondents, a 5-point Likert scale was used to collect descriptive data which converted to inferential statistics. It's from this data that the study established the comparison between the PRiSM approach and the traditional approach to project planning and management.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 Introduction

This chapter covers the presentation, analysis and discussion of the results from the data collected on the effectiveness of the PRiSM planning and management approach on building construction projects in Uganda. It sought to establish the environmental, social, and economic contribution of the PRiSM and traditional methods on project planning and management approach on building construction projects in Uganda, and later compare and contrast PRiSM and traditional building construction project planning and management approaches in Uganda and lastly suggest areas of improvement in the PRiSM strategy to enable greater roll out.

4.2 Response rate of respondents

The research targeted a total of 342 respondents and distributed questionnaires to all of them accordingly, of which 279 respondents returned filled questionnaires represented by 81.6% successfully participated in this study. The respondent's distribution was 150 from National teachers' college Kaliiro in Eastern, 54 National teachers' college Mubende in Central, 31 from National Teachers' College Muni and 44 from National teachers' college Unyama from Northern region of Uganda. The responses rate above 0.7 (70%) provided required data for the study as recommended by (Creswell & Creswell, 2018). In this case, the achieved sample size above 70% is treated as a whole and thus used for further analysis to answer the objectives of the study. There was representation of participants from the four national teacher's colleges which guaranteed reliability and validity of the data for this study. Furthermore 25 selected participants were successfully interviewed for this study.

4.3 Background to the study

The background information involved gender, age bracket, level of education and institution

identity. Understanding the nature of the respondents and institutions represented is vital to inform the preferred critical factors for effectiveness of PRiSM in project planning and management on building construction projects as well as the traditional approach.

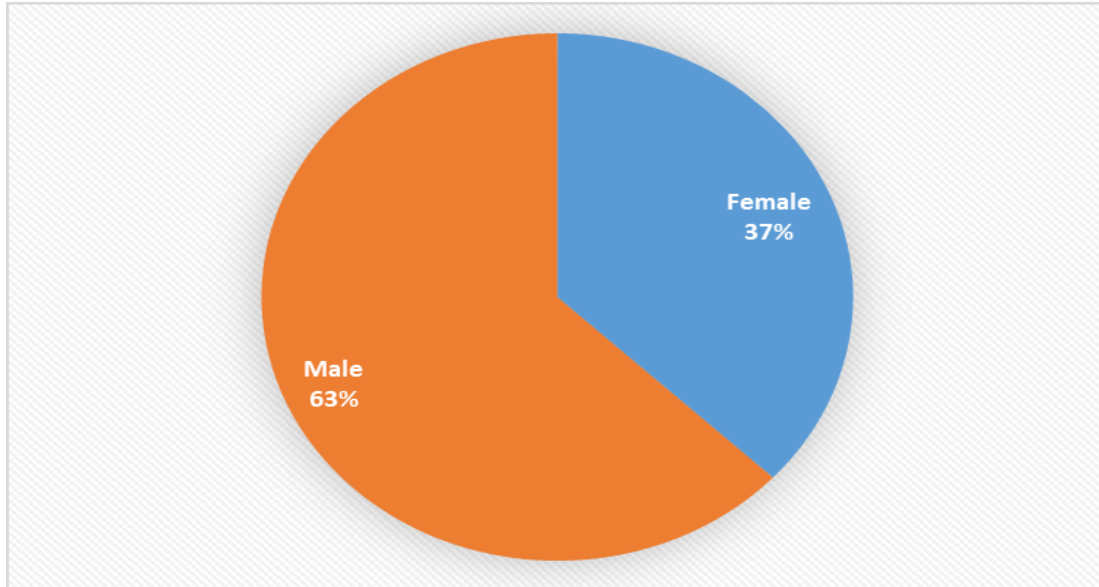


Figure 4.1: Gender of respondents

Source: Primary data (2023)

From figure 4.1, 63% of the respondents were male and 37% were female, indicating more male respondents than the female in this study. The data obtained represented both genders from the National Teachers' colleges as regards to effectiveness of PRiSM methods on project planning and management approach on building construction projects in Uganda.

Based on conducted interviews, 15 interviewed participants were female while 10 (ten) were male. Both gender was represented to avoid biased views about applicability of traditional and PRiSM approach on construction building management in Uganda.

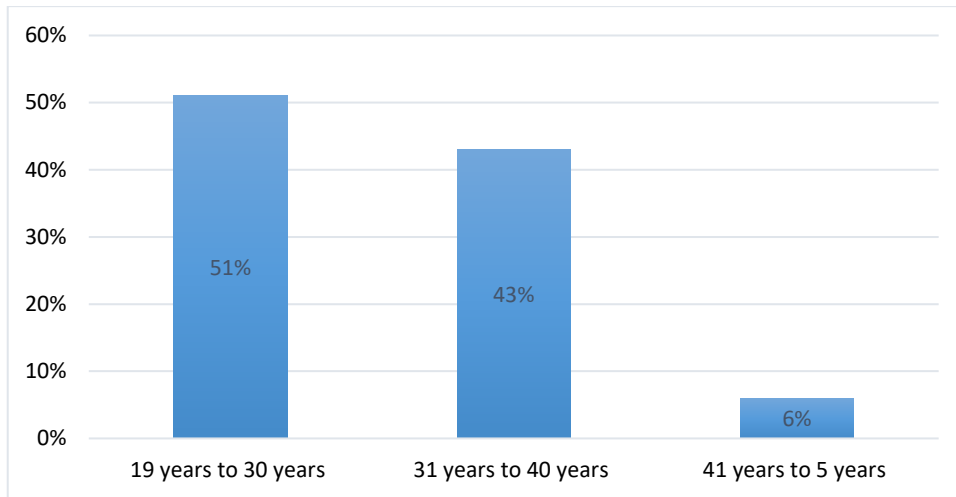


Figure 4.2: Age bracket of respondents

Source: Primary data (2023)

From the collected data, the majority of respondents at 51% were of the age group between 19 years and 30 years, 43% were between 31 to 40 years and 6% were aged between 41 – 50 years. This implies that results were a dependable representation of opinions from different age groups from young population to adults at 50 years of age.

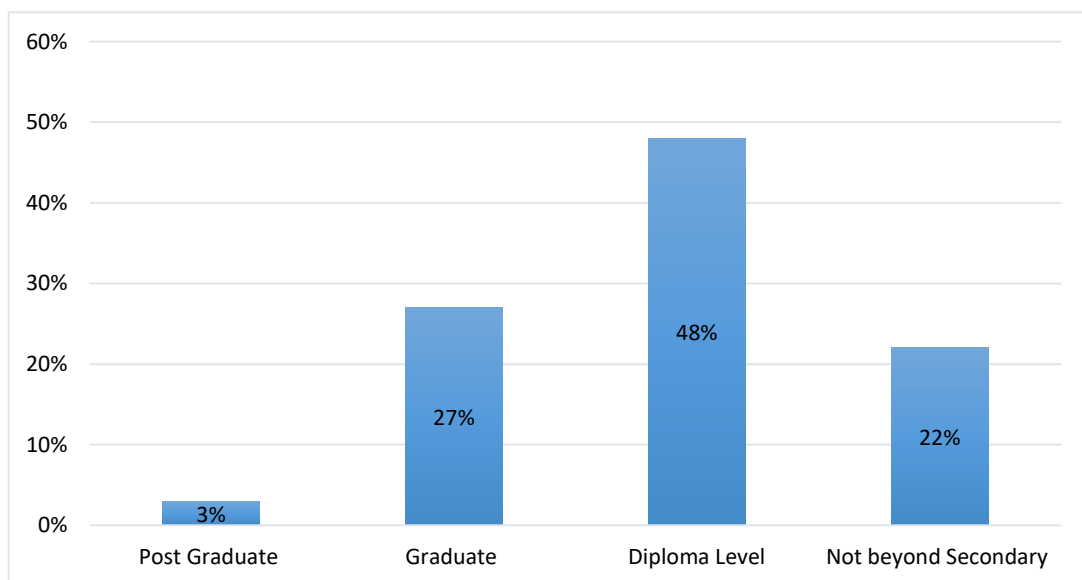


Figure 4.3: Level of education

Source: Primary data (2023)

Figure 4.3 indicates that 47.7% of respondents represented by 133 had obtained Diploma, followed by graduates at 27.2% represented with 76 respondents, 21.5% of respondents

represented by 60 who did not study beyond secondary level, lastly 3.6% had post graduate. In addition, 18 interviewed participants had Bachelor’s Degree engineering and seven had Master’s degree in courses related to engineering. This implies that the engaged respondents had attained average level of education with ability to respond to the questionnaire survey as well as those for interviews which eased data collection for this study.

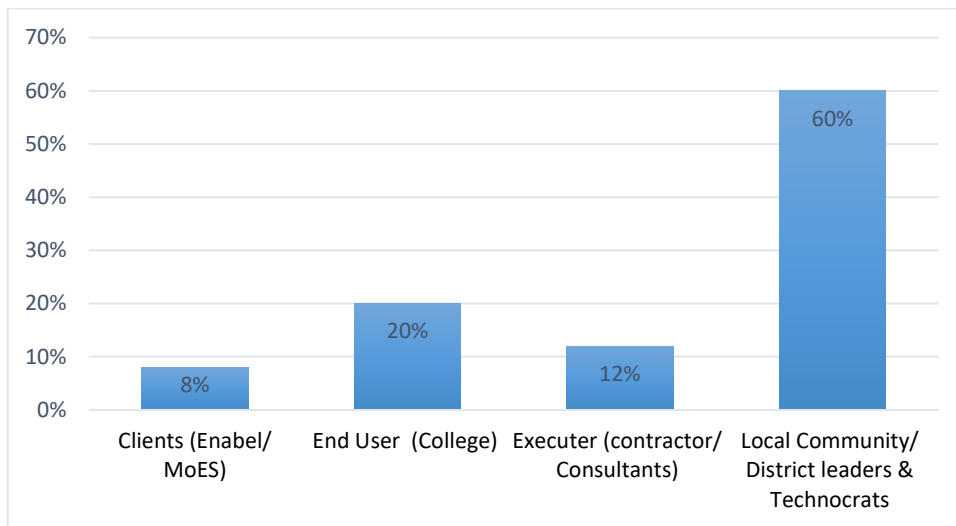


Figure 4.4: Stakeholders of projects

Source: Primary data (2023)

Figure 4.4, 60% of the respondents were representative from local community/District leaders and technocrats, 20% were end users at college, 12.2% were Executer (Contractor/Consultant), and lastly 8% were clients (Enabel/ MoES). This indicated that key stakeholders’ opinions and views for the project were represented in this study.

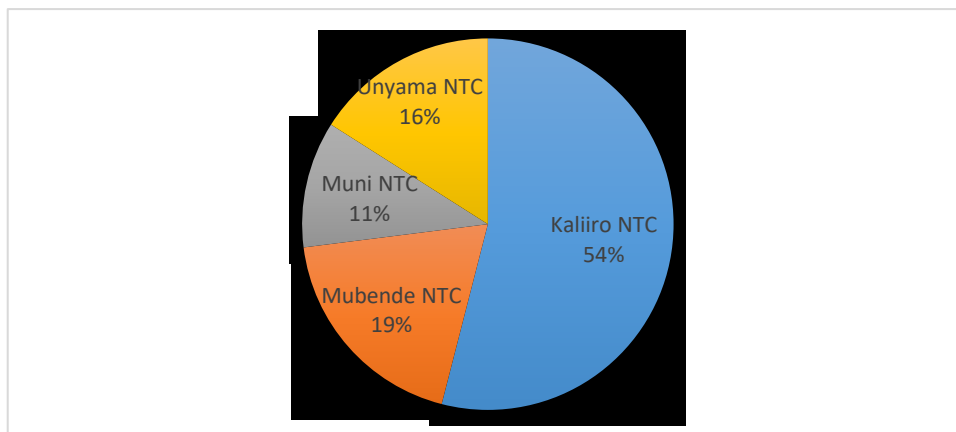


Figure 4.5: Institutions identity

Source: Primary data (2023)

Figure 4.5 above indicates that 54% of respondents from National teachers' college Kaliiro in Eastern, 19% of respondents from National teachers' college Mubende in Central, 11% of respondents from National Teachers' College Muni and 16% of respondents from National teachers' college Unyama from Northern region of Uganda which represented the four-study area.

