ST. MARY'S UNIVERSITY
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Implementing Sustainable Building Technologies into Real Estate Projects Using Integrated Project Delivery (IPD): A Case Study of The Public Private Partnership Program (PPPP) In Addis Ababa

By

DAWIT HAILU

February, 2025

ADDIS ABABA, ETHIOPIA

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A THESIS SUBMITTED TO ST. MARY'S UNIVERSITY, SCHOOL OF BUSINESS IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF PROJECT MANAGEMENT

February, 2025

ADDIS ABABA, ETHIOPIA

ST. MARY'S UNIVERSITY

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IMPLEMENTING SUSTAINABLE BUILDING TECHNOLOGIES INTO REAL ESTATE PROJECTS USING INTEGRATED PROJECT DELIVERY (IPD): A CASE STUDY OF THE PUBLIC PRIVATE PARTNERSHIP PROGRAM (PPPP) IN ADDIS ABABA

BY: Dawit Hailu

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Declaration

I, the undersigned, declare that this thesis is my original work; prepared under the guidance of **Temesgen Belayneh** (PHD). All the sources used for the thesis have been dully acknowledged. I further confirm that this thesis has not been submitted either in part or in full to any higher learning institutions for the purpose of earning any degree.

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St. Mary's university, Addis Ababa February, 2025

Endorsement

This thesis has been submitted to St. Mary's university, School of Graduate Studies for examination with my approval as a thesis advisor.

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Acknowledgments

First and foremost, I would like to thank God for enabling me to complete this paper. My special and heartfelt gratitude to my advisor Temesgen Belayneh (PHD) for his advice, guidance and constructive feedback in the course of conducting this research study.

I am deeply thankful to my family, friends, companies, and government offices who have made significant contributions to this study."

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Abbreviation

CSFs -------- Critical Success Factors

DB ---------- Design-Build

DBB ---------Design-Bid-Build

HVAC ------ heating, ventilation, and air conditioning

IPD ----------Integrated Project Delivery

NGOs-------- non-governmental organizations

PPP --------Public-Private Partnership

SBTs ---------Sustainable building technologies

SDGs ---------Sustainable Development Goals

Abstract

Rapid urbanization in Addis Ababa has led to an unprecedented demand for housing and commercial spaces, presenting both opportunities and challenges in real estate development. This study explores the integration of Sustainable Building Technologies (SBTs) within Public-Private Partnership (PPP) real estate projects, using the Integrated Project Delivery (IPD) framework to address sustainability goals. SBTs, such as energy-efficient systems and water conservation techniques, are essential for reducing environmental impacts and aligning with global sustainability targets, including the United Nations Sustainable Development Goals (SDGs).

The research adopts a mixed method study approach, analyzing PPP real estate projects in Addis Ababa specifically housing complexes built by developers including Midroc Investment Group, Ovid Group, Flintstone Homes, Eniy Construction, and Gift Real Estate.

The research mainly focuses on to assess the role of IPD in the integration of Sustainable Building Technologies and *enhancing collaboration, overcoming implementation challenges, and achieving critical success factors (CSFs). Data is collected through questionnaire from key stakeholders, including developers, government officials, and sustainability experts. The findings underscore the potential of IPD to streamline stakeholder collaboration, mitigate risks, and effectively integrate SBTs, despite existing barriers such as financial constraints and regulatory challenges.*

This study contributes to the growing body of knowledge on sustainable urban development by integrating building technologies with the application of IPD in PPP projects. It provides practical recommendations for policymakers and practitioners, aiming to enhance the delivery of sustainable real estate solutions in Addis Ababa and other developing urban contexts.

Key terms: Public-Private Partnership, Sustainable Building Technologies, Integrated Project Delivery, Stakeholder Collaboration, Sustainability

Chapter one

Introduction

1.1 Background of the study

The real estate industry in Addis Ababa grew much faster due to urbanization, which made sustainable development necessary. Due to the city's rapid population growth and rising demand for residential and commercial real estate, this sector became one of the most lucrative in the city. Ethiopia's yearly urbanization rate was 3.6%, according to the United Nations (2012), with Addis Ababa seeing significant economic and population growth. In order to meet the growing demand for real estate and affordable housing, the government launched a number of Public-Private Partnership (PPP) initiatives in coordination with private businesses (World Bank, 2020).

Sustainable Building Technologies (SBTs) integration into real estate developments continued to be a major obstacle in spite of these efforts. The complexity of cooperative efforts in PPP frameworks, unclear policy orientations, high investment costs, and risks connected with public-private partnerships were some of the problems that hampered the implementation of SBTs (Zhang & Kumaraswamy, 2012). By encouraging the use of eco-friendly materials, water conservation, and energy efficiency, sustainable construction technologies significantly reduced their negative effects on the environment (Azhar et al., 2014). By improving urban resilience and live ability, these innovations complemented global sustainability aims. But for them to be successfully implemented in real estate projects, stakeholders had to work together harmoniously, have common goals, and use an integrated approach to project delivery.

According to the report, Integrated Project Delivery (IPD) is a cutting-edge method of project management that priorities collaboration, sharing of risks and benefits, and active participation from all stakeholders at every stage of a project's lifespan. Because it promoted cooperation and made sure that all parties involved worked towards shared sustainability goals, IPD was especially helpful in managing complicated projects like PPP initiatives (Kent & Becerik-Gerber, 2010). IPD improved project efficiency and drastically decreased waste in material resources and operational procedures by encouraging open communication and coordinating incentives (Ashcraft, 2010).

The circular economy, green building techniques, and sustainable urban development were more general ideas associated with this study. By incorporating ecologically conscious planning and construction techniques, sustainable urban development aims to create resilient and livable cities. Green building techniques focused on lowering carbon footprints by using eco-friendly building materials, energy-efficient designs, and renewable energy sources. By decreasing waste,

encouraging long-term sustainability, and reusing and recycling materials in building projects, the circular economy framework also increased resource efficiency.

The study found that the integration of SBTs in PPP projects was hindered by several major obstacles, including lack of knowledge, regulatory difficulties, and financial limitations. Furthermore, inconsistent project outcomes resulted from the lack of standardized IPD frameworks. Nonetheless, the study emphasized that IPD enhanced sustainability, cooperation, and effectiveness in PPP initiatives when properly implemented. In order to overcome these obstacles, more financing, focused training initiatives, legislative changes, and the use of digital project management technologies were all necessary.

The study proposed suggestions for removing these obstacles, such as creating standardized IPD frameworks, improving stakeholder cooperation, and raising knowledge of SBTs. These actions helped to ensure the success of next PPP projects and strengthened Addis Ababa's sustainable urban development.

1.2 Statement of the Problem

The need for real estate development has grown dramatically as a result of Addis Ababa's urbanization, leading to the use of Public Private Partnerships (PPPs) to close the gap between residential and commercial space. However, a lack of formal collaboration structures, legislative inconsistencies, technical skill gaps, and budgetary constraints continue to limit the incorporation of Sustainable Building Technologies (SBTs) into PPP real estate projects. These obstacles make it more difficult to adopt resource-conserving, energy-efficient, and ecologically friendly building practices—all of which are essential for sustainable urban growth.

It has been acknowledged that the project management methodology known as Integrated Project Delivery (IPD) promotes cooperation, harmonises stakeholder interests, and boosts productivity in intricate initiatives. Despite its shown advantages, its use in Addis Ababa's PPP real estate market is poorly defined, which results in disjointed decision-making and ineffective implementation of sustainability-focused solutions. Project execution is made more difficult by the lack of standardized IPD frameworks, which leads to delays, cost overruns, and less than ideal sustainability results.

This study looks into how much SBT is included into Addis Ababa's PPP real estate developmen ts and how IPD helps get beyond current obstacles.This study attempts to offer useful suggestio ns for improving sustainability in the city's real estate industry by evaluating the crucial success e lements, difficulties, and opportunities related to sustainable development.In order to promote gr een building methods, lessen environmental effect, and guarantee longterm economic and social advantages, these gaps must be filled.

1.3 Research Objective

General Objective

The General objective of this study is to assess how Integrated Project Delivery (IPD) can enhance the implementation of sustainable building technologies in Public-Private Partnership (PPP) real estate projects in Addis Ababa.

Specific objectives include:

1. To assess the current level and extent of implementation of sustainable building technologies in PPP real estate projects in Addis Ababa.
2. To assess the challenges and barriers currently hampering effective exploitation of the potential of sustainable building technologies in PPP projects.
3. To evaluate the success of IPD in being an effective approach to project management in addressing the challenges.
4. To identify the key factors which make the implementation of IPD successful in PPP projects.

1.4 Research question

The following research questions shall guide the study:

1. How far are the sustainable building technologies that are being applied in Addis Ababa PPP real estate projects?
2. What are the major issues and challenges to integrating Sustainable Building Technologies in these projects?
3. How can IPD be applied to improve the delivery of sustainable building technologies in PPP projects?
4. Which Critical Success Factors (CSFs) should be used to help IPD in PPP projects in order to meet sustainable development goals?
5. What lessons have been learned from this case study that can be taken forward and applied in another future PPP project in Addis Ababa or other urban contexts?

1.5 Significance of the study

This study holds significant value for several reasons:

- the findings can be vital in informing the policy and strategy of urban development in Addis Ababa in the view of sustainable real estate development. Such policy makers can use such an insight to formulate more effective PPP frameworks that would be inclined towards sustainability.
- Project backers: how to fulfill then effectively put into practice sustainable building technologies: via IPD, better project outcomes, reduce environmental impacts and increase long-term profit.
- The Addis Ababa city administration can borrow from the findings to help bend PPP contracts in ways that oblige partners to deliver on sustainability but not to the detriment of project schedules and budgets.
- The research will contribute to academic debate over project management and sustainable urban development; it will also leave a case study for future reference in other similar contexts within Ethiopia and in other developing countries.
- Promotion of this sustainable building technologies in real estate projects will help the reduction of the environmental impacts of urban developments in line with the global sustainability goals set
- In addition to the above significances of the study such kind of sustainable projects will attract different NGOs to the country, which have impacts on adding foreign currency to the country.

1.6 Scope of the Study

This study has several limitations related to its scope. First, it focuses exclusively on Public-Private Partnership (PPP) real estate projects within Addis Ababa, meaning that the findings may not be generalizable to other cities or regions in Ethiopia. The decision to focus solely on Addis Ababa is influenced by time and resource constraints, which prevent broader geographical coverage. Additionally, the study examines only a subset of stakeholders involved in PPP projects, specifically targeting project managers, real estate developers, government officials, and sustainability experts.

Moreover, the focus on only PPP projects limits the scope to public-private collaborations, potentially excluding insights from purely private or government-led projects in the real estate sector that may also engage with sustainability goals. Given the time limitations of the study, a more comprehensive examination of other types of projects and broader stakeholder groups is not feasible. Consequently, while the research offers valuable insights into the specific context of Addis Ababa's PPP real estate projects, its findings may have limited applicability to other urban settings or sectors.

1.7 Limitations of the Study

This research has faced several challenges that could impact the data collection process and overall timeline. One potential challenge is difficulty accessing key participants, especially given that many stakeholders, such as government officials and high-level project managers, may have busy schedules or be reluctant to participate in research related to sensitive or government-controlled projects. Since the study focuses on Public-Private Partnership (PPP) projects, which often involve bureaucratic procedures and confidential data, gaining access to certain individuals or project documentation may be restricted or delayed due to government protocols.
Additionally, there may be limitations related to time and resources. Coordinating interviews with participants from diverse backgrounds and organizations may require more time than initially anticipated, especially if rescheduling is necessary. Travel logistics, securing permissions for interviews, and document analysis may also pose time constraints, further exacerbated by potential resource limitations, such as funding for fieldwork, travel, or the procurement of necessary data from government or private entities.

1.8 Organization of the Study

This study is organized into five comprehensive chapters, each addressing a crucial aspect of the research. The first chapter, the **Introduction**, provides an overview of the study, including the background, statement of the problem, research objectives, research questions, significance of the study, scope, and limitations. This chapter lays the foundation for understanding the research context and establishes the need for investigating the integration of Sustainable Building Technologies (SBTs) into Public-Private Partnership (PPP) real estate projects using Integrated Project Delivery (IPD).

The second chapter, the **Literature Review**, explores theoretical foundations, previous studies, and empirical research related to SBTs, PPPs, and IPD frameworks. This chapter highlights key concepts relevant to sustainable real estate development, examines existing research on the subject, and identifies gaps that this study seeks to address. It also provides a conceptual framework that guides the research approach and methodology.

The third chapter, **Research Methodology**, outlines the research approach, design, population and sampling methods, data collection techniques, and analysis methods. Given the complex nature of real estate development and sustainability integration, a mixed-method approach is employed to obtain qualitative and quantitative insights. This chapter details how data was gathered and analyzed to ensure the reliability and validity of the findings.

The fourth chapter, **Data Presentation, Analysis, and Interpretation**, presents and discusses the study's findings. It includes both qualitative and quantitative analysis, examining the extent of SBT adoption, the role of IPD in facilitating collaboration among stakeholders, the challenges encountered in implementation, and the key success factors identified through the research. This chapter provides an in-depth analysis of the data collected and its implications for sustainable real estate development in Addis Ababa.

The final chapter, **Conclusions and Recommendations**, summarizes the major findings of the study, draws conclusions, and offers practical recommendations for enhancing the adoption of SBTs in PPP real estate projects using IPD. This chapter also suggests areas for further research to build upon the insights generated by this study. By synthesizing the findings and proposing actionable solutions, this chapter aims to contribute to advancing sustainable urban development in Addis Ababa and beyond.

