Review Article

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Implementing Artificial Intelligence for Sustainable Resource Management in the Hospitality Sector of Southeast Nigeria

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ABSTRACT

This study explored the influence of artificial intelligence on the sustainable development of the hospitality sector in Southeast, Nigeria. Specifically, the study determined the influence of Alexa software on community engagement in the hospitality sector in Southeast, Nigeria. Also, it ascertained the influence of chatbot applications on capacity building of the hospitality sector in Southeast, Nigeria. The study is anchored on the Fourth Industrial Revolution (4IR) theory by Klaus Schwab in 2016. The study employed descriptive survey research design and random sampling probability techniques. The population of the study was 304. Hypotheses were tested with Pearson Product Moment Correlation Coefficient with the aid of Statistical Package for Social Sciences (SPSS, version 27). Research hypothesis one indicates that the use of Alexa software positively impacts community engagement of the hospitality sector in Southeast, Nigeria. The Pearson correlation result is confirmed when r = 0.782, n = 304, and the p-value of 0.000 (p<0.05). Hypothesis two revealed that the use of chatbot applications positively influences capacity building of the hospitality sector in Southeast, Nigeria. The Pearson correlation result is confirmed when r = 0.923, n = 304, and the p-value of 0.000 (p<0.05). The study concluded that artificial intelligence positively influences the sustainable development of the hospitality sector in Southeast, Nigeria. The study recommended that the hospitality sector in Southeast, Nigeria, needs to leverage chatbot technology to support and enhance capacity-building initiatives, leading to improved skills and performance. Also, the government needs to prioritize the design and development of user-friendly and interactive technologies to enhance community engagement and participation of the hospitality industries sector in Southeast, Nigeria.

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Introduction
Background Information
Artificial intelligence (AI) is transforming sustainable development in the hospitality sector by streamlining operations, optimizing energy use, and enhancing resource efficiency. For instance, AI-driven data analytics can predict occupancy rates and adjust heating, ventilation, and lighting, accordingly, reducing energy consumption and promoting environmental sustainability. Additionally, AI-based customer service tools improve guest satisfaction while minimizing resource usage, aligning hospitality services with sustainable practices [1,2]. The combination of AI and sustainability has the potential to significantly impact the industry's environmental footprint

The recent breakthrough in technological advancement such as artificial intelligence and machine learning have enabled the development of more sophisticated AI systems that can learn and adapt in complex environments. AI has the potential to unlock significant economic and social benefits, from improving productivity and efficiency to enhancing customer experiences and outcomes. As AI continues to evolve, even more innovative applications and services emerge, from intelligent homes and cities to personalized healthcare and education. With vast potential to transform industries and improve lives, AI is an exciting and rapidly evolving field that holds much promise for the future. As exploration of AI continues, possibilities are endless, limited only by imagination and creativity in harnessing its power to drive positive change and progress.

The concept of sustainable development is deeply rooted in the idea of balancing economic, social, and environmental needs to create a more equitable and just society. Artificial intelligence (AI) is increasingly being recognized as a critical component in the pursuit of sustainable development. The intersection of AI and sustainable development is characterized by the potential of AI to support the achievement of sustainable development goals, including the enhancement of human well-being, social justice, and environmental sustainability. Alexa plays a vital role in this context, as it enables the design of intuitive and user-friendly interfaces that facilitate access to sustainable development information, resources, and services. Moreover, AI-powered chatbots are emerging as a key tool in facilitating community engagement and participation in sustainable development initiatives, enabling the contribution of ideas, concerns, and expertise to the decision-making process. The integration of AI in sustainable development is also closely tied to capacity building, as it necessitates the development of skills and knowledge to effectively design, implement, and utilise AI systems that support sustainable development [3-5].

Southeastern region of Nigeria is a hub of economic and cultural activity, with a rich history and diverse population. As the region continues to grow and develop, it faces a unique opportunity to harness the power of artificial intelligence (AI) to drive sustainable development. AI has the potential to transform industries, improve healthcare and education, and enhance the overall quality of life for citizens. By leveraging AI, Southeast Nigeria can position itself as a leader in sustainable development, driving innovation and progress in the region [6].