4.4 Descriptive statistics

4.4.1 Environmental, social, and economic contribution of the PRiSM approach on building construction projects in Uganda

Based on the self-administered questionnaire, 7 economic factors, 7 environment factors and 12 environment factors were set to determine the effectiveness of PRiSM in project planning and management on building construction projects. The critical factors were those who obtained the threshold of 0.5 and above. The items were scaled using the five point Likert scale where code 1 = Very Low (VL), 2=Low (L), 3 = Moderate (M), 4 = High (H) and 5 = Very High (VH). The normal distribution curve was conducted to determine whether normality assumption was not violated. The descriptive statistics for each of the factors/items are detailed according to percentage, frequency and means. The mean was later ranked from the highest to the lowest using the descending order and are presented below.

Table 4. 1: Percentages, Frequencies and Means for Economic factors in PRiSM

Factors	F/%	Very low	Low	Moderate	High	Very High	Mean	Rank
Locals were employed.	F	3	29	54	78	115	3.98	5
	%	1.1	10.4	19.4	28.0	41.2		
Employees were satisfied.	F	3	6	51	108	111	4.14	1
	%	1.1	2.2	18.3	38.7	39.8		
The project was profitable.	F	6	3	56	138	76	3.99	4
	%	2.2	1.1	20.1	49.5	27.2		
The suppliers were satisfied.	F	2	5	51	124	97	4.11	2
	%	.7	1.8	18.3	44.4	34.8		
There were/are minimal defects.	F	3	5	61	146	64	3.94	6
	%	1.1	1.8	21.9	52.3	22.9		
The designs were easy to interpret, construct or monitor.	F	5	20	71	120	63	3.77	7
	%	1.8	7.2	25.4	43.0	22.6		
The project was completed on time.	F	3	8	38	147	83	4.07	3
	%	1.1	2.9	13.6	52.7	29.7		

From the results on economic factors in Table 4.1, as regards to whether locals were employed, a bigger percentage of the respondents (69.2%) respond to high, while the remaining 11.5% responds to low and 19.4% were moderate. A mean of 3.98 was achieved and ranked as the fifth (5th) critical factor for effectiveness of PRiSM approach for project planning and management on building construction projects which indicates that the dominant respondents agreed high on the five point Likert scale used. The results therefore suggest that the rate of employing locals as key stakeholders in the planning and management of construction projects in the study area are high. It is vital to employ locals as beneficiaries in project planning and management to accommodate their interest to prevent interruption from local community during project implementation.

In regards to whether employees were satisfied, 78.5% of respondents says high, 3.3% said low and 18.3% were moderate. As factor related to satisfaction of employees was ranked the first place based on survey results (Mean value: 4.14). Satisfied employees ably take care about the quality of the work committed with project planning and management. The employee become more productive and implement the projects as desired whenever satisfied with the project planning and management of building construction projects. As to whether the project was profitable, 76.7% of the respondents were agreed to high, 3.3% said low and 20.1% responded to moderate. The mean of 3.99 as ranked in fourth place of critical factors which indicated that the respondents confirmed to achievement of profitability in the project. PRiSM approach determined project profitability during project planning and management. Of the total respondents, 79.2% agreed to high that suppliers were satisfied, 0.7% says low and 18.3% were moderate realized a mean of 4.11 ranked in the second critical factor incorporated in application of PRiSM approach in project planning and management. The suppliers are catered for within the PRiSM approach in project. Whenever employees, and supplier become satisfied this allows for the achievement of various stakeholder objectives

through shared, acceptable goals and lines of action (Miao Yu 1, 2018). Regarding whether, there were/are minimal defects, 75.2% says highly agreed, 2.9% lowly agreed and 21.9% respond to moderate agreement. With the mean of 3.94, the factor was ranked in the sixth (6th) position which implies that defects are minimized with adoption of PRiSM approach during planning and management in construction projects in Uganda. Whether designs were easy to interpret, construct or monitor, 65.6% responds to high and 9.0% said low whereas 25.4% agreed to moderate. It realized a mean value 3.77 which was ranked in seventh position of critical factors in the project planning and management. PRiSM approach provide accurate information when planning to ensure effective management of projects. The findings concurs (Onyam and Nnadi, 2023) PRiSM cater for the integration of right information to minimize risk in the project planning and management to support success.

In relation to whether, projects were completed on time majority of respondents at 82.4% says high, 4% says low and 13.6% agreed to moderate raising a mean value of 4.07 which was ranked in three place in the critical factors of projects. Time is key critical factor embedded in PRiSM to support project planning and management of construction projects. The above results indicated that PRiSM approach enabled high quality of project planning and management on building construction of projects by ENABEL Uganda. In addition, the curve in Figure 4.6 shows that the results on economic factors under PRiSM approach looks normally distributed, thus did not violate the normality assumption.

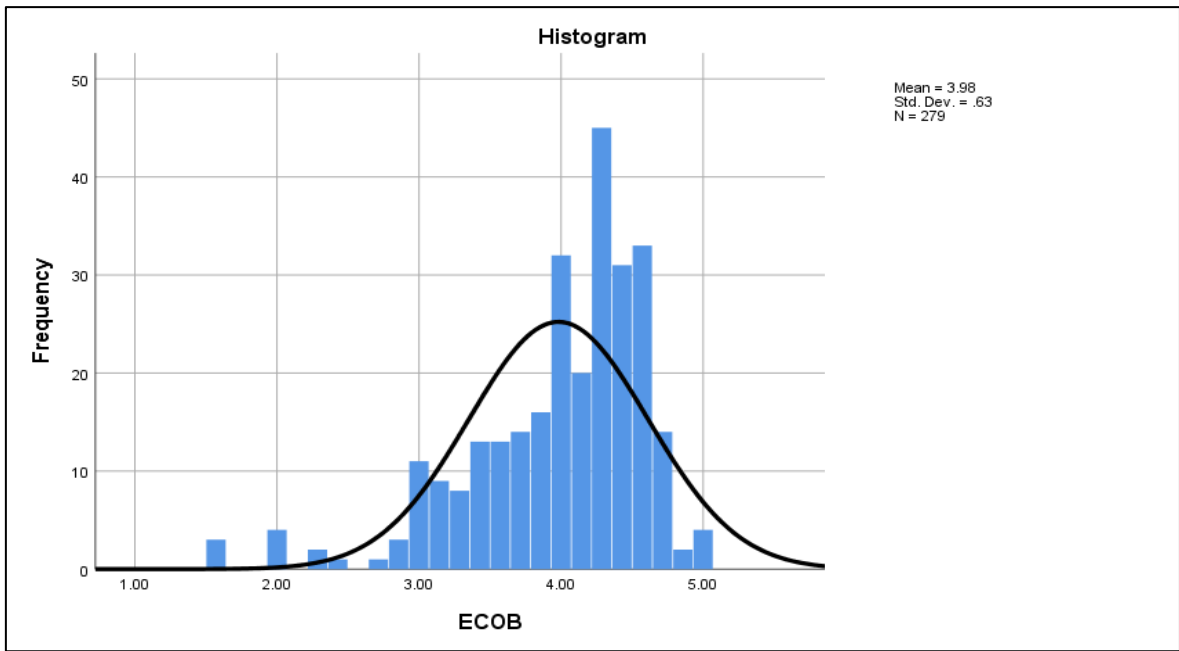


Figure 4.6: Economic factors

Table 4.2: Percentages, Frequencies and Means for environmental factors in PRiSM

Factors	F/%	Very low	Low	Moderate	High	Very High	Mean	Rank
There was/is minimization and elimination of waste during construction.	F	2	13	74	132	58	3.83	3
	%	0.7	4.7	26.5	47.3	20.8		
There was good management of noise and dust.	F	3	11	84	134	47	3.76	5
	%	1.1	3.9	30.1	48.0	16.8		
There was/is protection of sensitive ecosystems.	F	2	5	68	139	65	3.93	2
	%	0.7	1.8	24.4	49.8	23.3		
Supplies were being bought locally.	F	27	80	67	69	36	3.56	7
	%	9.7	28.7	24.0	24.7	12.9		
Materials being used were environmentally friendly.	F	1	12	77	149	40	3.77	4
	%	0.4	4.3	27.6	53.4	14.3		
There was use of recycled /sustainability sourced materials.	F	12	48	85	91	43	3.58	6
	%	4.3	17.2	30.5	32.6	15.4		
There was rainwater harvesting.	F	6	16	32	68	157	4.27	1
	%	2.2	5.7	11.5	24.4	56.3		

Source: Primary data (2023)

From the results on environmental factors in Table 4.2, as regards to whether PRiSM facilitates minimization and elimination of waste during construction, a bigger percentage of the respondents (68.1%) respond to high, while the remaining 5.4% responds to low and 26.5% were moderate. A mean of 3.83 was achieved and ranked as the third (3rd) critical factor for effectiveness of PRiSM approach for project planning and management on building construction projects to conserve environment which indicates that the dominant respondents agreed high on the five-point Likert scale used. The results therefore suggest that the PRiSM approach facilitate planning for minimization and elimination of waste during building construction. This is probably the reason why the factor on elimination of waste is vital for pollution control on the building construction project.

In regards to whether there was good management of noise and dust, 64.8% of respondents says high, 5.0% said low and 30.2% were moderate. As factor related to good management of noise and dust was raked in the fifth position on survey results (Mean value: 3.76). Good management of noise and dust is vital to control air pollution during the building construction project. PRiSM approach caters for planning and management of noise and dust with in the building construction project. The use equipment with low noise emissions and maintain them properly is key to control air pollution. Contractors facilitates use of appropriate Personal Protective Equipment (PPE) such as dust masks and earplugs for employee at site facilitates project success.

As to whether the project plan for protection of sensitive ecosystems, 73.1% of the respondents agreed to high, 2.5% said low and 24.4% responded to moderate. The mean of 3.93 as ranked in second position among critical factors which indicated that the respondents confirmed to plan for protection of sensitive ecosystem in the project. PRiSM approach facilitates planning for protection of sensitive ecosystem during project planning and

management. The sensitive ecosystem protection areas are intact, undisturbed and free of development activities and are kept undisturbed, intact and free of development activities and no restoration or enhancement of any sensitive ecosystem protection area requirement for sensitivity protection of ecosystem. In relation to whether supplies were being bought locally, 37.6% agreed to high that supplies were being bought locally, 38.7% says low and 24.0% were moderate realized a mean of 3.56 ranked in the last position (7th) among the critical factor incorporated in application of PRiSM approach in project planning and management. The supplies are bought not locally with use PRiSM approach in project planning and management due to international bidding for procurements. The competitive bidding and absence of standard supplies from local producers' pave way to procure material on international market for quality assurance.

Regarding whether, materials being used were environmentally friendly, 67.7% says high, 4.7% says low and 27.6% respond to moderate. With the mean of 3.77, the factor was ranked in the fourth (4th) position which implies that material planned under PRiSM approach are environmentally friendly for construction projects in Uganda. Planning for use of environmentally friendly material to preserve the environment support project success. Whether projects use of recycled /sustainability sourced materials, 48.0% responds to high and 21.5% said low whereas 32.6% agreed to moderate. This achieved a mean value 3.58 which was ranked in sixth position of critical factors in the project planning and management. PRiSM approach provides effective planning for use of recycled /sustainability sourced materials in the building construction project.

In relation to whether, projects planned for rainwater harvesting respondents at 80.7% says high, 7.9% says low and 11.5% agreed to moderate raising a mean value of 4.27 which was ranked in first position is the critical factor for environment management of projects. The

process of rainwater harvesting involves the collection and the storage of rainwater with the help of artificially designed systems that run off naturally or man-made catchment areas like the rooftop, compounds, rock surface, hill slopes, artificially repaired impervious or semi-pervious land surface is key critical factor embedded in PRiSM in project planning and management of construction projects by ENABEL Uganda. The curve in Figure 4.7 shows that the results looks normal and did not violate the normality assumption. The results were plotted and the distribution curve attained showed that data is normally distributed.

