EFFECT OF SMART ENERGY MANAGEMENT SYSTEM ADOPTION ON PERFORMANCE OF ECONOMY HOTELS IN NAIROBI CITY - COUNTY, KENYA

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THARAKA UNIVERSITY

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DECLARATION AND RECOMMENDATIONS

Declaration

This thesis is my original work and has not been presented for an award of diploma or conferment of degree in any other university.

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DEDICATION

This work is dedicated to my parents Dr. Joseph Muriungi Kirugua and Lilian Kagendo and sister Ruth Karendi.

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ABSTRACT

The hospitality industry faces substantial energy management challenges, particularly in economy hotels, where operational costs and energy expenses are critical concerns. Inefficient energy use in these hotels leads to increase in cost as well as negatively affects guest satisfaction. Utilizing modern technologies like Internet of Things (IoT) devices and smart sensors, smart energy management systems present a viable way to maximize energy use, cut expenses, and improve operational effectiveness. However, there is limited literature on the adoption of Smart Energy Management Systems in economy hotels in Kenya. Moreover, little is known about the impact of Smart Energy Management Systems adoption on the performance of these hotels. This study, therefore, sought to investigate the effect of Smart Energy Management Systems adoption on the performance of economy hotels in Nairobi City County. The study aimed to; assess the adoption levels of Smart Energy Management Systems, examine the effects of Smart Energy Management Systems on hotel financial performance, evaluate the impact of Smart Energy Management Systems on hotel business processes, analyze the effects of Smart Energy Management Systems on customer satisfaction, and identify factors influencing Smart Energy Management Systems adoption. A descriptive research design was used to describe adoption levels and identify barriers to Smart Energy Management Systems adoption, while a correlational research design assessed the effects of Smart Energy Management Systems adoption on hotel performance. The target population for this study consisted of 83 economy hotels in Nairobi City County, with a sample size of 25 hotels. Respondents included 25 hotel managers and 385 guests. Simple random sampling was applied to select economy hotels, purposive sampling in selecting hotel managers and convenience sampling for hotel guests. The study adopted survey questionnaires as the primary sources of data. Research instruments were validated for content validity by supervisors. Reliability testing using Cronbach's Alpha yielded a coefficient of 0.816, indicating high reliability. Data were analyzed using descriptive statistics including frequencies, percentages, means, and standard deviation, and inferential statistics involving simple linear regression. Results revealed that Smart Energy Management Systems adoption in economy hotels was significantly low, with an average adoption rate of 2.500, suggesting that many hotels have not formalized the integration of ISO 50001 guidelines into their energy policies. Regression analysis indicated that Smart Energy Management Systems adoption explained 28% of the variance in financial performance, with the remaining 72% attributed to other factors, such as operational strategies and market conditions. Furthermore, the analysis showed that Smart Energy Management Systems adoption explained only 3.7% of the variance in internal business processes, suggesting limited influence on these processes. The findings also revealed an inverse relationship between Smart Energy Management Systems adoption and customer satisfaction, with a negative regression coefficient (-0.382), indicating that for every unit increase in Smart Energy Management Systems adoption, customer satisfaction decreased by 0.382 units. The study recommends that economy hotel should focus on improving Smart Energy Management Systems implementation to maximize its potential benefits. Additionally, policymakers need to develop effective energy management policies to support Smart Energy Management Systems adoption. The study also suggests further research on SEMS adoption across different hotel categories to enhance comparisons and informed decision-making.

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LIST OF ABBREVIATIONS AND ACRONYMS

ANOVA	Analysis of Variance
ASYMP	Assumptions
BSC	Balance Scorecard
DF	Degrees of Freedom
EM	Energy Management
EMS	Energy Management Systems
EMM50001	Energy Management Model 50001
ISERC	Institutional Scientific Research Ethic Committee
SEMS	Smart Energy Management System
SIG	Significance
TRA	Tourism Regulatory Authority
UK	United Kingdom
US	United States

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Hospitality industry is a major contributor to the global economy, providing jobs, generating revenue, and fostering cultural exchange (Khan et al., 2020). Within this industry, managing energy is essential for achieving operational efficiency, reducing costs, and enhancing customer satisfaction (Filimonau et al., 2021; Seraj et al., 2023).

Hotels across various categories are increasingly focused on reducing energy consumption as a strategic approach to lower operational costs, meet regulatory or voluntary sustainability targets, and improve performance. Economy hotels, in particular, aim to offer quality accommodations at competitive prices. However, these hotels often encounter high operational expenses, with energy costs representing a significant financial burden (Gennitsaris et al., 2023). Therefore, efficient cost management is critical for maintaining financial success and competitive advantage in the market (Chi et al., 2020). Moreover, due to narrow profit margins, economy hotels are especially compelled to manage expenses closely (Osinaike, 2021).

Energy-related costs including heating, cooling, lighting, and appliance use, constitute a substantial portion of operational expenditures (Filimonau & Magklaropoulou, 2020; Pang et al., 2020; Salehi et al., 2021). Inefficiencies in energy systems not only drive up energy costs but also negatively affects the hotels' sustainability performance (Salehi et al., 2021). Research further estimates that up to 90% of energy systems may operate inefficiently, often leading to frequent maintenance issues and operational disruptions, which ultimately disrupts guest experience (Pang et al., 2020; Salehi et al., 2021). Further, unreliable energy systems compromise the overall reliability and efficiency of hotel services, affecting the smooth functioning of housekeeping, food service, and front desk operations.

Moreover, high-energy costs lead to increased operational expenses, forcing hotels to reduce guest amenities or services to maintain profitability (Gennitsaris et al., 2023). This directly affects customer satisfaction as guests experience discomfort due to inadequate heating, cooling, or lighting, or encounter inconvenience from malfunctioning equipment. As a result, leading to negative reviews and decreased customer loyalty. Therefore, need for economy hotels to optimize their energy consumption without compromising guest comfort and service quality (Gennitsaris et al., 2023).

Energy Management Systems (EMS) offer a viable approach to addressing the energy management challenges encountered by economy hotels (Filimonau & Magklaropoulou, 2020). The term "smart" refers to innovative solutions that harness advanced technology to enhance functionality and efficiency (Wang et al., 2018). Smart Energy Management Systems (SEMS) utilize advanced technologies, including smart sensors, Internet of Things (IoT) devices, and sophisticated analytics, to track and control energy consumption in real time (Tiwari et al., 2022). These systems enable hotels to automate energy-consuming processes, predict maintenance needs, and optimize the performance of energy-intensive equipment (Gennitsaris et al., 2023). By doing so, SEMS can substantially minimize energy consumption, lower operational costs, and enhance overall efficiency (Filimonau & Magklaropoulou, 2020).

The global hospitality sector is increasingly embracing advanced energy management technologies to improve sustainability and reduce costs (Singh et al., 2024). Studies conducted in U.S. hotels revealed that hotels are adopting smart energy management systems as a strategy to reduce energy costs and enhance sustainability (Walker & Jones, 2019; Singh et al., 2022). Kumar and Raghavan (2019) suggested that innovate technologies such as smart energy management offer a possible solution lowering energy consumption and operational expenses.

SEMS offer real-time data on energy consumption, enabling prompt adjustments and long-term strategic planning (Filimonau & Magklaropoulou, 2020). The integration of SEMS aligns with global trends toward sustainability, cost efficiency, and enhanced guest experiences (Sun & Nasrullah, 2024). Studies conducted in the UK and Iran have shown that through the implementation of SEMS, hotels can achieve substantial energy savings by up to 14%, reduce their carbon footprint, and gain a competitive advantage in the marketplace (Gunarathne & Lee, 2021; Kuo et al., 2021). Further, sustainability reports indicate that international hotel chains such as Marriott International, Intercontinental Hotel Group and Wyndam Destinations have realised significant reduction in energy costs, and improved environmental performance as a result of implementing smart energy management systems (Ahmed et al., 2020).

Despite the advancements in SEMS, significant gaps persist in the literature regarding their application in the hospitality sector. While past research exclusively focused on SEMS in international hotel chains, there is a lack of targeted studies investigating their adoption and effectiveness in economy hotels, limiting the generalizability of findings (Ahmed et al., 2020; Kuo et al., 2021). Additionally, the specific impacts of IoT and data analytics on energy efficiency and operational costs within the context of economy hotels remain underexplored. Moreover, the role of automation in regulating energy-consuming devices in smaller establishments has not been adequately addressed. Thus, there is a pressing need for further research examining the unique challenges and opportunities for SEMS adoption in economy hotels.

Assessing adoption levels of SEMS is a major challenge in the hospitality. However, various tools such as International Organization for Standardization (ISO) can be used to overcome the challenge. ISO 50001 serves as a foundational standard guiding organization in the development and implementation of energy policies, the establishment of objectives, targets, and action plans for energy efficiency, and the conduct of periodic reviews to evaluate performance and ensure continual improvement (ISO, 2018). This standard provides an internationally recognized framework for establishing, implementing, maintaining, and improving energy management systems (EMS), enabling organizations effectively manage energy use, reduce costs, and enhance sustainability (ISO).

ISO 50001 has gained prominence as a standardized framework for assessing and enhancing the adoption of energy management practices within the hospitality industry. This standard provides structured guidance for developing energy policies, establishing objectives, and evaluating energy performance through periodic reviews (ISO, 2018). ISO 50001 assists hotels in systematically integrating energy management practices, identifying cost-saving opportunities, and optimizing energy usage, ultimately contributing to regulatory compliance and sustainable operations (Filimonau &

Magklaropoulou, 2020; Tiwari et al., 2022). This approach not only helps in achieving regulatory compliance and meeting sustainability goals but also enhances operational efficiency and cost-effectiveness (Sun & Nasrullah, 2024).

Nairobi City- County, Kenya, boasts a burgeoning hospitality industry that significantly contributes to the region's economic development (Ndiba & Mbugua, 2018). The county's economy hotels cater to a diverse clientele, including international tourists and local travellers (Osiako & Szente, 2021). These hotels face the dual challenge of maintaining affordability while managing rising operational costs (Nguku et al., 2022). Energy consumption is a major operational expense, and inefficient energy use can erode profitability (Magro & Borg, 2023). SEMS provide a practical solution by enabling hotels to monitor and control energy usage effectively, thereby reducing costs and supporting environmental sustainability initiatives (Ogola et al., 2023). This not only enhances the competitive edge of economy hotels but also aligns with national sustainability goals. Therefore, this study aimed to assess the adoption levels, impacts, facilitators, and barriers of smart energy management systems adoption in economy hotels within Nairobi City County.

1.2 Statement of the Problem

One of the prominent challenges facing the hotel industry is energy optimization in operations. While economy hotels aim to provide quality accommodation at affordable prices, they often encounter high operational costs, with energy expenses accounting for approximately 50% of total expenditures, representing a significant burden. These increased costs further intensify financial strain, resulting in reduced profit margins. Additionally, 90% of energy systems in these hotels are inefficient thus, leading to abrupt equipment breakdowns and frequent maintenance issues, disrupting daily operations and increasing on operational costs. Consequently, the rising operational expenses have compelled economy hotels to cut back on guest amenities and services to maintain profitability. This, in turn, compromises guest comfort, as evidenced by the rising number of negative reviews. Despite the potential of Smart Energy Management Systems (SEMS) to reduce energy consumption by up to 14%, a notable gap exists in understanding how economy hotels are leveraging these systems to enhance operational performance. Moreover, previous studies have primarily focused on luxurious hotels, creating a lack of studies concerning the implementation levels of SEMS in economy hotels, as well as the associated impacts, facilitators, and barriers to adoption. Consequently, empirical research on SEMS and its effects within economy hotels in Kenya remains limited. Therefore, the aim of this study was to examine the effects of smart energy management systems adoption on performance of economy hotels within Nairobi City – County, Kenya.

1.3 General Objective

The purpose of the study was to investigate the effect of smart energy management systems adoption on the performance of economy hotels.

1.4 Specific Objectives

The study was guided by the following objectives:

i. To assess the adoption levels of smart energy management systems in economy hotels in Nairobi City - County, Kenya.
ii. To examine the effect of smart energy management systems adoption on financial performance of economy hotels in Nairobi City - County, Kenya.
iii. To examine the effect of smart energy management systems adoption on internal business processes in economy hotels in Nairobi City - County, Kenya.
iv. To examine the effect of smart energy management systems adoption on customer satisfaction in economy hotels in Nairobi City - County, Kenya.
v. To analyse factors that influence the adoption of smart energy management systems among economy hotels.

1.5 Research Questions

i. What are the adoption levels of smart energy management systems in economy hotels in Nairobi City County, Kenya?
ii. How do smart energy management systems influence the financial performance of economy hotels in Nairobi City County, Kenya?
iii. How do smart energy management systems influence internal business processes in economy hotels in Nairobi City County, Kenya?
iv. How do smart energy management systems influence customer satisfaction in economy hotels in Nairobi City County, Kenya?

v. What are the factors that influence the adoption of smart energy management systems among economy hotels in Nairobi City County, Kenya?

1.6 Significance of the Study

By examining the extent to which Smart Energy Management Systems (SEMS) adoption affect hotel performance, this study offered economy hoteliers insights into SEMS benefits, demonstrating how they can reduce operational costs, enhance guest satisfaction, and improve internal business processes, ultimately enabling faster returns on investment. Awareness of SEMS advantages and the pursuit of a competitive edge emerged as the main facilitators of adoption, while financial constraints posed the primary barrier due to high initial costs. These findings provide practical guidance for hoteliers, policymakers, and government agencies on promoting SEMS, highlighting the need for tailored energy efficiency standards in economy hotels This study also expand the knowledge base on SEMS and offered insights to researchers interested in energy efficiency in the hotel industry.

1.7 Scope of the Study

This study focused on examining the adoption level of Smart Energy Management Systems (SEMS) in economy hotels located in Nairobi City-County, Kenya, selected for its significant concentration of these hotels and growing interest in energy efficiency practices within the hospitality sector. By assessing the adoption level of SEMS, along with their financial impacts and effects on internal business processes and customer satisfaction, the study aimed to provide a comprehensive understanding of how these systems influence the economic and operational aspects of economy hotels and enhance the overall guest experience. Furthermore, analysing the factors that influence SEMS adoption offered valuable insights into the barriers and facilitators faced by hotel managers. The subjects of the study, hotel managers and guests, were chosen to ensure a well-rounded perspective, capturing both the operational challenges encountered by hotel management and the experiences of guests benefiting from improved energy efficiency. Primary data collection in August 2024 provided timely insights into the current state of SEMS adoption in the rapidly evolving hospitality landscape of Nairobi.

1.8 Limitations of the Study

The study encountered the following limitations: it focused exclusively on economy hotels, which limited the generalizability of the findings to other hotel categories. Recognizing this, the researcher recommended that future studies replicate the research across different hotel categories to enable comparison and draw broader conclusions. Additionally, reliance on self-reported data presented a potential for inaccuracies. To mitigate this, the researcher conducted a pilot study to validate the research instrument, making necessary adjustments to ensure consistency and clarity.

1.9 Assumptions of the Study

The study was guided by the following assumptions: respondents possessed adequate literacy skills to accurately complete the questionnaires, ensuring reliable and representative data. Additionally, it was assumed that the research instruments were comprehensive enough to address the research questions effectively. In conducting regression analysis, key statistical assumptions were also considered, including linearity (a linear relationship between variables), independence (each observation being independent), homoscedasticity (constant variance of errors across levels of independent variables), and normality (normally distributed residuals). These assumptions were crucial for ensuring the validity and accuracy of the study's findings.

1.10 Operational Definition of Terms

Customer Satisfaction: Ability to meet and exceed guest needs. It is assessed through customer satisfaction rates, repeat customer and positive feedbacks and reviews

Economy Hotels: Hotels classified as non- star- rated, one, two and three-star rated hotels with limited but highly standardized services.

Energy Efficiency: The ability to use less energy to perform similar task and function without affecting quality of services. It the ability of a system to save energy cost with minimum amount of energy.

Energy Management: Process of monitoring, controlling and conserving energy in a building.

Financial Performance: Refers to energy saving strategies, cost reduction and short return on investment periods.

Internal Business Process: Processes designed to meet organizational objectives and goal such as energy efficiency, reduction in cost and downtime reduction.

Level of Adoption: The rate and extent at which energy policy, energy planning, implementation and operation, monitoring, measurement, and management review aspects are implemented.

Non- financial Performance: Performance aspects such as customer satisfaction, efficient business processes and learning.

Performance: How an organization minimizes its energy costs, maintenance costs, and satisfies customers leading to increase in profits and growth of organization.

Smart Energy Management Systems: Energy systems that harness technology in order to enhance hotel's performance.

CHAPTER TWO

LITERATURE REVIEW

2.1 Adoption Levels of Smart Energy Management Systems

ISO 50001 provides a framework for enhancing energy performance through structured energy policy, planning, implementation, operation, monitoring, measurement, and management review. The adoption of Smart Energy Management Systems (SEMS) can be significantly influenced by ISO 50001 (Rajić et al., 2022). The framework mandates the establishment of an energy policy, setting performance objectives, conducting energy reviews, and identifying significant energy uses, thus promoting SEMS integration (ISO, 2018). Implementation requires action plans, operational controls, and staff training, while monitoring and measurement involve real-time data collection through smart technologies (Rajić et al., 2022).

A study in Mexico employed the ISO 50001 to assess the implementation of energy management systems in planning stage (Britel & Cherkaoui, 2022). The study used aspects such as energy policies, energy reviews and energy objectives to evaluate the adoption level. Moreover, a study conducted in the Western Balkans region, used the ISO 50001 to assess the adoption level of EMS. The study reported an implementation level of 38.07%, which was relatively low (Rajić et al., 2022).

In addition to SEMS adoption, smart technologies play a critical role in hotel energy management. A qualitative study conducted on "Enabling diffusion and assimilation of smartness in hospitality" within 39 UAE hotels revealed that smart technologies are seamlessly integrated into existing hotel operations (Stylos et al., 2021). The study suggested guidelines for hotels to leverage smart energy management systems effectively; however, it did not assess how hotels have adopted these systems or to what extent. Moreover, the reliance on in-depth interviews limited the generalizability of the results. Hence, this study used surveys to assess the adoption levels of SEMS in economy hotels in Kenya.