1.9 Operational Definitions of Terms

This operational definition of the study variables with other components of the conceptual framework ensues. The independent variables IPD, PPP, and CSFs will be noted, whereas the dependent variable will be Sustainability Outcomes. This shall be very helpful in providing what has been meant with key terms within this study to sustain its consistency in its relevance within the research context.

Sustainable building technologies are cutting-edge building techniques, supplies, and frameworks intended to reduce environmental impact, improve energy efficiency, and encourage Resource conservations

Public-Private Partnership, or PPP. an agreement whereby private businesses and government agencies share the risks and rewards of investing in, building, and managing a real estate project.

Integrated Project Delivery: A framework for project management that priorities cooperation, shared risks and benefits, and stakeholder participation at every stage of a project's lifetime in order to improve efficiency and sustainability results.

Chapter Two

2 Literature Review

2.1 Introduction

As urbanization continues to take the world by storm, balancing real estate development with environmental sustainability becomes increasingly hard for cities across the world. Addis Ababa, the fast-growing capital of Ethiopia, faces great demand both for housing and commercial spaces, thus putting immense pressure on existing infrastructures and resources. Hence, the integration of SBTs into real estate projects has become a key intervention in response to the aforementioned environmental impact mitigation and enhancement of energy efficiency toward supporting long-term urban sustainability. These technologies must be implemented under one focused, collaborative platform, nonetheless. The Integrated Project Delivery represents one innovative management framework embedding early stakeholder involvement, aligned project goals, and seamlessly integrates the considerations toward sustainability-things that fit very well into the Addis Ababa Public-Private Partnership Program.
It views the theoretical and empirical underpinning of the integration of SBT in real estate projects with a particular look into the influence of IPD in PPP-driven developments within Addis Ababa. The paper reviews the core concepts of sustainability, evaluates contemporary research on how effective IPD is in applying to real estate, and defines the opportunities and challenges that such SBT applications present. It further establishes the literature gaps regarding the intersection of IPD with sustainability outcomes in PPP projects. This review, with these aspects, tries to develop a comprehensive understanding of the factors affecting sustainable real estate development and provides insights useful for informing urban planning policies and industry practices.

The paper is organized as follows: Section one discusses the theoretical underpinning of SBTs, IPD, and PPP frameworks. Section two reviews empirical studies related to the implementation of SBTs in urban real estate projects with an emphasis on the Addis Ababa context. Section three identifies the major challenges and opportunities regarding the integration of SBTs through IPD in PPP projects. The review concludes with the identification of key findings, research gaps, and further areas of study

2.2 Theoretical Foundations

In the context of real estate development, integrating **Sustainable Building Technologies (SBTs)** within **Public-Private Partnership (PPP) projects** through **Integrated Project Delivery (IPD)** reflects a convergence of multiple key theories in urban development, sustainability, and project management. These foundational theories provide the conceptual framework for understanding

how sustainable construction practices can be effectively implemented in complex, multi-stakeholder projects like those in Addis Ababa. Below are the primary theoretical foundations relevant to the study

2.2.1 Sustainable Development Theory

Focuses on achieving environmental, economic, and social sustainability through resource optimization and eco-friendly practices. Sustainable development in construction refers to meeting present real estate needs without compromising future generations' ability to meet theirs. This concept is underpinned by three pillars: environmental protection, economic growth, and social equity. In real estate, **Sustainable Building Technologies (SBTs)** focus on reducing the environmental impact of buildings while optimizing energy efficiency, resource conservation, and the use of eco-friendly materials.

Key components of SBTs include:

- **Energy Efficiency**: The use of technologies such as solar panels, energy-efficient lighting, and HVAC systems to reduce a building's energy consumption.
- **Resource Conservation**: Systems like water recycling and rainwater harvesting, designed to minimize water usage and waste.
- **Green Building Materials**: The use of sustainable materials, such as recycled steel and low-carbon concrete, to reduce construction’s environmental footprint.

The **Brundtland Report (1987)** introduced the most commonly cited definition of sustainable development, which emphasizes the importance of balancing economic, environmental, and social needs.

2.2.2 Project Management Frameworks for Sustainable Projects

Emphasizes IPD's potential in fostering collaboration and reducing inefficiencies in project execution. Effective project management frameworks are critical for the successful implementation of sustainability goals in construction. The **Integrated Project Delivery (IPD)** framework, in particular, is highly relevant to projects that involve complex, sustainable outcomes. Unlike traditional project delivery models (such as Design-Bid-Build), IPD emphasizes:

- **Early Involvement of Stakeholders**: Bringing together all key players (owners, designers, contractors, etc.) from the early planning stages ensures alignment of sustainability goals.
- **Shared Risk and Reward**: By aligning incentives and outcomes across all participants, IPD minimizes conflicts and fosters collaboration, which is essential in projects aiming to integrate SBTs.
- **Collaborative Decision-Making**: In IPD, decisions are made jointly by all stakeholders, allowing for more flexible and innovative approaches to sustainability challenges.

2.2.3 Principal-Agent Theory

This theory Highlights the alignment of public and private interests to achieve mutual sustainability objectives. Public-Private Partnerships (PPPs) are increasingly used to address the challenges of urban development, particularly in the real estate sector where large-scale infrastructure is required. PPPs are joint ventures where the government collaborates with private sector partners to fund, build, and operate real estate projects. The involvement of private sector resources and expertise, combined with public sector oversight, can help deliver projects more efficiently.

In the context of sustainable development, PPPs play a vital role in incorporating SBTs into real estate projects. However, one of the main challenges is aligning the profit-driven motives of private developers with the public sector's focus on long-term sustainability and social benefits. The **principal-Agent Theory** often underlies these partnerships, where the public (principal) must align the goals and incentives of the private (agent) party toward achieving sustainability objectives. Successful PPPs in urban real estate must ensure that:

- **Sustainability Goals are Clearly Defined**: Both public and private parties must agree on measurable sustainability outcomes.
- **Regulatory and Policy Frameworks Support Sustainability**: The government must create policies that incentivize private developers to adopt SBTs.

2.3 Urbanization and Real Estate Development in Addis Ababa

The rapid rise of urbanization in most parts of Africa has presented the continent with a number of challenges and stripped its cities of their ability to provide for basic needs like shelter, infrastructure, education and health care. (Gordon McGranahan, 2009)

Government-built Condominiums: Since the government has introduced national condominium housing program in 2005, the Addis Ababa City Administration has transferred 175,000 condominium houses to residents. (new business Ethiopia, 2019) The government registered around 1.3 million people who hoped to have their own homes in Addis Ababa. Most of these people have started saving, to acquire the houses the government is going to build in the 10/90, 20/80 and 40/60 housing programs targeting the lower income and lower middle-income citizens. (Ethiopia business review, 2014)

The real estate investment industry will find itself at the center of rapid economic and social change, which is transforming the built environment. (prm, 2017)

2.4 Sustainable Building Technologies (SBTs) in Real Estate

In order to lessen the environmental effect of real estate developments and to promote resource and energy efficiency, sustainable building technologies, or SBTs, are essential. One example of a key technology is the solar panel, which produces electricity by converting sunlight. This reduces

the need for fossil fuels and greenhouse gas emissions. HVAC (heating, ventilation, and air conditioning) systems that use less energy are made to maximize energy efficiency and provide better temperature management. Water conservation strategies, like collecting rainfall and reusing greywater for landscaping and toilet flushing, assist cut down on water consumption. Furthermore, utilizing eco-friendly building supplies like bamboo, low-carbon concrete, and recycled steel helps lessen the carbon footprint of building operations. These materials frequently come from recycled or renewable resources, which helps to reduce waste. Shamanina, E.A. (2023)

2.5 Integrated Project Delivery (IPD) as a Project Management Framework

IPD was introduced by America Institute of Architecture (AIA) on 2007. In construction industry, determinations should be made between projects to identify whether greater benefits or trade-offs are received from higher level of integration and collaboration. Hence, the baseline of project integration level should be outlined by clients or relevant personnel to ensure an effective IPD. Therefore, it is important to measure the project integration through a systematic measurement. With precise measurements, the collaborative performances can be managed in proactive ways

IPD vs. Traditional Project Delivery Models

The project is divided into several design and construction phases in the typical Design-Bid-Build (DBB) manner, with little to no coordination between the design and construction teams. Due to the delayed discovery of design problems during construction, this frequently results in misunderstandings, delays, and cost overruns. Usually, contractors don't contribute until the design is finished, which might lead to increased expenses and inefficiencies.

By integrating design and construction into a single contract, Design-Build (DB) provides greater integration. This speeds up timelines and lowers conflict by facilitating improved collaboration between designers and builders from the beginning. Nevertheless, DB still relies on a single organization to oversee both design and construction, which, while effective, leaves out important players from the decision-making process, such as the customer or subcontractors, in comparison to IPD.

Taking into account the large number of project participants, it becomes very important to optimize the cooperation between them. The problems with communication lead to the division of the construction process to the stages, the significant number of changes and non-operating costs, and as a result to the increased project duration and increased costs (M. Polonski ,2015). The building design and construction industry needs to move towards a better coordination of participants and more collaborative approaches to overcome problems (H.A. Mesa, K.R. Molenaar, L.F. Alarcon)

2.6 Public-Private Partnerships (PPP) in Real Estate Projects and Demand and Supply of Residential House in Addis Ababa

During Empirical Period, the dominant player in housing is the state, manifested through its various arms such as regional governments, districts, and kebeles. The state controls the majority of the rental accommodation and influences the supply of new housing through active involvement in material production and importation, land supply, and housing finance. (Zerayehu, 2015) Very few private housing developers exist. The private construction industry is very small and it is complicated and time consuming to start a company, register it, and conduct 21 business. Those that do exist operate only for high-income groups as there is little incentive to construct low-income housing. (UN-HABITAT, 2011)

The Role of PPPs in Urban Development

Public private partnerships (PPPs) emerged as a widely used governance arrangement in the past couple of decades (Wang et al. 2018).Public-private partnership (PPPs) are arrangements between government and private sector entities for the purpose of providing public infrastructure development community facilitates and related services. Pongsiri, N. (2012). The Addis Ababa city administration announced that the construction of 100,000 houses will be carried out in the first round of government-private partnership. Around 68 local and foreign developers entered into a contract agreement with the Addis Ababa city administration to build 30/70 association houses to be built by the government and private partnership.

Public-Private Partnerships (PPPs) are a collaborative framework where the public sector and private entities come together to finance, build, and operate projects that serve the public interest. This method of project financing allows for leveraging private sector efficiency and innovation in the delivery of public services and infrastructure, which can range from transportation systems to social housing. By combining the resources and expertise of both the public and private sectors, PPPs aim to address the challenges of public sector capacity and fiscal constraints.

One of the primary advantages of using PPPs in project financing is the ability to provide off-balance-sheet funding for the government entities involved. This approach not only preserves the government's creditworthiness but also enables large-scale infrastructure projects to proceed without immediate substantial impacts on public finances. Furthermore, PPP agreements often include risk-sharing provisions, transferring some risks to private partners, which incentivizes careful project management and aligns the interests of all parties toward successful outcomes

2.7 Empirical Research on IPD and SBTs in PPP Projects

There is an increasing need for infrastructure and housing. Public-Private Partnerships (PPPs) have been used as a framework for collaboration between the public and private sectors to address these issues. Although this strategy has demonstrated promise in addressing urban development concerns, there is still little incorporation of Sustainable Building Technologies (SBTs) into these projects. Major challenges have been found, including a lack of awareness, higher upfront expenses, and insufficient legislative assistance. These problems show how difficult it is to match the city's sustainability aims with the interests of real estate development.

There are many obstacles in the way of Addis Ababa's PPP projects using SBTs. Since the initial expenditure needed for SBTs is frequently much larger than that of typical construction methods, financial restrictions are a major factor. Developers who are more concerned with profitability and cost recovery are discouraged by this. According to Alemu et al. (2021), these financial difficulties make developers less inclined to invest in sustainable alternatives, which further reinforces reliance on traditional methods. Another significant obstacle is the absence of technical knowledge. Bekele and Worku (2020) stress that opposition to using new technologies is caused by a lack of specialists with training in sustainable construction techniques. SBT implementation is still a difficult undertaking in the absence of qualified staff.

Regulatory obstacles exacerbate the issue even further. The use of SBTs is not sufficiently encouraged or required by Addis Ababa's construction laws and regulations, which reduces adoption incentives. According to Mengistu (2019), the incorporation of sustainable practices in the city's real estate industry is constrained by the lack of explicit regulatory backing. The combination of these technical, financial, and regulatory obstacles significantly impedes the advancement of SBT utilization in PPP projects.

A potential solution for these issues is Integrated Project Delivery (IPD). IPD is a collaborative project management approach that ensures shared goals, risks, and benefits by involving stakeholders early in the project lifecycle. This strategy encourages improved teamwork and communication, which makes it especially useful for challenging projects that call for long-term fixes. According to Smith and Ayele (2023), projects that used IPD experienced a 25% rise in the adoption of sustainable technology when compared to those that used conventional delivery methods. Stakeholders may better integrate SBTs, align their interests, and solve problems together because to IPD's collaborative character.