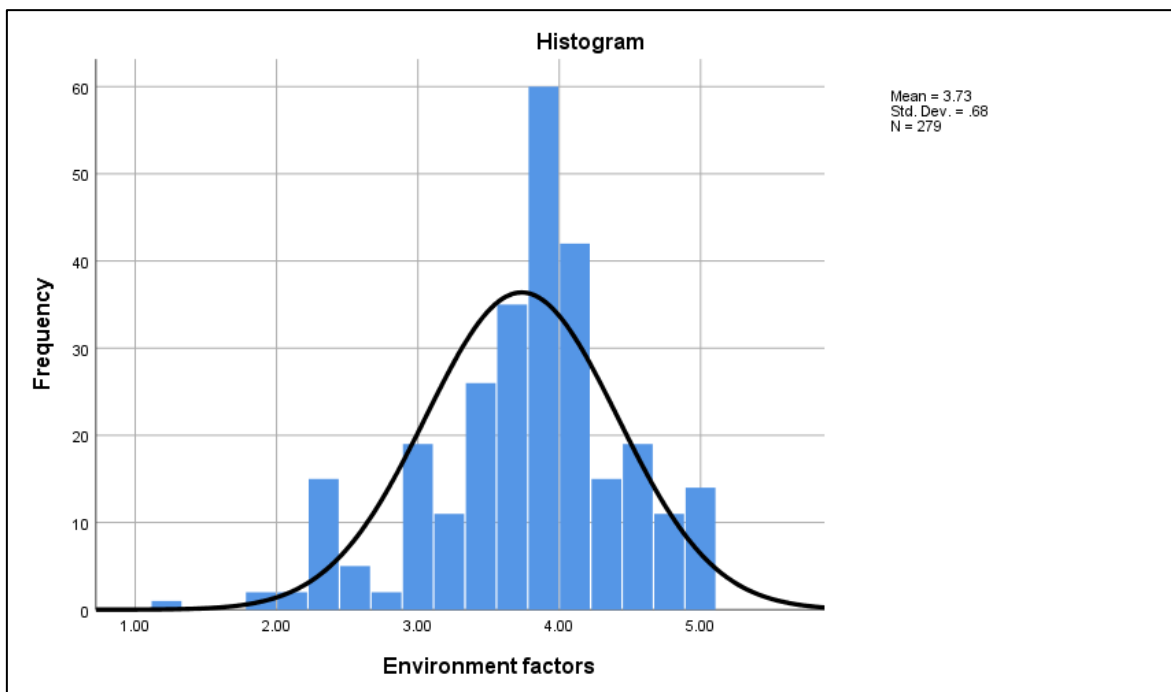


Figure 4.7: Environmental factors

Table 4. 3: Percentages, Frequencies and Means for social factors with PRiSM approach

Factors	F/%	Very low	Low	Moderate	High	Very High	Mean	Rank
The institution services are accessible and affordable.	F	2	6	65	125	81	4.01	10
	%	0.7	2.2	23.3	44.8	29.0		
There was respect of staff, employees and all other associates.	F	3	3	44	153	76	4.05	8
	%	1.1	1.1	15.8	54.8	27.2		
Local women were not impregnated and neither social harassed.	F	4	4	15	165	91	4.20	4
	%	1.4	1.4	5.4	59.1	32.6		
HIV/AIDS was not spread.	F	3	3	9	116	148	4.45	2
	%	1.1	1.1	3.2	41.6	53.0		
There were/are equal opportunities and chances for employment/service access.	F	2	7	53	125	92	4.07	6
	%	0.7	2.5	19.0	44.8	33.0		
There was/is healthy, safety and convenient working environment.	F	2	7	43	148	79	4.06	7
	%	0.7	2.5	15.4	53.0	28.3		
There was/is work morale and employee satisfaction.	F	2	8	48	155	66	3.99	11
	%	0.7	2.9	17.2	55.6	23.7		
There was inclusive participation in decision making before, during and after construction.	F	3	11	96	101	68	3.79	12
	%	1.1	3.9	34.4	36.2	24.4		
The services brought improved the general local environment.	F	1	8	43	112	115	4.19	5
	%	0.4	2.9	15.4	40.1	41.2		
There is increase in enrolment population of students.	F	1	7	60	127	84	4.03	9
	%	0.4	2.5	21.5	45.5	30.1		
Government was/is supportive.	F	2	4	23	84	166	4.47	1
	%	0.8	1.4	8.2	30.1	59.5		
Locals were/are supportive.	F	1	6	56	79	137	4.24	3
	%	0.4	2.2	20.1	28.3	49.1		

From the results on social factors in Table 4.3, as regards to whether institution services are accessible and affordable by the society, 73.8% respond to high, while the remaining 2.9% responds to low and 23.3% were moderate. A mean of 4.01 was achieved and ranked as the tenth position (10th) critical factor for effectiveness of PRiSM approach for project planning and management on building construction projects. Therefore, PRiSM approach ensures that institution services are accessible and affordable by the society located in the site area for the project. The dominant respondents agreed high on the five point Likert scale used. The results therefore suggest that the PRiSM approach ensures that building are accessible and affordable by people with disabled pathways, fire protection units among others on the completed construction project.

In regards to whether there was respect of staff, employees and all other associates, 82% of respondents says high, 2.2% said low and 15.8% were moderate. As factor related to respect of staff and other associates on project was raked in the eight position on survey results (Mean value: 4.05). The mutual respect in the workplace, lets and other associates all employees know that they are valued for their achievements, abilities and qualities during the building construction project. Whenever employees feel valued and treated respectfully helps to promote a positive work culture in which employees are fulfilled, loyal, engaged and motivated to perform at their very best at the project.

As to whether local women were not impregnated and neither social harassed, 91.7% of the respondents agreed to high, 2.8% said low and 5.4% responded to moderate. The mean of 4.20 as raked in forth position among critical factors which indicated that the respondents confirmed to have been incorporated in the planning and management of projects with adoption of PRiSM approach. The building construction projects have to plan on prevention of social harassment on the site, so that they have clear understanding about the potential

risk of unlawful sexual acts on the project. In relation to whether HIV/AIDS was not spread, 94.6% agreed to high, 2.1% says low and 3.2% were moderate realized a mean of 4.45 ranked in the second position among the critical factor embedded in application of PRiSM approach in project planning and management. Project team cater for the prevention of HIV/AIDS in the community to pursue successful completion of the project.

Regarding whether, there are equal opportunities and chances for employment/service access, 77.8% says high, 3.2% says low and 19.0% respond to moderate. With the mean of 4.07, the factor was ranked in the sixth position which implies that PRiSM approach provides equal opportunities and chances for employment to people and society on construction projects in Uganda. Provision of equal opportunities for employment is notion to involve society which facilitates project planning and management. Whether projects providers healthy, safety and convenient working environment, 81.3% responds to high and 3.2% said low whereas 15.4% agreed to moderate. This achieved a mean value 4.06 which was ranked in seventh position of critical factors in the project planning and management. PRiSM approach provides favorable healthy, safety and convenient working environment for building construction project.

In relation to whether, work morale and employee satisfaction is catered for under PRiSM, respondents at 79.3% says high, 3.6% says low and 17.2% agreed to moderate achieved a mean value of 3.99 which was ranked in eleventh position is the critical factor for social benefits on projects. Employee morale is the attitude, satisfaction, and overall outlook of employees during their association with project planning and management. The employee satisfaction promotes productivity to support project success by ENABEL Uganda. As regard to inclusive participation in decision making before, during and after construction under PRiSM, respondents at 60.6% says high, 5.0% says low and 34.4% agreed to moderate

achieved a mean value of 3.79 which was ranked in twelve position is the critical factor for social benefits on projects. This factor is ranked lower compared to other factors discussed, inclusive decision-making is an approach to considering options and making a decision that actively involves all those who would be directly affected by the outcome of the decision. It values disabled people and places disabled people within society not outside it to support project success in Uganda.

In relation to whether services brought improved the general local environment under PRiSM, respondents at 81.3% says high, 3.3% says low and 15.4% agreed to moderate achieved a mean value of 4.15 which was ranked in fifth position is the critical factor for social benefits on projects. The adoption of PRiSM presents a smart way to improve the local environment for effective project planning and management. This indicates that planning and management of construction project plays important role in general improvement of local environment. Furthermore, response on the increase in enrolment population of students under PRiSM, respondents at 75.6% says high, 2.9% says low and 21.5% agreed to moderate achieved a mean value of 4.03 which was ranked in ninth position is the critical factor for social benefits on projects. The adoption of PRiSM increases the enrolment population in the project planning and management. In addition, response whether government was/is supportive, respondents at 89.6% says high, 2.2% says low and 8.2% agreed to moderate achieved a mean value of 4.47 which was ranked in first position is the critical factor for social benefits on projects. Government intervention through regulation on preservation of norms and values in society is key to foster project planning and management. Lastly, findings whether locals were/are supportive, respondents at 77.4% says high, 2.6% says low and 20.1% agreed to moderate achieved a mean value of 4.24 which was ranked in third position is the critical factor for social benefits on projects. Support from the local community is strong safety mechanism to ensure effective project implementation

which stimulate contractors to cater for their interest and actively complete within desired time.

The curve in Figure 4.8 shows that the results were almost normally distributed. The social factor results were plotted and the distribution curve attained showed that they within the range and appear normally distributed on the building construction project for ENABEL Uganda.

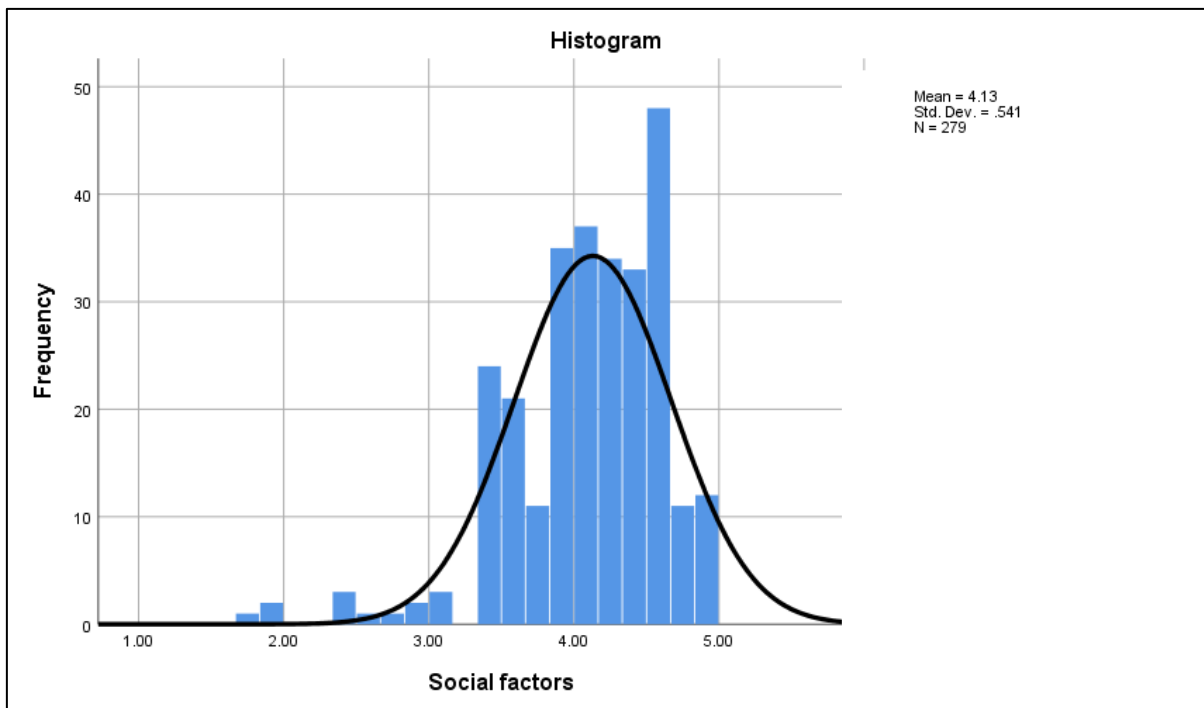


Figure 4.8: Social factors

4.4.2 Environmental, social, and economic contribution of the traditional approach on building construction projects in Uganda

The critical factors were assessed on second objective about how environmental, social, and economic aspects are yielded with traditional approach in project planning and management of building construction. The economic, environmental and social factors related to traditional approach were ranked based on mean and decision criteria was developed with factor analysis following the threshold of 0.5 to determine their contribution on project planning and management on building constructions.