A study on the impact of energy monitoring and management systems in Italy assessed the usefulness of ISO 50001 in evaluating the adoption levels of energy management practices (Herce et al., 2021). The findings indicated that organizations implementing

ISO 50001 Energy Management Systems (EMS) experienced enhanced energy monitoring capabilities and notable energy savings. However, the study was conducted within large organizations, so it cannot be assumed that similar benefits would apply to small-scale enterprises. Therefore, this study utilized ISO 50001 to specifically assess the adoption levels of energy management systems in economy hotels.

To further evaluate SEMS adoption, this research adopted classification scales from previous studies. Zhao et al. (2017) expanded this categorization, defining high adoption as mean scores above 4.0, moderate adoption as scores between 3.0 and 4.0, and low adoption as scores below 3.0. These scales provided a comprehensive framework for assessing the extent of SEMS implementation in this study. Similarly, Wang et al. (2020) adopted the scale to assess the adoption levels of SEMS in luxurious and denoted to be moderate with a mean of 3.47. Nevertheless, these findings were limited to luxurious hotels.

Similarly, Ogola et al. (2023) conducted a study assessing the execution of energy conservation opportunities identified in energy audits within 4-star and 5-star hotels in Nairobi, Kenya. Their findings indicated that the hotel industry is progressively integrating smart energy management systems to counteract escalating energy costs and uncertainties. However, their research findings did not assess the implementation levels of these systems. Therefore, the present study evaluated the adoption levels of smart energy management systems in economy hotels.

2.2 Smart Energy Management Systems and Hotel Performance

2.2.1 Smart Energy Management Systems and Financial Performance

Energy management systems monitor and control energy consumption efficiently, leading to significant cost savings and improving the financial performance of hotels (Alhashmi et al., 2020; Windapo & Moghayedi, 2020). Economy hotels strive to enhance financial performance; hence, SEMS play a significant role in achieving this goal. To provide a detailed evaluation, this study adopted a balanced scorecard framework (Kaplan and Norton, 1996), integrating financial performance indicators such as cost reduction, energy cost saving, profit maximization and return on investment with customer satisfaction, learning and growth, and business processes.

Reduction in energy costs is vital for economy hotels in evaluating performance. Lower energy costs allow for the reallocation of finances to other activities. Past studies have indicated that SEMS identify and monitor energy-consuming systems, substantially reducing energy expenditure during peak seasons in hotels (Laayati et al., 2022; Qayyum et al., 2024). Additionally, a study by Bonilla et al. (2018) found that SEMS have monitoring capabilities that enable hotels to reduce energy costs by 40%. Furthermore, the study noted that the use of energy management systems enhances effective management decisions and decreases utility costs. A previous study conducted in the Kenyan coastal region on 4-star and 5-star hotels demonstrated that EMS implementation led to a significant reduction in operational costs (Gaturu et al., 2022). Additionally, the study noted that international hotel groups, such as Serena, have massively invested in EMS, thereby enhancing their performance. However, these findings were limited in luxurious hotels, thus this study attempted to fill the gap by examining the effect of SEMS in energy cost reduction.

Energy cost saving is crucial in economy hotels as it reduces utility expenses, thereby increasing the organization’s financial outputs. A study conducted in Pakistan on integrating smart energy management systems pointed out that the algorithms and control capabilities regulate energy consumption, resulting in significant cost savings of 15% (Saleem et al., 2023). Moreover, a study in Arrabida National Park found that SEMS employ sensors to control energy usage based on occupancy rates, reducing energy costs (Pereira et al., 2021). Nevertheless, these results were limited to luxury hotels; hence, similar conclusions cannot be made for economy hotels. As a result, this study assessed the impact of SEMS on energy saving in economy hotels.

According to a report by the U.S. Department of Energy (2016), the Return on Investment (ROI) for SEMS can be substantial, with payback periods often less than three years due to the high cost of energy in hotel operations. Additionally, a study conducted in China found that hotels that implemented SEMS had a payback period of 2.96 years (Wang et al., 2022). A study examining the energy performance of an intelligent energy management system in metro stations demonstrated a short energy payback period for SEMS, ranging between 40 and 55 days (Doe & Smith, 2023). Consequently, the system provided a substantial ROI by paying back between 33 and

91 times the energy initially invested. Furthermore, Filimonau and Magklaropoulou (2020) found that despite the high costs of implementing a SEMS, the benefits accrued are greater. Additionally, the study indicated that budget hotels that prioritize investing in SEMS experience a payback period of one and a half years. However, these conclusions drawn were conducted in hotels that heavily rely on seasonality, limiting the generalization of the results.

The ultimate goal for any business is profit maximization. Managing energy costs is crucial for hotels, as high-energy costs affect profit margins. However, through the integration of smart energy management systems (SEMS), hotels can reduce their energy expenses while maximizing profits. A study conducted on 45 hotel chains in Brazil indicated that SEMS regulate energy usage in rooms, thereby decreasing energy costs and improving profit margins (Arenhart et al., 2022). However, this study focused on large hotel chains; hence, similar conclusions cannot be made for independent and non-chain-affiliated hotels. This study thus assessed the relationship between SEMS and profitability of economy hotels.

2.2.2 Smart Energy Management Systems and Internal Business Processes

Kaplan and Norton (1996) provide an all-inclusive framework that, the balanced scorecard, identifies internal business processes as a performance metric. The framework includes constructs such as energy efficiency, reduction in maintenance costs, and downtime reduction.

Energy efficiency is an important aspect in the operational success and financial sustainability of economy hotels. The implementation of smart energy management systems (SEMS) have a key role in enhancing energy efficiency by enabling real-time monitoring and control of energy consumption. A study by Granderson et al. (2011) revealed that SEMS substantially enhance energy efficiency through these capabilities, ensuring that hotels can maintain optimal performance. Further, a study conducted in Taiwan found that businesses that implement SEMS enhance their energy intensity efficiency through real-time monitoring and control capabilities (Chiu et al., 2012). Moreover, a study in India demonstrated that the use of smart technologies, such as energy management systems, leads to better resource utilization by 89% (Kavitha et al., 2024).

Reduction in maintenance costs is another crucial benefit of implementing SEMS in economy hotels. Research by Sauter and Lobashov (2011) shows that predictive maintenance enabled by SEMS can significantly lower maintenance expenses by identifying potential issues before they escalate. Additionally, a study by Kaushik and Naik (2024) noted that SEMS could save repair costs by up to 75%. This proactive approach not only prevents costly repairs but also extends the lifespan of the system, contributing to the overall financial health of hotels. Furthermore, a study on the adoption of smart technologies and circular economy performance of buildings in South Africa suggested that the implementation of SEMS enables easy identification of problem areas, thereby reducing maintenance costs (Windapo & Moghayedi, 2020). However, the study collected data through interviews, increasing the possibility of subjectivity and limiting the generalizability of the results. Therefore, survey questionnaires were used in this study to assess the effects of SEMS on the reduction of maintenance costs. This technique ensured a more objective and systematic collection of data, enhancing the reliability and generalizability of the findings.

Downtime reduction is a significant advantage of implementing SEMS in economy hotels. A study by Katipamula et al. (2012) shows that smart systems help minimize downtime through continuous monitoring and early fault detection, ensuring that hotel operations remain uninterrupted. This capability is essential for sustaining high service standards and operational efficiency, which directly affects the guest experience and overall profitability of hotels. Further, Kaushik and Naik (2024) found that SEMS detect anomalies and suggest possible solutions, thus reducing downtime by an average of ten days. However, the study adopted a qualitative approach, therefore the present study adopted a quantitative approach.

2.2.3 Smart Energy Management Systems and Customer Satisfaction

Customer satisfaction is paramount for economy hotels, directly influencing guest retention and loyalty. SEMS contribute to customer satisfaction through various mechanisms, such as improving room comfort and demonstrating environmental responsibility. Meng and You (2021) found that SEMS significantly enhance guest satisfaction in European hotels by ensuring precise control over room conditions like temperature and lighting, leading to a consistently pleasant guest experience. Similarly, Xu et al. (2020) reported in their case study in Africa that SEMS not only optimize energy use but also minimize fluctuations in room environment; further enhancing guest comfort and satisfaction. Moreover, Salami et al. (2024) conducted a qualitative case study in Nigeria that indicated energy-efficient initiatives, including SEMS, improve environmental performance and guest satisfaction. However, the study focused on managerial perceptions, who may not fully capture guest experiences.

Guests increasingly value sustainability in their choice of accommodations. Research by Aragon-Correa et al. (2018) found that guests prefer hotels with strong sustainability practices, which SEMS help to demonstrate by reducing energy consumption and carbon footprints. This aligns with guests' environmental values, enhancing their perception and satisfaction with the hotel. Furthermore, Wang and Han (2020) highlighted that eco-friendly initiatives, supported by SEMS, positively influence a hotel's reputation and attract environmentally conscious guests, thereby boosting overall customer satisfaction.

Repeat guest rates serve as a crucial indicator of customer loyalty and satisfaction. Verma and Chandra (2018) revealed that hotels with effective sustainability practices, including SEMS implementation, experience higher repeat guest rates. This suggests that guests who appreciate the hotel's environmental efforts and consistent service quality are more likely to return. Similarly, Xu et al. (2020) found that positive guest experiences with sustainability initiatives lead to increased word-of-mouth referrals and repeat visitation.

Positive guest feedback is another significant outcome of SEMS implementation. Xie et al. (2019) revealed that guests tend to leave favourable reviews when they perceive the hotel as committed to environmental sustainability through SEMS. This positive feedback not only enhances the hotel's online reputation but also attracts new guests who prioritize sustainability. Meng and You (2021) also reported that SEMS contribute to the intrinsic benefits of staying in a green hotel, fostering greater guest satisfaction and loyalty.

2.3 Factors that Influence Adoption of Smart Energy Management Systems

The concept of "smart" in business networks denotes a transformative revolution driven by innovative technologies that optimize networks and ecosystems (Buhalis, 2020). While the tourism sector has embraced these advancements, the hospitality industry, particularly within budget hotels, has been slower to adopt smart energy management technologies.

Filimonau and Magklaropoulou (2020) found that integrating energy conservation targets into the corporate agenda of a budget hotel, alongside dedicated policy support, are essential for enhancing the business viability of new energy management initiatives. However, the study’s limitations such as a small sample from a single UK hotel and insufficient exploration of organizational differences restricted its broader applicability and reliability. This study sought to address these gaps by conducting a comprehensive evaluation on factors influencing the adoption of SEM-based energy management models, focusing on a diverse range of economy hotels.

Similarly, Langaat et al. (2023) highlighted that ease of use and management support are key determinants of adopting sustainable practices in hotels. Further, the study suggested that waste management practices, including the use of smart technologies, influence overall hotel performance. However, the study failed to analyse how individual characteristics of hotel such as age and size influence the adoption of SEMS. Therefore, this study explored how hotels' characteristics influence the adoption of smart energy management systems in economy hotels.

An exploration by Rajić et al. (2022) on energy management models for sustainable development found that the average implementation rate of energy management systems in three, four, and five-star hotels in the Western Balkans was 38.07%, with 15% of hotels not implementing these systems. Despite these findings, the study did not analyse the aspects contributing to the low implementation rate. This study sought to fill this gap by investigating the factors that hinder the adoption of Smart Energy Management Systems (SEMS) in economy hotels.

Salehi et al. (2021) examined the factors facilitating the adoption of energy systems in large-sized hotels in Tehran, noting that cost reduction, a positive managerial perception of smart energy systems and cultural aspects drive adoption. However, their study generalized the findings to developing countries and was limited to large hotels, which restricts the applicability of their conclusions. This study therefore, sought to investigate the facilitators of SEMS adoption within economy hotels in Nairobi City – County.

Eskerod et al. (2019) and Abdou et al. (2020) highlighted that perceived benefits such as cost reduction and operation efficiency facilitates adoption of smart energy management systems (SEMS) and energy conservation strategies. However, these studies are limited in scope, focusing on luxury hotels and not addressing the barriers and challenges faced by smaller hotels. To address these gaps, this study used survey questionnaires to assess the facilitators, barriers, and challenges of SEMS adoption in economy hotels.

Therefore, to address these gaps, this research sought to explore factors such as policy support, financial support, the potential for cost reduction and operational efficiency, crucial support from top management, positive perceptions among managers, and the user-friendliness of smart technologies comprehensively to provide insights for enhancing the adoption of smart energy management systems (SEMS) in economy hotels in Nairobi City- County.

2.4 Theoretical Framework

Two key frameworks guided this study: the ISO 500001 – Based Energy Management Model (EMM500001) and Balanced Scorecard (BSC) Model**.** The EMM50001 was used to assess the adoption levels of SEMS. The BSC Model was instrumental in evaluating the performance outcomes of SEMS adoption in economy hotels.

2.4.1 ISO 50001 – Based Energy Management Model

ISO 50001 is a systematic approach with principles and requirements to establish energy management systems for efficient energy use (ISO, 2018). The standard's primary components include energy policy, planning, implementation, operation, checking, and management review. The ISO 50001 Energy Management Model (EMM50001) integrates these standards in assessing the adoption of energy management systems (Yücel & Halis, 2016). According to the model, as maturity increases, the amount of resources invested also increases. This model uses five stages to describe the adoption level of energy management systems, adopting the Plan, Do, Check, Act (PDCA) framework (Yücel & Halis, 2016). These stages represent the level of adoption of the Energy Management System (EMS) and integrate ISO standards into a comprehensive checklist.

The EMM50001 involves key actions such as training employees on energy management, establishing effective communication processes, and maintaining required documentation. Organizations must also plan and control operations with significant energy use, integrate energy performance considerations into design processes, and incorporate energy criteria into procurement. Regular monitoring, measurement, and analysis of energy performance, compliance with legal requirements, internal audits, and corrective actions are essential for maintaining the EMS. Top management reviews ensure the system's ongoing suitability and effectiveness, identifying opportunities for improvement (ISO, 2018).

Implementing EMM50001 offers substantial benefits, including improved energy performance, cost savings, reduced environmental impact, regulatory compliance, and enhanced organizational reputation (ISO, 2018). The implementation process involves assessing current practices, developing a project plan, raising awareness, conducting energy reviews, creating documentation, deploying the EMS, and engaging a certification body for auditing and certification. ISO 50001 provides a structured approach for organizations to systematically manage energy performance, leading to significant financial and environmental benefits (ISO, 2018).

Jovanović and Filipović (2016) proposed and validated an energy management maturity model based on the ISO 50001 standard within the industrial sector. The study used the model to assess the level of maturity in energy management practices and identified areas for improvement, demonstrating the model's effectiveness in guiding organizations toward more advanced energy management practices. Further, a study in Europe on the energy management model for sustainable development in hotels in the Western Balkans region used the ISO 50001 to assess the adoption level of EMS (Rajić et al., 2022).

This study utilized the EMM50001 framework to assess adoption levels by incorporating energy policy, implementation and operation, management review, implementation and operation to formulate an adoption checklist. The components of energy policy, evaluated the existing policies that drive energy management and efficiency initiatives. Implementation and operation reviewed the processes and practices in place for putting energy management systems into action and maintaining their operation. Management review examined the processes in place for management review. By using, EMM50001 framework, the study provides a detailed understanding of the adoption levels of SEMS.

2.4.2 Balanced Scorecard Model

The Balanced Scorecard (BSC) Model is a strategic management tool developed by Kaplan and Norton in the early 1990s to measure and improve organizational performance beyond traditional financial metrics (Kaplan & Norton, 1992). The BSC incorporates four perspectives: Financial, Customer, Internal Business Processes, and Learning and Growth. This model assist organizations in aligning their strategic objectives with operational activities to achieve better performance outcomes.

Kaplan and Norton (1992), argue that the BSC presents a broad overview of organizational performance by integrating financial results with customer satisfaction, internal processes, and employee development. This integrated approach allows organizations to monitor and improve various aspects of their operations, fostering a balanced approach to management (Kaplan & Norton, 1992).

A study by Ribeiro et al. (2019), applied the BSC model to analyse the process, growth, customer satisfaction, and finances of 4-star and 5-star hotels in Portugal. The research revealed that the BSC effectively integrates intangible assets and management aspects, providing a clear understanding of hotel performance. Additionally, Tsai and Wu (2016) explored the application of the BSC in Taiwanese hotels and found that it improved organizational performance through better strategic alignment and operational efficiency.

This study adopted BSC Model to evaluate how SEMS adoption influences various performance metrics in economy hotels in Nairobi City - County. Financial performance was assessed through energy cost reductions, energy savings, return on investment, and profitability. Customer satisfaction, repeat guest rates, and positive feedback was used to gauge guest experiences and loyalty. Efficiency gains and operational improvements highlighted the optimization of internal processes through sustainable energy practices. Therefore, by utilizing the BSC Model, this study provides a detailed assessment of how SEMS adoption influences performance across multiple dimensions, including financial outcomes, customer satisfaction and internal processes (Kaplan & Norton, 1996).

2.5 Conceptual Framework

This study investigates the adoption of Smart Energy Management Systems (SEMS) in economy hotels, utilizing an ISO 50001-based checklist to assess energy management practices. The Balanced Scorecard (BSC) model was applied to evaluate SEMS impacts on hotel performance. Figure 1 explains the conceptual framework adopted by the study.