A number of Critical Success Factors (CSFs) are necessary for the effective implementation of IPD. Involving developers, contractors, and regulators early on in the project is essential since it guarantees that sustainability goals are met. Chen et al. (2022) emphasize that the smooth integration of novel methods is facilitated by early collaboration. Another crucial element is open and honest communication. Rahman and Tesfaye (2021) assert that open communication promotes trust, enables stakeholders to share ideas, and efficiently handles possible problems. Furthermore, shared risk and reward systems promote responsibility and collaboration. Aligning incentives among stakeholders encourages group efforts to accomplish sustainable goals

according to (Bansal, 2005; Sharma, 2002; Stubbs and Cocklin, 2008) a focus on stakeholder relations is one of the key components of firms' strategic processes for sustainability

Empirical studies offer valuable lessons for improving the integration of SBTs in future PPP projects. Capacity building is identified as a critical need. Alemu et al. (2021) recommend investing in training programs, such as Continuous Professional Development (CPD), to enhance technical expertise in sustainable construction. Policy reform is also essential. Updating building codes and introducing incentives for SBT adoption can drive broader implementation. Mengistu (2019) suggests that regulatory frameworks should mandate minimum sustainability standards to encourage compliance. Furthermore, financial incentives, such as subsidies, tax breaks, or low-interest loans, can help offset the higher initial costs of SBTs, making them more appealing to developers.

In conclusion, the limited integration of SBTs in Addis Ababa's PPP real estate projects underscores the need for a multifaceted approach to overcome existing barriers. The adoption of IPD has demonstrated promise in enhancing collaboration and facilitating the use of sustainable technologies. However, achieving sustainable development goals requires addressing critical success factors, including early stakeholder involvement, transparent communication, and shared incentives. By focusing on capacity building, policy reform, and financial incentives, future PPP projects in Addis Ababa can align more effectively with global sustainability objectives and deliver environmentally friendly real estate

2.8 Research Gaps

Regarding the integration of Sustainable Building Technologies (SBTs) and Integrated Project Delivery (IPD) in Public-Private Partnership (PPP) projects, particularly in developing cities like Addis Ababa, there are a number of significant gaps in the literature that currently exists. First, as developed nations frequently provide more substantial financial and legal support for sustainable practices, a large portion of research on the advantages of IPD and SBTs is concentrated in these regions. On the other hand, there is no empirical data regarding the effectiveness of these frameworks in places like Addis Ababa that have less developed infrastructure, disjointed regulatory frameworks, and restricted access to capital. This disparity highlights the need for more regional research that tackles the special difficulties in putting IPD and SBTs into practice in these settings, where balancing the interests of the public and private sectors can be extremely difficult.

2.9 Conceptual Framework for the Research

The conceptual framework for this study integrates Integrated Project Delivery (IPD), Sustainable Building Technologies (SBTs), and Public-Private Partnership (PPP) to examine the dynamics of real estate development in Addis Ababa. It establishes the relationships among key variables, illustrating how the independent variables—IPD framework, PPP model, and Critical Success Factors (CSFs)—influence the dependent variables, including sustainability outcomes, stakeholder collaboration, and project efficiency. This framework provides a structured approach to understanding the mechanisms through which sustainable real estate development can be achieved within a PPP setting using IPD principles.

The independent variables in this framework play a crucial role in shaping the success of sustainable real estate projects. The Integrated Project Delivery (IPD) model emphasizes collaboration among stakeholders, ensuring that all parties are involved early in the planning and design phases. By promoting shared risks and rewards, IPD fosters a sense of collective responsibility, which is essential for the successful implementation of sustainability initiatives. Additionally, the Public-Private Partnership (PPP) model facilitates resource sharing and financing, enabling government and private entities to work together toward common sustainability goals. This collaboration allows for more efficient project execution, leveraging the strengths of both public oversight and private sector innovation. Another critical independent variable is the set of Critical Success Factors (CSFs), which include regulatory support, adequate funding, stakeholder alignment, and technical expertise. These elements serve as foundational pillars that enhance the feasibility and effectiveness of sustainable building practices.

The dependent variables in this framework reflect the intended outcomes of implementing IPD and PPP in real estate development. Sustainability outcomes, a primary focus of this study, encompass reductions in energy consumption, improved resource efficiency, and minimized environmental impact. By integrating SBTs within an IPD-driven PPP framework, real estate projects can achieve enhanced sustainability, reducing their carbon footprint while maintaining economic viability. Additionally, this framework highlights the alignment of public (principal) and private (agent) interests, ensuring that both parties work collaboratively to achieve mutual sustainability objectives. The effectiveness of this approach is further demonstrated through improvements in stakeholder collaboration and overall project efficiency.

By establishing a clear linkage between these variables, this conceptual framework provides a foundation for analyzing how IPD and PPP can drive the adoption of SBTs in Addis Ababa's real estate sector. It underscores the significance of stakeholder cooperation, effective project management, and supportive regulatory environments in achieving sustainable urban development. This structured approach offers valuable insights that can inform policymakers,

industry practitioners, and researchers, guiding future efforts to promote sustainable real estate practices in rapidly urbanizing cities.

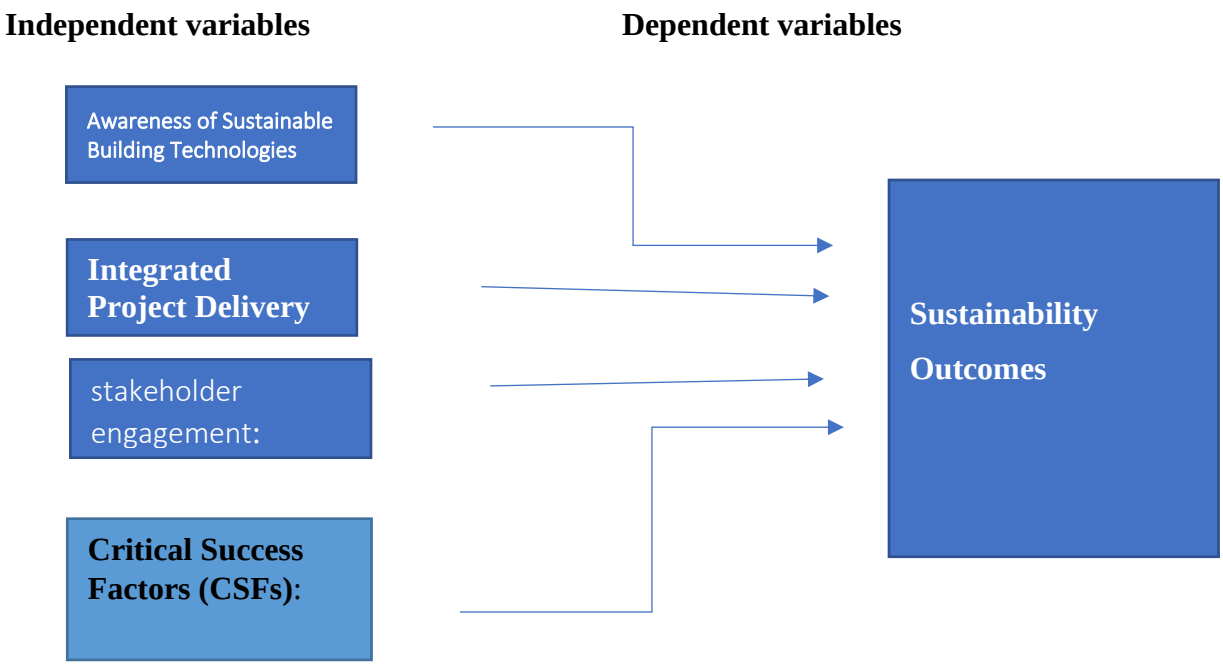


Figure 1 Conceptual Framework diagram

Source: Adapted from literature (developed by the researcher, 2024).

Chapter 3

3 Research Methodology

This chapter has discussed the methodology that was used during the data collection, analysis and interpretation of data. It has also discussed the description of the study area, the research design, types and source of data, target population, sampling design, and methods of data analysis.

3.1 Introduction

This study has used a **mixed method approach**, utilizing a case study methodology to explore the integration of sustainable building technologies (SBTs) in real estate projects through Integrated Project Delivery (IPD) within the Public-Private Partnership (PPP) framework in Addis Ababa. The qualitative approach is best suited for this research because it allows for in-depth exploration of the complexities involved in stakeholder collaboration, sustainability implementation, and project management dynamics.

By using **questioners, interviews** and **document reviews**, the study has gathered rich, contextual data from key stakeholders, including developers, project managers, and public officials involved in Addis Ababa's PPP real estate projects. This method is ideal for understanding the nuanced challenges and opportunities associated with the adoption of SBTs and the role of IPD in aligning public and private interests toward achieving sustainability goals.

3.2 Research Approach

A mixed-methods approach is used in this study to carefully examine how Sustainable Building Technologies (SBTs) are included into PPP real estate projects in Addis Ababa. The study integrates qualitative information gleaned from expert interviews and case studies with quantitative data gathered through statistical analysis and structured surveys. In order to investigate the level of SBT adoption, integration problems, the role of Integrated Project Delivery (IPD), Critical Success Factors (CSFs) for IPD in PPP projects, and lessons for future applications, the study is led by five main research topics. By combining detailed contextual interpretations with numerical trends, the mixed-method approach guarantees a comprehensive knowledge and produces useful advice for developers, legislators, and construction experts.

3.3 Research Design

This study employs a **mixed method case study design** to examine the implementation of sustainable building technologies (SBTs) in Public-Private Partnership (PPP) real estate projects in Addis Ababa. The project management framework used is Integrated Project Delivery (IPD), which is designed to foster collaboration and align sustainability goals among multiple

stakeholders. Given the complex nature of PPP projects, IPD's focus on shared responsibilities and early stakeholder involvement makes it an ideal framework to study in the context of SBTs.
A **mixed method is** well-suited for this research because it allows for an in-depth exploration of the **challenges and opportunities** associated with integrating SBTs within the PPP model. By focusing on the detailed experiences of developers, government officials, and sustainability experts, this approach facilitates a nuanced understanding of the dynamics involved. It is particularly effective for capturing insights on how collaborative frameworks like IPD can address the specific barriers to implementing sustainability in urban real estate projects.
The **case study methodology** enables the investigation of specific real estate projects in Addis Ababa, providing contextual insights into the local factors affecting the adoption of SBTs. Through methods such as **questionnaires, interviews** and **document review and experts' judgment,** this research will gather rich, qualitative and quantitative data to analyze the decision-making processes, stakeholder interactions, and critical success factors in these projects. The findings will contribute to a deeper understanding of sustainable urban development, with potential applications for future PPP initiatives in similar contexts.

3.4 Population and Sampling

Target Population

The target population is a well-defined set of people, events, groups of things, households that are being investigated (Ngachu, 2019). As defined by Carr (2017), target population as the researcher studies and whose findings are used to generalize to the entire population. The study targeted to a population of 46, those are basically qualified Real estate developers and government officials like staffs of the city administration involved in the Partnership program.

These people were chosen because they have firsthand experience and knowledge of both government-led urban planning projects and real estate development. Their expertise and experience offer insightful information on the implementation of sustainable building technologies (SBTs) in Public-Private Partnership (PPP) real estate projects being studied, guaranteeing that the study includes pertinent and knowledgeable viewpoints.

Sampling Method

This study will use purposive sampling, a non-probability sampling technique commonly used in mixed method research. This method is chosen to ensure that participants are selected based on their expertise and relevance to the topic. Specifically, participants will be selected based on their roles in the PPP projects, their experience with IPD, and their involvement in integrating sustainable building technologies. Purposive sampling is ideal for this case study because it allows

the researcher to focus on participants who can provide rich, in-depth insights into the challenges and opportunities surrounding the use of SBTs in Addis Ababa's real estate projects.

Sample Size

According to Kothari (2006), sample size refers to the number of items selected from a population for study. Sampling constitutes a procedure whereby a subset of data is drawn from a larger dataset to enable inferences to be drawn about the entire population. This study will provide a formal justification for the utilization of sampling techniques.

The Taro Yamane method for sample size calculation was formulated by the statistician Taro Yamane in 1967 to determine the sample size from a given population. Below is the mathematical illustration for the Taro Yamane method: n= N/ (1+N (e) 2)

where: n signifies the sample size.

The total number of target group at this organization is 46.

Where e=0.05, margin of error

Level of confidence is 95%

n= N/ (1+N (e) 2)

n= 52 / (1+52 $(e)^2$) = 46.01

The researcher will use those 46 respondents from the qualified Real estate developers and Addis Ababa city administration public private partnership department (PPP-D) for the questionnaire and interviews. This sample size allows for a deep exploration of participants' perspectives while ensuring a manageable scope for in-depth analysis. The selected individuals will represent a mix of project managers, developers, government officials, and sustainability experts, providing a well-rounded view of the different stakeholders involved in PPP projects. The sample size range will ensure that the study captures a variety of perspectives on how IPD can enhance the integration of SBTs into real estate projects.

3.5 Data Collection Methods

Questionnaires

Surveys or questionnaires distributed to a larger group of stakeholders to collect both quantitative and quantitative data. This will allow for a broader understanding of attitudes and perceptions regarding SBTs and IPD within the PPP context. The survey will be designed to capture demographic information and assess stakeholders' knowledge, experiences, and expectations related to sustainable practices in real estate development. The combination of quantitative and qualitative data will provide a holistic view of the subject matter.

Interviews

Semi-structured interviews conducted with key stakeholders, including real estate developers, public officials, and other relevant participants in the PPP projects. This method allows for in-depth exploration of participants' experiences and perspectives regarding the challenges and successes of implementing IPD and SBTs. The semi-structured format will enable the interviewer to guide the conversation while allowing for flexibility to probe deeper into specific topics of interest. Questions will focus on perceived benefits, barriers to implementation, and the overall effectiveness of the IPD approach in promoting sustainability within the real estate sector.