Table 4.4: Percentages, Frequencies and Means for economic factors in traditional

Factors	F/ %	Very low	Low	Moderate	High	Very High	Mean	Rank
Locals were employed.	F	138	76	6	56	3	2.57	5
	%	49.5	27.2	2.2	20.1	1.1		
Employees were satisfied.	F	5	2	51	124	97	4.04	2
	%	1.8	0.7	18.3	44.4	34.8		
The project was profitable.	F	29	3	54	78	115	4.10	1
	%	10.4	1.1	19.4	28.0	41.2		
The suppliers were satisfied.	F	5	51	2	97	124	3.89	3
	%	1.8	18.3	0.7	34.8	44.4		
There were/are minimal defects.	F	20	71	2	120	63	3.83	4
	%	7.2	25.4	1.8	43.0	22.6		
The designs were easy to interpret, construct or monitor.	F	147	3	38	8	83	2.10	7
	%	52.7	1.1	13.6	2.9	29.7		
The project was completed on time.	F	111	51	3	108	6	2.43	6
	%	39.8	18.3	1.1	38.7	2.2		

From the results on economic factors in traditional approach in Table 4.4, as regards to whether Locals were employed, 76.7% respond to low, while the remaining 21.2% responds to high and 2.2% were moderate. A mean of 2.57 was achieved and ranked in fifth position critical factor for effectiveness of traditional approach for project planning and management on building construction projects. Therefore, local are not employed which probably lack of skills in the past to participate in the construction projects. The building projects were dominated by employees sourced outside the community due to limited skills and exposure of local people on the activities performed on the construction project. In regards to whether employees were satisfied, 79.2% of respondents says high, 2.5% said low and 18.3% were moderate. As factor related to satisfied employees on project was raked in the second position on survey results (Mean value: 4.04). The employees were remunerated as per terms and conditions to motivate them yield high productivity as engine to project success.

As to whether project was profitable, 69.2% of the respondents agreed to high, 11.5% said low and 19.4% responded to moderate. The mean of 4.10 was achieved and raked in first position among critical factors which indicated that profitability is emphasized in traditional approach on the projects. Assessment on whether suppliers were satisfied, 79.2% of the respondents agreed to high, 20.1% said low and 0.7% responded to moderate. The mean of 3.89 was achieved and raked in third position among critical factors which indicated that suppliers were satisfied with terms and conditions set in the traditional approach on project planning and management.

In relation to whether they are minimal defects, 65.6% agreed to high, 32.6% says low and 1.8% were moderate, realized a mean of 3.83 ranked in the fourth position among the critical factor embedded in application of traditional approach in project planning and management. Project team plan for minimization of defects liability on the projects. Defects reduces profits

and deter reputation, thus their minimization with compliance to ISO 9001:2008 “Quality Management Systems – Requirements induces project planning and management of building construction projects. Regarding whether, designs were easy to interpret, construct or monitor, 53.8% says low, 32.6% says low and 13.6% respond to moderate. With the mean of 2.10, the factor was ranked in the seventh position which implies that designs were not easily interpreted, construct of monitored in the traditional approach on building construction projects. This is probably due to lack of computers to support self-search on design quality and interpretation on project.

Whether project was completed on time, 58.1% responds to low and 40.9% said high whereas 1.1% agreed to moderate. This achieved a mean value 2.43 which was ranked in sixth position of critical factors in the project planning and management. Meeting building project expectations in the workplace is an important measure of success, and adhering to deadlines is part of achieving those goals. Completing projects on or ahead schedule ensures that manager, consultants and clients can all accomplish their objectives in time.

The curve in Figure 4.9 shows that the results were not normally distributed. The economic factors results related to traditional approach were plotted and the distribution curve attained showed that they appeared normally distributed with mean of 4.00 and minimum standard deviation of 0.625. The data is clustered towards the mean value for this study.

Histogram

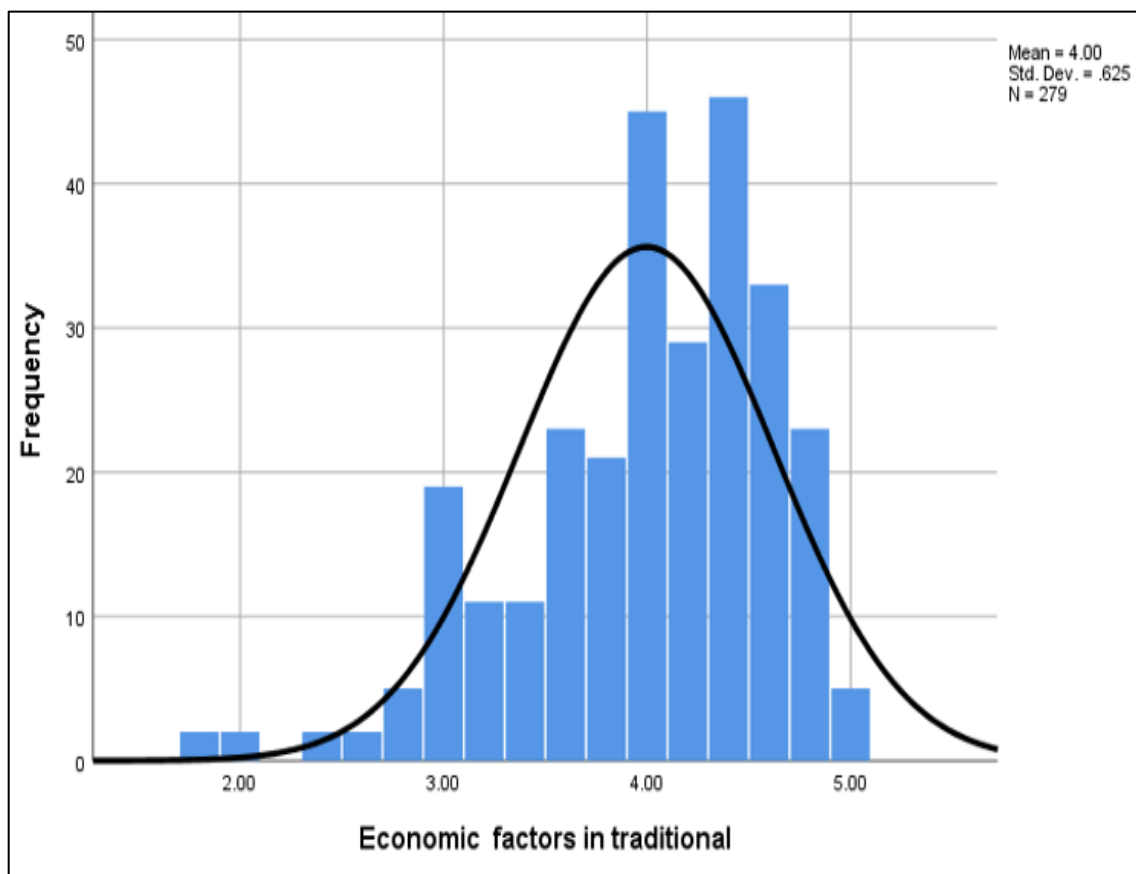


Figure 4.9: Normal distribution of economic factors in traditional approach

Table 4.5: Percentages, Frequencies and Means for social factors in traditional approach

Factors	F/ %	Very low	Low	Moderate	High	Very High	Mean	Rank
HIV/AIDS was not spread.	F/	7	2	53	92	125	3.61	7
	%	2.5	0.7	19.0	33.0	44.8		
There were/are equal opportunities and chances for employment/service access.	F/	116	2	9	4	148	2.97	8
	%	41.6	0.7	3.2	1.5	53.0		
There was/is healthy, safety and convenient working environment.	F/	2	7	43	148	79	3.62	6
	%	0.7	2.5	15.4	53.0	28.3		
There was/is work morale and employee satisfaction.	F/	8	2	48	155	66	3.67	5
	%	2.9	0.7	17.2	55.6	23.7		
There was inclusive participation in decision making before, during and after construction.	F/	1	8	43	112	115	3.97	2
	%	0.4	2.9	15.4	40.1	41.2		
The services brought improved the general local environment.	F/	7	1	60	127	84	3.76	4
	%	2.5	0.4	21.5	45.5	30.1		
There is increase in enrolment population of students.	F/	1	7	43	148	79	4.01	1
	%	0.7	2.5	15.4	53.0	28.3		
Government was/is supportive.	F/	5	3	61	146	64	3.87	3
	%	1.8	1.1	21.9	52.3	22.9		

Source:

From the results on social factors in traditional approach in Table 4.5, as regards to whether HIV/AIDS was not spread, 77.8% respond to high, while the remaining 3.2% responds to low and 19.0% were moderate. A mean of 3.61 was achieved and ranked in seventh position critical factor for effectiveness of traditional approach for project planning and management on building construction projects. Therefore, HIV/AIDs was not spread on the building construction projects with adoption of traditional method. In regards to whether there were/are equal opportunities and chances for employment/service access, 95.5% of respondents says high, 42.3% said low and 3.2% were moderate. As factor related to equal opportunities and chances for employment/service access was raked in the eighth position on survey results (Mean value: 2.98). The employment opportunities were not equally distributed between the local and foreign employees on the building project.

Regarding whether projects provide health, safety and convenient working environment, 81.3% of the respondents agreed to high, 3.2% said low and 15.4% responded to moderate. The mean of 3.62 was achieved and raked in sixth position among critical factors which indicated that projects at low extent provided favorable working conditions at workplace on building construction project. Assessment on whether is work morale and employee satisfaction, 79.3% of the respondents agreed to high, 3.6% said low and 17.2% responded to moderate. The mean of 3.67 was achieved and raked in fifth position among critical factors which indicated that work morale and employee satisfaction were considered in the project planning and management.

In relation to whether there was inclusive participation in decision making before, during and after construction, 81.3% agreed to high, 2.9% says low and 15.4% were moderate, realized a mean of 3.97 ranked in the second position among the critical factor embedded in traditional approach in project planning and management. Inclusive decision-making is an

approach to considering options and making a decision that actively involves all those who would be directly affected by the outcome of the decision. Regarding whether, services brought improved the general local environment, 75.6% says low, 2.9% says low and 21.5% respond to moderate. With the mean of 3.76, the factor was ranked in the fourth position which implies that service brought with construction project improve general local environment to achieve development.

Whether there was increase in enrolment population of students, 81.3% responds to high and 3.2% said low whereas 15.4% agreed to moderate. This achieved a mean value 4.01 which was ranked in first position of critical factors in the project planning and management. Traditional approach allows increased enrolment of the population. In relation to whether, government is supportive, respondents at 75.2% says high, 2.9% says low and 21.9% agreed to moderate achieved a mean value of 3.87 which was ranked in third position is the critical factor for social benefits on projects. The government support through regulations and guidelines support project planning and performance on building projects.

The curve in Figure 4.10 shows that the results were not normally distributed. The social factor results were plotted and the distribution curve attained showed that they appeared normally distributed. This implies that analyze results had to be used for further analysis.

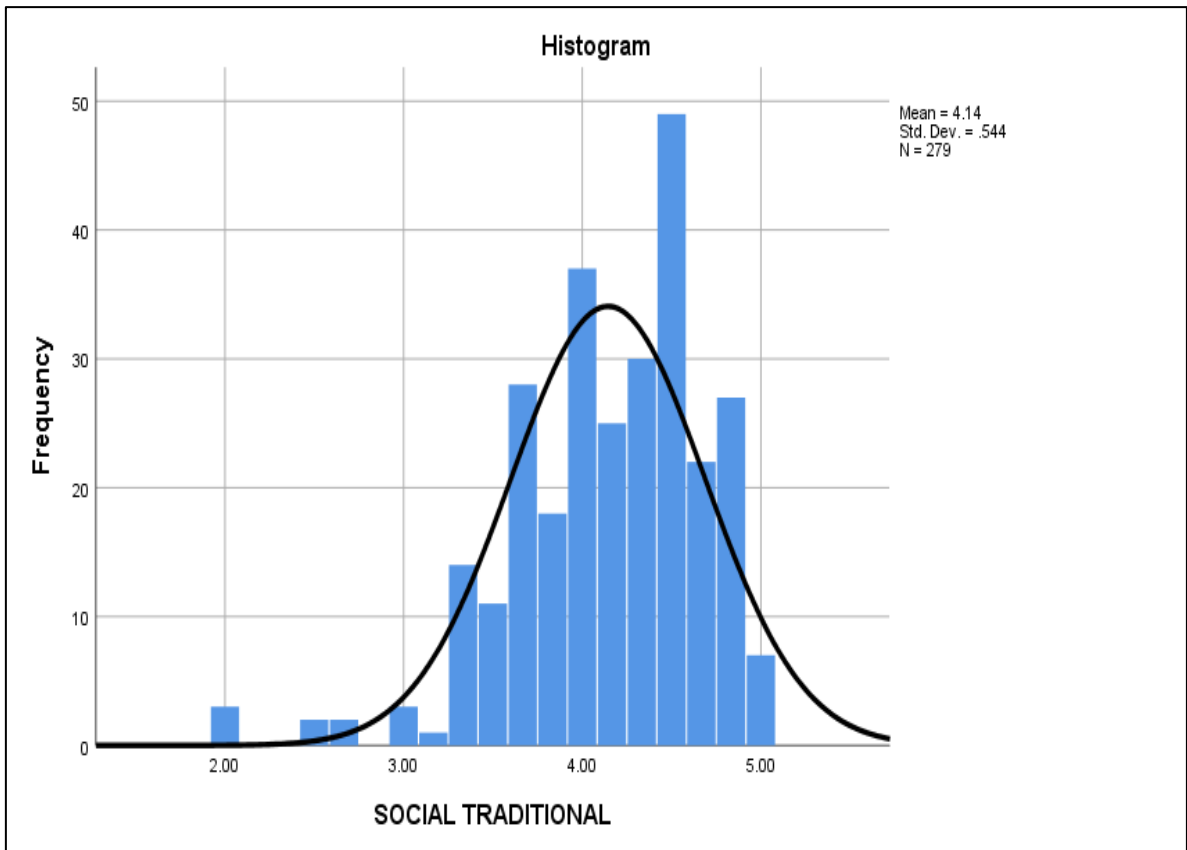


Figure 4.10: Normal distribution of social factors in the traditional approach

Table 4.6: Percentages, Frequencies and Means for environmental factors in traditional approach