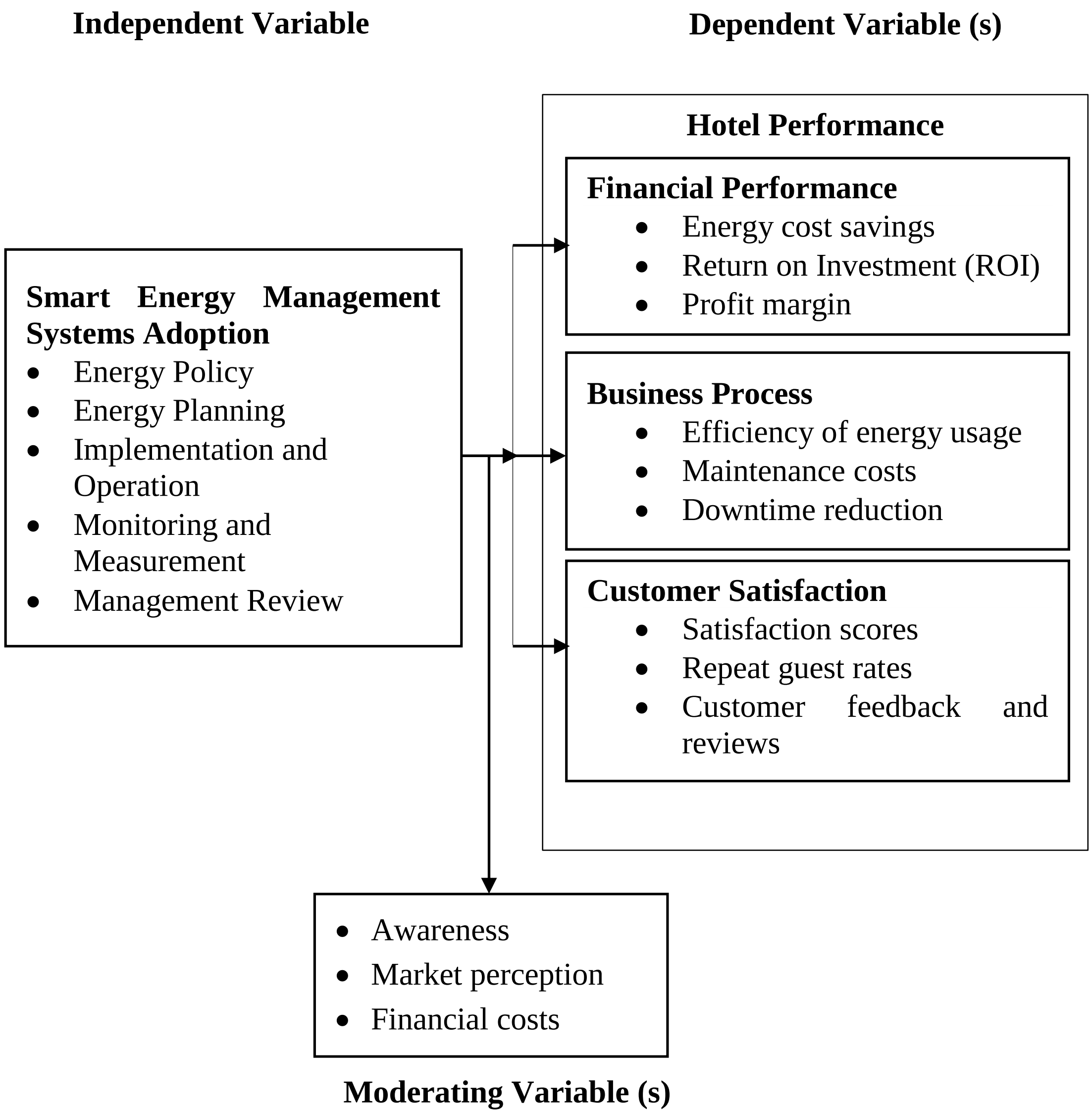

Figure 1: Conceptual Framework

Source: Researcher, (2024)

CHAPTER THREE

METHODOLOGY

3.1 Location Study

The study was conducted in Nairobi City- County. The city is situated at 1009S $36^0$39’E and $1^0$27’S$37^0$06’E and occupies 696 square metres. The city is the economic, political and cultural hub of Kenya and serves as a major regional commercial centre in East Africa, providing a high concentration of economy hotels catering to both local and international visitors. Moreover, reports from Kenya Tourism Board and Kenya Association of Hotelkeepers and Caterers (2022), indicated that Nairobi City – County has a wider range of economy hotels. Furthermore, Nairobi is home to major tourist attractions such as Nairobi National Park, the National Museum, the Giraffe Centre, the Karen Blixen Museum, and the David Sheldrick Wildlife Trust, which drive demand for accommodation, including economy hotels. This demand highlights the importance of assessing how Smart Energy Management Systems (SEMS) can enhance hotel performance, particularly in terms of energy efficiency, cost management and customer satisfaction. Therefore, the unique economic and cultural context of Nairobi City County makes it a relevant and strategic choice for this study.

3.2 Research Design

The study adopted a descriptive research design to provide a detailed information of SEMS implementation within economy hotels and to describe its effects on hotel performance. This design enables a systematic assessment of the current state of SEMS adoption, highlighting how economy hotels are implementing energy management practices. Further the study adopted correlational research design to examine the extent to which SEMS systems influence financial performance, customer satisfaction, and internal business processes. Additionally, the descriptive approach was used to identify the factors influencing SEMS adoption in economy hotels. Therefore, by capturing both the level of adoption and its effects, the descriptive research design offers a comprehensive overview of SEMS impacts within the economy hotel sector.

3.3 Population of the Study

The study population consisted of hotel managers and guests derived from economy hotels within Nairobi City. According to the Tourism Regulatory Authority (TRA) report (2021), there are a total of 83 economy hotels located in Nairobi City classified as 1-star. 2-star, 3-star and non- star rated (Table 1).

Table 1

Study Population (TRA, 2021)

Type of Hotel	No. of hotels	No. of general managers
Non-star rated	30	30
1- star	29	29
2 - star	9	9
3 - star	15	15
Total	83	83

3.4 Sampling Procedures and Sample Size

The study adopted simple random sampling for selecting economy-scale hotels within Nairobi City County and purposive sampling for assessing the hotel managers, as they are considered well informed about the hotel's performance. According to Mugenda and Mugenda (2013), 30% of the target population is sufficient and a reliable representation of the targeted population. The researcher’s sample size consisted of 25 managers from 24 economy hotels (Table 2).

Table 2

Sample Matrix (Researcher, 2024)

Type of Hotel	No. of hotels	No. of general managers	Sample (No. of Hotels)	Sample (general managers)
Non- rated	30	30	9	12
1 - star	29	29	8	10
2 - star	9	9	3	3
3 - star	15	15	5	5
Total	83	83	25	25

The sample size for the guests was obtained using the Creative Research Systems (2003) formula where:

$$ss = \frac{(z^2 * p)(1-p)}{c^2}$$

Where:

ss ═ Sample Size

Z ═ Z- value (e.g., 1.96 for 95 per cent confidence level)

P ═ Percentage of population picking a choice, expressed as decimal (0.5)

C ═ confidence interval, expressed as decimal (e.g., 0.05═ ±5)

$$\frac{(1.96^2 * 0.5)(1 - 0.5)}{0.05^2}$$

Therefore, the sample size for hotel guest was 385. Convenience sampling was adopted to select hotel guests across economy hotels.

3.5 Research Instrument

The study adopted questionnaires as the primary data collection tool, targeting both customers and hotel managers. The closed- ended survey questions were used to elicit predetermined responses, ensuring consistency and ease of analysis. Additionally, considering financial and time constraints, questionnaires were the most suitable option for this study. Furthermore, utilizing questionnaires enabled swift collection of large amounts of data within a relatively short period.

Questionnaires for hotels guests were divided into two sections. Section A consisted of demographic information for guests, while Section B assessed the effects of SEMS on customer satisfaction. Questionnaires for hotel managers were divided into four sections. Section A contained demographic information for hotel managers. Section B assessed the adoption level of smart energy management systems, using ISO 50001 guidelines to inform a checklist. Section C evaluated the impacts of SEMS on hotel performance, with questions formulated using the BSC model. Section D evaluated the factors that hindered the adoption of SEMS. The questionnaires used Likert scales ranging from 1 (strongly agree) to 5 (strongly disagree).

3.6 Piloting

Mugenda and Mugenda (2013) assert that piloting is a vital step in research. Piloting assisted the researcher in determining the validity and reliability of the research instruments and identifying the challenges participants were likely to face during the data collection process. Piloting was conducted in Nakuru County due to the similarity in the sample characteristics. The pilot study was conducted at Graceland Hotel, Midland Hotel, and Ole-Ken Hotel. The sample size for guests was 10% of the study sample size. This sample ensured that the researcher could assess the clarity of the questionnaires and identify potential challenges that respondents might encounter when answering the questions.

3.6.1 Reliability of Research Instrument

According to Hair et al. (2021), reliability refers to the extent to which a measuring tool produces accurate, consistent, and trustworthy outcomes. Internal consistency reliability was analysed using Cronbach's alpha (α) to establish the measure of reliability of the items. This method assessed the extent to which different items produce similar results. A more reliable scale was indicated by a higher value. Each variable's reliability was assessed, and Table 3 displays the findings.

Table 3

Reliability Analysis of Scales for SEMS Adoption

Scale	Cronbach's Alpha	Number of Items
Level of SEMS adoption	0.814	6
SEMS and financial Performance	0.797	6
SEMS and business process	0.788	6
SEMS and customer satisfaction	0.839	6
Barriers to SEMS adoption	0.804	6
Facilitators to SEMS adoption	0.852	9

Based on the reliability analysis presented in Table 3, the scales used in the study on SEMS adoption demonstrated varying levels of internal consistency, as measured by Cronbach's Alpha. The scale assessing the level of SEMS adoption had a Cronbach's Alpha of 0.814, indicating good internal consistency. The scale evaluating SEMS and financial performance had a reliability score of 0.797, while the scale for SEMS and business processes showed a slightly lower, yet acceptable value of 0.788. The SEMS and customer satisfaction scale exhibited excellent reliability with a Cronbach's Alpha of 0.839. The scales for barriers to SEMS adoption and facilitators to SEMS adoption recorded Cronbach's Alpha values of 0.804 and 0.852, respectively, reflecting good to excellent reliability. Overall, all scales met the acceptable threshold of 0.7 or above, affirming their reliability for further analysis and reporting.

3.6.2. Validity of the Research Instrument

Validity, as defined by Mugenda & Mugenda (2018), is the degree to which a study measures what it is supposed to measure. Face validity was enhanced by using the title headings and research objectives indicated in the questionnaires (Appendix II and III). Content validity was achieved by working closely with supervisors and experts from the hotel industry. Additionally, experts in the field of hospitality were consulted to ensure the questionnaires were suitable for assessing the impacts of smart energy management systems on hotel performance.

3.7 Data Collection Procedures

Clearance was sought from Tharaka University Institutional Scientific Research Ethics Committee (ISREC), and a research permit authorization was subsequently obtained from the National Commission of Science, Technology and Innovation (NACOSTI). Primary data collection utilized questionnaires to gather quantitative insights from economy hotel managers and guests, employing purposive sampling to ensure representation across economy hotels and guest demographics. Questionnaires were administered over a three-week period to collect sufficient responses. Additionally, secondary data was gathered from existing literature and reports on Smart Energy Management Systems (SEMS) adoption in the hospitality sector, which was continuously analysed alongside primary data. Data analysis employed quantitative methods such as descriptive statistics and regression analysis to identify patterns and correlations related to SEMS adoption and its impacts in economy hotels. Quality control measures, including pilot testing of questionnaires and rigorous data cleaning procedures, were implemented to ensure the reliability and validity of the findings.

3.8 Data Analysis

After data collection, the questionnaires were coded, organized and analysed using descriptive and inferential statistics. Descriptive statistics were used to determine to describe the hotels and guests while charts and tables were used to summarize the levels of adoption. Regression analysis was used to investigate how adoption levels of SEMS influence hotel performance. Coded data was analysed using the Statistical Package for Social Science (SPSS software Version 26). The processed data was presented in frequency tables, pie charts and percentage tables.

3.8.1 Regression Model

The study adopted the following linear regression

$Y=ß_0 +ß_1 X_1+e$

Where,

Y= Financial Performance/ business processes/ customer satisfaction

X_1= Smart energy management systems

$ß_0$= Constant (Y intercept when X=zero)

3.9 Ethical Considerations

The study upheld ethical standards throughout the research process by adhering to several key principles. Ethical permits were obtained from relevant authorities, including the Institutional Scientific and Ethics Review Committee (ISERC) of Tharaka University and the National Commission for Science, Technology and Innovation (NACOSTI). Respondents were fully informed on the purpose of data collection, ensuring they understood the context of their participation. To protect respondents' privacy, strict anonymity was maintained, and their confidentiality was guaranteed; this confidentiality was achieved by anonymizing data to remove personal identifiers and by presenting findings in aggregate form without identifying individuals. Additionally, all secondary sources used in the literature review were accurately cited to acknowledge the original authors, reinforcing the commitment to intellectual honesty. Participation in the study was voluntary, with respondents giving consent freely, without any form of coercion or promises of incentives. Finally, expert input was sought from statisticians and field specialists to ensure the research instruments were valid and reliable, contributing to the accuracy and integrity of the data analysis.

CHAPTER FOUR
RESULTS AND DISCUSSION

4.0 Introduction

The research findings and discussions are presented in this chapter. Regression analysis, diagnostic tests, descriptive statistics, response rate, and a discussion of the results in light of the study's goals are all included. The research findings and discussions are presented in this chapter. Descriptive statistics, diagnostic tests, regression analysis, response rate, and a discussion of the results in light of the study's goals are all included.

4.1 Response Rate

The study selected a sample of 25 hotels and 385 guests from economy hotels. All participants were given questionnaires, and the response rate is shown in Table 4.

Table 4

Response Rate

Respondents	Sample size	Response rate
Hotel managers	25	24 (96%)
Hotel guests	385	300 (77.92)

From the results in Table 4, the response rate for the hotel managers was 96%, which corresponds to 24 respondents while for hotel guests, was 77.92% which corresponds to 300 respondents. This study received an exceptional response, and as a result, it was utilized for data analysis and reporting. Mugenda & Mugenda (2012) state that a response rate of 50% or above is sufficient and can be used for data analysis and reporting, while 60%, higher is good and 70%, or higher is great.

4.2 Demographic Information

The study aimed to ascertain the type of visit, citizenship, age, and gender. The subsequent subsections presented outcomes that were obtained.

4.2.1 Respondents' Gender

The purpose of the study was to assess the gender distribution of the research participants. This made it easier to assess the character traits of the respondents who stayed at affordable hotels. It also provided information on potential bias in the study's respondent selection procedure. The results are shown in Table 5.

Table 5

Gender Distribution of Respondents

Gender	Frequency	Percent
Male	150	50
Female	150	50
Total	300	100

Results obtained in Table 5 show that 50% of the participants were male while 50% were female. This equal representation suggests that the study was conducted without bias in selecting respondents based on gender, ensuring that both male and female perspectives were equally considered. This balanced sample supports the reliability of the study in capturing insights into the preferences, behaviors, and experiences of guests at economy hotels in Nairobi City-County. Additionally, the equal distribution of genders suggests that Nairobi's economy hotels attract an array of clientele.

4.2.2 Age of Respondents

The aim of the study was to establish the sample's age distribution. Following the evaluation, the findings are shown in Table 6.

Table 6

Respondents Age Distribution

Age	Frequency	Percent
Below 25 years	75	25.0
26-40 years	152	50.7
41-50 years	52	17.3
51-60 years	19	6.3
Above 61	2	.7
Total	300	100.0

According to the results, most of respondents (50.7%) were in the 26–40 age range. This indicates that majority of the guests in economy hotels are in their prime working years, which could imply that these hotels are popular among young professionals, business travelers, and individuals in the mid-stage of their careers. The high percentage of guests in this age group might also be associated with the affordability and convenience that economy hotels offer, making them a preferred choice for middle-income earners or younger travelers who prioritize cost-effective accommodations. 25% of respondents were below 25 years. This highlights the presence of a younger demographic, possibly students, recent graduates, or young tourists. Economy hotels might be particularly appealing to this group due to budget constraints and preferences for shorter stays or value-for-money accommodations.

Guests aged 41-50 years accounted for 17.3% of the respondents, representing a smaller but notable proportion of middle-aged travelers who may have different expectations in terms of comfort and amenities compared to younger guests. Furthermore, 6.3% of the individuals examined were between the ages of 51 and 60, while only 0.7% were above 61 years, suggesting that economy hotels are less frequented by older guests, potentially due to a preference for more upscale or specialized accommodations among this demographic. These findings show that while economy hotels serve a varied clientele, their primary customer base consists of younger and middle-aged adults, particularly those aged 26-40

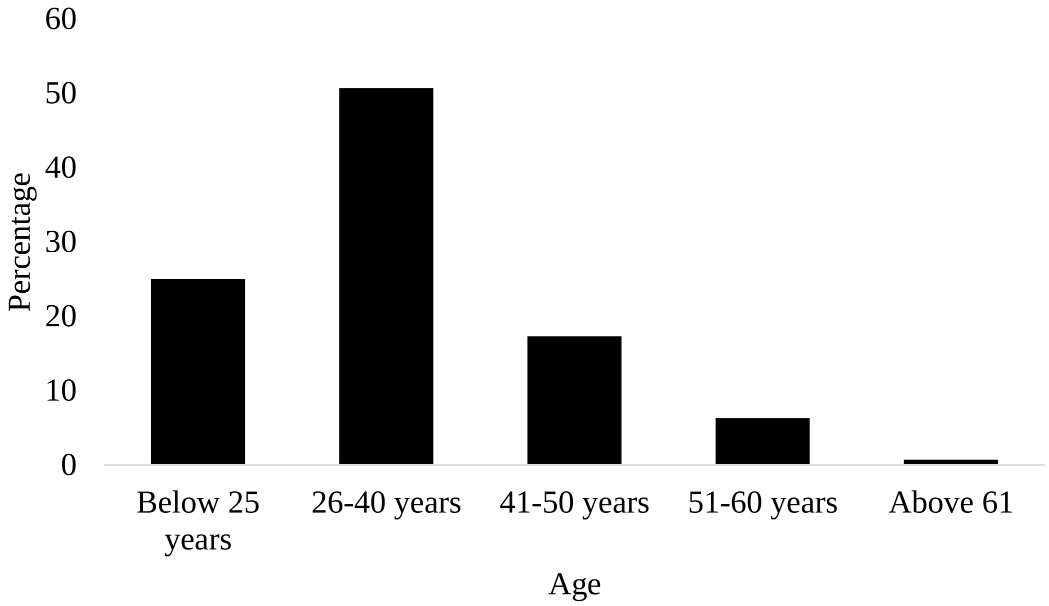

Figure 2. Respondents Age Distribution

4.2.3 Respondents Citizenship

Nationality was a matter posed to respondents. This guided the study in determining origin of guests who visit economy hotels. Their results were analysed and presented in Table 7.