The convergence of AI and sustainable development is a rapidly evolving field, marked by the increasing application of AI technologies in support of sustainable development goals. This includes the use of AI in data analysis, pattern recognition, and insight generation, which can inform sustainable development decision-making. Additionally, AI-powered chatbots are being utilized to facilitate community engagement, enable feedback mechanisms, and provide personalized support to individuals and communities. The role of alexa in this context is crucial, as it enables the design of interfaces that facilitate access to sustainable development resources and services. Furthermore, the integration of AI in sustainable development is closely tied to capacity building, as it necessitates the development of skills and knowledge to effectively utilize AI systems that support sustainable development. As the field continues to evolve, it is essential to understand the complex interplay of alexa, community engagement, chatbot and capacity building in support of sustainable development [7].

Recent studies reveal that artificial intelligence (AI) is becoming increasingly integral to environmental monitoring and sustainability initiatives worldwide. In Europe, for instance, AI is employed in satellite and drone-based environmental monitoring, allowing for precise deforestation tracking, methane emission measurement, and biodiversity assessments. These applications not only help meet sustainability goals but also provide data to support informed policymaking and conservation efforts (UNEP, 2023). In the United States, AI-driven systems are used to optimize renewable energy grids, enhancing power distribution efficiency, reducing waste, and managing resources more sustainably. By predicting demand patterns and potential faults in renewable energy infrastructure, AI helps improve overall system stability and sustainability. Asia has similarly leveraged AI in environmental health and smart city development, with projects focusing on air quality monitoring and waste management. In India and China, smart city initiatives use AI and IoT to manage energy consumption, track pollution levels, and improve urban planning to reduce carbon footprints. These innovations are critical as they allow countries to align urban growth with sustainable practices [8,9].

Several researchers have identified a strong correlation between artificial intelligence (AI) and sustainable development in various ways across Nigeria, Europe, Asia, and the Americas. In Nigeria, evaluated the influence of technological adoption on supply chain management in Nigerian Brewery Plc, South-East Zone Nigeria. The study found that artificial intelligence (AI) adoption positively contributes to supply chain visibility (SCV) in the Nigerian Brewery. Additionally, in explored how AI enables precise monitoring of weather patterns and energy demands, enhancing real-time decision-making crucial for sustainability in Linkoping Sweden. The study found AI as essential in reducing energy use and promoting efficiency within industries, but also caution about potential privacy and ethical challenges that require collaborative governance efforts in EU [10,11].

Considering the above studies, little study has been identified on artificial intelligence and sustainable development in the hospitality sector in southeast, Nigeria. Previous studies on the subject were conducted using different industries in different locations. The researchers seek to fill research gap in the use of context, geography coverage and analytical tool. The study therefore seeks to investigate the role of artificial intelligence in sustainable development in the hospitality sector, southeast, Nigeria. The problem statement is formulated below.

Statement of the Problem
Even though artificial intelligence (AI) has the potential to improve sustainability through waste reduction, energy efficiency, and optimal resource management, many hospitality firms find it difficult to successfully incorporate these technologies. High implementation costs, ignorance, and poor data management skills are some of the issues that have a detrimental impact on sustainability in the hospitality sector. Increased resource usage and detrimental effects on the ecosystem would result from these issues.

The integration of artificial intelligence (AI) in sustainable development is a crucial step towards enhancing human well-being, social justice, and environmental sustainability. However, the current state of AI in sustainable development is characterized by a lack of effective alexa, limited community engagement, and inadequate capacity building. The absence of user-friendly interfaces and intuitive systems hinders the adoption of AI solutions in sustainable development, exacerbating the existing knowledge gap. Moreover, the limited use of AI-powered chatbots in facilitating community engagement and participation in sustainable development initiatives restricts the potential for inclusive and collaborative decision-making. Furthermore, the insufficient capacity building in AI and sustainable development hampers the development of effective AI solutions that cater to the needs of diverse stakeholders.