Factor	F/ %	Very low	Low	Moderate	High	Very High	Mean	Rank
There was/is protection of sensitive ecosystems.	F	6	16	68	32	157	3.93	2
	%	2.2	5.7	24.4	11.5	56.3		
Supplies were being bought locally.	F	12	48	43	91	85	3.53	5
	%	4.3	17.2	15.4	32.6	30.5		
Materials being used were environmentally friendly.	F	1	12	77	149	40	3.77	3
	%	0.4	4.3	27.6	53.4	14.3		
There was use of recycled /sustainability sourced materials.	F	27	36	67	69	80	3.58	4
	%	9.7	12.9	24.0	24.7	28.7		
There was rainwater harvesting.	F	6	16	32	68	157	4.17	1
	%	2.2	5.7	11.5	24.4	56.3		

From the results on environmental factors in traditional approach in Table 4.6, as regards to whether protection of sensitive ecosystems, 67.8% respond to high, while the remaining 7.9% responds to low and 24.4% were moderate. A mean of 3.93 was achieved and ranked in second position critical factor for effectiveness of traditional approach for project planning and management on building construction projects. Therefore, protection of ecosystem to conserve wetlands and riparian areas, older forest, terrestrial herbaceous areas (rocky outcrops and grassy knolls), coastal bluffs and coastal dunes and spits enhance project planning and management of building constructions. In regards to whether supplies were being bought locally, 63.1% of respondents says high, 21.5% said low and 15.4% were moderate. As factor related to procuring of supplies locally was ranked in the fifth position on survey results (Mean value: 3.53). Domestic procurement is conducted easily, cheaper and builds reputation of the building project with the society. The procurement from local market contribute to the economic development of area where building project is located.

Regarding whether materials being used were environmentally friendly, 67.7% of the respondents agreed to high, 4.7% said low and 27.6% responded to moderate. The mean of 3.77 was achieved and ranked in third position among critical factors which indicated that material used were environmentally friendly with adoption of traditional approach in the building construction projects. Assessment on whether projects uses recycled /sustainability sourced materials, 53.4% of the respondents agreed to high, 22.6% said low and 24.0% responded to moderate. The mean of 3.58 was achieved and ranked in fourth position among critical factors which indicated that projects actively use recycled /sustainability sourced materials on building construction projects.

In relation to whether there was rainwater harvesting, 80.7% agreed to high, 11.5% says low and 7.9% were moderate, realized a mean of 4.17 ranked in the first position among the

critical factor embedded in traditional approach in project planning and management. The construction activities require large quantities of water and most of this will be for non-potable applications such as dust suppression and staff welfare facilities. Therefore, rainwater harvesting can be used to reduce mains water consumption on a construction site to foster project success. The curve in Figure 4.11 shows that the results did not violate normality assumption. The environmental factor results were plotted and the distribution curve attained appeared normally distributed. This implies that analyzed results had to be used for further analysis.

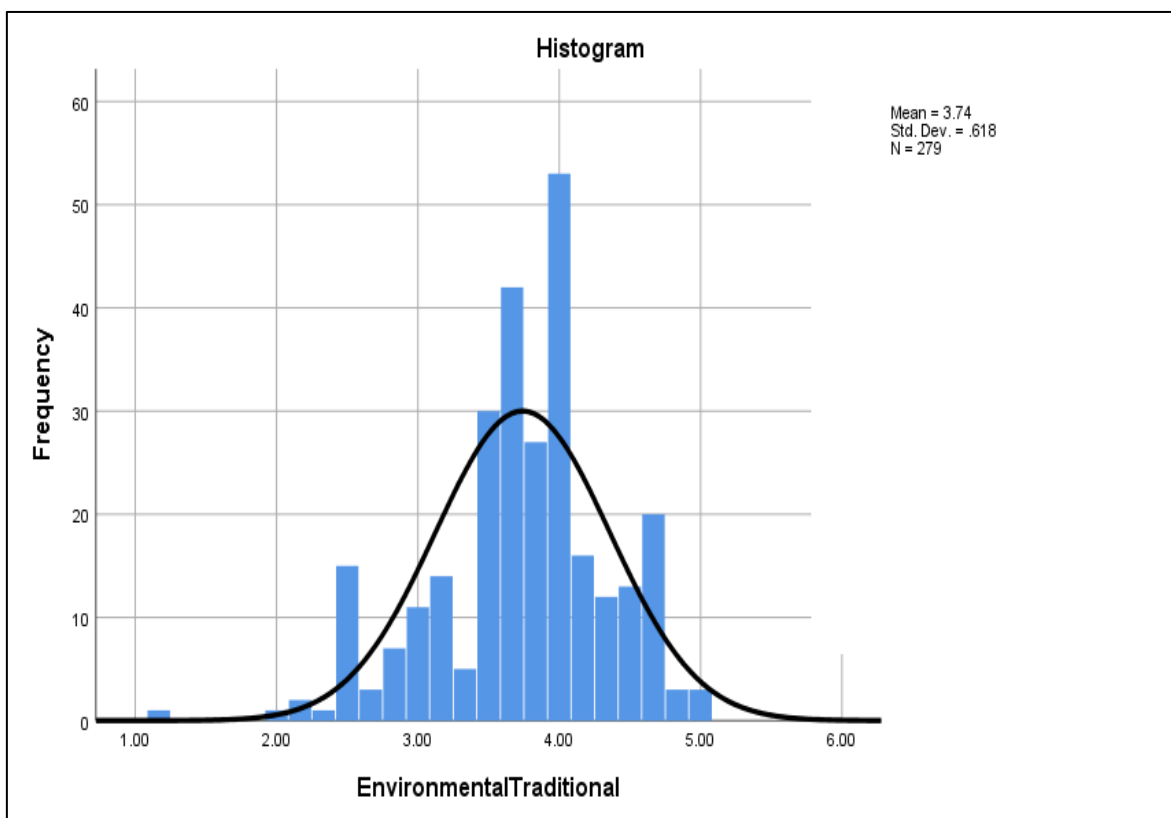


Figure 4.11: Normal distribution of environmental factors in traditional approach

4.4.3 Suggestion to improve PRiSM approach to enhance project management on construction sites in Uganda

The economic, social and environment factors with low score of significance level below 0.8 consists of areas for improvement in PRiSM approach. This is because factor loading of

a variable above 0.8 means that the variable is highly correlated with the significant influence on underlying factor. The economic factors as per Component 1 include stakeholders' involvement, time management and prioritization of locals need with emphasis on the profitability. Time management as per the task breakdown facilitate effective completion the building construction projects.

Furthermore, interviews stated that *environment conservation and pollution controls are needed to ensure minimization and elimination of waste during construction, good management of noise and dust, protection of sensitive ecosystems and use of friendly materials on the building construction projects.*

In addition, social factors, location of institution in accessible and affordable range, respect of staff, employees and all other associates, provision of equal opportunities and offer employment chances to local people. Interview 03 stated that *provision of convenient working environment, inclusive participation in decision making, increased government and local support foster sustainable management of building construction project.* The consideration of environment and social impact on project spur construction sustainability.

Interview stated that utilize building information model for clash detection, improved collaboration, and accurate data management throughout the project lifecycle. Employ advanced software that supports PRiSM principles, such as budgeting, cost tracking, and risk management. Regularly communicate with all stakeholders (clients, subcontractors, suppliers) to ensure alignment and gather feedback and ensure that all project participants understand the sustainability goals and their roles in achieving sustainable construction projects that cater for environment, economic and social aspects in the community.

One of the interviewees stated that *knowledge sharing among the project team and continuous improvement enhances their ability to identify and address challenges affecting implementation of PRiSM approach for sustainability construction projects.*

In addition, documentation and continuous analysis of past project data to improve risk

analysis to inform future decision-making foster sustainability of building project. In-depth team work from project design, quantification of material and implementation to completion foster effective control on the building construction projects.

4.4.4 Compare and contrast traditional and PRiSM in ensuring sustainability of construction projects

The factors in PRiSM and traditional approach in building construction project planning and management were compared and contrasted using Spearman rank correlation from the mean values. The identified factors that appear similar in PRiSM and traditional were ranked for making comparison and contrasts on the project planning and management of the building construction projects in Uganda. The Spearman's rank correlation measures the strength and direction of association of the monotonic relationship between two category ranked variables that lies $-1 < r < 1$. The scale is; Absent (0.00); low (-+0.01 to -+0.50); moderate (-+ 0.51 to -+0.75); high (-+ 0.76 to -+0.99) strong; and perfect (-+1).

Respondents judged the critical factors of economic, environmental and social between PRiSM and tradition on the project planning and management of building construction projects. It basically gives the measure of relation between two variables ranked on categorical factors represented below.

Table 4.7: Comparison and Contrast of Economic factors in PRiSM and Traditional

Economic factors	Traditional		PRiSM		d	d2
	Mean	Rank	Mean	Rank		
Locals were employed.	2.57	5	3.98	5	0	0
Employees were satisfied.	4.04	2	4.14	1	1	1
The project was profitable.	4.10	1	3.99	4	-3	9
The suppliers were satisfied.	3.89	3	4.11	2	1	1
There were/are minimal defects.	3.83	4	3.94	6	-2	4
The designs were easy to interpret, construct or monitor.	2.10	7	3.77	7	0	0
The project was completed on time.	2.43	6	4.07	3	3	9
Total						24

$$r = 1 - \frac{6\epsilon d \Delta 2}{n(n\Delta 2 - 1)}$$

$$r = 1 - \frac{6 \times 24}{7(7 \times 2 - 1)}$$

$$r = 1 - \frac{144}{336} \quad r = 0.571 \times 100 = 57.1\%$$

Table 4.7 indicates the comparison and contrast of similar economic factors of PRiSM and traditional approach in building construction projects. The Spearman rank correlation indicated with r was determined and yielded 0.571, which implies that there is a positive moderate significant relationship between rank from respondents on PRiSM approach and Traditional approach. The PRiSM approach and Traditional approach emphasize economic aspects specifically cost underrun with completion on time to realize profitability on building construction project. With both approaches earlier mentioned, economic aspect is prioritized in the project planning and management for the building construction. This finding concurs with Wadugodapitiya et al. (2010) who provided that project team prioritizes cost under run with project success in traditional and PRiSM approaches on the building projects in Sri Lanka. In addition, Research has shown that PRiSM leads to a reduced carbon footprint and better resource conservation (Bryde et al., 2013).