Table 7

Respondents Citizenship

Country	Frequency	Percent
Kenya	169	56.3
Rest of Africa	70	23.3
Europe	25	8.3
USA	19	6.3
Asia	17	5.7
Total	300	100.0

The results presented in the Table 7 on respondents' citizenship indicate a diverse range of guests at economy hotels, reflecting the international nature of the clientele. Table 7 shows that the majority of the respondents (56.3%) were Kenyan nationals, which suggests that local tourism or business travel might be a significant driver of hotel occupancy in economy hotels. This local dominance could be attributed to affordability, proximity, and the nature of services that cater to domestic travelers.

Notable 23.3% of respondents came from other African countries, which emphasizes the regional appeal of economy hotels. This suggests that economy hotels play a key role in accommodating regional travelers, such as business professionals, tourists, or individuals visiting for other purposes like conferences and seminars. International guests from Europe (8.3%), the USA (6.3%), and Asia (5.7%) make up a smaller portion of the total guest population, though these numbers indicate that economy hotels do attract a global clientele. The presence of these international visitors highlights the importance of maintaining quality standards and amenities that appeal to a wide array of cultural preferences and travel needs.

4.2.4 Respondents Visit Type

Respondents were requested to evaluate how frequently their visit the hotel. Table 8 displays the results and conclusions researchers concluded on.

Table 8

Respondents Visit Frequency

Visit type	Frequency	Percent
First time	226	75.3
Return guest	74	24.7
Total	300	100.0

Results in Table 8 show that 75.3% of guests were visiting the hotel for the first time while 24.75 were returning guests. The findings indicated that most of the guests (75.3%) in economy hotels were returning guests. These findings suggest that economy hotels attract a significant proportion of new guests, possibly indicating that these hotels are popular among transient or short-term customers, who may visit once or infrequently. Moreover, the relatively lower percentage of return guests (24.7%) highlights the challenge economy hotels face in fostering guest loyalty or encouraging repeat stays.

4.3 Hotel General Information

The study's objectives were to identify the hotel's rating, number of rooms, sustainability certifications, average occupancy over time, staff count, and years of operation. This helped the researcher identify the characteristics of economy hotels.

4.3.1 Hotel Capacity

Understanding the average number of hotel rooms was essential for the study because hotel capacity directly influences various operational and financial aspects of a hotel. Further, hotel capacity can affect the adoption and implementation of Smart Energy Management Systems (SEMS), as larger hotels may have more resources and a greater need to optimize energy consumption. Additionally, knowing the number of rooms helped to contextualize the findings, such as energy efficiency or customer satisfaction, by allowing comparisons across hotels of different sizes. This information also aided in segmenting the data, ensuring that the analysis considered how hotel size influenced key variables like financial performance or barriers to SEMS adoption. The outcome results are shown in Table 9.

Table 9

Average Hotel Capacity

Capacity	Frequency	Percent
Less than 50	16	66.7
50-100	7	29.2
101-200	1	4.2
Total	24	100.0

Results presented show that 66.7% of economy hotels had a capacity of less than 50 rooms, 29.2% had capacity ranging 50- 100 while 4.2% had a capacity range of 101-200 rooms. This was an indication that most of the economy hotels in Nairobi City have a room capacity less than 50.

4.3.2 Hotel Rating

The study attempted to ascertain whether a hotel had a one-, two-, three-, or no-star rating because star ratings provided a standardized measure of a hotel's quality, services, and facilities. These ratings directly influenced a hotel's operational strategies, financial capabilities, and customer expectations, all of which were crucial factors when evaluating the adoption of Smart Energy Management Systems (SEMS). The findings were presented as shown in Table 10.

Table 10

Distribution of Hotel Rating among Respondents

Category	Frequency	Percent
Not rated	7	29.2
1-star	10	41.7
2-star	4	16.7
3-star	3	12.5
Total	24	100.0

From the findings from Table 10 and Figure 3, 41.7% of economy hotels are 1-star rated, suggesting that most economy hotels offer basic amenities and services that meet the minimum standards for star-rated accommodations. Additionally, 29.2% of the economy hotels are not rated. This could imply that these hotels may offer even more limited services and amenities, positioning themselves as ultra-budget accommodations. The findings also show that 16.7% of economy hotels are 2-star rated, and 12.5% are 3-star rated, which represents a smaller portion of the economy hotel sector.

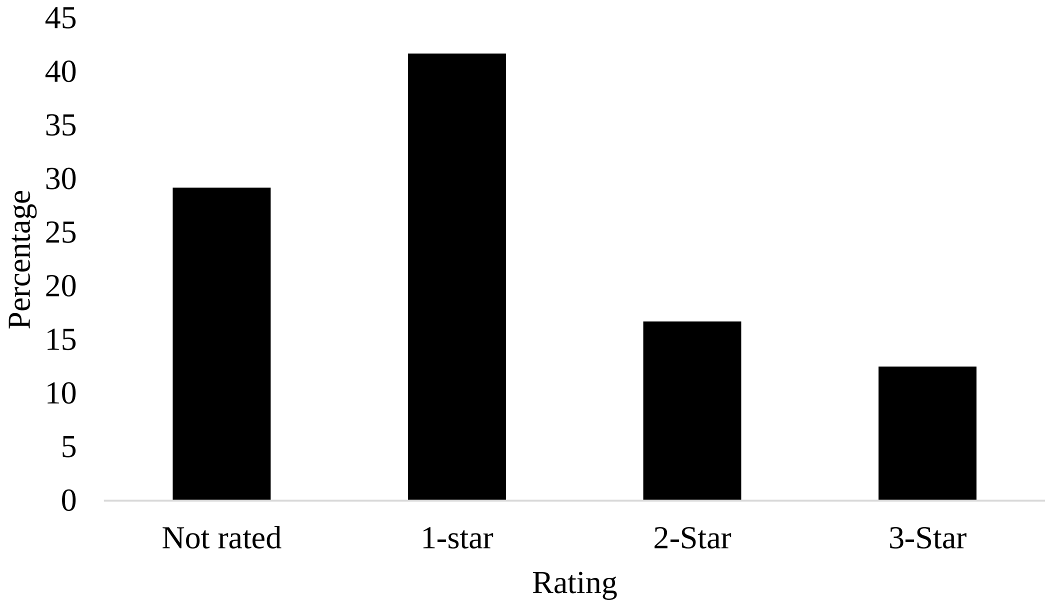

Figure 3: Hotel Star Rating Distribution

4.3.3 Average Hotel Occupancy over the Year

Determining the average occupancy of economy hotels over the year was important because it directly affected the hotel's revenue and operational efficiency. This helped the researcher to evaluate the effectiveness of SEMS in managing energy demand. The findings are presented in Table 11.

Table 11

Average Hotel Occupancy over the Past Year

Average occupancy	Frequency	Percent
Less than 25%	2	8.3
26-50%	6	25.0
51-75%	14	58.3
76-100%	2	8.3
Total	24	100.0

The results presented show that 8.3% of economy hotels had an average occupancy rate of less than 25%, 25.0% had an average occupancy rate between 26% and 50%, 8.3% had an average occupancy rate ranging between 76% and 100%, and 58.3% had an average occupancy rate ranging between 51% and 75%. This implies that the average occupancy rate in economy hotels was between 51% and 75%.

4.3.4 Number of Employees

Respondents were asked about the substantial number of individuals who worked in their hotel. Figure 4 presents the analysis findings.

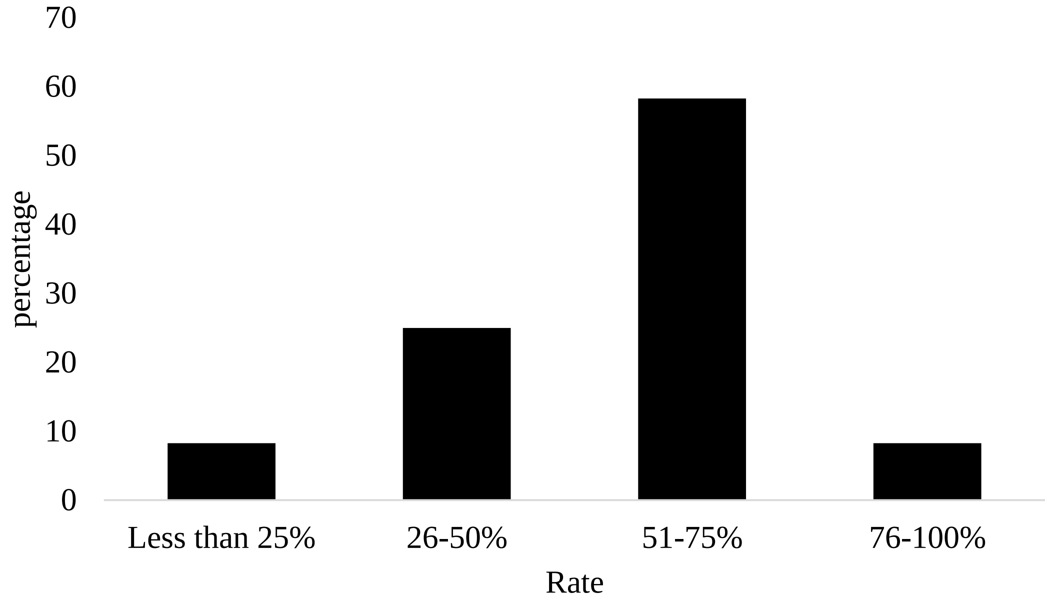

Figure 4: Average Hotel Occupancy Rates

The findings indicated that majority (83.3%) of economy hotels employed fewer than 50 employees. This indicates that most economy hotels operate on a relatively small scale, likely relying on a lean workforce to manage their daily operations. 16.7% of the economy hotels reported having between 51 and 100 employees, suggesting that a smaller portion of economy hotels operate on a slightly larger scale. These findings indicate that most economy hotels maintain a small workforce, which aligns with their focus on affordability and minimal service offerings.

4.3.5 Years of Operation

Hotel managers were asked to indicate how long their hotels have been operating. The responses they provided were examined, and the results are displayed in Table 12.

Table 12

Average Years of Operation

No. of years	Frequency	Percent
5 years and below	7	29.2
6-10 years	16	66.7
11-15 years	1	4.2
Total	24	100.0

From the findings presented, 66.7% of the economy hotels have been in operation for 6-10 years, indicating that the majority of these establishments have been active for a medium-term period. This suggests a certain level of stability and experience in the market, as economy hotels that have been in business for this duration are likely to have built a solid foundation, developed a customer base, and established operational practices. 29.2% of the economy hotels have been operating for 5 years or less, which reflects the presence of newer entrants into the economy hotel segment. This could imply that the market for economy hotels is still expanding, with newer hotels emerging to meet the demand for budget accommodations. 4.2% of the economy hotels have been in business for 11-15 years, which indicates that long-established economy hotels are relatively rare.

4.4 Descriptive Statistics

Respondents were asked to rate the level to which they agreed or disagreed with some of the statements relating with the variables. A five point Likert scale was used; 1- SD (Strongly Disagree), 2- D (Disagree), 3- N(Neutral), 4- A(Agree) and 5- SA (Strongly Agree). Standard deviations, averages, and percentages were used to analyse the results.

4.4.1 Adoption Levels of Smart Energy Management Systems

Evaluating the degree of Smart Energy Management System implementation in economy hotels was the study's fundamental objective. The researcher sought information regarding SMES aspects adopted in economy hotels. The results were analysed and presented as shown in Table 13

Table 13

Frequencies on Adoption Levels of SEMS

Statement	SD	D	N	A	SA	M	SD
Our hotel has a formal energy policy that aligns with the principles of ISO 50001.	4 (16.7%)	11 (45.8%)	9 (37.5%)	-	-	2.2083	0.72106
Our hotel regularly conducts energy planning activities, including setting energy objectives and targets.	1 (4.2%)	14 (58.3%)	8 (33.3%)	-	1 (4.2%)	2.4167	0.77553
Our hotel has implemented operational controls and procedures to manage energy consumption effectively.	-	14 (58.3%)	8 (33.3%)	-	2 (8.3)	2.5833	0.88055
Our hotel continuously monitors and measures energy performance to identify areas for improvement.	-	12 (50%)	10 (41.7%)	-	2 (8.3%)	2.6667	0.86811
Our hotel's management regularly reviews the energy management system to ensure its effectiveness and make necessary adjustments.	-	11 (45.8%)	12 (50%)	-	1 (4.2%)	2.625	0.71095

(SD- Strongly Disagree; D- Disagree; N- Neutral; A- Agree; SA- Strongly Agree; M-Mean, SD- Standard Deviation)

The research findings in Table 13 indicated that 16.7% of respondents agreed that their hotel has a formal energy policy that aligns with ISO 50001, 45.8% disagreed with the statement, and 37.5% were neutral. The mean score of 2.2083 with a standard deviation of 0.72106 reflects a general lack of formalized energy policies adhering to ISO 50001 among economy hotels. The findings further showed that 4.2% agreed that their hotel regularly conducts energy planning activities, while 58.3% disagreed and 33.3% were neutral. With a mean of 2.4167 and a standard deviation of 0.77553, this disparity suggests a prevalent lack of systematic energy planning practices.

The findings also indicated that 8.3% agreed that their hotel implements operational controls and procedures for effective energy management, 58.3% disagreed, and 33.3% were neutral. The mean score of 2.5833 with a standard deviation of 0.88055 highlights that most hotels do not effectively manage energy consumption through operational controls and procedures. Continuous monitoring and performance measurement showed that 8.3% agreed, 50% disagreed, and 41.7% were neutral. The mean of 2.6667 and a standard deviation of 0.86811 suggest that while some hotels engage in energy performance monitoring, many do not systematically assess or track energy performance.

Further, the findings showed that 4.2% of respondents agreed that the hotel management regularly reviews the energy management system, 45.8% disagreed, and 50% were neutral. The mean score of 2.625 with a standard deviation of 0.71095 indicates infrequent evaluations of energy management systems, with many economy hotels either lacking formal review processes or not actively engaging in regular reviews. The research results indicated that the average adoption rate of Smart Energy Management Systems (SEMS) among economy hotels was approximately 8.34%. This low rate highlights a significant gap in the adoption and implementation of SEMS, pointing to an urgent need for improved energy management practices within economy hotels.

The average mean score for SEMS adoption across various aspects was to be 2.5000, derived from the mean scores of formal energy policies aligned with ISO 50001 (2.2083), regular energy planning activities (2.4167), operational controls and procedures (2.5833), continuous monitoring and measurement (2.6667), and regular review of energy management systems (2.6250). These scores reflect a low adoption level, which contrasts sharply with benchmarks established in past studies.

Zhao et al. (2017) categorized high adoption as mean scores above 4.0, moderate between 3.0 and 4.0, and low below 3.0. The current study's score of 2.5000 clearly falls into the low adoption category. Moreover, Ogola et al. (2023) observed a moderate adoption rate in higher-star hotels with mean scores around 3.5, highlighting a lower SEMS adoption rate in economy hotels compared to higher-star establishments. Kumar et al. (2022) defined low adoption as below 25%, and the current study's adoption rate of 8.34% aligns with this classification, reinforcing the significant gap in SEMS implementation.

Further, these findings align with the existing literature on ISO 50001 and SEMS, revealing a notable gap in the implementation of structured energy management practices among economy hotels (ISO, 2018). The high percentage of disagreements and neutral responses further denotes the deficiency in SEMS adoption, emphasizing the critical need for enhanced energy management practices in economy hotels.

4.4.2 Overall Satisfaction Rates

Information was sought regarding guests' overall satisfaction rates. The respondents indicated their agreement with statements in satisfaction rates. Table 14 displays the results of frequencies and percentages.

Table 14

Frequencies on Overall Satisfaction Rates

Statement	SD	D	N	A	SA	M	SD
Overall satisfaction with your stay at our hotel	0.7%	4%	20%	62.3%	13%	3.83	0.723
Comfort and quality of my room during the stay	1.3%	11%	24 %	48.7%	15 %	3.65	0.911

(SD- Strongly Disagree; D- Disagree; N- Neutral; A- Agree; SA- Strongly Agree; M- Mean, SD- Standard Deviation)

The results from Table 14 indicated that 75.3% of guests agreed that they were overall satisfied with their stay, while 4.7% disagreed, and 20% remained neutral. This suggests that the majority of guests had a positive experience, leading to a high overall satisfaction rate at the hotel. With a mean score of 3.83 and a standard deviation of 0.723, the responses were moderately consistent, indicating that most guests leaned toward being satisfied. The small percentage of dissatisfied guests points to the hotel generally meeting guest expectations, though the 20% who were neutral or dissatisfied highlight areas where improvements could enhance the guest experience and convert neutral opinions into positive ones. Furthermore, 63.7% of guests agreed that they were satisfied with the comfort and quality of their rooms during their stay, while 12.3% expressed dissatisfaction, and 24% remained neutral. This suggests that while most guests were content with their room experience, there is room for improvement. The mean score of 3.65 and the higher standard deviation of 0.911 indicate more varied opinions about room comfort and quality, pointing to a need for consistent upgrades in this area to boost satisfaction levels and reduce dissatisfaction. The findings highlighted the significance of upholding high standards in room quality as a crucial element for achieving overall guest satisfaction.