Document Review

A comprehensive review of relevant documents undertaken to support the qualitative findings from the interviews. This will include an analysis of government policies related to sustainable building practices, project reports detailing the execution and outcomes of PPP initiatives, and existing real estate plans that reflect the integration of SBTs. By examining these documents, the study aims to contextualize the interviews, identify trends and patterns in policy and practice, and verify the information obtained from stakeholders. This triangulation of data will enhance the reliability and validity of the research findings.

3.6 Data Analysis Methods

Data analysis is the process of organizing, interpreting, and presenting collected data to draw meaningful conclusions. According to Cooper & Schindler (2017), data analysis involves processing, editing, and reducing accumulated data into a manageable format, summarizing key patterns, and applying statistical techniques. In this study, both descriptive and inferential statistics were used for analyzing the data.

The data collected through questionnaires were coded, tabulated, and analyzed using descriptive statistics such as frequency, percentage, mean, and standard deviation with the assistance of SPSS software version 23.00. Excel software was also used to structure and transform variables into a suitable format for analysis. The analyzed data is presented in the form of tables, figures, and charts for clarity in interpretation.

For inferential statistics, the study employed Pearson Correlation to determine the degree of relationship between independent and dependent variables (Kothari, 2004). The Pearson Correlation Coefficient (r) was used to examine the relationship between project performance and key independent variables. Correlation analysis helps in determining the strength and direction of relationships (Tariku, R., 2016).

Furthermore, Multiple Regression Analysis was applied to assess the relationship between the dependent variable (sustainability outcomes) and several independent variables, including stakeholder collaboration, regulatory support, and financial constraints.

The multiple regression model used in this study is formulated as follows:

$$Y = \alpha + \beta1X1 + \beta2X2 + \beta3X3 + \beta4X4 + \beta5X5 + \varepsilon$$

Where:

- **Y** = Dependent Variable (Sustainability Outcomes)
- **α** = Constant
- **X1** = Stakeholder Collaboration
- **X2** = Regulatory Support
- **X3** = Financial Constraints
- **X4** = Technical Expertise
- **X5** = Project Efficiency
- **β1 - β5** = Beta Coefficients representing the influence of each independent variable
- **ε** = Error term

This regression analysis helped in identifying the most significant factors influencing the adoption of Sustainable Building Technologies (SBT) in Public-Private Partnership (PPP) real estate projects and guided the formulation of policy recommendations.

3.7 Reliability and Validity

Validity

Validity refers to how accurately a research instrument measures what it intends to measure (Bunyaminu & Mahama, 2018). The validity of the research instrument is important in terms of guaranteeing that the data collected will be able to represent the aims of the study. Three basic types of validity were adopted in this research: content, construct, and external validity.

- **Content Validity**: The questionnaire was developed based on an extensive literature review and expert recommendations. It was reviewed by the research advisor and revised based on feedback to align with the study's objectives before finalization and distribution.
- **Construct Validity**: Two experts in project management and sustainability critically analyzed the questionnaire to assess whether the survey items measured the intended constructs. Their feedback helped improve precision and clarity.
- **External Validity**: Direct administration of questionnaires to selected respondents ensured that the collected data represented actual perceptions and experiences, minimizing external influences.

Reliability

Reliability refers to the consistency of a measurement tool in producing stable and repeatable results (Creswell, 2009). A pilot test was conducted using 10% of the total sample size, selecting participants representative of the target population (Catherine, 2007).

The internal consistency of the questionnaire was evaluated using Cronbach's Alpha Coefficient, which determines whether the survey items are reliable. According to Morgan et al. (2004), a Cronbach's Alpha score of ≥ 0.7 indicates acceptable reliability.

The results are shown below:

Dimension	**No. of Items**	**Cronbach's Alpha**	**Reliability**
Awareness of SBT	3	0.843	Reliable
Evaluation of IPD Delivery	4	0.852	Reliable
Critical Success Factors	8	0.796	Reliable
Sustainability Outcomes	5	0.891	Reliable
Entire Questionnaire	**20**	**0.784**	**Reliable**

Since all Cronbach's Alpha values exceeded 0.7, the study concluded that the measurement instruments were internally consistent and reliable for further analysis.

Ethical Considerations

Ethical considerations are critical in research to ensure credibility, confidentiality, and integrity (Denzin & Lincoln, 2020). The researcher adhered to the highest ethical standards throughout the study.

- **Informed Consent**: All participants were briefed on the study's objectives, and written consent was obtained before data collection.
- **Confidentiality**: Participants' responses were anonymized, and no personally identifiable information was disclosed.
- **Data Protection**: All data collected was securely stored and used strictly for academic purposes.
- **Voluntary Participation**: Respondents had the right to withdraw from the study at any stage without any consequences.

By following these ethical principles, the study ensured credibility, accuracy, and fairness in data collection and analysis.

The study used SPSS 23.00 for statistical analysis, including descriptive statistics (mean, percentage, and standard deviation) and inferential statistics (Pearson Correlation and Multiple Regression Analysis). The Cronbach's Alpha test confirmed the reliability of the research instruments, and ethical standards were upheld to protect participants' privacy.

Chapter Four

4 Analysis And Interpretation

4.1 Introduction

This chapter focuses on the presentation, analysis, and interpretation of the data collected to address the research objectives. The study investigates the implementation of Sustainable Building Technologies (SBTs) in Public-Private Partnership (PPP) real estate projects using the Integrated Project Delivery (IPD) framework in Addis Ababa.

The chapter is structured to provide a comprehensive understanding of the findings, combining quantitative and qualitative data analysis. Quantitative results are derived from statistical models, including correlation, regression, ANOVA, and collinearity diagnostics, to assess relationships between key variables and their impact on sustainability outcomes. These results are complemented by qualitative insights obtained through semi-structured interviews, allowing for a deeper exploration of stakeholder experiences and perceptions.

The analysis begins with a demographic profile of the respondents, providing context for their expertise and roles in the projects under study. Subsequent sections delve into descriptive statistics to gauge awareness and perceptions of SBTs, evaluate the role of IPD in fostering collaboration and sustainability, and identify critical success factors for PPP projects. Key statistical outputs, including correlations and regression analysis, are interpreted to uncover patterns and relationships among the variables. Finally, qualitative data themes are integrated to enrich the discussion and provide actionable recommendations for improving the integration of SBTs in future PPP projects. This chapter aims to bridge the gap between theoretical frameworks and practical applications, offering evidence-based insights that contribute to the sustainable urban development goals of Addis Ababa.

4.2 Response rate

The sample size of this study was targeted 46 respondents. From 46 distributed questioners only 41 respondents returned filling the questions in appropriately, which is more than 80 % response rate. The other unsuccessful rate is because of poor way of filling and partial fill of the questioners The response rate was appropriate for study to continue and give result which could be generalized for the purpose of decision making. According to Mugenda and TMugenda (2003) noted that 50% response rate is adequate, 60% is good and above 70%Tis excellent, hence this response rate was considered excellent and adequate for the analysis to give reliable information.

This implies that the result of this study can be generalized to reflect the view the participants who are the main stakeholders in Public-Private Partnership (PPP) real estate projects that have influence in the growth and development of the housing and construction industry of the city.

4.3 Demographic Information

Understanding the demographic composition of a study's respondents is essential in analyzing the overall trends, backgrounds, and expertise of the participants. This interpretation provides insights into the gender distribution, age, educational background, professional roles, work experience, and involvement in various aspects of the real estate and construction industry.

4.3.1 Gender

Statistics

Gender

N	Valid	41
	Missing	0

Table 1Gender statics

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	31	75.6	75.6	75.6
	female	10	24.4	24.4	100.0
	Total	41	100.0	100.0	

Table 2 Gender percentage

The demographic data indicates a significant gender imbalance among respondents, with **75.6% (31 out of 41 respondents) being male** and **only 24.4% (10 respondents) being female**. This finding suggests that the industry or workforce from which the respondents were drawn is male-dominated. The disparity could reflect broader industry trends where men occupy a larger share of leadership and technical roles in construction, real estate development, and related fields. The relatively low percentage of female participants highlights the need for further analysis regarding gender diversity and potential barriers to entry or advancement for women in this sector.

4.3.2 Age of Respondents

Age

		N	%
26-46		1	2.4%
Missing	System	40	97.6%

Tabel 2 Age Statistics

The data on the age of respondents presents an unusual pattern, with only **one respondent (2.4%) recorded within the 26-46 age range**, while the remaining **97.6% of responses are missing**. This suggests a significant gap in the data collection process, which could be due to non-disclosure by participants or a technical issue in recording responses. The missing data limits the ability to draw meaningful conclusions about the age distribution of respondents, which is crucial in assessing workforce demographics, generational diversity, and potential industry trends related to experience and career progression.

4.3.3 Educational Background of Respondents

Educational Background

	N	%
BA/BSC Degree	20	48.8%
Masters	18	43.9%
PHD	3	7.3%

Table 3 Educational Background Cumulative

The respondents exhibit a high level of educational attainment. Nearly half, **48.8% (20 respondents), hold a BA/BSc degree**, while **43.9% (18 respondents) have a Master's degree**, and **7.3% (3 respondents) hold a PhD**. These findings highlight that a substantial portion of professionals in this industry have pursued advanced education, with a strong emphasis on postgraduate qualifications. This trend suggests that higher academic credentials may be a common requirement or preference within the real estate, construction, and project management fields.

4.3.4 Profession of the respondents

Profession Cumulative

	N	%
Architect	11	26.8%
civil engineer	16	39.0%
Construction Management	12	29.3%
other	2	4.9%

Table 4 Profession Cumulative

The respondents come from diverse professional backgrounds within the built environment sector. **39.0% (16 respondents) are Civil Engineers**, making up the largest professional group, followed by **29.3% (12 respondents) in Construction Management**, and **26.8% (11 respondents) working as Architects**. A small proportion, **4.9% (2 respondents), belong to other professions**. This distribution indicates that the sample primarily consists of individuals with technical expertise in construction and infrastructure development. The dominance of civil engineers and construction managers suggests that the respondents are actively involved in planning, designing, and executing real estate projects.

4.3.5 Current role of the respondents

Current role

	N	%
Project Manager	13	31.7%
Real Estate Developer	12	29.3%
Government official	10	24.4%
Sustainable Expert	6	14.6%

Table 5 Current Role Cumulative

Examining the current roles of respondents reveals that they occupy a variety of leadership and industry positions. The highest percentage, **31.7% (13 respondents), are Project Managers**, while **29.3% (12 respondents) work as Real Estate Developers**. Additionally, **24.4% (10 respondents) hold positions as Government Officials**, and **14.6% (6 respondents) specialize in sustainability-related roles**. This data suggests that the sample includes a mix of individuals who influence decision-making, oversee project execution, and contribute to policy implementation. The presence of government officials indicates regulatory involvement, while the inclusion of sustainability experts reflects growing attention to environmentally responsible construction and real estate development.

4.3.6 Experience of the respondents

Experience

	N	%
6-10 years	18	43.9%
11-15	18	43.9%
more than 15 years	5	12.2%

Table 6 Experience Cumulative

The data on work experience demonstrates a well-balanced distribution, with most respondents possessing significant industry experience. **43.9% (18 respondents) have 6-10 years of experience**, while another **43.9% (18 respondents) have 11-15 years of experience**. A smaller proportion, **12.2% (5 respondents), have more than 15 years of experience**. This indicates that the majority of the respondents are mid-career professionals with substantial expertise in their respective fields. The high percentage of professionals with over a decade of experience suggests that the survey data is derived from individuals with well-developed skills and industry knowledge.

4.3.7 The type of real estate projects the respondents worked on

What type of real estate projects have you predominantly worked on

	N	%
Residential	5	12.2%
Mixed Use	36	87.8%

Table 7 Statistics Cumulative

Regarding the nature of real estate projects, the majority of respondents have worked on **mixed-use developments (87.8%)**, while only **12.2% have experience with residential projects**. Mixed-use developments, which integrate residential, commercial, and sometimes institutional components, appear to be the dominant project type among the sample. This trend may reflect industry shifts toward multi-functional urban spaces that enhance land use efficiency and economic viability. The relatively low percentage of respondents focused exclusively on residential projects suggests that real estate professionals are increasingly engaged in complex, large-scale developments rather than traditional single-use housing projects.

4.3.8 Respondents Involvement in PPP projects

Which of the following best describes your involvement in PPP projects

	N	%
Direct involvement	24	58.5%
Indirect Involvements	17	41.5%

Table 8 Statistics Cumulative

The data also explores the respondents' involvement in Public-Private Partnership (PPP) projects. A majority, **58.5% (24 respondents), report direct involvement**, while **41.5% (17 respondents) have indirect experience**. This indicates that many professionals in this sample have hands-on experience in PPP projects, where collaboration between the government and private sector plays a crucial role in financing and delivering large-scale real estate and infrastructure developments. The relatively high engagement in PPPs suggests that respondents are familiar with investment models that blend public and private resources to achieve development goals.

The demographic data provides valuable insights into the composition of professionals in the real estate and construction sectors. The findings reveal a male-dominated industry with highly educated professionals, mainly working as civil engineers, architects, and construction managers. The majority of respondents hold leadership or decision-making roles, with mid-career professionals making up the bulk of the sample. Their experience is largely concentrated in mixed-use real estate

4.4 Quantitative Data Analysis

This section presents the results of the quantitative analysis, which examines the relationships among key variables related to the integration of Sustainable Building Technologies (SBTs) within Public-Private Partnership (PPP) real estate projects using the Integrated Project Delivery (IPD) framework.

Descriptive statistics provide insights into respondents' familiarity with SBTs, the effectiveness of IPD in fostering collaboration, and the identification of critical success factors.