Factor analysis was conducted to validate the commonalities for principle component on line items measures of traditional and PRiSM approach on sustainability of project. The survey data of the seven factors were fed into the SPSS version 24 for principal component analysis to determine the implied economic factors in project management on building construction projects as indicated in fig 4.12 and Table 4.9 below

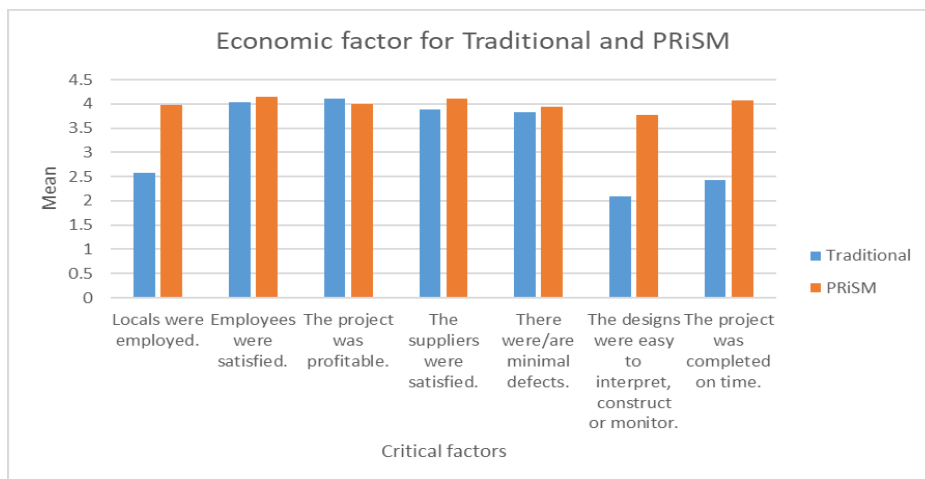


Figure 4. 12: Comparison on economic factors in Traditional and PRiSM

Table 4.8: Factor analysis for economic variables in the Traditional and PRiSM approach

Factors	Traditional Component	PRiSM Component	
	1	1	2
Locals were employed.	.724	.714	
Employees were satisfied.	.867	.868	
The project was profitable.	.668	.689	
The suppliers were satisfied.	.869	.867	
There were/are minimal defects.	.768	.769	
The designs were easy to interpret, construct or monitor.	.563		.940
The project was completed on time.	.680	.664	
Total Variance Explained: Rotation Sums of Squared Loading			
Initial Eigenvalues	3.530	3.547	1.054
% of Variance	58.825	50.665	15.036
% Cumulative	58.825	50.665	65.701
KMO and Bartlett's Test			
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.854	.847	
Bartlett's Test of Sphericity ; Approx. Chi-Square	730.604	744.991	
Df	15	21	
Sig.	.000	.000	
Extraction Method: Principal Component Analysis.			
a. 1 components extracted.			

Table 4.8 showed that, factor analysis was performed on seven variable measures of economic factors in traditional using principal component analysis with varimax rotation to determine the components. The rotated component of loaded factors on variables in table 4.9 below show that KMO and Bartlett's Test of Sphericity statistics was significant KMO of 0.854 was achieved, (Chi-square = 730.604), $df=15$, $p=.000$). All factors belong to the cluster formed by factor analysis, with a loading of 0.50. The principal component analysis produced one solution with eigenvalues larger than 1.0 out of the seven items considered.

The total cumulative variance explained reveals that only one component was retrieved, accounting for 58.825% of the variation. Based on the critical criteria involved in clustering, they had an initial Eigen value of 3.530 when 7 items were loaded. The items' significance indicated that the data did not have a singularity problem. The Eigen value exceed 1 indicated that the factors are independent from each other and confirmed that factor analysis was appropriately carried out on economic benefits embedded in traditional approach on building construction projects.

For PRiSM, Kaiser–Meyer–Olkin (KMO) was conducted to check on adequacy of variables based on those that exceed minimum threshold of 0.5 as recommended by (Taherdoost, 2016). The rotated component of loaded factors on variables in table 4.3 below show that KMO and Bartlett's Test of Sphericity statistics was significant KMO of 0.847 was achieved, (Chi-square = 744.991), $df=21$, $p=.000$). Therefore, sample data was suitable and meets the fundamental requirements for the factor analysis (Hair et al, 1995). Each factor belongs only to one of the two clusters identified by factor analysis, with explained loadings ranging from 0.50. The principal component analysis produced two solutions with eigenvalues larger than 1.0 out of the seven items considered. The total cumulative variance explained reveals that two components account for 65.701% of the variance. Based on the essential factors in each

cluster, the first factor had an initial Eigen value of 3.547 and was loaded with 6 items. Under the second and final factor, one item was loaded with an initial Eigen value of 1.054. The significance of the items implied that the data had no singularity problem. Factor loadings range from 0 to 1, with values above 0.3 considered significant. For instance, if the factor loading of a variable is 0.8, it means that the variable is highly correlated with the underlying factor. The factor coefficient of 0.5 and above was used to determine how variables are correlated with each other. This supported with Brown (2009) provides for use of varimax rotation if the coefficient is greater than 0.5. This means that the factors are independent from each other and confirmed that factor analysis was appropriately carried out on economic intention embedded in PRiSM approach on building construction projects.

Component 1: Cost underrun for maximization of profits in traditional Approach and Stakeholders involvement and time management for PRiSM

The cost underrun for maximization of profits was clustered in the component comprises of locals were employed, employees were satisfied, project was profitable, suppliers were satisfied, minimal defects and project was completed on time support economic benefits to project planning and management on building construction projects. This component account for 58.825% of the total variance explained among all the critical factors (see Table 4.9).

The significance of economic benefits in traditional approach measured as per whether locals were employed (0.724), employees were satisfied (0.867), project was profitable (0.668), suppliers were satisfied (0.869), minimal defects (0.768) and project was completed on time (0.680) all exceed the cut off of 0.5, thus contribute to project planning and management of costs on building construction projects. Employment of local as well as remunerating them is cheaper compared to outsourced human resources for the projects. The locals are primary

beneficiaries of the projects, thus vigorously immerse their efforts to achieve project success. Traditional approach allows maximization of project team through employment of local people on the building construction project.

The minimization of defect liabilities reduces on the risks of failure to support the project profitability. Defects minimization is the first condition of reducing construction cost and improving the quality with maximization of profits. This also reduce the cycle time by reducing reworks and finally result on the building construction projects for higher productivity to achieve success. Traditional method improves business processes by reducing defects and errors, minimizing variation, and increasing quality and efficiency. It is acknowledged that care must be taken throughout building projects to minimize defects liability, waste and energy use while safeguarding the surrounding ecosystem. This concurs with (Salas, 2017), suggested that urban regions around the world are seeing population growth of almost 200,000 people every day, necessitating a constant demand for more housing and infrastructure. The goal of Six Sigma is to achieve a level of quality that is nearly perfect, with only 3.4 defects per million opportunities to ensure effective project planning and management.

Payment of suppliers ensure continuous delivery of construction material on time at minimal lead time. The project contractors comply to payment of suppliers for securing products and services needed to complete a building construction project on time and within budget. It is handled by a project manager with use of advanced billing before the project begins; arrears billing at the end of the project and progress billing as the project progresses. The payment of suppliers is significant factors to ensure project continuity with interruption from delayed suppliers to complete it in time.

Stakeholders involvement and time management for PRiSM

The stakeholder involvement component comprises of employment of locals, employees and suppliers, profitability through minimal defects; time management entail project completion on time is relevant to project planning and management on building construction projects. This component account for 50.665% of the total variance explained among all the critical factors.

Employment of locals, satisfied employees, profitable project, minimal defects and timely completion are all related to the stakeholders. Whilst acknowledging their vital importance for effectiveness of PRiSM approach in project planning and management on building construction projects, it was found that stakeholder involvement is key in project planning and management, since employment of local, employee and supplier satisfaction received a significance of .714, .868, .867. It is important to employ locals, allow them to supply procurements through domestic bidding and effectively budget for their remuneration foster project planning and management. The engagement of locals in project is crucial preconditions which enables project managers to gather as more information as possible about the project, so that a clear planning and management is achieved.

This foster safety of the project and adherence to the interest of local community is significant factor for influencing effectiveness of PRiSM approach in building construction projects in Uganda. The engagement of stakeholders in the community is key in inducing better understanding of activities based decision to support project planning and management (Prebanić & Vukomanović, 2023).

Project profitability is emphasized in the PRiSM approach and have received significance 0.689. Project profitability is associated with the way revenue of the project exceed the costs incurred throughout completion. Planning and management of project requires consideration

of profitability at any stage of completion to ensure achievement of set objectives of constructors and other stakeholders. In addition, minimization of defects liabilities is core elements to determine the profitability of the building projects. This indicates that contractors at ENABEL adopt PRiSM approach in planning and management to prevent risk of loss to realize profitability. It is important to determine the profitability of the building projects from the planning phase to effective management of activities to achieve project success.

The role of factor, project completion on time influences integration of PRiSM approach in project planning and management realize significance of 0.664. Determination of time for project completion facilitates its evaluation from various stages of completion on building construction project. The timely completion is key in determination of project performance and probably the reason why the factor “project was completed on time” appears significant in this category for the building project. This findings is supported with the facts that project constructors’ emphasis timely completion in planning and management of construction projects in Sri Lanka (Abeysinghe & Jayathilaka, 2022).

Component 2: Quality design for PRiSM

The quality design is relevant to the project planning and management of the project due to easy to interpret, construct or monitor build project. This component account for 15.036% of the total variance explained among the critical factors. Quality design with significance 0.940 is an important factor in PRiSM approach for the project planning and management to deal with the building construction projects. This characteristic is primarily vital in the project planning and management to enable constructor’s/ project managers deal with critical events which reduces the risks constraining quality and provide adequate economic support to the project.

A high loading is given to quality alone compared to other variables in component 1 which justified its critical importance in the project planning and management of building construction projects for ENABEL Uganda. The mean of 3.98 with a significant deviation of 0.63 was established which indicated that factors were normally distributed. The traditional and PriSM cater for the economic aspect on the project planning and management.

Table 4.9: Comparison and Contrast of Social factors in PRiSM and Traditional

Social factors	Traditional		PRiSM		d	d2
	Mean	Rank	Mean	Rank		
HIV/AIDS was not spread.	3.61	7	4.45	2	5	25
There were/are equal opportunities and chances for employment/service access.	2.98	8	4.07	4	4	16
There was/is healthy, safety and convenient working environment.	3.62	6	4.06	5	-1	1
There was/is work morale and employee satisfaction.	3.69	5	3.99	7	2	4
There was inclusive participation in decision making before, during and after construction.	3.97	2	3.37	8	6	36
The services brought improved the general local environment.	3.76	4	4.19	3	-1	4
There is increase in enrolment population of students.	4.01	1	4.03	6	-5	25
Government was/is supportive.	3.87	3	4.47	1	1	1
Total						108

$$r = 1 - \frac{6\epsilon d \Delta 2}{n(n\Delta 2 - 1)}$$

$$r = 1 - \frac{6 \times 108}{8(8\Delta 2 - 1)}$$

$$r = 1 - \frac{648}{504} \quad r = -0.286 \times 100 = -28.6\%$$

Table 4.9 indicates the comparison and contrast of similar social factors of PRiSM and traditional approach in building construction projects. The Spearman rank correlation indicated with r was determined and yielded - 0.286, which implies that there is a negative low significant relationship between rank from respondents on PRiSM approach and Traditional approach. The PRiSM approach takes different direction from the traditional approach during project planning and management of building construction projects. This implies that, when PRiSM cater for social activities, the traditional approach does not. Hence, makes the PRiSM approach different from the Traditional approach in project planning and management. This finding concurs with (Bognár et al., 2022) , provide that PRiSM provide a visual support and control function to solve practical problem with inclusion of social interest based in the planning for the project. The balanced view of sustainable performance covers triple bottom line components of environmental responsibility, economic return (wealth creation), and social development which indicates adoption to PRiSM (IChemE, 2002; Galvan et al., 2015). The comparison on social factors between traditional and PRiSM is illustrated below.