4.4.3 Repeat Guests Rates

Information was sought from guests regarding repeat rates. The respondents indicated the level of agreement with indicators on guests repeat rates. The results are presented in Table 15.

Table 15

Frequencies of Repeat Guest Rates

Statement	SD	D	N	A	SA	M	SD
Based on my present stay, I will visit your hotel again.	16 (5.3%)	39 (13%)	58 (19.3%)	151 (50.3)	36 (12%)	3.51	1.036
I can recommend my friends and family based on my experience.	7 (2.3%)	42 (14%)	48 (16%)	153 (51%)	50 (16.7%)	3.66	0.991
The hotel commitment to energy efficiency is a key factor when recommending others	11 (3.7%)	45 (15%)	116 (38.7%)	100 (33.3%)	28 (9.3%)	3.30	0.958
The hotel sustainability practices influence future re-visit.	7 (2.3%)	46 (15.3%)	99 (33%)	106 (35.3%)	42 (14%)	3.43	0.988

(SD- Strongly Disagree; D- Disagree; N- Neutral; A- Agree; SA- Strongly Agree; M- Mean, SD- Standard Deviation)

The research findings indicated that 62.3% of guests agreed that they would visit the hotel again based on their present stay, while 18.3% disagreed, and 19.3% remained neutral. This suggests that a majority of guests had a positive intention to return, reflected by a mean score of 3.51 and a standard deviation of 1.036, indicating a moderate variation in responses. While many guests are inclined to return, the significant percentage of neutral or dissatisfied respondents points to an opportunity for the hotel to improve experiences to increase repeat visits.

Additionally, 67.7% of guests agreed that they would recommend the hotel to friends and family, while 16.3% expressed disagreement, and 16% remained neutral. With a mean score of 3.66 and a standard deviation of 0.991, most guests were willing to recommend the hotel, though there was some variability in opinions. The hotel’s ability to consistently deliver positive experiences could enhance its reputation through word-of-mouth recommendations.

The research results on the hotel’s commitment to energy efficiency indicated that 72% of guests agreed that this was a factor influencing their likelihood of recommending the hotel, with 18.7% disagreeing or remaining neutral. The mean score of 3.30 and standard deviation of 0.958 suggest a more diverse range of opinions, indicating that energy efficiency is important to some guests but may not be a decisive factor for others. Further, 49.3% of guests agreed that the hotel’s sustainability practices would influence their decision to re-visit, while 17.6% disagreed, and 33% were neutral. The mean score of 3.43 and standard deviation of 0.988 suggest that while sustainability is an important factor for many guests, it may not be universally influential. Thus, economy hotels should further emphasize its sustainability efforts to attract more repeat visitors.

The study's results show that a majority of guests would return to and recommend the hotel, corresponding with findings by Meng and You (2021) and Xu et al. (2020), who reported that SEMS enhance guest satisfaction by improving room comfort and supporting environmental values. Additionally, the significant influence of sustainability on guest recommendations, as reflected by 72% of respondents, aligns with the findings of Wang and Han (2020), who determined that eco-friendly initiatives attract environmentally conscious guests. However, the study also revealed that a notable portion of guests remained neutral or disagreed on the importance of sustainability in their decision-making, suggesting that while SEMS are important, other factors also play a crucial role in guest loyalty, a finding that aligns with Salami et al.'s (2024) insights on the varied perceptions of energy-efficient initiatives.

4.4.4 Customer Feedback and Review

The researcher sought information on customer feedback and review. The frequencies, percentages, means, and standard deviations were displayed in Table 16's results, which offered an in-depth analysis of the findings.

Table 16

Frequencies on Customer Feedback Review

Statement	SD	D	N	A	SA	M	SD
Considering the hotel smart energy management initiatives in the hotel, the value for money was worthy.	2 (0.7%)	13 (4.3%)	62 (20.7%)	187 (62.3%)	36 (12%)	3.81	0.724
The room maintained a consistent temperature throughout my stay.	7 (2.3%)	72 (24%)	92 (30.7%)	100 (33.3%)	29 (9.7%)	3.24	1.000
The heating and cooling was easy to adjust and control.	9 (3%)	56 (18.7%)	93 (31%)	102 (34%)	35 (11.7)	3.33	1.013
I was satisfied with the overall comfort of the room.	7 (2.3%)	17 (5.7)	84 (28%)	144 (48%)	48 (16%)	3.70	0.887
The noise level from the window, air conditioners, hydronic heating system was minimal	7 (2.3%)	47 (15.7%)	128 (42.7%)	91 (30.3%)	27 (9%)	3.28	0.915

(SD- Strongly Disagree; D- Disagree; N- Neutral; A- Agree; SA- Strongly Agree; M-Mean, SD- Standard Deviation)

The analysis presented in Table 17 indicates that 74.3% of respondents perceived the hotel’s smart energy management initiatives as offering good value for money, with a mean score of 3.81 and a standard deviation of 0.724. This reflects a generally positive assessment of the sustainability efforts, although there is some variability in responses.

Similarly, regarding room temperature consistency, the findings reveal notable variability, with a mean score of 3.24 and a standard deviation of 1.000. Specifically, 26.3% of guests expressed dissatisfaction, and 24% were neutral. This variability indicates potential areas for improvement in temperature control, suggesting that enhancing this aspect could lead to increased guest satisfaction.

The ease of adjusting heating and cooling systems was positively rated by 45.7% of guests, with a mean score of 3.33 and a standard deviation of 1.013. However, 31% of guests remained neutral, and 21.7% were dissatisfied, indicating mixed experiences with the system's adjustability. Overall room comfort received a positive rating from 64% of respondents, evidenced by a mean score of 3.70 and a standard deviation of 0.887. Nonetheless, 30.3% of guests were either neutral or dissatisfied, highlighting opportunities for enhancing comfort levels.

Further, 39.3% of guests agreed that noise levels from windows, air conditioners, and heating systems were minimal, as reflected by a mean score of 3.28 and a standard deviation of 0.915. However, 42.7% of guests remained neutral, indicating diverse perceptions regarding sound management. This suggests that while some guests find noise levels acceptable, there is a significant portion who are indifferent, highlighting the need for targeted noise reduction strategies to address varying guest preferences.

These findings agree with the existing literature, demonstrating that Smart Energy Management Systems (SEMS) enhance guest satisfaction by improving room conditions and supporting environmental values (Meng & You, 2021; Xu et al., 2020). The majority of guests acknowledging the value for money of SEMS supports the notion that these systems are appreciated for their sustainability benefits. Additionally, the significant influence of sustainability on guest recommendations aligns with Wang and Han (2020), who found that eco-friendly initiatives positively affect guest perceptions and recommendations. Furthermore, the finding that 64% of guests were satisfied with overall room comfort, yet 30.3% were dissatisfied, suggests that room comfort remains a significant factor influencing guest satisfaction beyond the benefits provided by SEMS. This aligns with Salami et al. (2024), who noted varied perceptions of energy-efficient initiatives.

4.4.5 Smart Energy Management Systems and Financial Performance

Information was sought on effect of SEMS on financial Performance and the descriptive statistics for each financial performance indicator were measured using a Likert scale. The respondents indicated their agreement with the statements and frequencies and percentages were computed. The results are presented in Table 17.

Table 17

Frequencies on Financial Performance

Statement	SD	D	N	A	SA	M	SD
Implementation of SEMS has significantly reduced our organization's energy costs.	1 (4.2%)	10 (41.7%)	13 (54.2%)	-	-	2.5	0.59877
SEMS have helped us identify and eliminate unnecessary energy consumption.	-	11 (45.8%)	12 (50%)	-	1 (4.2%)	2.625	0.71094
SEMS have provided real-time data that has led to actionable insights for reducing energy costs.	-	18 (75%)	6 (25%)	-	-	2.25	0.44233
Our energy costs are more predictable and stable since adopting SEMS.	-	15 (62.5%)	9 (37.5%)	-	-	2.375	0.49454
The financial investment in SEMS has been justified by the savings we have realized.	-	18 (75%)	6 (25%)	-	-	2.25	0.44233
Our organization has achieved a positive return on investment from SEMS within the expected timeframe.	-	14 (58.3%)	10 (41.7%)	-	-	2.4167	0.50361
SEMS have allowed us to allocate savings to other areas of our business, thereby improving profitability.	-	11 (45.8%)	10 (41.7%)	-	3 (12.5%)	2.7917	0.97709

(SD- Strongly Disagree; D- Disagree; N- Neutral; A- Agree; SA- Strongly Agree; M- Mean, SD- Standard Deviation)

The research findings presented in Table 18 showed a mean score of 2.5 (SD = 0.59877) for the statement implementation of SEMS has significantly reduced our organization's energy costs. This score reflected a tendency towards agreement, with 54.2% of respondents indicating that SEMS had reduced energy costs, while 41.7% disagreed. The variability in responses suggests that while SEMS may have contributed to cost reductions, its effectiveness appeared to vary among organizations, possibly due to implementation challenges. The findings further show the mean, for the statement SEMS have helped us identify and eliminate unnecessary energy consumption was 2.625 (SD = 0.71094). This indicated a mixed perception, with 50% of respondents agreeing and 45.8% disagreeing. This variability implies that some economy hotels may not fully benefit from SEMS in identifying high-energy consumption areas, indicating potential limitations in implementation or a need for improved training and system adjustments.

The statement "SEMS have provided real-time data that has led to actionable insights for reducing energy costs" recorded a mean score of 2.25 (SD = 0.44233). This score indicated predominant disagreement, as 75% of respondents reported that SEMS did not provide actionable real-time data. The low standard deviation underscored a consensus among respondents that SEMS did not effectively support data-driven decisions for cost reduction. The statement "Our energy costs are more predictable and stable since adopting SEMS" yielded a mean score of 2.375 (SD = 0.49454). This result suggested that SEMS had not significantly influenced the predictability and stability of energy costs for the majority of respondents, as indicated by 62.5% disagreeing and 37.5% agreeing. The observed variability in responses highlights differing experiences with SEMS, revealing that its effectiveness in enhancing cost predictability and stability varied widely among economy hotels.

The statement "The financial investment in SEMS has been justified by the savings we have realized" recorded a mean score of 2.25 (SD = 0.44233). This finding indicated predominant disagreement, with 75% of respondents expressing that the investment had not been justified. This result reflected a general perception that the financial returns from SEMS did not meet expectations, suggesting that the anticipated cost savings might not have been realized as initially hoped.

Similarly, the analysis of return on investment, based on the statement "Our organization has achieved a positive return on investment from SEMS within the expected timeframe," revealed a mean score of 2.4167 (SD = 0.50361). With 58.3% of respondents disagreeing and 41.7% agreeing, the findings suggested that a positive return on investment from SEMS had not been universally achieved. This discrepancy highlighted potential issues with SEMS implementation. Overall, these findings indicated that while SEMS might offer certain financial benefits, their effectiveness and impact varied significantly across economy hotels.

4.4.6 Smart Energy Management Systems and Business Process

Information was sought on effect of SEMS on Business Processes and the descriptive statistics for each financial performance indicator were measured using a Likert scale. The respondents indicated their agreement with the statements and frequencies and percentages were computed. The results are presented in Table 18.

Table 18

Frequencies on Internal Business Process

Statements	SD	D	N	A	SA	M	SD
SEMS have allowed us to monitor and optimize energy consumption in real-time.	1 (4.2%)	13 (54.2%)	9 (37.5%)	-	1 (4.2%)	2.4583	0.77903
SEMS have enabled us to identify and address areas of high-energy consumption effectively.	1 (4.2%)	9 (37.5%)	11 (45.8%)	-	3 (12.5%)	2.7917	1.02062
SEMS have enabled faster detection and resolution of energy-related issues, reducing downtime.	-	13 (54.2)	9 (37.5%)	-	2 (8.3%)	2.625	0.87839
Our hotel experiences fewer disruptions in energy services due to SEMS.	-	15 (62.5%)	8 (33.3)	-	1 (4.2%)	2.4583	0.72106
SEMS have contributed to more cost-effective maintenance scheduling and resource allocation.	-	16 (66.7%)	8 (33.3%)	-	-	2.3333	0.48154
The implementation of SEMS has improved the reliability and availability of our hotel's energy systems.	1 (4.2%)	16 (66.7%)	7 (29.2%)	-	-	2.25	0.53161

(SD- Strongly Disagree; D- Disagree; N- Neutral; A- Agree; SA- Strongly Agree; M-Mean, SD- Standard Deviation)

The findings in Table 18 reveal that the statement “SEMS have allowed us to monitor and optimize energy consumption in real-time” received a mean score of 2.4583 with a standard deviation of 0.77903. A significant portion of respondents, 54.2%, disagreed with this statement, 37.5% remained neutral, and only 4.2% strongly agreed. This relatively low mean score, combined with a moderate standard deviation, suggests that although SEMS are implemented, their real-time monitoring capabilities are not widely perceived as effective. This perceived ineffectiveness may be attributed to system complexities.

Furthermore, the statement “SEMS have enabled us to identify and address areas of high-energy consumption effectively” had a mean of 2.7917 and a standard deviation of 1.02062. 45.8% of respondents agreed, while 37.5% disagreed. This higher mean suggests a better perception of SEMS in identifying high-energy consumption areas compared to the previous statement. However, the significant level of disagreement highlights ongoing challenges in optimizing energy consumption through SEMS.

Additionally, the mean score for the statement “SEMS have enabled faster detection and resolution of energy-related issues, reducing downtime” is 2.625 with a standard deviation of 0.87839. With 54.2% of respondents disagreeing and only 8.3% strongly agreeing, there is noticeable variability in SEMS effectiveness for reducing downtime. This variability indicates that while some hotels benefit, others face difficulties in effective integration. Moreover, the statement “Our hotel experiences fewer disruptions in energy services due to SEMS” shows a mean of 2.4583 and a standard deviation of 0.72106. With 62.5% of respondents disagreeing, it appears that SEMS may not consistently reduce energy service disruptions across all economy hotels, suggesting variability in effectiveness.

The mean scores for “SEMS have contributed to more cost-effective maintenance scheduling and resource allocation” and “The implementation of SEMS has improved the reliability and availability of our hotel's energy systems” are 2.3333 and 2.25, respectively, with standard deviations of 0.48154 and 0.53161. The substantial disagreement (66.7%) on both aspects suggests that SEMS are not widely seen as enhancing maintenance scheduling or system reliability. This indicates that many economy hotels may not fully leverage SEMS for these purposes, possibly due to implementation or training gaps.

These findings emphasize that while SEMS have been adopted by economy hotels, their impact on real-time energy management, downtime reduction, and maintenance efficiency varies. The moderate to low mean scores and significant standard deviations point to potential issues in system usage or training. Addressing these issues through improved training, better system integration, and more tailored solutions may help maximize the benefits of SEMS.

4.4.7 Factors that Influence Adoption of Smart Energy Management Systems

The study sought to determine the factors that influence the adoption of Smart Energy Management Systems (SEMS) in economy hotels in Nairobi, Kenya. Figures are used to present the findings, in percentages illustrating the key trends and relationships. This approach provides a clear and concise understanding of the various factors influencing SEMS adoption.

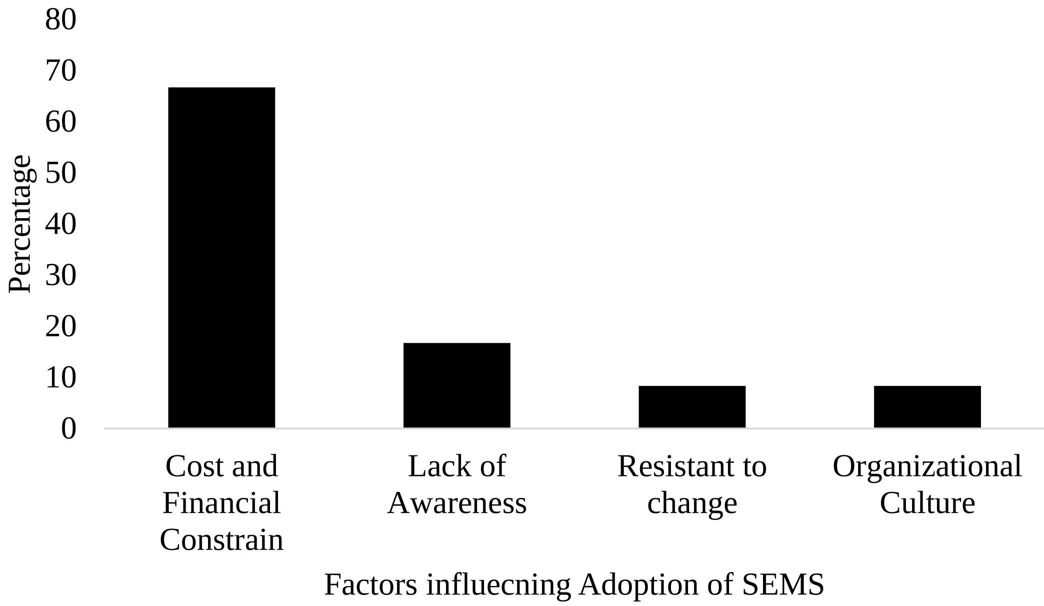

Figure 5: Factors that Hinder Adoption of Smart Energy Management Systems

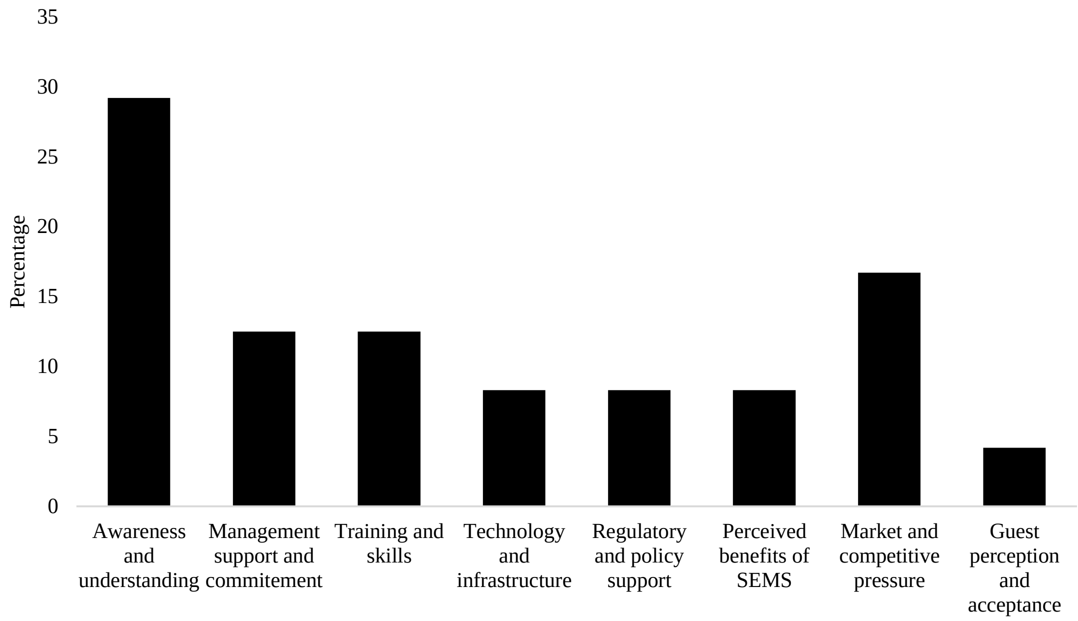

Figure 6: Factors that Facilitate the Adoption of Smart Energy Management Systems

The results in Figure 5 and 6 revealed a complex interrelation of factors influencing the adoption of Smart Energy Management Systems (SEMS) in economy hotels. Awareness and understanding emerged as the most significant facilitator, accounting for 29.2% of responses, indicating that informed management and staff are more likely to implement SEMS. Market and competitive pressure influenced 16.7% of respondents, suggesting competition within the hotel industry drives the adoption of energy-efficient technologies. Additionally, management support, commitment, training and skills were each presented by 12.5%, highlighting the importance of leadership and expertise.