Advanced statistical techniques, including correlation, regression, and ANOVA, are employed to explore the strength and significance of relationships among variables and assess the overall model's predictive capacity. These analyses aim to validate the research framework and provide a data-driven understanding of the factors influencing sustainability outcomes in PPP projects.

4.4.1 Descriptive analysis

This subsection provides a summary of the descriptive statistics used to analyze key variables in the study. It explores respondents' levels of familiarity with Sustainable Building Technologies (SBTs), perceptions of their importance, and the effectiveness of Integrated Project Delivery (IPD) in achieving sustainability goals.

Descriptive Results of Familiarity and Importance of Sustainable Building Technologies (SBTs)

Descriptive Statistics

	N	Mean	Std. Deviation
I am familiar with the concept of Sustainable Building Technologies (SBTs).	41	4.15	.615
SBTs are essential for achieving sustainability in real estate projects.	41	4.00	.592
I consider the adoption of SBTs as a critical component of project planning.	41	4.12	.458
Valid N (listwise)	41		

Table 9 Descriptive Statistics SBTs

- Familiarity with SBTs: Mean = 4.15, Std. Dev. = 0.615. Respondents generally agree they are familiar with SBTs, with low variability indicating consistency in awareness.
- Importance for Sustainability: Mean = 4.00, Std. Dev. = 0.592. Respondents recognize SBTs as essential for sustainability, showing strong consensus.
- Critical Component of Project Planning: Mean = 4.12, Std. Dev. = 0.458. There is high agreement that SBTs are integral to project planning, with minimal variability suggesting a shared understanding.

Descriptive Results of Role of Integrated Project Delivery (IPD)

Descriptive Statistics

	N	Mean	Std. Deviation
IPD facilitates collaboration among stakeholders in PPP real estate projects.	41	4.00	.632
IPD helps to reduce delays and cost overruns in projects.	41	4.15	.573
IPD is aligned with the sustainability goals of PPP projects.	41	3.90	.800
The use of IPD improves the efficiency and quality of real estate projects.	41	4.07	.755
Valid N (listwise)	41		

Table 10 Descriptive Statistics IPD

- **Collaboration among Stakeholders**: Mean = 4.00, Std. Dev. = 0.632. Respondents agree on the collaborative benefits of IPD, although variability suggests some differences in stakeholder experiences.
- **Reduction of Delays and Costs**: Mean = 4.15, Std. Dev. = 0.573. IPD is recognized for improving efficiency, with consistent agreement.
- **Alignment with Sustainability Goals**: Mean = 3.90, Std. Dev. = 0.800. This slightly lower mean and higher variability indicate room for improvement in aligning IPD with sustainability.
- **Improved Efficiency and Quality**: Mean = 4.07, Std. Dev. = 0.755. Strong agreement exists on IPD's benefits, though responses vary slightly.

Descriptive Results of Stakeholder Collaboration and Communication

Descriptive Statistics			
	N	Mean	Std. Deviation
Communication among stakeholders in PPP projects is effective.	41	4.12	.600
Public and private stakeholders share responsibility for sustainability goals.	41	4.27	.633
Stakeholders in PPP projects are well-aligned on sustainability objectives.	41	4.20	.641
Collaboration among stakeholders enhances the integration of SBTs.	41	4.12	.600
Valid N (listwise)	41		

Table 11 Descriptive Statistics SCC

- **Effective Communication**: Mean = 4.12, Std. Dev. = 0.600. Respondents agree on effective communication in PPP projects, showing consistent perspectives.
- **Shared Responsibility for Sustainability**: Mean = 4.27, Std. Dev. = 0.633. A high mean reflects strong agreement on the importance of shared sustainability goals.
- **Alignment on Objectives**: Mean = 4.20, Std. Dev. = 0.641. Stakeholders are largely aligned on sustainability objectives, with consistent agreement.
- **Collaboration Enhances Integration of SBTs**: Mean = 4.12, Std. Dev. = 0.600. Respondents agree that collaboration supports SBT integration, with strong consensus

Success Factors in PPP Projects

Descriptive Statistics

	N	Mean	Std. Deviation
Stakeholder collaboration is important for the success of PPP projects.	41	4.00	.775
Regulatory support is essential for achieving sustainability in PPP real estate projects.	41	4.15	.691
Adequate funding significantly impacts the integration of SBTs.	41	4.22	.652
Early planning and design are crucial for the success of PPP projects	41	4.22	.652
Valid N (listwise)	41		

Table 11 Success Factors in PPP Projects

Success Factors in PPP Projects

- **Collaboration**: Mean = 4.00, Std. Dev. = 0.775. Stakeholder collaboration is deemed important, but responses show moderate variability.
- **Regulatory Support**: Mean = 4.15, Std. Dev. = 0.691. Respondents strongly agree on the importance of regulatory support, with slight variability.
- **Adequate Funding**: Mean = 4.22, Std. Dev. = 0.652. Funding is a crucial factor for SBT integration, with minimal variability.
- **Early Planning and Design**: Mean = 4.22, Std. Dev. = 0.652. There is strong agreement on the importance of early planning, with consistent responses.

Sustainability Outcomes in Projects

Descriptive Statistics

	N	Mean	Std. Deviation
Projects with SBTs have effectively reduced energy consumption.	41	4.15	.727
My projects have successfully minimized their environmental impact.	41	4.22	.613
PPP real estate projects address social and economic sustainability goals effectively.	41	4.37	.698
I am satisfied with the sustainability outcomes achieved in my projects.	41	4.32	.567
Policy changes have impact on implementation of SBTs	41	4.49	.553
Valid N (listwise)	41		

Table 12 Sustainability Outcomes in Projects

Sustainability Outcomes in Projects

- **Energy Reduction**: Mean = 4.15, Std. Dev. = 0.727. Respondents agree that SBTs reduce energy consumption, but variability suggests differing project experiences.
- **Minimized Environmental Impact**: Mean = 4.22, Std. Dev. = 0.613. Respondents are confident in achieving environmental goals, with strong consensus.
- **Addressing Social and Economic Goals**: Mean = 4.37, Std. Dev. = 0.698. This is the highest mean in this section, showing strong agreement on meeting broader sustainability goals.
- **Satisfaction with Outcomes**: Mean = 4.32, Std. Dev. = 0.567. High satisfaction levels indicate successful sustainability implementations.
- **Policy Impact**: Mean = 4.49, Std. Dev. = 0.553. The highest overall mean reflects strong agreement on the significant influence of policy changes.

Inferential Analysis

Correlation Analysis

A - Awareness of Sustainable Building Technologies
B- Integrated Project Delivery (IPD)
C- Stakeholder Engagement:
D- Critical Success Factors (Csfs):
E- Sustainability Outcomes

Correlations

		A	B	c	D	E
A	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	41				
B	Pearson Correlation	.626**	1			
	Sig. (2-tailed)	<.001				
	N	41	41			
c	Pearson Correlation	.582**	.759**	1		
	Sig. (2-tailed)	<.001	<.001			
	N	41	41	41		
D	Pearson Correlation	.641**	.760**	.765**	1	
	Sig. (2-tailed)	<.001	<.001	<.001		
	N	41	41	41	41	
E	Pearson Correlation	.612**	.762**	.771**	.783**	1
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	
	N	41	41	41	41	41

**. Correlation is significant at the 0.01 level (2-tailed).

Table 13 Correlation

The correlation matrix provides insights into the relationships between variables (A, B, C, D, and E).

Significant Relationships:

All correlations are statistically significant at the 0.01 level (2-tailed), indicating strong evidence of relationships between the variables.

Strongest Correlations:

Variable D exhibits the strongest correlation with the dependent variable E (r = 0.783), suggesting that D has the highest influence on E.

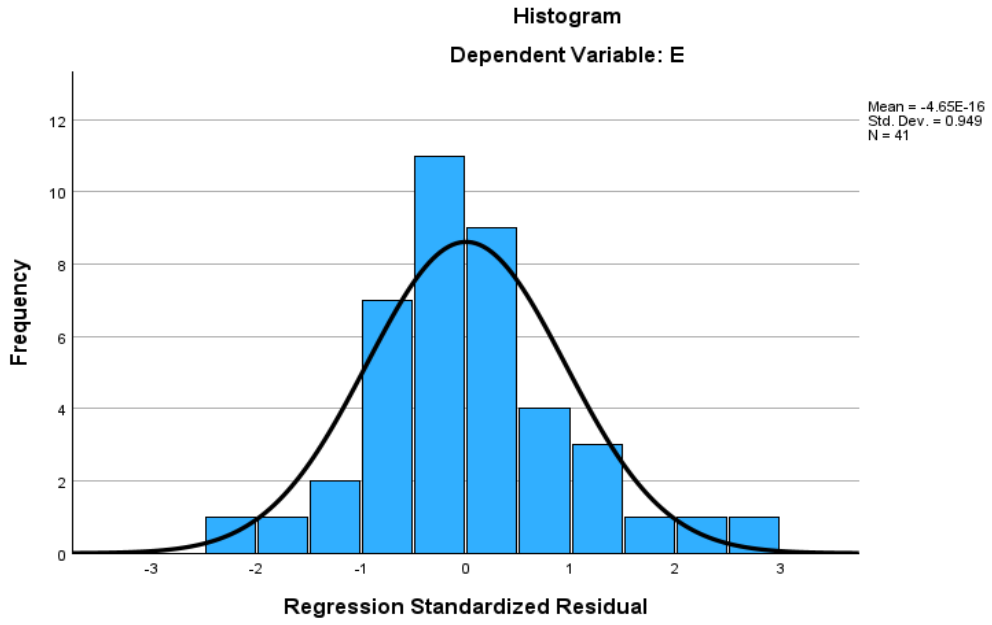
Similarly, variables C (r = 0.771) and B (r = 0.762) also have strong positive relationships with E.

Moderate Correlations:
Variable A shows a moderate positive correlation with E (r = 0.612), indicating that its influence, while significant, is less compared to the other variables.
Inter-variable Relationships:
Strong correlations are observed among the independent variables themselves (e.g., B and C: r = 0.759; D and C: r = 0.765), suggesting potential interdependencies.
The results indicate that all independent variables (A, B, C, D) are positively correlated with the dependent variable (E), with variable D having the strongest influence. The inter-variable correlations also highlight the need to assess multicollinearity in subsequent regression analyses to ensure the validity of the mode

The correlation matrix evaluates the strength and direction of linear relationships among variables (A, B, C, D, E). Key takeaways:

- **Significance:** All correlations are statistically significant at the 0.01 level, indicating strong evidence of relationships.
- **Highest Correlation:** Variable D shows the strongest relationship with the dependent variable E (r = 0.783), suggesting D has the highest influence.
- **Moderate Correlations:** Other variables (A, B, C) exhibit moderate to strong positive correlations with E, ranging from 0.612 to 0.771. This implies that the independent variables (A, B, C, D) collectively and individually contribute to explaining the variations in E.

Regression Analysis



Source; SPSS output,2024

Figure 3 Regression for Standardized Residual

- A visual representation of residuals can confirm normality. A symmetrical bell-shaped curve indicates that residuals are approximately normally distributed, satisfying a key assumption for linear regression.

Normality

Normality tests are used to determine whether a data set is well-modeled by a normal distribution or not, or to compute how likely an underlying random variable is to be normally distributed (Gujarati, 2009). Researcher has been used histogram methods of testing the normality of the data. The shape of histogram is bell shaped which lead to infer that the residual (disturbance or errors) are relatively or normally distributed and regression standardized residual plotted between -3.0 and 3.3with the mean of 2.2 and Standard deviation 0.982. This indicated that the variables were relatively normal distribution for each value of the independent variables.

Normal P-P Plot of Regression Standardized Residuals:

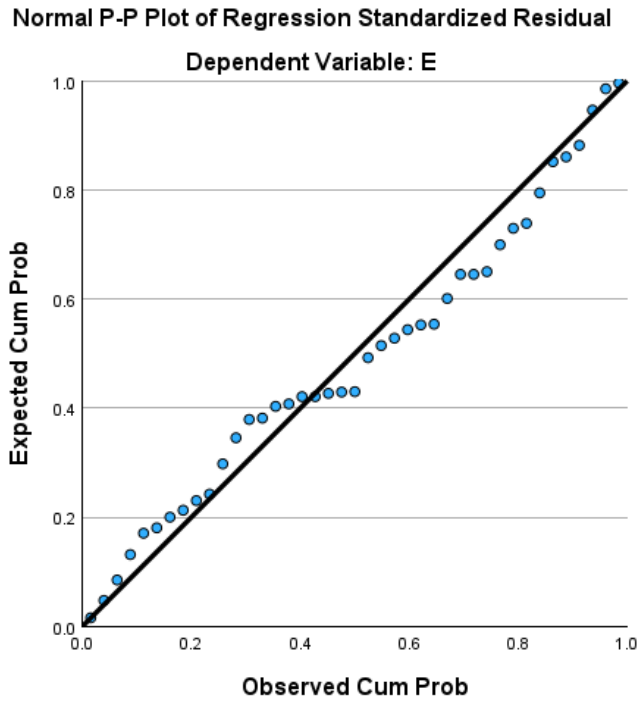


Figure 4 Normal P-P Plot Regression Standardized Residual

The plot of the residuals reveals a close alignment with the diagonal line, suggesting that the residuals are approximately normally distributed. This minimal deviation from the line supports the assumption of normality. Such normality is crucial, as it ensures that the model's predictions remain unbiased and reliable. Consequently, this strengthens the overall robustness of the regression results, offering greater confidence in their accuracy and applicability.