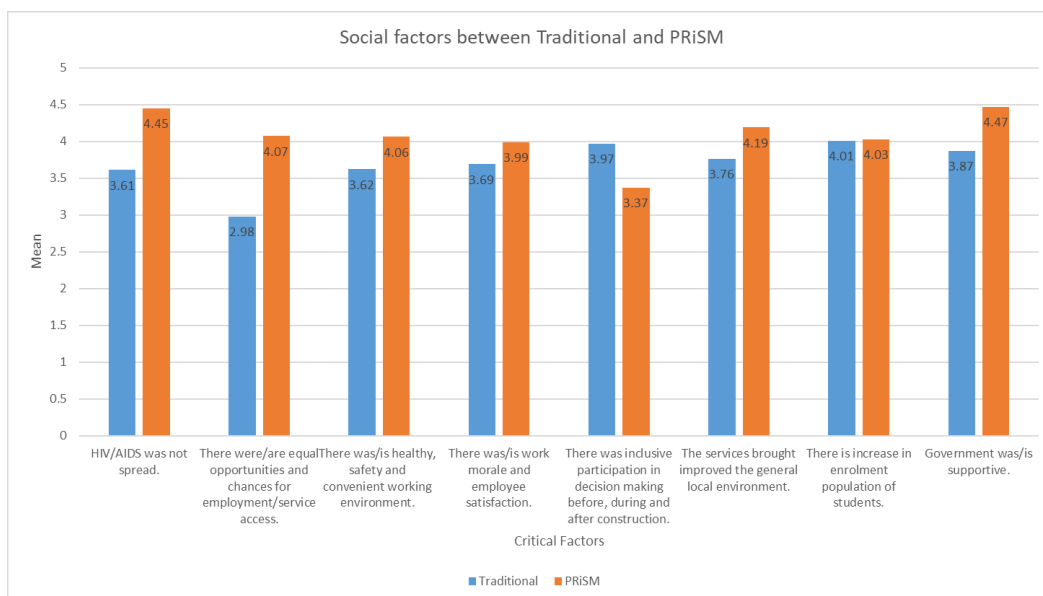


Figure 4.13: Comparison on Social factors in Traditional and PRiSM

Table 4.10: Factor analysis for social variables in Traditional and PRiSM approach

	Component Traditional		Component PRiSM	
	1	2	1	2
The institution services are accessible and affordable.			.698	
There was respect of staff, employees and all other associates.			.794	
Local women were not impregnated and neither social harassed.				.815
HIV/AIDS was not spread.		.839		.907
There were/are equal opportunities and chances for employment/service access.	.685		.694	
There was/is healthy, safety and convenient working environment.	.735		.733	
There was/is work morale and employee satisfaction.	.855		.847	
There was inclusive participation in decision making before, during and after construction.	.778		.670	
The services brought improved the general local environment.	.830		.825	
There is increase in enrolment population of students.	.616		.680	
Government was/is supportive.		.605	.541	
Locals were/are supportive.			.721	
Total Variance Explained: Rotation Sums of Squared Loading				
Initial Eigenvalues	4.164	1.021	5.847	1.359
% of Variance	52.048	12.762	48.727	11.324
% Cumulative	52.048	64.810	48.727	60.051
KMO and Bartlett's Test				
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.889		.902	
Bartlett's Test of Sphericity ; Approx. Chi-Square	948.287		1672.4 26	
Df	28		66	
Sig.	.000		.000	
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.				
a. Rotation converged in 3 iterations.				

Table 4.10 showed that, factor analysis was performed on eight variable measures of social factors in traditional using principal component analysis with varimax rotation to determine the components.

The rotated component of loaded factors on variables in table 4.11 below show that KMO and

Bartlett's Test of Sphericity statistics was significant KMO of 0.889 was achieved, (Chi-square = 948.287), $df=28$, $p=.000$). All factor belongs only to the cluster generated by factor analysis, with the loading on each explained, from 0.50. From the 8 items that were factored in, the principle component analysis yielded 2 solutions with eigenvalues greater than 1.0. The total cumulative variance explained, from which it can be seen that two components were extracted which account for 64.810% of the variance. Based on the critical factors involved two clusters, first component had initial Eigen values of 4.164 with 6 items being loaded. The second component had initial Eigen values of 1.021 with 2 items being loaded. The significance of the items implied that the data had no singularity problem. The Eigen value exceed 1 indicated that the factors are independent from each other and confirmed that factor analysis was appropriately carried out on social benefits embedded in traditional approach on building construction projects.

For PRiSM, factor analysis was performed on seven variable measures of social factors using principal component analysis with varimax rotation to determine the components. The rotated component of loaded factors on variables in table 4.7 below show that KMO and Bartlett's Test of Sphericity statistics was significant KMO of 0.902 was achieved, (Chi-square = 1672.426), $df=66$, $p=.000$). Each factor belongs only to one of the two clusters generated by factor analysis, with the loading on each explained, from 0.50. From the 12 items that were factored in, the principle component analysis yielded 2 solutions with eigenvalues greater than 1.0. The total cumulative variance explained, from which it can be seen that two components account for 60.051% of the variance. Based on the critical factors involved in each cluster, the first factor had an initial Eigen values of 5.847 with 10 items being loaded. Under the second and last factor, 2 items were loaded with an initial Eigen values of 1.359. The significance of the items implied that the data had no singularity problem. The Eigen value exceed 1 indicated that the factors are independent from each other and confirmed that factor analysis was appropriately carried out on social benefits embedded in PRiSM approach on building construction projects.

Component 1: Occupation management for Traditional and Working conditions and employment of society members for PRiSM

The occupation management was clustered in the component comprises of; provision of equal opportunities and chances for employment/service access, healthy, safety and convenient working environment, work morale and employee satisfaction, inclusive participation in decision making before, during and after construction, services brought improved the general local environment and increase in enrolment population of students support social benefits to project planning and management on building construction projects. This component account for 52.048% of the total variance explained among all the critical factors (see Table 4.9).

The significance of social benefits in traditional approach measured as per whether clustered in the component comprises of; provision of equal opportunities and chances for employment/service access (0.685), healthy, safety and convenient working environment (0.735), work morale and employee satisfaction (0.855), inclusive participation in decision making (0.778), services brought improved the general local environment (0.830) and increase in enrolment population of students (0.616) contribute to project planning and management on building construction projects. Traditional approach improved the general local environment, emphasis work morale and employee satisfaction with healthy, safety and convenient working environment (OHSAS 18001:2007 “Occupational Health and Safety Management Systems) are precondition which enable project team to better understand the potential risks and uncertainties in the building construction project to ensure successful planning and management.

Working conditions and employment of society members

The favorable working conditions and employment of society members component comprises of institution services are accessible and affordable, respect of staff, employees and all other associates, equal opportunities and chances for employment/service access, healthy, safety and convenient working environment, work morale and employee satisfaction, inclusive participation in decision making before, during and after construction,

services brought improved the general local environment, increase in enrolment population of students, locals were/are supportive are social benefits to project planning and management on building construction projects. This component account for 48.727% of the total variance explained among all the critical factors (see Table 4.7).

The significance of social benefits of PRiSM realized through favorable working conditions include accessible and affordable institution 0.698, respect of staff and other associates 0.794, healthy, safety and convenient working environment 0.733, inclusive participation in decision making before, during and after construction 0.670, services brought improved the general local environment 0.825, increase in enrolment population of students 0.680 and locals were/are supportive 0.721; whereas employment factors include work morale and employee satisfaction 0.847 and equal opportunities and chances for employment/service access 0.694 facilitate project planning and management on building construction projects. It is important to provide favorable working condition for the employee through involvement in exposure to healthy, safety and convenient working environment. PRiSM approach ensures that planning for working environment where society trust, cooperation, safety, risk-taking support, accountability, and equity to preserve norms, values and culture of the community. The society attributes in form of value, norms and culture have to be incorporated in the working environment for employee and society at the building construction project. The least factor is government support significant at 0.541 is probably not optimum for securing society during project implementation.

Component 2: Sexual harassment for traditional and government intervention for PRiSM

The social factors on sexual harassment is relevant to the project planning and management represented by factors; local women were impregnated and neither social harassed and

HIV/AIDS was not spread were received a significance of 0.815 and 0.907 respectively (see Table 4.7). This components account for 11.324% of the total variance explained among the critical factors. PRiSM approach cater for the measures to prevent sexual harassment at the site during planning and management of building construction project. Employees at the construction project site and community are sensitized about the prevention of sexual harassment such as not impregnating local women to spread HIV/ AIDs. The adoption to PRiSM approach caters for prevention act of sexual harassment to facilitate planning and management of building construction project for ENABEL Uganda.

Government interventions

The social factors on government interventions is relevant to the project planning and management represented by factors whether; HIV/AIDS was not spread and government was/is supportive received a significance of 0.839 and 0.605 respectively (see Table 4.11). This components account for 12.762% of the total variance explained among the critical factors. The government intervention through sensitization of people on preventive measures on spread of HIV/ AIDs was vital in the project planning and management of building construction project in Uganda.

Table 4.11: Comparison and Contrast of Environment factors in PRiSM and Traditional

Environmental factors	Traditional		PRiSM		d	d2
	Mean	Rank	Mean	Rank		
There was/is protection of sensitive ecosystems.	3.81	4	3.93	2	2	4
Supplies were being bought locally.	3.94	2	3.56	5	-3	9
Materials being used were environmentally friendly.	3.67	5	3.77	3	2	4
There was use of recycled /sustainability sourced materials.	3.98	1	3.58	4	-3	9
There was rainwater harvesting.	3.89	3	4.27	1	2	4
Total						30

$$\text{Spearman correlation } r = 1 - \frac{6\epsilon d\Delta 2}{n(n\Delta 2-1)}$$

$$r = 1 - \frac{6 \times 30}{5(5 \times 2 - 1)}$$

$$r = 1 - \frac{180}{120} \quad r = -0.50 \times 100 = -50\%$$

Table 4.11 indicates the comparison and contrast of similar environment factors of PRiSM and traditional approach in building construction projects. The Spearman rank correlation indicated with r was determined and yielded - 0.50, which indicates that there is a negative moderate significant relationship between rank from respondents on PRiSM approach and Traditional approach. The PRiSM approach on environment benefits takes different direction from the traditional approach during project planning and management of building construction projects. This implies that, when PRiSM preserve and protect environment, the traditional approach does not. Hence, justified that PRiSM approach differ from the Traditional approach adoption in project planning and management. This finding concurs with (Kasych et al., 2020), PRiSM is the pyramid of environment conservation on construction project for sustainable development through infrastructures. The survey data of the seven factors were fed into the SPSS version 24 for principal component analysis to determine the implied environmental factors in project planning and management on building construction projects. The comparison between traditional and PRiSM approach on environment critical factors is demonstrated below.

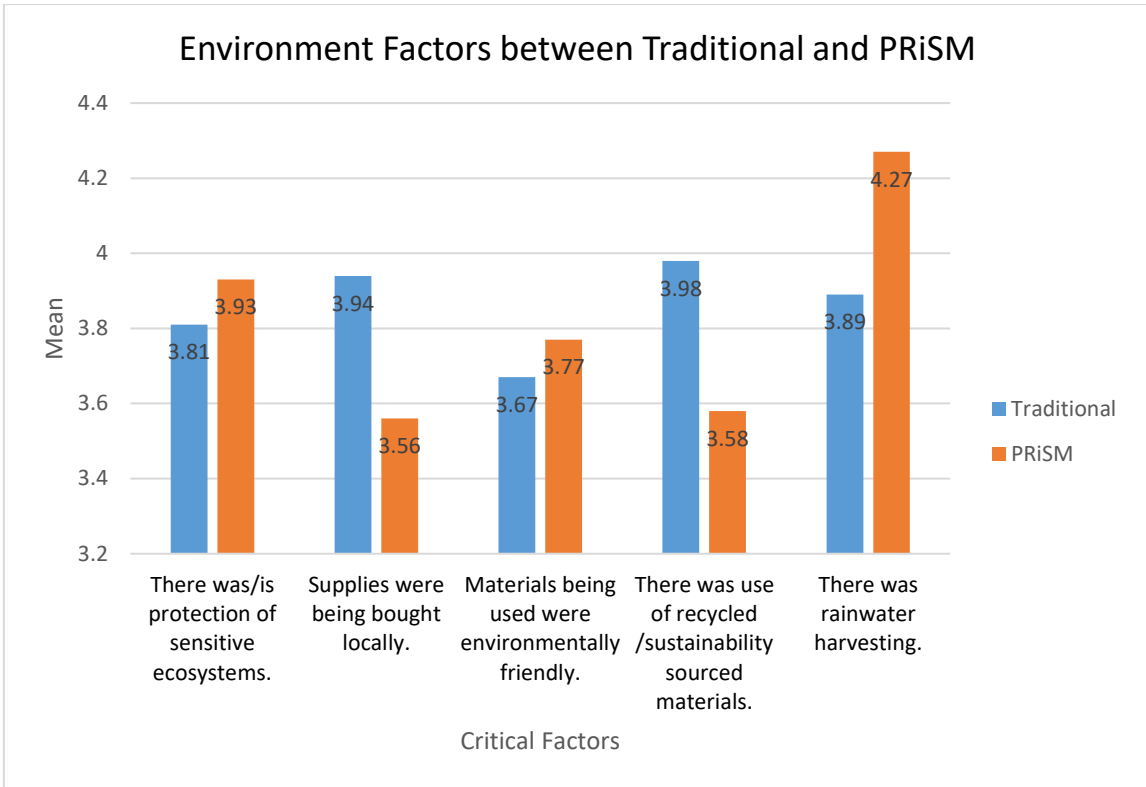


Figure 4. 14: Comparison on Environmental factors on Traditional and PRiSM

Table 4.12: Factor analysis for Environmental variables in Traditional and PRiSM approach

	Traditional Component		PRiSM Component	
	1	2	1	2
There was/is protection of sensitive ecosystems.		.712	.727	
Supplies were being bought locally.	.739		.593	
Materials being used were environmentally friendly.	.729		.793	
There was use of recycled /sustainability sourced materials.	.745			.834
There was rainwater harvesting.		.703	.840	.694
Total Variance Explained: Rotation Sums of Squared Loading				.833
Initial Eigenvalues	2.523	1.083	3.540	1.137
% of Variance	40.460	11.754	50.571	16.241
% Cumulative	40.460	52.214	50.571	66.812
KMO and Bartlett's Test				
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.680		.798	
Bartlett's Test of Sphericity ; Approx. Chi-Square	393.879		743.110	
Df	10		21	
Sig.	.000		.000	
Extraction Method: Principal Component Analysis.				
Rotation Method: Varimax with Kaiser Normalization.				
a. Rotation converged in 3 iterations.				