Conversely, cost and financial constraints were identified as the most significant barrier, with 66.7% of respondents citing this as a challenge, affecting the critical role of financial considerations in SEMS adoption. Lack of awareness and understanding was also a notable barrier for 16.7% of respondents, reflecting the dual role of awareness as both a facilitator and a hindrance, depending on its presence or absence. Resistance to change and organizational culture that does not embrace new ideas were each identified by 8.3% of respondents as barriers, while lack of management support and regulatory and policy support were not reported as significant barriers, contrasting with some of the facilitators identified.

These findings align with a study by Filimonau and Magklaropoulou (2020), which emphasized the need for integrating energy conservation targets into the corporate agenda, alongside policy support, reflecting the importance of awareness and competitive pressure found in this study. However, the absence of significant barriers related to management support and policy in this study contrasts with their findings, suggesting that other factors, particularly financial constraints, may play a more dominant role in economy hotels.

Similarly, the study by Langaat et al. (2023) identified top management support as a key determinant, which aligns with the moderate influence of management support in this study. However, this study also highlights the critical role of financial constraints, a factor not extensively explored in Langaat et al.'s research, indicating a possible gap in the understanding of SEMS adoption in different hotel categories.

Further, the findings also agree Rajić et al. (2022) study by providing a detailed analysis of the specific barriers to SEMS adoption, such as cost and resistance to change, which were not explored in their study on implementation rates in the Western Balkans. Similarly, Salehi et al. (2021) highlighted the importance of cost reduction and managerial perception, which this study supports, though with a stronger emphasis on the barriers posed by financial constraints.

Moreover, these results correspond to studies by Eskerod et al. (2019) and Abdou et al. (2020), which emphasized that perceived benefits, such as cost reduction and operational efficiency, influence SEMS adoption. However, the significant role of financial constraints and the lesser impact of perceived benefits in economy hotels suggest that the barriers to SEMS adoption may be more evident in smaller, resource-constrained establishments

4.5 Diagnostics Tests

The section entailed normality test, and heteroscedasticity test.

4.5.1 Normality Test

The variables were tested their normality using the Kolmogorov–Smirnov test. According to Ghasemi and Zahediasl (2012), Kolmogorov Smirnov test is used where a sample size is greater than 50 while Shapiro–Wilk test is used when it is less than 50 or equal to 50. This normality check is essential as it determines the suitability of the data for further statistical analyses that often assume a normal distribution. Table 19 presents the normality test results.

Table 19

Normality Test Results for Variables Related to SEMS Adoption and Hotel Performance

		SEMS adoption	Financial Performance	Business Process	Customer Satisfaction
N	24	24	24	24	24
Normal Parameters[a,b]	Mean	2.5000	2.4306	2.4861	3.5724
	Std. Deviation	.44915	.32938	.39292	.36461
Most Extreme Differences	Absolute	.169	.199	.156	.115
	Positive	.169	.199	.156	.115
	Negative	-.127	-.125	-.099	-.069
Test Statistic		.169	.45	.156	.115
Asymp. Sig. (2-tailed)		.075[c]	.015[c]	.134[c]	.200[c,d]

The normality results presented in Table 19 showed that the data for SEMS adoption, financial performance, business process, and customer satisfaction were generally normally distributed, which was necessary to confirm the data's suitability for further analysis. A sample size of 24 was used for each variable guaranteeing accurate statistical interpretation. The means and standard deviations revealed moderate clustering around the mean for SEMS adoption (mean = 2.5, SD = 0.44915), financial performance (mean = 2.4306, SD = 0.32938), and business process (mean = 2.4861, SD = 0.39292), while customer satisfaction had a slightly higher mean (3.5724) with less variation (SD = 0.36461). The extreme differences reflected maximum deviations from normality, with absolute values for SEMS adoption (0.169), financial performance (0.199), business process (0.156), and customer satisfaction (0.115) indicating minimal deviations, except for financial performance, which was slightly higher. The test statistics and p-values further indicated that SEMS adoption (p =

0.075), business process (p = 0.134), and customer satisfaction (p = 0.200) had p-values above the 0.05 threshold, confirming normal distribution for these variables. Only financial performance had a p-value below this threshold (0.015), suggesting a slight deviation from normality. Therefore, the data were considered sufficiently normal to support its use in further analyses that assumed normal distribution.

4.5.2 Heteroscedasticity Test

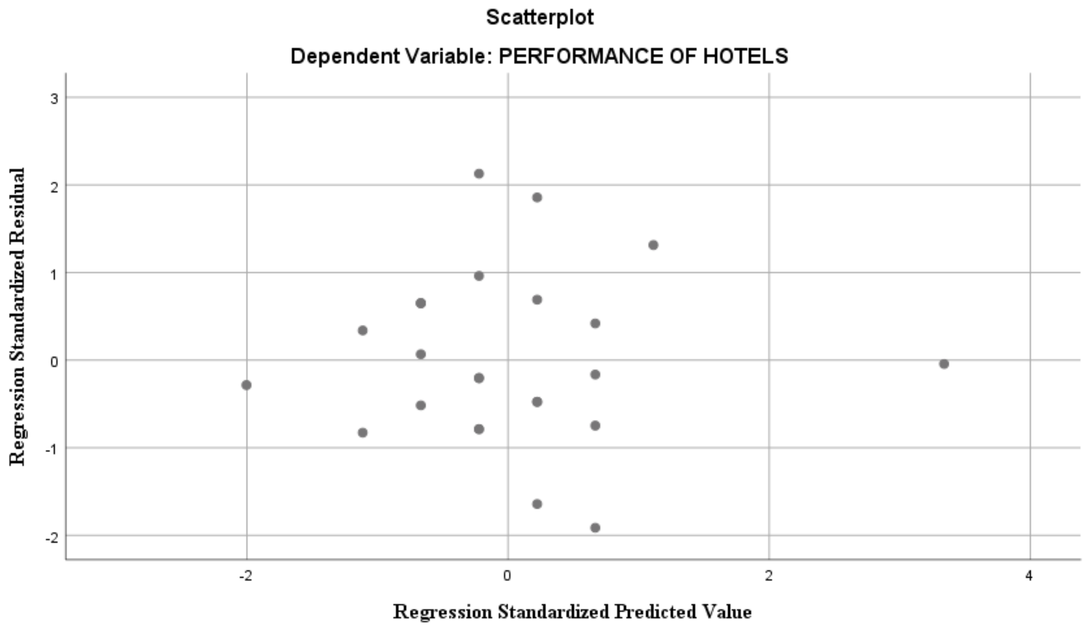

Figure 7: Heteroscedasticity Plot

The plots analysis in figure 7 indicated that the data points displayed no specific pattern or shape and were scattered randomly around the scatter plot. This random dispersion suggests that there was no particular relationship between the variables that could imply a trend or pattern. Consequently, the absence of a consistent pattern in the data supported the conclusion that there were no issues with heteroscedasticity, as the variance of the residuals appeared to be constant across different levels of the independent variable, thereby satisfying the assumption of linear regression analysis.

4.5.3 Linearity

Linearity was tested using scatter plots, which provided a visual representation of the relationship between SEMS and hotel performance as presented in Figure 8, Figure 9 and Figure 10.

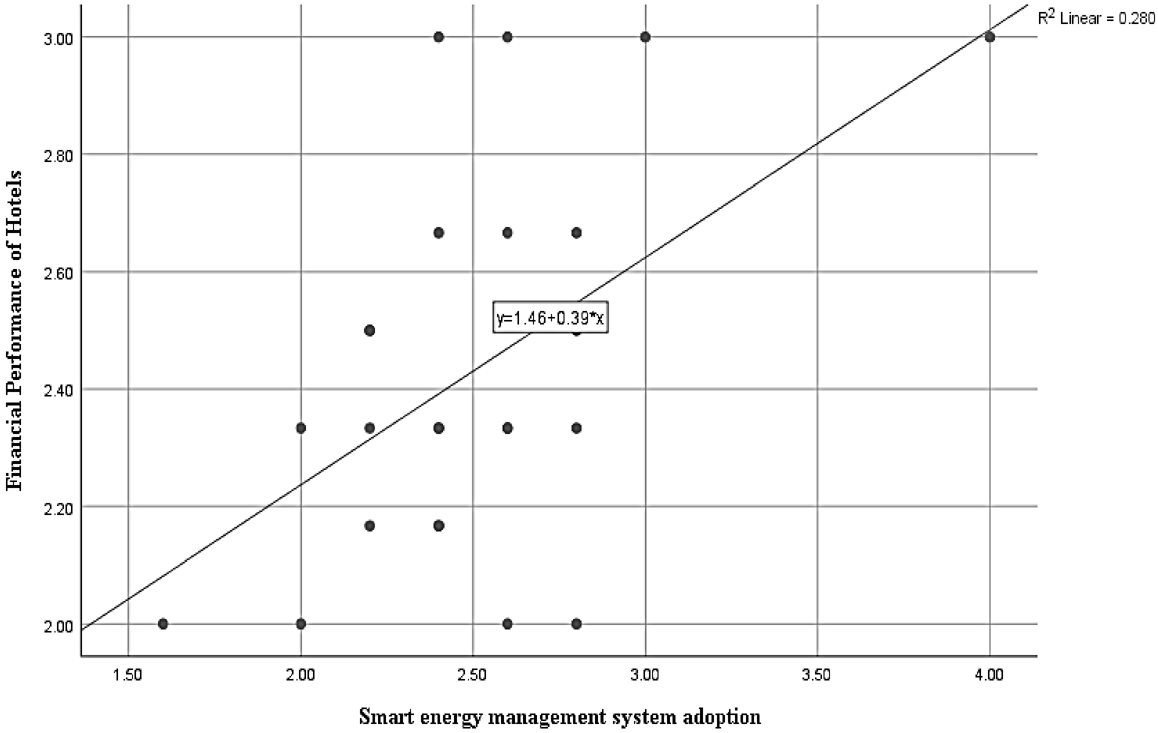

Figure 8: Linearity plot of SEMS and Financial Performance

The scatter plot in Figure 8 demonstrates a positive slope in the regression line (y=1.46+0.39x) suggesting that as SEMS adoption increases in a linear manner, which validates the linearity assumption. The R-squared value of 0.280 indicates that while 28% of the variance in financial performance is explained by SEMS adoption, the data points' spread around the line shows some variability, suggesting that other factors also play a role. This alignment with the linearity rule enhances the reliability of using linear regression.

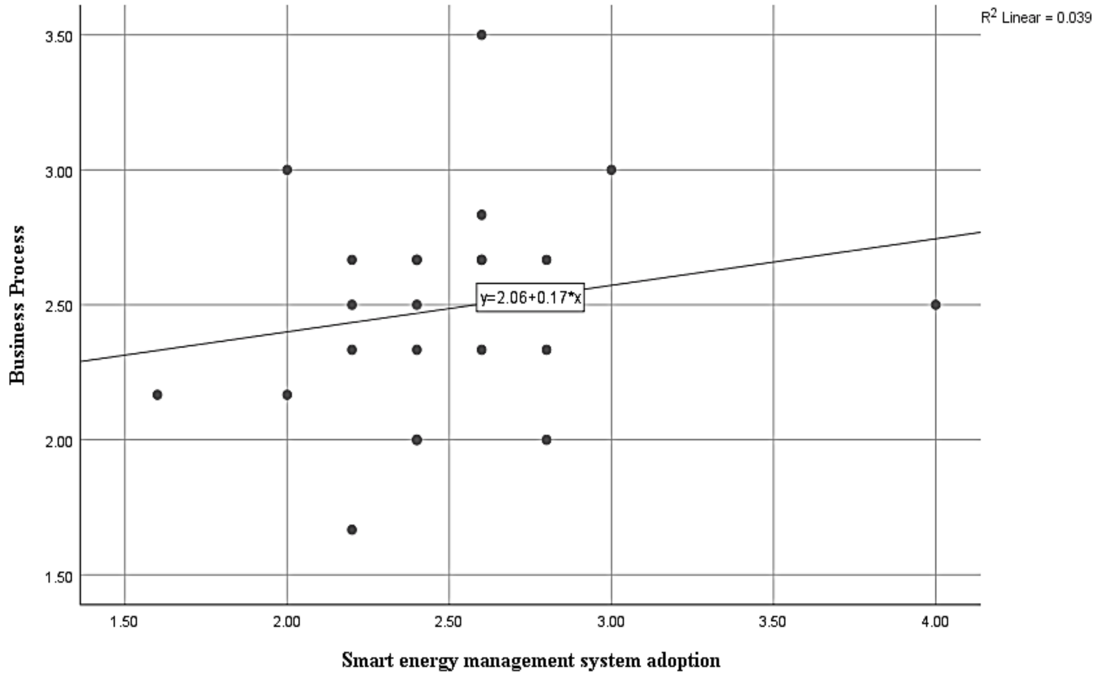

Figure 9: Linearity Plot of SEMS and Internal Business Process

The scatter plot in Figure 9 reveals a positive slope in the regression line (y=2.06+0.17x), suggesting that as SEMS adoption increases, there is a slight linear increase in business process performance. This trend supports the linearity assumption in regression analysis, as the relationship between SEMS adoption and business process performance appears to be approximately linear. The spread of data points around the line suggests considerable variability, suggesting that other factors likely play a larger role in influencing business process performance. Despite this variability, the overall positive slope aligns with the linearity rule, supporting the use of linear regression for modelling this relationship.

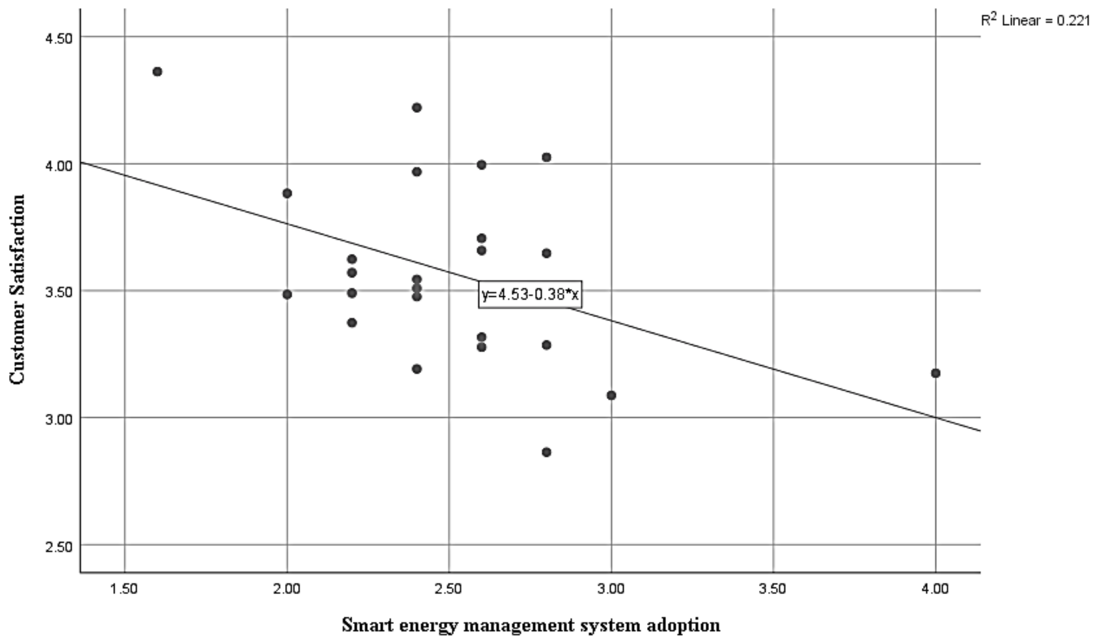

Figure 10: Linearity plot of SEMS and Customer Satisfaction.

The slope in Figure 10 indicates a negative slope (y=4.53−0.38x) of the regression line denoting that as SEMS adoption increases, customer satisfaction tends to decrease in a linear manner, which aligns with the linearity assumption required for regression analysis.

4.6 Regression Analysis

Regression was performed to examine the effect of smart energy management systems adoption on performance of economy hotels in Nairobi- City.