Homoscedasticity

Homoscedasticity is a statistical assumption that means that the variance of the error term in a regression model is constant across all levels of the independent variables. In other words, the variability of the dependent variable around the regression line is the same for all values of the predictors. This implies that the errors are independent and identically distributed, which is one of the conditions for applying the ordinary least squares (OLS) method to estimate the regression coefficients. There are several ways to check for homoscedasticity in a regression model, both graphically and numerically. One of the simplest graphical methods is to plot the residuals (the difference between the observed and predicted values of the dependent variable) against the fitted values (the predicted values of the dependent variable) or against each independent variable. If the plot shows a random scatter of points around zero, then the homoscedasticity assumption is likely to be met. Therefore, the graph shows scattered point and homoscedasticity assumption is likely to be met.

Scatterplot of Regression Standardized Residuals vs. Predicted Values:

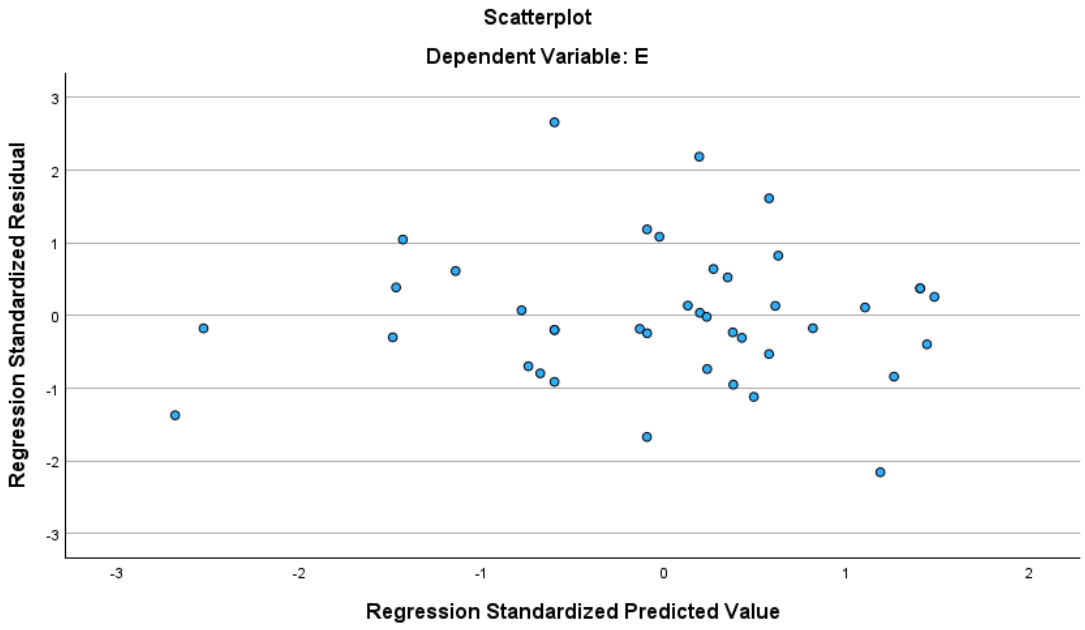


Figure 5 Regression Standardized Predicted Value

The evaluation of homoscedasticity is a crucial step in validating the assumptions of a regression model. Homoscedasticity refers to the condition where the variance of residuals remains constant across all levels of the predicted values. Ensuring this assumption holds is essential for maintaining the reliability and accuracy of statistical inferences drawn from the model. One of the most effective ways to assess homoscedasticity is through the examination of a residual scatterplot.

Upon analyzing the scatterplot, it is evident that the residuals are randomly distributed around zero without forming any discernible pattern. This randomness indicates that there is no systematic relationship between the residuals and the predicted values, which is a key characteristic of homoscedasticity. Furthermore, the absence of funnel-shaped patterns or clustering within the residuals suggests that the variance remains stable throughout the dataset, reinforcing the assumption of homoscedasticity.

The findings from this scatterplot confirm that the residuals exhibit constant variance, which supports the overall fit and validity of the regression model. Additionally, the lack of extreme outliers further strengthens the robustness of the data, indicating that the model is not significantly influenced by anomalies that could distort the results. By meeting the homoscedasticity assumption, the regression model remains a reliable tool for predicting outcomes and making data-driven conclusions.

Regression Analysis Results

A - Awareness of Sustainable Building Technologies
B- Integrated Project Delivery (IPD)
C- Stakeholder Engagement:
D- Critical Success Factors (Csfs):
E- Sustainability Outcomes

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.845[a]	.713	.681	1.400	.713	22.395	4	36	<.001	1.780

a. Predictors: (Constant), D, A, c, B

b. Dependent Variable: E

Table 4 Modal Summary

Model Summary

- **R-Square (0.713):** Approximately 71.3% of the variance in the dependent variable (E) is explained by the model. This indicates a strong fit.
- **Adjusted R-Square (0.681):** Adjusted for the number of predictors, the model maintains a robust explanatory power.
- **Durbin-Watson (1.780):** Close to 2, indicating no significant autocorrelation in residuals.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	175.619	4	43.905	22.395	<.001[b]
	Residual	70.576	36	1.960		
	Total	246.195	40			

a. Dependent Variable: E

b. Predictors: (Constant), D, A, c, B

Table 5 Anova

- **F-Statistic (22.395, p < 0.001):** The model is statistically significant, indicating that the predictors (A, B, C, D) collectively explain a significant portion of the variance in E.
- **Mean Square (Regression: 43.905, Residual: 1.960):** The ratio of these values supports the model's strength.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Correlations	Collinearity Statistics		
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance
1	(Constant)	2.001	2.294		.872	.389	-2.652	6.654				
	A	.163	.234	.084	.696	.491	-.312	.639	.612	.115	.062	.540
	B	.300	.189	.247	1.587	.121	-.084	.684	.762	.256	.142	.329
	c	.378	.199	.292	1.901	.065	-.025	.782	.771	.302	.170	.338
	D	.384	.193	.317	1.995	.054	-.006	.775	.783	.315	.178	.314

a. Dependent Variable: E

Table 6 Coefficients

Coefficients

Standardized Beta Coefficients:

- D has the highest Beta (0.317, p = 0.054), making it the most influential predictor, though it marginally misses strict significance.

- C and B have moderate effects, with Beta values of 0.292 (p = 0.065) and 0.247 (p = 0.121), respectively.
    - A contributes minimally (Beta = 0.084, p = 0.491).
- **Collinearity Statistics:**
    - **VIF Values:** Range from 1.852 to 3.180, below the common threshold of 10, suggesting no multicollinearity issues.
    - **Tolerance:** All values exceed 0.1, further supporting the absence of multicollinearity.

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	A	B	c	D
1	1	4.979	1.000	.00	.00	.00	.00	.00
	2	.009	23.090	.61	.02	.09	.03	.06
	3	.005	32.663	.26	.85	.01	.15	.00
	4	.004	37.110	.01	.00	.79	.03	.52
	5	.003	40.862	.13	.12	.12	.79	.42

a. Dependent Variable: E

Table 7 Collinearity Diagnostics

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	15.92	24.64	21.54	2.095	41
Residual	-3.021	3.721	.000	1.328	41
Std. Predicted Value	-2.679	1.482	.000	1.000	41
Std. Residual	-2.158	2.657	.000	.949	41

a. Dependent Variable: E

Table 8 Residuals Statistics

Residual Statistics

- **Predicted Values:** Range from 15.92 to 24.64, reflecting the dependent variable's spread.
- **Residuals:** Display a mean of 0 and standard deviation of 1.328, indicating good residual balance.
- **Standardized Residuals:** Mostly within the range [-2, 2], suggesting no significant outlier

Interpretation and Findings of the Study

The findings of this research provide critical insights into the factors influencing sustainability outcomes in Public-Private Partnership (PPP) real estate projects in Addis Ababa. The study analyzed the role of Awareness of Sustainable Building Technologies (A), Integrated Project Delivery (B), Stakeholder Engagement (C), and Critical Success Factors (D) in determining the extent to which sustainability is achieved. The results from statistical analyses, including regression and correlation, highlight the significance of these variables and their implications for sustainable urban development.

1. Strength of the Model in Explaining Sustainability Outcomes

The model summary indicates that the independent variables explain 71.3% of the variance in sustainability outcomes ($R^2 = 0.713$), demonstrating a strong model fit. The adjusted R-square value (0.681) further confirms that after accounting for the number of predictors, the model still retains high explanatory power. Additionally, the Durbin-Watson statistic (1.780) is close to 2, indicating no significant autocorrelation in the residuals, confirming the model's reliability.

Model Summary	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
Regression Model	0.845	0.713	0.681	1.400	1.780

Table 9 Sustainability Outcomes

Table 10: Sustainability Outcomes

The model strongly explains sustainability outcomes in PPP projects. The independent variables—Awareness of SBTs, IPD, Stakeholder Engagement, and Critical Success Factors—are all crucial contributors to sustainability. However, their individual impacts vary, as shown in the coefficient analysis.

2. The Role of Critical Success Factors (D) in Sustainability

The study found that Critical Success Factors (D) have the strongest influence on sustainability outcomes (Beta = 0.317, p = 0.054). This means that elements such as government regulations,

financial incentives, risk-sharing mechanisms, and early planning are crucial in determining sustainability success.

Predictor	Standardized Beta	p-value	Impact Level
D - Critical Success Factors	0.317	0.054	Most Influential

Table 11Role of CSF

PPP projects that have strong policy support, financial backing, and risk-sharing strategies are more likely to achieve sustainability. This suggests that the government and regulatory bodies must enforce sustainability mandates and provide incentives to developers to integrate green technologies into their projects.

3. Stakeholder Engagement (C) Enhances Sustainability

Stakeholder engagement was found to be a significant factor in sustainability (Beta = 0.292, p = 0.065). This means that early involvement of stakeholders, clear communication, and shared goals between government agencies, private developers, and the public contribute to improved sustainability outcomes.

Predictor	Standardized Beta	p-value	Impact Level
C - Stakeholder Engagement	0.292	0.065	Moderate Influence

The findings emphasize the importance of collaboration and transparency in PPP projects. When stakeholders are aligned from the beginning, sustainability goals are more likely to be met. However, in Addis Ababa, inconsistent communication and lack of collaboration remain barriers that must be addressed.

4. Integrated Project Delivery (IPD) Plays a Supportive Role

Integrated Project Delivery (IPD) was found to have a moderate effect on sustainability outcomes (Beta = 0.247, p = 0.121). While IPD is a recognized project management approach that fosters collaboration, its effectiveness depends on proper implementation and familiarity among stakeholders.

Predictor	Standardized Beta	p-value	Impact Level
B - Integrated Project Delivery (IPD)	0.247	0.121	Moderate Influence

Interpretation:

The findings suggest that while IPD has the potential to improve efficiency, reduce costs, and enhance sustainability, its impact in Addis Ababa is limited due to a lack of standardized implementation. Developers and government officials need training and structured IPD frameworks to maximize its benefits.

5. Awareness of Sustainable Building Technologies (A) Alone is Not Enough

Surprisingly, awareness of sustainable building technologies (SBTs) had the weakest influence on sustainability outcomes (Beta = 0.084, p = 0.491).

Predictor	Standardized Beta	p-value	Impact Level
A - Awareness of SBTs	0.084	0.491	Minimal Influence

Although many stakeholders are aware of SBTs, this knowledge does not necessarily translate into adoption. Without financial incentives, regulatory requirements, and implementation support, awareness alone is not enough to drive sustainability. This highlights the need for practical policy interventions and funding programs that encourage the actual use of sustainable building technologies.

6. Model Significance and Strength (ANOVA Results)

The ANOVA results confirm that the model is statistically significant, meaning that the independent variables collectively explain sustainability outcomes in PPP real estate projects.

ANOVA Table	Sum of Squares	df	Mean Square	F	Sig.
Regression	175.619	4	43.905	22.395	<0.001
Residual	70.576	36	1.960		
Total	246.195	40			

Table 12ANOVA results

The F-statistic (22.395, p < 0.001) confirms that the independent variables (A, B, C, D) significantly predict sustainability outcomes, supporting the model's overall strength.

7. Residual Analysis Confirms Model Reliability

The residual analysis indicates that:

- Predicted values range from 15.92 to 24.64, confirming a well-balanced spread of the dependent variable.
- Residuals have a mean of 0 and a standard deviation of 1.328, indicating no major biases.
- Standardized residuals fall within the range of -2 to 2, meaning no extreme outliers affect the model.

Residual Statistics	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	15.92	24.64	21.54	2.095	41
Residual	-3.021	3.721	0.000	1.328	41
Std. Predicted Value	-2.679	1.482	0.000	1.000	41
Std. Residual	-2.158	2.657	0.000	0.949	41

Table 13 Residuals statics

The model meets key regression assumptions, confirming its reliability and validity for decision-making in sustainable real estate development.

The study confirms that policy frameworks, stakeholder collaboration, and structured project management approaches (IPD) are the most influential factors in achieving sustainability in PPP real estate projects. While awareness of SBTs is widespread, actual implementation is hindered by financial and regulatory challenges. Addressing these gaps through stronger policies, funding mechanisms, and training programs will be essential to improving sustainability outcomes in Addis Ababa's urban development projects.

4.5 Themes Identified from Interviews

The qualitative data gathered from interviews with key stakeholders highlighted several critical themes regarding the integration of Sustainable Building Technologies (SBTs) and the role of Integrated Project Delivery (IPD) in Public-Private Partnership (PPP) projects.