Table 4.12 showed that, factor analysis was performed on five variable measures of environment factors in traditional using principal component analysis with varimax rotation to determine the components. The rotated component of loaded factors on variables in table 4.3 below show that KMO and Bartlett's Test of Sphericity statistics was significant KMO of 0.680 was achieved, (Chi-square = 393.879), $df=28$, $p=.000$). All factors belong only to the cluster identified by factor analysis, with loadings ranging from 0.50. The principle component analysis produced two solutions with eigenvalues larger than 1.0 out of the five items that were considered. The total cumulative variance explained reveals that two components were retrieved, accounting for 52.214% of the variance. Based on the critical factors involved two clusters, first component had initial Eigen values of 2.523 with 3 items being loaded. The second component had initial Eigen values of 1.083 with 2 items being loaded. The significance of the items implied that the data had no singularity problem. The Eigen value exceed 1 indicated that the factors are independent from each other and confirmed that factor analysis was appropriately carried out on environment benefits embedded in traditional approach on building construction projects.

For PRiSM, factor analysis was performed on seven variable measures of environmental factors using principal component analysis with varimax rotation to determine the components. The Kaiser–Meyer–Olkin (KMO) was conducted to check on adequacy of variables based on those that exceed minimum threshold of 0.5 as recommended by (Taherdoost, 2016). The rotated component of loaded factors on variables in table 4.6 below show that KMO and Bartlett's Test of Sphericity statistics was significant KMO of 0.798 was achieved, (Chi-square = 743.110), $df=21$, $p=.000$). Each factor belongs only to one of the two clusters generated by factor analysis, with the loading on each explained, from 0.50. From the 7 items that were factored in, the principle component analysis yielded 2 solutions with eigenvalues greater than 1.0. The total cumulative variance explained, from which it

can be seen that two components account for 66.812% of the variance. Based on the critical factors involved in each cluster, the first factor had an initial Eigen values of 3.540 with 4 items being loaded. Under the second and last factor, 3 items were loaded with an initial Eigen values of 1.137. The significance of the items implied that the data had no singularity problem. The Eigen value exceed 1 indicated that the factors are independent from each other and confirmed that factor analysis was appropriately carried out on environment benefits embedded in PRiSM approach on building construction projects.

Component 1: Use of local material for Traditional and pollution controls for PRiSM

Use of local material: The use of local material was clustered in the component comprises of procuring supplies locally, materials being used were environmentally friendly, and use of recycled /sustainability sourced materials support environmental benefits to project planning and management on building construction projects. This component account for 40.460% of the total variance explained among all the critical factors.

The significance of environmental benefits in tradition approach measured as per whether clustered in the component comprises of; procuring supplies locally (0.739), materials being used were environmentally friendly (0.729), and use of recycled /sustainability sourced materials (0.745) contribute to project planning and management on building construction projects. Traditional approach allows procurement of supplies locally which were environmentally friendly support society. Local procurement is the practice of procuring goods and services for building construction projects within a certain geographical area. In practice, however, local procurement is difficult and time-consuming to implement. Environmentally friendly procurements are key to conserve the norms and value of the society.

Pollution Controls for PRiSM

The pollution control component comprises of minimization and elimination of waste during construction, good management of noise and dust, protection of sensitive ecosystems and rainwater harvesting is relevant to project planning and management on building construction projects. This component account for 50.571% of the total variance explained among all the critical factors. Minimization and elimination of waste during construction, good management of noise and dust, protection of sensitive ecosystems and rainwater harvesting are all related to the pollution control in the environment. Whilst recognizing their vital importance for effectiveness of PRiSM approach in project planning and management on building construction projects, it was found that pollution control by refusal of disposal system is key in project planning and management, since minimization and elimination of waste during construction relates to relate to air pollution, good management of noise and dust relates to noise pollution, protection of sensitive ecosystems relate to soil pollution and rainwater harvesting relates to water pollution received a significance of .727, .593, .793 and .840. It is important to control pollution by treating, eliminating, avoid littering and compliance to environment management plan to preserve the ecosystem in the environment catered for in PRiSM foster effective project planning and management on building project.

Decommission of the nature such as filling the barrow pits, planting trees and vegetables are key to requirement for effectiveness of PRiSM in the project planning and management. All the mentioned discussed factors reading pollution control are crucial in ensuring project success through effective project planning and management. The findings agreed with (Yang et al., 2023), proposed that pollution controls predetermined at project planning phase facilitates management of risk in the environment in construction project.

Component 2: Protection of ecosystem in traditional and Environmentally friendly materials for PRiSM

The environment factors on protection of ecosystem is relevant to the project planning and management represented by factors include protection of sensitive ecosystems and rainwater harvesting received a significance of 0.712 and 0.703 respectively (see Table 4.13). This components account for 11.754% of the total variance explained among the critical factors. The protection of sensitive ecosystem and inclusion of rainwater harvesting units on building is important in project planning and management of building construction project for ENABEL Uganda. This provides significant biodiversity values and provide many habitat features required by threatened and endangered plant and animal species.

Environmentally friendly materials for PRiSM: The environmentally friendly materials are relevant to the project planning and management represented by factors; supplies were being bought locally, materials being used were environmentally friendly and recycled /sustainability sourced materials were received a significance of 0.834, 0.694 and 0.833 respectively (see Table 4.6). This components account for 16.24% of the total variance explained among the critical factors. PRiSM facilitate planning for procurement of environment friendly materials and managing them through the construction project. The planning for use of eco-friendly items and materials promote green living or green manufacturing methods that lessen the amount or types of resources used which do not harm environment is vital in the project planning and management. This PRiSM factors are critically important in the project management of building constructions projects.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter presents the summary, conclusion and recommendations and area for further research on effectiveness of PRiSM approach with comparison and contrast of traditional methods on project planning and management of building projects.

The study engaged 150 respondents from National Teachers' College Kaliiro in Eastern, 54 National teachers' college Mubende in Central, 31 from National Teachers' College Muni and 44 from National Teachers' College Unyama from Northern region of Uganda. Majority 63.1% of the respondents were male and 36.9% were female, and 51.2% were of the age group between 19 years and 30 years, 43.3% were between 31 to 40 years, 47.7% of respondents had obtained Diploma, followed by graduates at 27.2% provided responses to obtain the factors for sustainable management of building projects.

5.2 Conclusions

The first objective which was about to establish the environmental, social, and economic contribution of the PRiSM approach on building construction projects in Uganda conclude that PRiSM approach is effective with consideration of factors include; stakeholder involvement, time management quality design, pollution control, environmentally friendly material, working conditions and employment of society members on the building construction projects.

The second objective which was about to establish the environmental, social, and economic contribution of the traditional approach on building construction projects in Uganda conclude that traditional approach is influenced and determined by many factors in building construction practices with emphasis on cost underrun for maximization of profits within the contract of the project.

The third objective which was about to suggest areas of improvement in the PRiSM strategy to enhance project management on construction sites in Uganda conclude that PRiSM should cater for stakeholders' involvement and time management; locals need to be employed with emphasis on the profitability as well as effective completion on time on the building construction projects to realize the economic benefits. PRiSM has to implement measures for pollution control to ensure minimization and elimination of waste during construction, good management of noise and dust, protection of sensitive ecosystems and use of friendly materials on the building construction projects. PRiSM approach has to prioritize location of institution in accessible and affordable range, respect of staff, employees and all other associates, provision of equal opportunities and chances for employment/service access, increased government and increased enrolment of local population acquire skills for future effective project planning and management.

The decision outcome of Spearman ranking correlation critical factors conclude that PRiSM and traditional approach emphasizes the economic aspect with coefficient 0.57 to minimize cost, time and quality of the building construction project. While under environment and social critical factors PRiSM approach take different direction from traditional approach during planning and management of building projects at ENABEL Uganda.

The sustainable pyramid concludes the provided critical factors of pertaining PRiSM and traditional approach for sustainable project management. The environment, social equity, and economic prosperity is attribute in the three pillars. While these aspects are crucial, placing them directly at the base in a Ugandan context might not fully capture the challenges in achieving sustainability. In developed nations, established systems and strong institutions often provide a foundation for promoting and enforcing sustainable practices.

Conversely, developing countries like Uganda face challenges with limited resources, fragmented governance structures, and a lack of enforcement mechanisms for sustainability principles.

In this context, placing Institutional Governance at the base of your sustainability framework holds significant value. This approach acknowledges that strong governance is crucial for establishing the necessary policies, regulations, and frameworks that support and incentivize environmentally friendly, socially responsible, and economically viable practices.

Enabling Environment: Effective governance creates an enabling environment for sustainable development by:

Developing and Enforcing Sustainability Policies: Clear policies and regulations establish a baseline for sustainable practices in construction and other sectors.

Promoting Stakeholder Collaboration: Governance plays a role in facilitating communication and collaboration among stakeholders, including government agencies, private companies, civil society organizations, and communities.

Providing Incentives for Sustainable Practices: Policymakers can introduce incentives such as tax breaks or subsidies for companies that adopt sustainable construction methods.

Capacity Building and Awareness: Good governance fosters capacity building initiatives and awareness campaigns aimed at educating stakeholders about the importance of sustainable practices.

Addressing Corruption: Weak governance often leads to corruption, which can hinder sustainable development efforts. A strong governance system with robust anti-corruption

measures is essential for ensuring the ethical allocation of resources and the successful implementation of sustainability initiatives.

Long-Term Sustainability: Embedding sustainability principles within governance structures fosters a long-term perspective on development, moving beyond short-term economic gains towards a holistic approach that considers environmental and social well-being.

5.3 Recommendations

Based on the study findings, the following recommendations should do be adopted: -

Government should encourage adoption to PRiSM approach in the project planning and management of building construction projects in Uganda.

Government should improve on the support in the regulation and procedures to prevent spread of HIV/AIDs as well as encourage contractors to regular procure from local supplies as long as they meet the required standards include; ISO 9001:2008 “Quality Management Systems – Requirements”; ISO 14001:2004 “Environmental Management Systems – Requirements with guidance for use”; ISO 50001:2011 “Energy Management Systems – Requirements with guidance for use”; and OHSAS 18001:2007 “Occupational Health and Safety Management Systems” for economic development.

The contractors should create favorable working environment and inclusion of employees in decision making to maximize value while incorporating sustainability of social and environment consideration in the geographical area/ location site across the whole project lifetime.

The research is limited to projects implemented by Enabel as such; Further research should be carried out in relation to PRiSM principles, sustainable construction practices and

relevant technologies for the sustainability of building construction projects, including social, economic and environmental impact and risks in the traditional and PRiSM approach

5.4 Area for further research

- i. Evaluate the effectiveness of constructive conflicts in stakeholders' decision-making in building construction projects.
- ii. Evaluate factors affecting risk attitudes in the adoption of PRiSM in construction projects.

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APPENDICES

Appendix I: Krejcie and Morgan Table (1970)

<i>N</i>	<i>S</i>	<i>N</i>	<i>S</i>	<i>N</i>	<i>S</i>
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	100000	384

Note.—*N* is population size. *S* is sample size.

Source: Krejcie & Morgan, 1970

Appendix II: Introductory Letter

Appendix III: Plagiarism Test Results