4.6.1. Smart Energy Management System Adoption and Hotel Business Processes

The second objective examined the effect of SEMS on hotel internal business processes in Nairobi City County. A simple regression model was used to present the relationship between SEMS and internal business process of economy hotels. The results are presented in Table 20. From the regression analysis, in hotels as shown in Table 20.

Table 20

Significance of the Model

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate
1	.197[a]	.039	-.005	.39387

a. Predictors: (Constant), SEMS adoption
b. Dependent Variable: Business Process

As displayed in Table 20, the first model had an R of 0.197. This indicate that only 19.7% of the model is explained by the independent variable. These results indicate a relatively low level of correlation between SEMS adoption and the improvement of business processes. The findings showed that R^2 was 0.039, suggesting that only 3.9% of the variance in hotel business processes is explained by the adoption of SEMS. Therefore, SEMS adoption accounts for a minimal portion of the changes or improvements observed in the business processes of hotels. R is the correlation coefficient, which illustrates the relationship between variables, and from the results presented in the table above there was a weak positive correlation between smart energy management systems adoption and business processes as shown by 0.197.

As per the ANOVA analysis, the model was not significant p=0.356 indicating business process was not significantly affected by SEMS adoption as shown in Table 20.

Table 21

Significance of the Model

Model	Sum of squares	df	Mean squares	F	Sig.
Regression	.138	1	.138	.889	.356[b]
Residual	3.413	22	.155		
Total	3.551	23			

a. Dependent Variable: Business Process

The ANOVA results in Table 20 showed a p-value of 0.356, indicating that SEMS adoption does not significantly affect hotel business processes. The residual value of 3.413 showed the variation in business processes that is not explained by SEMS adoption. This lack of statistical significance further supports the argument that while SEMS adoption may contribute to minor improvements, it does not play a substantial role in operational efficiency of economy hotels.

Table 22

Significance of the Model

Model	Unstandardized coefficients B	Std. Error	Standardized coefficients Beta	T	Sig.
(Constant)	2.055	.464		4.428	.000
SEMS adoption	.172	.183	.197	.943	.356

From the findings in Table 22, the unstandardized B_0 (2.055) was significant (t statistics=4.428**,** p=0.000) signifying it statistically influenced the model. However the B1 which represented the smart energy management system adoption had a B value of 0.172 though it was not significant (t statistics=0.943, p=0.356). This indicated that with everything held constant, one unit of smart energy management adoption, led to a 0.172 increase in the business process. This implies that the adoption of SEMS does not have a substantial or statistically significant effect on the business process outcomes.

The results from Table 20, Table 21 and Table 22, indicate a weak positive correlation and non-significant effect of Smart Energy Management System (SEMS) adoption on hotel business processes. These findings contrast with past studies by Granderson et al. (2011) and Chiu et al. (2012), which highlighted substantial improvements in energy efficiency when SEMS were integrated into hotel operations, emphasizing the systems' real-time monitoring and control capabilities. Granderson et al. (2011) and Chiu et al. (2012) conducted their studies in environments where SEMS had been more deeply integrated into overall hotel management processes, which allowed for more direct and measurable impacts. In contrast, the current study likely reflected a context where SEMS adoption either was in its early stages or implemented on a more limited scale, thus failing to produce the substantial operational changes observed in previous research.

Similarly, research by Sauter and Lobashov (2011) and Kaushik and Naik (2024) emphasized the role of SEMS in significantly lowering maintenance costs and minimizing downtime through predictive maintenance and early fault detection. However, the contrasting finding from the currents study does not correspond with the findings.

4.6.2 Smart Energy Management Systems adoption and Customer Satisfaction

The study sought to examine the effect of SEMS on hotel customer satisfaction. A simple linear regression was used to present the relationship between SEMS on customer satisfaction and were tested at a 5 percent level and results presented in Table 23

Table 23

The Goodness Fit of the Model

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate
1	.470[a]	.221	.186	.32905

a. Predictors: (Constant), SEMS adoption.
b. Dependent Variable: Customer Satisfaction.

From the regression analysis on Table 23, the model had an *R* of 0.470. This indicate a moderate positive correlation between SEMS adoption and customer satisfaction. From the model, only 47.0% is explained by the independent variable. From the findings in Table 23, the value of R square (R^2) was 0.221, which implies that 22.1% of the change in customer satisfaction can be explained by the adoption of Smart Energy Management Systems (SEMS). The remaining 77.9% indicates that there are other factors, not included in the model, that contribute to the variation in customer satisfaction.

As per the ANOVA analysis, the model was significant (F=6.240, p<0.05). This indicated that SEMS adoption had a significant effect on customer satisfaction as shown by the results on Table 24.

Table 24:

Significance of the Model

Model	Sum of squares	df	Mean squares	F	Sig.
Regression	.676	1	.676	6.240	.020[b]
Residual	2.382	22	.108		
Total	3.058	23			

a. Dependent Variable: Customer Satisfaction
b. Predictors: (Constant), SEMS adoption.

From the findings in Table 24, the low p-value (p = 0.020) suggests that there is a statistically significant effect of Smart Energy Management System (SEMS) adoption on customer satisfaction. The significance level (p < 0.05) indicates that the probability of recording such an effect due to random chance is very low. Therefore, SEMS adoption explains a meaningful amount of variation in customer satisfaction outcomes. The F-statistic value of 6.240 further supports the conclusion that the model is significant. This relatively high F-value indicates that the variance in customer satisfaction explained by SEMS adoption is considerably greater than the variance left unexplained by the model. Therefore, these results suggest that the implementation of SEMS significantly and favorably affects hotel customer satisfaction.

Table 25

Significance of the Model

Model	Unstandardized coefficients B		Std. Error	Standardized coefficients Beta	T	Sig.
(Constant)	4.526	.388		11.673	.000	
SEMS adoption	-.382	.153	-.470	-2.498	.020	

a. Dependent Variable: Customer Satisfaction

The values from unstandardized coefficient in Table 25 reveal the B_0 (4.526) was significant (t statistics =11.673, $p<0.05$). This suggests that, even without any adoption of SEMS, the baseline level of customer satisfaction is 4.526 on the measurement scale used in the study. Further the B1 (-0.382) was also statistically significant (t=-2.498, $p<0.05$). The coefficient is negative, indicating an inverse relationship between SEMS adoption and customer satisfaction. Further, it also indicated that for every unit increase in the independent variable, here was a -0.382 increase in Y when other factors are held constant.

The regression equation that was developed from the results was:

$Y=4.526 - 0.382X$

The study findings on Table 23, Table 24 and Table 25 agree with a study by Meng and You (2021), which found that SEMS significantly enhance guest satisfaction in European hotels by ensuring precise control over room conditions like temperature and lighting. The consistency of room comfort facilitated by SEMS leads to a pleasant guest experience, thereby improving customer satisfaction. Furthermore, Aragon-Correa et al. (2018) highlighted that guests prefer hotels with strong sustainability practices, such as those facilitated by SEMS, which align with their environmental values and enhance their satisfaction. This aligns with the present findings, suggesting that SEMS adoption positively influences customer satisfaction by demonstrating environmental responsibility, which is increasingly important to guests.

Nevertheless, previous research by Xu et al. (2020) and Meng and You (2021), which established a positive relationship between SEMS adoption and customer satisfaction, does not align with the study's negative regression coefficient. This discrepancy suggests that there may be underlying factors in Nairobi economy hotels, which contribute to a less favorable guest experience with SEMS. Possible reasons might include poor implementation of SEMS.

4.6.3 Smart Energy Management Systems Adoption and Financial Performance

The purpose of the study was to investigate how SEMS affected financial performance. Upon performing a regression analysis, the results are shown in Table 26.

Table 26

The Goodness Fit of the Model

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate
1	.529[a]	.280	.247	.28581

a. Predictors: (Constant), SEMS adoption
b. Dependent Variable: Financial Performance

From the regression analysis in Table 25, the model R-value was 0.529. This indicates a moderate positive correlation between SEMS adoption and the financial performance of hotels. This suggest that as hotels adopt more smart energy management practices, there is a tendency for financial performance to improve by 52.9%.

According to Table 26, the implementation of SEMS can account for 28% of the variance in financial performance, as indicated by the R square of 0.280. This shows that the implementation of SEMS has a major impact on financial results. Other factors not covered by this model probably have an impact on the remaining 72.0% of the variations in financial performance.

Table 27

Significance of the Model

Model	Sum of squares	df	Mean squares	F	Sig.
Regression	.698	1	.698	8.548	.008[b]
Residual	1.797	22	.082		
Total	2.495	23			

a. Dependent Variable: Financial Performance
b. Predictors: (Constant), SEMS adoption

As per the Analysis of Variance (ANOVA) in Table 27, the model was highly significant (F=8.548, p<0.05), further reiterating the impact of the financial performance on the y-axis. The model is highly significant, according to the ANOVA results shown in Table 27. The disparity in financial performance that can be described by SEMS adoption is substantially larger than the variance that cannot be explained, as indicated by the F-statistic value of 8.548. The statistical significance of the association between SEMS adoption and financial performance is confirmed by a significant p-value of 0.008, which is below the 0.05 cutoff. A strong and consistent impact of SEMS adoption on financial performance is suggested by this low p-value, which shows that there is less than a 1% possibility that the observed relationship emerged by chance.

Table 28

Significance of the Model

Model	Unstandardized coefficients B		Std. Error	Standardized coefficients Beta	T	Sig.
(Constant)	1.461	.337		4.337	.000	
SEMS adoption	.388	.133	.529	2.924	.008	

a. Dependent Variable: Financial Performance

Table 28 study findings show that the constant (B_0 = 1.461) is statistically significant, with a t-statistic of 4.337 and a p-value of 0.000 (p < 0.05), suggesting that when Smart Energy Management System (SEMS) adoption is zero, the baseline performance of hotels is 1.461 units. Additionally, the coefficient for SEMS adoption (B_1 = 0.388) is positive and statistically significant, with a t-statistic of 2.924 and a p-value of 0.008 (p < 0.05). This indicates a positive relationship between SEMS adoption and hotel performance, implying that for every unit increase in SEMS adoption, hotel performance improves by 0.388 units, holding other factors constant. The positive Beta coefficient (0.529) further reinforces that SEMS adoption has a substantial impact on enhancing hotel performance.

The regression model fitted from the analysis fitted was:

Y=1.461+0.388X

This study finding on Table 26, Table 27 and Table 28 highlights the importance of Smart Energy Management Systems (SEMS) in influencing the financial performance of hotels. The model R-value of 0.529 indicates a moderate positive correlation between SEMS adoption and financial performance, meaning that a higher degree of SEMS adoption tends to enhance financial outcomes for economy hotels. The adoption of SEMS accounts for 28% of the variance in financial performance, as shown by the R-square value of 0.280. This aligns with findings from prior research by Alhashmi et al. (2020) and Windapo and Moghayedi (2020), who emphasized that SEMS improve energy efficiency and, consequently, financial performance.

Additionally, the remaining 72% of unexplained variance suggests that other factors beyond SEMS adoption, such as operational strategies, market conditions, and other technology integrations, play a role in shaping financial outcomes. This supports studies by Pereira et al. (2021), who observed that while SEMS adoption enhances cost savings, it must be complemented by other factors to maximize financial performance.

The ANOVA results further reinforce the significance of SEMS adoption. The *F*-statistic of 8.548 and the p-value of 0.008 ($p < 0.05$) indicate that SEMS adoption has a significant impact on financial performance, reaffirming the substantial influence it has. The results of this study correspond with a study by Bonilla et al. (2018), which similarly revealed that the implementation of SEMS results in notable savings in energy costs, thereby improving financial results.

Moreover, the regression coefficient results, where $B_1 = 0.388$, indicate that for every unit increase in SEMS adoption, financial performance improves by 0.388 units. This result agrees with the research conducted by Saleem et al. (2023), which highlighted the positive impact of SEMS on hotel operations and profitability. The statistically significant constant ($B_0 = 1.461$) suggests that economy hotels maintain a baseline level of financial performance even without SEMS adoption, but the system's integration significantly amplifies performance outcomes.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of Findings

The study sought to assess the adoption levels of SEMS in economy hotels in Nairobi City- County, Kenya. The research findings reveal that the adoption of Smart Energy Management Systems (SEMS) in economy hotels is significantly low, with an average adoption rate of 2.500. This suggest that most economy hotels in Nairobi City- County have not formalized the integration of ISO 50001 guidelines into their energy policies, indicating a widespread lack of structured energy management practices. Key activities such as systematic energy planning, setting energy objectives, and implementing operational controls are largely absent in these hotels. Furthermore, the findings suggest that continuous monitoring and performance assessments are infrequent, limiting these hotels' ability to identify and address energy inefficiencies. The lack of regular reviews of energy management systems indicated the minimal commitment of economy hotels to optimizing energy use. The findings revealed a significant gap in the adoption and implementation of structured energy management practices within economy hotels.

The second objective of the study was to examine the effects of smart energy management systems on financial performance in economy hotels in Nairobi City- County, Kenya. The findings reveal that SEMS generally enhance energy management practices, with 54.2% of economy hotels agreeing that SEMS are effective in real-time monitoring and optimization of energy use. This suggests that SEMS can contribute to improved energy efficiency and cost savings. However, there is variability, with 45.8% of economy hotels agreeing on effectiveness, 37.5% remaining neutral, and 12.5% disagreeing, indicating potential implementation challenges. The regression analysis shows that SEMS adoption explains 28% of the variance in financial performance. The remaining 72% of unexplained variance suggests that other factors, such as operational strategies, market conditions, and additional technology integrations, also affect financial performance. The substantial impact of SEMS on profitability is further supported by the significant ANOVA results.

The third objective of the study sought to examine the effect of smart energy management systems adoption on business processes in economy hotels in Nairobi

City- County, Kenya. The study on Smart Energy Management Systems (SEMS) in economy hotels reveals several implementation challenges. Findings show that 54.2% of hotels disagreed that SEMS effectively monitor and optimize energy use, suggesting limited benefits due to system complexities or inadequate training. Additionally, 45.8% of hotels agreed SEMS help identify high-energy consumption areas, but 37.5% disagreed, indicating challenges in achieving optimal energy use. SEMS also demonstrated mixed effectiveness in detecting and resolving energy issues, with 54.2% of hotels disagreeing on their speed of resolution. Furthermore, 62.5% of hotels reported SEMS did not reduce energy disruptions, and 66.7% disagreed that SEMS improved maintenance scheduling or system reliability. Further, from the regression analysis SEMS adoption explains only 3.9% of the variance in business processes, with a non-significant effect.

The fourth objective sought to examine the effect of smart energy management systems adoption on customer satisfaction in economy hotels in Nairobi City - County, Kenya. The findings revealed that 75.3% of guests were satisfied with their stay, and 63.7% were pleased with the comfort of their rooms, indicating overall positive experiences. However, 24.7% of guests were neutral or dissatisfied, suggesting areas for improvement. Additionally, 62.3% of guests indicated they were willing to return, and 67.7% would recommend the hotel, though a significant proportion remained neutral or disagreed. Sustainability practices had a positive influence on guest recommendations, with 72% agreeing that energy efficiency affected their decision, while 50.7% were neutral or disagreed about sustainability influencing future revisits. The regression analysis demonstrated a moderate positive correlation (R = 47.0%) between SEMS adoption and customer satisfaction. Despite this, the negative regression coefficient (-0.382) indicated an inverse relationship between SEMS adoption and customer satisfaction, suggesting that for every unit increase in SEMS adoption, satisfaction decreased by 0.382 units. This finding contrasts with prior research, which generally showed positive impacts of SEMS on guest satisfaction, thereby highlighting potential issues with SEMS implementation or guest perceptions.

The fifth objective sought to analyse factors that influence the adoption of smart energy management systems among economy hotels in Nairobi City- County. The study's findings revealed several key factors influencing the adoption of Smart Energy Management Systems (SEMS) in economy hotels in Nairobi. Awareness and understanding emerged as the most significant facilitator, indicating that informed management and staff in economy hotels are more likely to implement SEMS. Market and competitive pressure also played a role, suggesting that competition within the economy hotel sector drives the adoption of technologies that use less energy.

Additionally, management support, commitment, and training and skills were highlighted, emphasizing the importance of leadership and expertise in promoting SEMS adoption. However, cost and financial constraints were identified as the most significant barrier, emphasizing the critical role of financial considerations in SEMS implementation within economy hotels. Lack of awareness and understanding was also noted as a barrier, reflecting its dual role as both a facilitator and a hindrance. Other barriers included resistance to change and organizational culture. Further, lack of management support and regulatory and policy support were not seen as significant barriers. These findings highlight the central role of financial resources, awareness, and leadership in driving SEMS adoption in the economy hotel sector.

5.2 Conclusions

Based on the objectives of the study the following conclusions were made:
The adoption rate of Smart Energy Management Systems (SEMS) in economy hotels is relatively low. The study indicates that most of the economy hotels lack energy management systems as the resulted revealed a minority of economy hotels had a formal energy policy aligned with ISO 50001, and most lacked regular energy planning activities, operational controls for energy management, continuous monitoring, and performance measurement. Additionally, regular reviews of energy management systems were infrequent. The researcher concludes that there is a significant gap in the adoption and implementation of structured energy management practices within economy hotels.

Smart Energy Management Systems (SEMS) positively affect hotel financial performance. The study indicates that SEMS adoption leads to significant improvements in profitability. While SEMS integration greatly boosts performance, other factors such as operational strategies and market conditions also play a role in financial outcomes. Overall, SEMS proves to be a valuable tool in enhancing hotel profitability and operational efficiency. The researcher therefore concludes that SEMS adoption substantially improves financial performance, making it an effective strategy for increasing profitability and operational efficiency in hotels.

Smart Energy Management Systems (SEMS) have minimal impact on business processes within economy hotels. The study indicates that SEMS generally do not enhance real-time energy management, issue resolution, or maintenance efficiency, as evidenced by high percentages of disagreement and neutral responses from hotels. This suggests that SEMS are not fully effective in improving key operational areas. Therefore, the researcher concludes that for SEMS to make a meaningful difference, economy hotels need better system integration, more targeted training, and tailored solutions to address their specific challenges and improve overall efficiency.