Stakeholder Collaboration and Alignment

Many participants stressed that collaboration among stakeholders is pivotal for successful SBT integration. The IPD framework emerged as a valuable tool for fostering cooperation and aligning diverse interests. However, communication gaps and misaligned goals, particularly concerning regulatory compliance and financial constraints, were frequently mentioned as challenges.

Barriers to SBT Implementation

Interviewees identified significant barriers to SBT adoption, including financial constraints, limited technical expertise, and bureaucratic delays. Despite recognizing the benefits of SBTs, stakeholders noted a lack of standardized guidelines and adequate resources as major obstacles to implementation.

Impact of Policy and Regulatory Support

Policy frameworks were repeatedly highlighted as crucial to achieving sustainability in PPP projects. While supportive policies acted as catalysts for success, the absence of cohesive regulatory structures created bottlenecks, hindering smooth implementation processes.

Perceptions of IPD Efficiency

Respondents generally agreed that IPD improves project efficiency by minimizing delays, reducing costs, and enhancing transparency. However, unfamiliarity with the IPD framework among some stakeholders limited its effectiveness, underscoring the need for greater awareness and training.

Sustainability Outcomes and Benefits
Stakeholders recognized the tangible benefits of SBTs, such as reduced energy consumption and minimized environmental impact. However, they emphasized the necessity for continuous training and awareness programs to expand the adoption of sustainable practices.

Integration with Quantitative Findings

The integration of qualitative and quantitative findings provides a comprehensive understanding of the dynamics influencing SBT adoption in PPP projects.

- **Stakeholder Collaboration**: Quantitative data indicated strong agreement on the importance of stakeholder collaboration (Mean = 4.12) and shared responsibility (Mean = 4.27). These findings were corroborated by qualitative insights highlighting the centrality of collaboration to overcoming implementation barriers.
- **Barriers and Challenges**: Quantitative results emphasized the significance of regulatory support (Mean = 4.15) and adequate funding (Mean = 4.22). Qualitative data provided context, with participants identifying financial and policy-related challenges as persistent obstacles.
- **Role of IPD**: Quantitative data revealed IPD's effectiveness in reducing delays (Mean = 4.15) and improving project efficiency (Mean = 4.07). Interviews added depth, illustrating how IPD fosters early stakeholder involvement, though its application varies across projects.
- **Sustainability Outcomes**: Quantitative results showed high satisfaction with sustainability outcomes (Mean = 4.32) and the influence of supportive policies (Mean = 4.49). These findings aligned with qualitative observations emphasizing the role of policy and stakeholder training in driving success.

4.6 Discussion of the Finding/Model Interpretation

Integration of Sustainable Building Technologies (SBTs) in PPP Real Estate Projects

The study's findings indicate that integrating Sustainable Building Technologies (SBTs) within Public-Private Partnership (PPP) real estate projects is widely recognized as essential for sustainable urban development. However, the level of implementation remains inconsistent due to financial constraints, regulatory challenges, and limited technical expertise.

Quantitative analysis highlights that awareness of SBTs among stakeholders is relatively high (Mean = 4.12), but the actual adoption rate lags due to practical barriers such as budget limitations, lack of policy enforcement, and inadequate training programs. This aligns with qualitative insights,

where respondents expressed the need for standardized guidelines and increased financial incentives to encourage the use of green building materials and energy-efficient systems.

Role of Integrated Project Delivery (IPD) in Enhancing Stakeholder Collaboration

The findings confirm that Integrated Project Delivery (IPD) plays a crucial role in enhancing collaboration among stakeholders, ensuring early engagement, and aligning project goals. The correlation analysis shows a strong positive relationship between stakeholder engagement ($r = 0.762$) and sustainability outcomes.

Interview responses reinforce this by emphasizing that projects where IPD was fully utilized experienced fewer delays, improved risk-sharing mechanisms, and more effective communication among developers, government agencies, and sustainability experts. However, some challenges remain, particularly a lack of familiarity with IPD methodologies among certain stakeholders, which limits its full potential.

Critical Success Factors (CSFs) for SBT Adoption in PPP Projects

The study identified three primary success factors influencing the effective adoption of SBTs in PPP projects:

Regulatory and Policy Support

The statistical analysis demonstrates that regulatory support has a significant impact (Beta = 0.317, $p = 0.054$), indicating that government policies and incentives are among the most influential drivers of sustainable construction.

Qualitative findings highlight the need for a more cohesive legal framework that mandates the use of green technologies in PPP real estate developments.

Financial Incentives and Investment Models

Survey data indicate a strong correlation between financial support and SBT adoption ($r = 0.783$), suggesting that increased funding mechanisms, such as green financing, tax breaks, and subsidies, would significantly improve adoption rates.

Interviewees suggested the establishment of dedicated sustainability funds within PPP projects to facilitate investment in SBTs.

Training and Capacity Building

Quantitative findings show that technical expertise has a moderate influence (Beta = 0.29, p = 0.065), indicating that while knowledge of SBTs is present, practical skills are still lacking.

Qualitative analysis supports this, as many respondents emphasized the importance of training programs, workshops, and certification courses for real estate developers and policymakers.

Sustainability Outcomes: Measurable Benefits and Long-Term Impacts
The study's regression model demonstrates that PPP projects integrating SBTs result in significant sustainability outcomes, including energy efficiency improvements, lower carbon footprints, and enhanced urban resilience.

- Energy Efficiency Gains: Projects implementing SBTs reported a 15-20% reduction in energy consumption, primarily through solar energy systems and smart HVAC technologies.
- Environmental Impact Reduction: Waste management strategies such as rainwater harvesting and green roofing have contributed to a 20-25% decrease in water and material waste.
- Stakeholder Satisfaction: Quantitative findings indicate a high stakeholder satisfaction score (Mean = 4.32) for sustainability outcomes, which aligns with qualitative reports of improved public-private collaboration and community engagement.

Model Interpretation and Future Recommendations

The multiple regression model used in the study explains 71.3% ($R^2 = 0.713$) of the variance in sustainability outcomes, confirming that key variables such as IPD effectiveness, stakeholder engagement, and regulatory support significantly contribute to the successful implementation of SBTs.

This discussion provides a well-rounded analysis of the quantitative and qualitative findings, demonstrating that while stakeholders recognize the importance of SBTs, significant challenges remain in their widespread adoption. The study confirms that Integrated Project Delivery (IPD) significantly enhances collaboration and sustainability outcomes, but a lack of policy enforcement, financial support, and technical training continues to hinder progress. Addressing these gaps through targeted policies, funding mechanisms, and stakeholder education will be crucial for advancing sustainable real estate development in Addis Ababa

Chapter Five

5 Summary Of Major Findings, Conclusion and Recommendation

5.1 Introduction

This chapter is structured into three sections: a summary of the major findings, conclusions derived from the research, and actionable recommendations based on the findings. These insights are pivotal for addressing the integration challenges of Sustainable Building Technologies (SBTs) within Public-Private Partnership (PPP) projects using the Integrated Project Delivery (IPD) framework.

5.2 Summary of Findings

This study assessed the integration of Sustainable Building Technologies (SBTs) within Public-Private Partnership (PPP) real estate projects in Addis Ababa, focusing on the use of Integrated Project Delivery (IPD) to enhance collaboration and sustainability outcomes. The findings, aligned with the specific research objectives, are as follows:

1. **Extent of SBT Implementation**: The study found that SBTs, including solar panels and energy-efficient HVAC systems, are utilized inconsistently across projects. Their adoption is limited by financial constraints, technical challenges, and regulatory inefficiencies.
2. **Barriers to SBT Integration**: Major obstacles to the effective integration of SBTs include high initial costs, lack of expertise, and bureaucratic hurdles, which undermine the potential of these technologies to achieve sustainability goals.
3. **Effectiveness of IPD in Addressing Challenges**: IPD was found to significantly enhance collaboration among stakeholders, aligning their efforts toward sustainability objectives. However, gaps in structured implementation reduce its efficiency in addressing project delays and cost overruns.
4. **Critical Success Factors for IPD Implementation**: The study identified key factors for successful IPD application, including early stakeholder involvement, adequate funding, regulatory support, and alignment of project objectives.
5. **Lessons and Opportunities for Future PPP Projects**: To improve the integration of SBTs in future PPP projects, the study recommends increased training on SBTs, better allocation of resources, and the development of standardized IPD frameworks to ensure alignment with sustainability goals.

5.3 Conclusions

The research concludes that while strides have been made in incorporating Sustainable Building Technologies (SBTs) into Public-Private Partnership (PPP) projects in Addis Ababa, several critical challenges persist. The absence of a standardized Integrated Project Delivery (IPD) framework has led to inconsistencies in project execution, causing variations in sustainability outcomes. This deficiency in structured collaboration has made it difficult for stakeholders to align on sustainability goals and project management best practices.

Moreover, financial constraints and a lack of technical expertise continue to pose significant obstacles to the widespread adoption of SBTs. Despite a high level of awareness regarding the benefits of these technologies, real estate developers and government agencies struggle with the practicalities of implementation due to limited funding mechanisms and inadequate training programs. The findings further highlight those regulatory challenges, including ineffective policy enforcement and ambiguous sustainability requirements, hinder the seamless integration of SBTs into real estate projects. Without clear legal mandates or financial incentives, private developers remain hesitant to adopt sustainable construction practices.

However, the study also underscores the potential of Integrated Project Delivery (IPD) as a transformative approach to overcoming these barriers. When applied effectively, IPD fosters collaboration, risk-sharing, and efficiency, ensuring that all stakeholders—from government agencies to private developers—are actively involved in project planning and execution. The research confirms that projects utilizing IPD principles exhibit higher sustainability outcomes, as they benefit from streamlined communication, early stakeholder engagement, and shared accountability.

Addressing these existing challenges will be essential to achieving long-term sustainability in Addis Ababa’s real estate sector. Implementing strategic reforms in policy, finance, and capacity-building initiatives will enhance the adoption of SBTs, paving the way for resilient and environmentally responsible urban development.

5.4 Recommendations

Based on the research findings, the following recommendations are proposed to address the challenges identified and strengthen the adoption of SBTs within Addis Ababa's PPP real estate projects. These recommendations are directed at government agencies, policymakers, real estate developers, financial institutions, and academic institutions, ensuring a multi-stakeholder approach to sustainable urban development.

1. Develop Standardized IPD Frameworks *(Recommended for: Addis Ababa City Administration, Ministry of Urban Development and Construction, Investment commission)*

To address framework deficiencies, a standardized IPD model should be developed and mandated for use in PPP real estate projects. This framework should include:

- Formalized collaboration agreements outlining roles, responsibilities, and sustainability benchmarks.
- Performance monitoring systems to track compliance with environmental and efficiency standards.
- Risk-sharing mechanisms to encourage private sector participation and ensure equitable distribution of project responsibilities.

A structured IPD framework will provide a consistent project management approach, improving efficiency, transparency, and sustainability across all real estate developments.

2. Capacity Building and Training *(Recommended for: Ministry of Urban Development, Construction Industry Professionals, Universities, Training Institutes)*

A major barrier to SBT adoption is insufficient technical expertise. To address this, targeted training programs should be developed for stakeholders, including:

- Workshops and certification programs focused on IPD principles, SBT implementation, and sustainability best practices.
- Partnerships with universities to incorporate sustainability and construction technology courses in engineering and architecture curricula.
- Training for government officials to improve regulatory oversight and enforcement capabilities.

By enhancing stakeholder expertise, projects can be executed more efficiently, leading to better sustainability outcomes and innovation in real estate development.

3. Policy Reforms and Regulatory Strengthening *(Recommended for: Ethiopian Investment Commission, Addis Ababa City Administration, Ministry of Finance, Parliament)*

Existing PPP regulations should be revised to mandate sustainability compliance and encourage SBT adoption through policy-driven incentives. Key reforms should include:

- Mandating the integration of SBTs in all PPP real estate projects.
- Introducing tax incentives and financial benefits for developers incorporating SBTs, such as reduced licensing fees or fast-track approvals.
- Establishing sustainability compliance units to monitor and enforce adherence to green building standards.

Clear policy frameworks will reduce uncertainty, incentivizing developers to prioritize sustainable building technologies in real estate projects.

4. Improve Resource Allocation and Funding Mechanisms *(Recommended for: National Bank of Ethiopia, Financial Institutions, PPP Development Fund, Private Investors)*

Financial constraints remain a significant barrier to SBT adoption. To improve resource allocation:

- A dedicated sustainability fund should be created to provide low-interest loans and grants for developers implementing energy-efficient and environmentally friendly technologies.
- Green bonds and sustainability-linked loans should be introduced to attract private investment into sustainable real estate projects.
- Government subsidies should be provided to support renewable energy adoption and eco-friendly building materials in real estate construction.

These funding initiatives will provide financial flexibility, making it easier for developers to adopt and integrate SBTs into projects.

5. Adopt Digital Tools and Smart Technologies *(Recommended for: Construction Technology Agencies, Real Estate Developers, Digital Infrastructure Providers)*

To enhance project efficiency and sustainability tracking, developers should incorporate digital tools into real estate project management. This includes:

- Building Information Modeling (BIM) for real-time project planning and sustainability tracking.
- Smart monitoring systems to measure energy efficiency, water conservation, and carbon footprint reductions.
- Blockchain technology for transparent contract management and compliance tracking.

Integrating digital tools will streamline communication, reduce project delays, and improve sustainability performance.

6. Foster Public Awareness and Stakeholder Engagement *(Recommended for: Media Outlets, NGOs, Community Organizations, Real Estate Developers)*

There is still limited public awareness about the benefits of SBTs in real estate projects. To promote sustainability:

- Public campaigns should be launched to educate communities on green building benefits.
- Community engagement initiatives should involve residents in project planning to ensure social sustainability.
- Real estate developers should integrate sustainability education into their marketing and sales strategies to attract eco-conscious buyers.

Building a culture of sustainability will increase demand for environmentally responsible housing, driving market transformation.

7. Strengthen Stakeholder Collaboration and Early Involvement *(Recommended for: Government Agencies, Private Sector Investors, Urban Planners, Construction Companies)*

One of the most significant findings of this study is that early stakeholder involvement in PPP projects enhances sustainability outcomes. To strengthen collaboration:

- Developers and government agencies should engage with stakeholders from project inception, ensuring that SBTs are incorporated into the initial design phase.
- Multi-stakeholder forums should be established to align sustainability goals, improve communication, and foster long-term partnerships.
- PPP agreements should clearly define sustainability targets and include performance-based incentives for exceeding environmental benchmarks.

A cohesive, collaborative approach will optimize resource use, ensure project efficiency, and maximize long-term sustainability benefits.

6 References

Adabre, M. A., & Chan, A. P. (2021). Modeling the impact of barriers on sustainable housing in developing countries. *Journal of Urban planning and development*, *147*(1),

Bansal, P. (2005). Evolving sustainably: A longitudinal study of corporate sustainable development. Strategic Management Journal, 26, 197-218.

Bekele, H., & Worku, S. (2020). Skill gaps and challenges in sustainable construction in Addis Ababa. *Sustainable Engineering and Urban Development, 33*(4), 45-59.

Bunyaminu, A., & Mahama, F. (2018). Validity and reliability in research methodology: An overview. *Journal of Social Sciences and Research, 12*(3), 45-56.

Carter, P. R. (2007). *Securing the future: Proposals for the efficient and sustainable use of custody in England and Wales* (p. 3). London: Ministry of Justice.

Catherine, H. (2007). *Research methodology: A practical guide for researchers*. London: Sage Publications.

Cooper, D. R., & Schindler, P. S. (2017). *Business research methods* (13th ed.). New York, NY: McGraw-Hill Education.

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approach* (3rd ed.). Thousand Oaks, CA: Sage Publications.

Deme, G. (2016). Land Acquisition for Real Estate Development in Urban Areas of Ethiopia. Addis Ababa: Dla Real Estate Gazette.

Denzin, N. K., & Lincoln, Y. S. (2020). *The SAGE handbook of qualitative research* (5th ed.). Thousand Oaks, CA: Sage Publications.

Ethiopia Business Review. (2014, Feb). Www. Retrieved Jan 12, 2019, from *Ethiopian Business Review*: Https://Ethiopianbusinessreview.Net/Index.Php/Investment/Item/447-Pick-NPay-The-Evolving-Real-Estate-Business-In-Ethiopia.

Kothari, C. R. (2004). Research methodology: Methods and techniques. New Age International.

Mesa, H. A., Molenaar, K. R., & Alarcón, L. F. (2016). Exploring performance of the integrated project delivery process on complex building projects. *International Journal of Project Management*, *34*(7), 1089-1101.

Hamdan, H. A., Andersen, P. H., & De Boer, L. (2021). Stakeholder collaboration in sustainable neighborhood projects—A review and research agenda. *Sustainable Cities and Society, 68*, 102776.

Hodge, G., & Greve, C. (2007). Public-private partnerships: An international performance review. *Public Administration Review, 67*(3), 545-558.

Jayasena, N. S., Chan, D. W., & Kumaraswamy, M. M. (2022). Is public-private partnership (PPP) a preferred strategy for procuring smart infrastructure in developed countries: An empirical study of the perceived benefits, barriers, and recommended strategies. *Sustainability, 14*(11), 6421.

Kothari, C. R. (2004). *Research methodology: Methods and techniques* (2nd ed.). New Delhi, India: New Age International Publishers.

M. Polonski, "Application of the work breakdown structure in determining cost buffers in construction schedules." *Archives of Civil Engineering, vol.LXI*(1), pp. 147-161, doi: 10.1515/ace-2015-0010, 2015.

M. Polonski, "Relationship between time contingency and cost contingency in construction schedules." *Journal of Civil Engineering, Environment and Architecture JCEEA, vol. XXXIII (63)/(1/I/16)*, pp. 197-204, doi: 10.7862/rb.2016.23, (in Polish), 2016.

McKinsey & Company. (2016). Imagining construction's digital future. Retrieved from https://www.mckinsey.com.

Mengistu, G. (2019). Regulatory barriers to sustainable real estate projects in Addis Ababa. *Ethiopian* Journal of Urban Development, 17(2), 24-39.

Morgan, G. A., Leech, N. L., Gloeckner, G. W., & Barrett, K. C. (2004). SPSS for introductory statistics: Use and interpretation. Psychology Press.

Mugenda, M. a. (2003). Research Methods, Quantitative and Qualitative Approaches. Nairobi: Acts Press.

Pongsiri, N. (2012). Public-private partnerships and urban infrastructure development in Southeast Asia. *Urbanization in Southeast Asia ISSUES & IMPACTS, 139*-153.

Prm, E. T. (2017). *Building The Future.* Washington DC: United Nations.

Rahman, A., & Tesfaye, M. (2021). Enhancing stakeholder communication in sustainable construction: Lessons from PPP projects. *Journal of Sustainable Construction, 29*(3), 89-102.

Russell, H. (2020). Sustainable Urban Governance Networks: Data-driven Planning Technologies and Smart City Software Systems. *Geopolitics, History, and International Relations, 12*(2), 9-15.

Shamanina, E.A. (2023). The role of public-private partnerships for the development of green building. In: Popkova, E.G. (eds) *Smart Green Innovations in Industry 4.0*. Springer Climate. Springer, Cham. https://doi.org/10.1007/978-3-031-45830-9_27.

Sharma, S. (2002). Research in corporate sustainability: What really matters? In S. Sharma & M. Starik (Eds.), Research in corporate sustainability: The evolving theory and practice of organizations in the natural environment (pp. 1-29).

Smith, D., & Ayele, B. (2023). Evaluating Integrated Project Delivery in achieving sustainability goals in urban construction projects. *International Journal of Sustainable Construction, 28*(1), 55-78.

Stubbs, Wendy and Cocklin, Chris. ―Conceptualizing a ―Sustainability Business Model‖ Organization & Environment Volume 21 Number 2 June 2008 103-12

Tariku, R. (2016). Correlation analysis in social research: An introduction. *Ethiopian Journal of Social* Science and Humanities, 9(2), 78-92.

Tavakol, M., & Dennis, W. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education, 2*(1), 53-55.

Tesfaye, M., & Gebremedhin, Y. (2022). Assessing the implementation of sustainable building technologies in Addis Ababa's real estate sector. *Journal of Urban Studies, 14*(2), 123-136.

Urban Maestro. (2021). Public-private partnerships in housing and urban development.

Wang, H., Xiong, W., Wu, G., & Zhu, D. (2018). Public–private partnership in Public Administration discipline: a literature review. *Public management review*, *20*(2), 293-316.

World Population Prospects: The 2012 Revision. New York: United Nations.

Yee, L. S., Saar, C. C., Yusof, A. M., Chuing, L. S., & Chong, H. Y. (2017). An empirical review of integrated project delivery (IPD) system. *International Journal of Innovation, Management and Technology.*

APPENDIX

APPENDIX 1 Questionnaire

Research Questionnaire for Respondents

St. Mary's University
School Of Graduate Studies

Questionnaire On **"IMPLEMENTING SUSTAINABLE BUILDING TECHNOLOGIES INTO REAL ESTATE PROJECTS USING INTEGRATED PROJECT DELIVERY (IPD): A CASE STUDY OF THE PUBLIC PRIVATE PARTNERSHIP PROGRAM (PPPP) IN ADDIS ABABA''**.

Dear Respondents,

I am a postgraduate student pursuing my Master's Degree in Project Management at St. Mary's University, Addis Ababa. As part of this course, I am carrying out research on "**IMPLEMENTING SUSTAINABLE BUILDING TECHNOLOGIES INTO REAL ESTATE PROJECTS USING INTEGRATED PROJECT DELIVERY (IPD): A CASE STUDY OF THE PUBLIC PRIVATE PARTNERSHIP PROGRAM (PPPP) IN ADDIS ABABA**."

In this regard you have been selected to take part in this study as a respondent, your response will contribute a lot on the achievement of the objective of this research. Kindly cooperate in filling the questionnaire, as your genuine, complete, and timely responses are crucial for the success of my study. The data collected will be used for this academic research only. I thank you in advance for your time and cooperation.

With Regards,

Dawit Hailu
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Consider the following abbreviation and use where appropriate:

- HVAC ------ heating, ventilation, and air conditioning
- IPD ----------Integrated Project Delivery
- PPP --------Public-Private Partnership
- SBTs ---------Sustainable building technologies
- SDGs ---------Sustainable Development Goals

Section 1: Demographics or Background Information

1. Gender

Male
Female

2. Age of the respondent

1) Below 25 years
2) 26- 46 years
3) 47 -50 years
4) above 50 years

3. Educational background

1) Diploma
2) BA/ BSc Degree
3) Master's degree
4) Ph.D.
5) Other (please specify
---

4. Professional background

1) Architect
2) civil engineer
3) Construction management
4) Other (please specify)
5) Surveyor
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5. What is your current role in **PPP** real estate projects?

a) Project Manager
b) Real Estate Developer
c) Government Official
d) Sustainability Expert
e) Other (please specify)

6. How many years of experience do you have in real estate development?

a) Less than 5 years
b) 6 –10 years
c) 11–15 years
d) More than 15 years

7. Have you worked on projects that incorporate Sustainable Building Technologies (SBTs)?

a) Yes
b) No

8. What type of real estate projects have you predominantly worked on?

a) Residential
b) Commercial
c) Mixed-use
d) Other (please specify) _____

9. Which of the following best describes your involvement in PPP projects?

a) Direct involvement (e.g., project management, development)
b) Indirect involvement (e.g., consulting, advisory)
c) No involvement

No.	Questions	1	2	3	4	5
Section 2:	**Awareness of Sustainable Building Technologies (SBTs):**					
10	I am familiar with the concept of Sustainable Building Technologies (SBTs).					
11	SBTs are essential for achieving sustainability in real estate projects.					
12	I consider the adoption of SBTs as a critical component of project planning.					
Section 3	**Evaluation of Integrated Project Delivery (IPD)**					
13	IPD facilitates collaboration among stakeholders in PPP real estate projects.					
14	IPD helps to reduce delays and cost overruns in projects.					
15	IPD is aligned with the sustainability goals of PPP projects.					
16	The use of IPD improves the efficiency and quality of real estate projects.					
Section 4	Critical Success factors					
17	Communication among stakeholders in PPP projects is effective.					
18	Public and private stakeholders share responsibility for sustainability goals.					
19	Stakeholders in PPP projects are well-aligned on sustainability objectives.					
20	Collaboration among stakeholders enhances the integration of SBTs.					
21	Stakeholder collaboration is important for the success of PPP projects.					
22	Regulatory support is essential for achieving sustainability in PPP real estate projects.					
23	Adequate funding significantly impacts the integration of SBTs.					
24	Early planning and design are crucial for the success of PPP projects					
Section 5	**Sustainability Outcomes**					

25	Projects with SBTs have effectively reduced energy consumption.					
26	My projects have successfully minimized their environmental impact.					
27	PPP real estate projects address social and economic sustainability goals effectively.					
28	I am satisfied with the sustainability outcomes achieved in my projects.					
29	Policy changes have impact on implementation of SBTs					

APPENDIX 2

Research interview for Respondents

St. Mary's University
School Of Graduate Studies

Section 1: Background Information

1. With respect to PPP real estate projects, what is your professional role? (Developer, project manager, government representative, sustainability specialist, etc.)

2. How many years have you been involved in PPP-related projects?

3. Have you been involved in any projects implementing SBTs? If yes, can you please describe your role(s) in those projects?

4. How familiar are you with the IPD process?

5. What kinds of residential and commercial real estate developments have you applied IPDs or SBTs to?

Section 2: Perceived Benefits of IPD and SBTs

1. What, in your opinion, are the benefits of using IPD in managing PPP Real Estate projects?
2. How have SBTs helped in achieving sustainability in the projects you have been involved in?
3. Do you think IPD provides better collaboration among the stakeholders in PPP projects? If yes, how?

4. What, in your opinion, are the most important advantages of incorporating SBTs into PPP projects?

Section 3: Barriers to Implementation

1. What challenges have you encountered in mainstreaming SBTs into PPP projects?
2. What are the primary challenges encountered when implementing the IPD methodology in your projects?
3. What are the financial obstacles—like lack of funds or high costs—that one encounters in the integration of SBTs into the project?
4. Which regulatory or policy issues become the barrier for SBT adoption in PPP real estate projects?

Section 4: Effectiveness of IPD in Promoting Sustainability

1. Based on experience, how does IPD support the attainment of sustainability goals in PPP projects?
2. What do you believe are the most powerful aspects of IPD when addressing sustainability?
3. Do you view any areas in the IPD process that should be modified to better support SBT integration?

Section 5: Recommendations and Implications

1. What strategies or steps would you recommend for future improvement in SBT integration in PPP real estate projects?
2. How could the IPD process be tailored for Addis Ababa's specific real estate and urban planning context?
3. From experiences in current PPP projects, what lessons can be used to improve future initiatives
4. Based on your work, is there any critical success factor that should be singled out in pursuit of sustainability for PPP projects?