The adoption of Smart Energy Management Systems (SEMS) inversely affects customer satisfaction. This study indicates that despite majority of guests in economy hotels reported satisfaction with their stay and room comfort, the adoption of Smart Energy Management Systems (SEMS) was associated with a decrease in customer satisfaction. Despite the value SEMS adoption among guests, the findings indicate an inverse relationship where increased adoption was linked to a decline in satisfaction levels among guests. The researcher concludes that addressing potential issues with SEMS implementation could help mitigate this inverse effect and enhance customer satisfaction.

Adoption of SEMS in economy hotels is influenced by various factors. Awareness and understanding were identified as key facilitators, with informed management and staff being more likely to implement these systems. Cost and financial constraints were found to be the most significant barriers, underscoring the critical role of financial resources in economy hotels. Market pressure and management support were also found to drive adoption, emphasizing the importance of leadership and expertise. Addressing financial challenges and enhancing awareness are crucial for advancing SEMS in economy hotels. The researcher concludes that overcoming financial barriers, improving management support, and increasing awareness are essential steps for successful SEMS adoption in economy hotels.

5.3 Recommendations

The study sought to assess the effect of smart energy management systems adoption on performance of economy hotels. Based on the findings of the study, the following recommendations were made:

i. There is a need to develop and implement formal energy management policies aligned with ISO 50001, and to enhance energy planning and monitoring processes in economy hotels by introducing regular activities, operational controls, and performance measurement systems to improve energy efficiency and management practices.
ii. There is a need to conduct frequent reviews of energy management systems and integrate Smart Energy Management Systems (SEMS) more effectively within economy hotels to enhance real-time energy management, issue resolution, and maintenance efficiency.
iii. There is a need to assess the specific features of Smart Energy Management Systems (SEMS) currently implemented and their impact on hotel operations. Adjust or replace any features that are causing dissatisfaction or not delivering the expected benefits to improve overall effectiveness and guest satisfaction.

5.4 Suggestions for Further Research

The researcher suggests the following areas for future research:

i. A Longitudinal Study on the Relationship between Smart Energy Management Systems (SEMS) Adoption and Customer Satisfaction in Economy Hotels.
ii. Comparative Study of Smart Energy Management Systems (SEMS) Adoption and Impact on Hotel Performance.

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APPENDICES

Appendix I: Consent Letter

I trust this finds you well. My name is Gladwell Gatwiri, a Master of Science Degree student at Tharaka University, pursuing Hotel Management. This research focuses on understanding the ‘Effect of Smart Energy Management Systems Adoption on Performance of Economy Hotels in Nairobi City- County, Kenya.

Attached to this letter is a questionnaire designed to gather insights into this research. The questionnaire has two section; section A contains demographic information of respondent while section B assess the impacts of smart energy management systems on hotel’s performance.

I request that you provide your input by completing all items in the questionnaire to ensure an accurate reflection of your opinions and experiences. Your contribution will significantly help in advancing our understanding of the levels, impacts and factors that hinder adoption of smart energy management systems. Rest assure, I am committed to handling your response with utmost care and confidentiality, your identity will remain anonymous throughout the study, and all information shared will be used exclusively for research purposes. Permission has been obtained from relevant institutions to conduct this study, ensuring its legitimacy and ethical standards.

If you have any question or would like further clarification regarding this study, feel free to reach me via mobile; 0704280427 or email at gladwellgatwiri6@gmail.com.

I sincerely thank you in advance for your anticipated participation.

Yours, sincerely,
Gladwell Gatwiri Muriungi.

Consent to participate

I have read the information provided above and voluntarily agree to participate in the study.
Signature: ……………………………….

Appendix II: Questionnaires for Hotel Guests

Thank you for participating in this research on 'Effect of Smart Energy Management Systems Adoption on Performance in Economy Hotels'. Your valuable insights are crucial for this study and will help us understand how these systems can enhance customer satisfaction. Your participation is greatly appreciated, and we assure you that your responses will be kept confidential and used solely for this research.

SECTION A: DEMOGRAPHIC INFORMATION (Please tick appropriately)

1. Gender

Male [ ]   Female [ ]

1. Age

Below 25 years [ ]   26 - 40 years [ ]

41 – 50 years [ ]   51 – 60 years [ ]

Above 61 [ ]

2. Country of Citizenship

Kenya [ ]

Rest of Africa [ ]

Europe [ ]

United States [ ]

Asia [ ]

3. Visit Type

First time [ ]

Returning guest [ ]

Section B: Effect of Smart Energy Management Systems on Customer Satisfaction

4. Overall Satisfaction Rates

Please rate your level of agreement with each statement: The rates are as follows 1=(Very Dissatisfied), 2=(Dissatisfied), 3=(Neutral),4 =(Satisfied), 5 (Very Satisfied)

Statement	**1**	**2**	**3**	**4**	**5**
Overall satisfaction with your stay at our hotel					
Comfort and quality of my room during my stay					

5. Repeat Guests Rate

Please rate your level of agreement with each statement: The rates are given as: 1=SD (Strongly Disagree), 2= D (Disagree), 3= N (Neutral), 4= A (Agree), 5= SA (Strongly Agree).

Statement	**1**	**2**	**3**	**4**	**5**	
Based on my present stay, I will visit your hotel again.						
I can recommend my friends and family based on my experience.						
The hotel commitment to energy efficiency is a key factor when recommending others.						
The hotel smart sustainability practices influences future re-visit.						

6. Customer Feedback and Review

Please rate your level of agreement with each statement: The rates are as follows: : 1=SD (Strongly Disagree), 2= D (Disagree), 3= N (Neutral), 4= A (Agree), 5= SA (Strongly Agree).

Statements	1	2	3	4	5
Considering the hotel smart energy management initiatives in the hotel, the value for money was worthy.					
The room maintained a consistent temperature throughout my stay					
The heating and cooling system was easy to adjust and control					
I was satisfied with the overall comfort of the room					
The noise level from the window air conditioners, hydronic heating system and air source heating system was minimal					

Thank you for your participation.

Appendix III: questionnaires for hotel managers

I am a student pursuing a Master's degree in Hotel Management at Tharaka University. I am conducting research on the effects of Smart Energy Management Systems adoption on performance in economy hotels, Nairobi City County. This research study is a requirement for the award of a Master's degree in Hotel Management from Tharaka University. I kindly request your participation in this research study. The information hereby given will be used for academic purposes only and will be treated with utmost confidentiality. Yours, sincerely

SECTION A: GENERAL INFORMATION

1. **Number of Rooms:**
   Less than 50 [ ] 50-100 [ ] 101-200 [ ] 201-300 [ ] More than 300 [ ]
2. **Hotel Rating:**
   Not rated [ ] 1-star [ ] 2-star [ ] 3-star [ ]
   Other *(please specify)* ________________
3. **Sustainability certifications** *(Please list any sustainability certification(s) obtained if any e.g. eco-certification… if none, type NA)*
   ____
4. **What has been your hotel's average occupancy rate over the past year?** *(Financial year ending 30th June 2024)*
   Less than 25% [ ] 26% - 50% [ ] 51-75% [ ] 76% - 100% [ ]
5. **Number of employees**
   Below 50 [ ] 51-100 [ ] 101-150 [ ] 151-200 [ ]
   201- 250 [ ] 251-300 [ ] 300 and above [ ]
6. **Years of operation**
   5 years and below [ ] 6-10 years [ ] 11-15 years [ ] 16-20 years [ ]
   Over 20 years [ ]

SECTION B: ADOPTION LEVELS OF SMART ENERGY MANAGEMENT SYSTEMS

7. **To what extent has your hotel adopted Smart Energy Management Systems (SEMS)?**
   Not adopted [ ] Slightly adopted [ ] Moderately adopted [ ] Mostly adopted [ ] Highly adopted [ ]
8. Please rate the following statements on the **adoption levels of SEMS** in economy hotels, Nairobi City County. The rates are given as: 1=SD (Strongly Disagree), 2= D (Disagree), 3= N (Neutral), 4= A (Agree), 5= SA (Strongly Agree).

Statement	**1**	**2**	**3**	**4**	**5**
Energy Policy					
Our hotel has a formal energy policy that aligns with the principles of ISO 50001.	[1]	[2]	[3]	[4]	[5]
Energy Planning					

Our hotel regularly conducts energy planning activities, including setting energy objectives and targets.	[1]	[2]	[3]	[4]	[5]
Implementation and Operation					
Our hotel has implemented operational controls and procedures to manage energy consumption effectively.	[1]	[2]	[3]	[4]	[5]
Monitoring and Measurement					
Our hotel continuously monitors and measures energy performance to identify areas for improvement.	[1]	[2]	[3]	[4]	[5]
Management Review					
Our hotel's management regularly reviews the energy management system to ensure its effectiveness and make necessary adjustments.	[1]	[2]	[3]	[4]	[5]

SECTION 3: PERFORMANCE OF HOTELS

9. Please rate the following statements on the **Effects of Smart Energy Management Systems on Financial Performance** in economy hotels, Nairobi City County. The rates are given as: 1=SD (Strongly Disagree), 2= D (Disagree), 3= N (Neutral), 4= A (Agree), 5= SA (Strongly Agree).

Statement	**1**	**2**	**3**	**4**	**5**
Implementation of SEMS has significantly reduced our organization's energy costs.					
SEMS have helped us identify and eliminate unnecessary energy consumption.					
SEMS have provided real-time data that has led to actionable insights for reducing energy costs.					
Our energy costs are more predictable and stable since adopting SEMS.					
The financial investment in SEMS has been justified by the savings we have realized.					
Our organization has achieved a positive return on investment from SEMS within the expected timeframe.					
SEMS have allowed us to allocate savings to other areas of our business, thereby improving profitability.					

10. Please rate the following statements on the **Effects of Smart Energy Management Systems on Business Process** in economy hotels, Nairobi City County. The rates are given as: 1=SD (Strongly Disagree), 2= D (Disagree), 3= N (Neutral), 4= A (Agree), 5= SA (Strongly Agree).

Statements	1	2	3	4	5
SEMS have allowed us to monitor and optimize energy consumption in real-time.					
SEMS have enabled us to identify and address areas of high-energy consumption effectively.					
SEMS have enabled faster detection and resolution of energy-related issues, reducing downtime.					

Our hotel experiences fewer disruptions in energy services due to SEMS.					
SEMS have contributed to more cost-effective maintenance scheduling and resource allocation.					
The implementation of SEMS has improved the reliability and availability of our hotel's energy systems.					

SECTION 4: Facilitators and Barriers to Smart Energy Management Systems Adoption

11. The following Barriers hinder the Adoption of Smart Energy Management Systems in our hotel *(Please select all that apply)*

a. Cost and Financial Constraints [ ]

b. Lack of Awareness and Understanding [ ]

c. Lack of Management Support and Commitment [ ]

d. Resistance to change [ ]

e. Organizational Culture (does not embrace new ideas) [ ]

f. Lack of Regulatory and Policy Support [ ]

12. The following Facilitators drive the Adoption of Smart Energy Management Systems in our hotel *(Please select all that apply)*

a) Awareness and Understanding [ ]

b) Management Support and Commitment [ ]

c) Training and Skills [ ]

d) Technology and Infrastructure [ ]

e) Organizational Culture (that embraces new ideas) [ ]

f) Regulatory and Policy Support [ ]

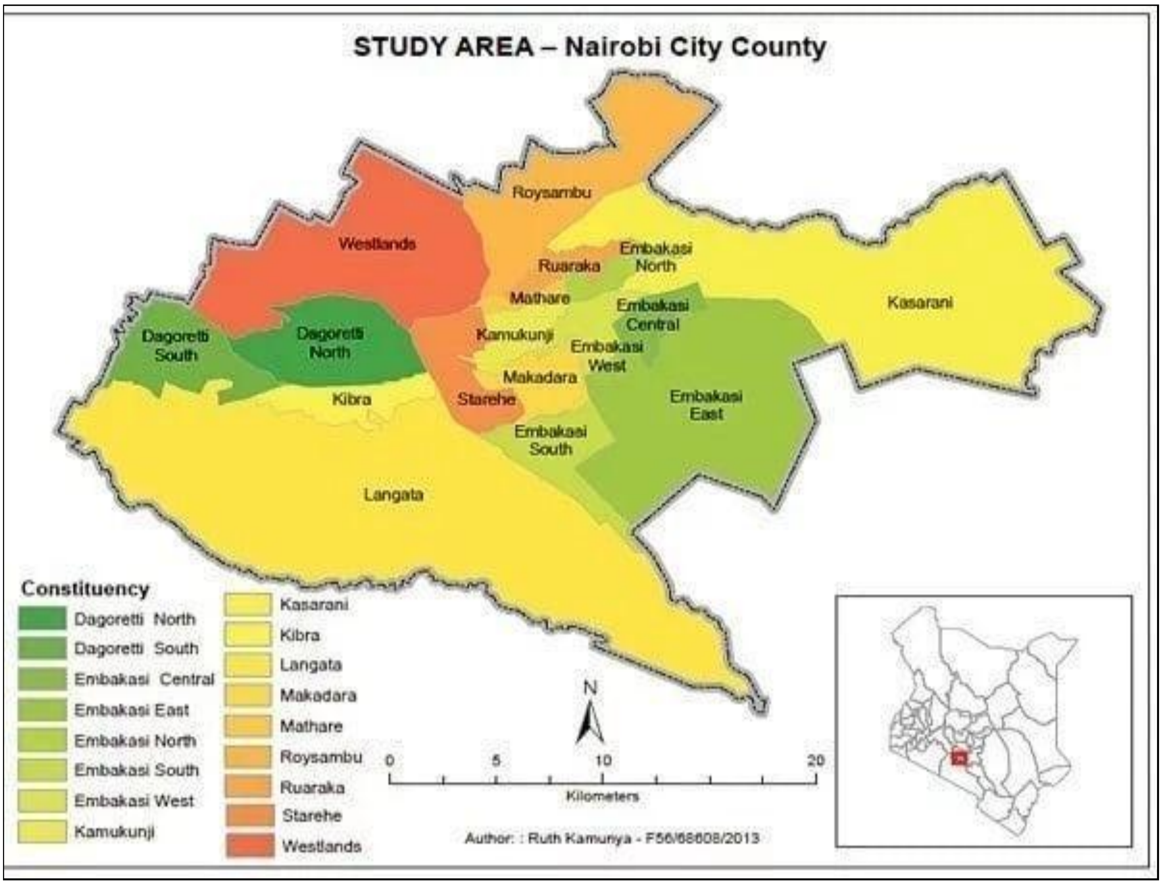
g) Perceived Benefits of Smart Energy Management Systems [ ]

h) Market and Competitive Pressure [ ]

i) Guest Perception and Acceptance [ ]

Thank you for your participation

Appendix IV: Map of the Study Area



Appendix V: Introductory Letter

THARAKA UNIVERSITY

P.O BOX 193-60215,
MARIMANTI, KENYA

Telephone: +(254)-0202008549
Website: https://tharaka.ac.ke
Social Media: tharakauni
Email: info@tharaka.ac.ke

OFFICE OF THE DIRECTOR
BOARD OF POSTGRADUATE STUDIES

REF: TUN/BPGS/PL/08/24 **1st August, 2024**

To Whom It May Concern

Dear Sir/Madam,

RE: GLADWELL GATWIRI MURIUNGI ADMISSION NO. NMT20/05875/22

Ms. Gladwell Gatwiri Muriungi is a postgraduate student at Tharaka University undertaking a Master's degree in **Hotel Management**. The student has completed her coursework and is expected to proceed for collection of data after successfully defending her proposal at faculty level. The title of the study is ***"Effects of Smart Energy Management System Adoption in Performance in Hotels in Nairobi City County".*** The proposed study will be carried out in Nairobi County.

Any assistance accorded to him will be highly appreciated.

Thank you in advance.

Yours faithfully,

12/08/2024

THARAKA UNIVERSITY
DIRECTOR BOARD OF POST
GR...
12 AUG 2024
P. O. Box 193-60215,
MARIMANTI, KENYA

Dr. Ambrose Vengi, Ph.D.
Director
Board of Postgraduate Studies.

Appendix VI: Tharaka University ISERC Approval

THARAKA UNIVERSITY

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INSTITUTIONAL SCIENTIFIC ETHICS REVIEW COMMITTEE

9th August, 2024

REF: TUNISERC/NSEC/M019

Dear, Gladwell Gatwiri Muriungi,

RE: Effect of Smart Energy Management System Adoption on Performance in Hotels in Nairobi City County.

This is to inform you that ***Tharaka University ISERC*** has reviewed and approved your above research proposal. Your application approval number is ***ISERC04023.*** The approval period is **9th August, 2024 – 9th August, 2025.**

This approval is subject to compliance with the following requirements;

i. Only approved documents including (informed consents, study instruments, MTA) will be used.
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by ***Tharaka University ISERC.***
iii. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to ***Tharaka University ISERC*** within 72 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to ***Tharaka University ISERC*** within 72 hours
v. Clearance for export of biological specimens must be obtained from relevant institutions.
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days upon completion of the study to ***Tharaka University ISERC.***

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://research-portal.nacosti.go.ke and also obtain other clearances needed.

Yours Sincerely,

Dr. Fidelis Ngugi
Chair, ISERC Tharaka University

Appendix VII: NACOSTI Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Ref No: **551374**

Date of Issue: **16/August/2024**

RESEARCH LICENSE

This is to Certify that Miss.. GLADWELL MURIUNGI GATWIRI of Tharaka University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: EFFECT OF SMART ENERGY MANAGEMENT SYSTEM ADOPTION ON PERFORMANCE OF ECONOMY HOTELS IN NAIROBI CITY - COUNTY, KENYA for the period ending : 16/August/2025.

License No: **NACOSTI/P/24/39136**

551374

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

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See overleaf for conditions