The sparsity of research on the interplay of alexa, community engagement, chatbot and capacity building underscores the need for a comprehensive examination of these factors. The limited understanding of how AI can be leveraged to support sustainable development outcomes, such as poverty reduction, climate change mitigation, and resource efficiency, highlights the necessity for further investigation. Additionally, the absence of studies on the role of alexa in facilitating access to sustainable development resources and services, as well as the limited exploration of AI-powered chatbots in enhancing community engagement, necessitates a deeper exploration of these topics. Moreover, the inadequate attention to capacity building in AI and sustainable development underscores the need for a more detailed understanding of the skills and knowledge required to effectively design, implement, and utilize AI solutions that support sustainable development. It is against this backdrop that this study sought to explore the relationship between artificial intelligence and sustainable development of hospitality industries sector in Southeast, Nigeria.

Objectives of the Study
The main objective of this study is to examine the relationship between Artificial intelligence (AI) and sustainable development of hospitality industries in Southeast, Nigeria. The specific objectives are:

I. To determine the relationship between Alexa and Community Engagement of hospitality industries in Southeast, Nigeria.

II. To ascertain the relationship between Chatbot and Capacity Building of hospitality industries sector in Southeast, Nigeria.

Research Questions
I. What is the relationship between Alexa and Community Engagement of hospitality industries sector in Southeast, Nigeria?
II. What is the relationship between Capacity Building of hospitality sector in Southeast, Nigeria?

Research Hypotheses
HO1: There is no significant relationship between Alexa and Community Engagement of hospitality sector in Southeast, Nigeria.

HO2: There is no significant relationship between Chatbot and Capacity Building of hospitality sector in Southeast, Nigeria.

Significance of the Study
Artificial intelligence (AI) plays an essential role in improving sustainability across industries and within the hospitality industry. The significance of AL in sustainable development is stated below.

Hospitality Sector
This study is crucial for hospitality sector as it explores the potential of Artificial Intelligence (AI) in enhancing sustainable development, improving operational efficiency, and increasing customer satisfaction. The findings provide insights on how AI-powered chatbots and alexa can streamline services, reduce costs, and promote eco-friendly practices, ultimately boosting competitiveness.

Government
The study's outcomes can inform government policies and initiatives supporting the adoption of AI in hospitality industries, fostering sustainable development and economic growth. Governments can leverage the research to develop frameworks, regulations, and incentives encouraging AI-driven innovation, job creation, and environmental sustainability in the hospitality sector.

Populace
The study benefits the populace by promoting sustainable development and environmental responsibility in hospitality sector. AI-driven solutions can enhance customer experiences, provide job opportunities, and contribute to local economic growth. Moreover, eco-friendly practices in hospitality sector can improve public health and well-being.

Academics
This research contributes to the academic discourse on AI and sustainable development, providing valuable insights for scholars and researchers. The study's findings can inform theoretical frameworks, methodologies, and future research directions, advancing knowledge in AI applications, hospitality management, and sustainable development. The research will also provide a case study for students and academics to explore the intersection of technology, business, and sustainability.

Food and Beverage Industry
AL can be deployed to minimize overproduction and waste, particularly in food and beverage operations where artificial intelligence can suggest optimal inventory levels based on historical data and trends.

Review of Related Literature
Conceptual Review
The Concept of Artificial Intelligence
Artificial Intelligence (AI) is the simulation of human intelligence in machines that are programmed to think and learn like humans. It involves the development of algorithms and statistical models that enable machines to perform tasks that typically require human intelligence, such as understanding language, recognizing patterns, and making decisions. AI systems can analyze vast amounts of data, identify trends, and generate insights that can inform decision-making. They can also learn from experience, adapt to new situations, and interact with humans in a way that is increasingly indistinguishable from human-to-human interaction. As AI technology advances, we are seeing its applications expand into various areas, including healthcare, finance, transportation, and education [12-14].

Artificial Intelligence (AI) is a transformative technology that has the potential to accelerate progress towards Sustainable Development. By analyzing vast amounts of environmental and social data, AI can help identify patterns and trends that can inform sustainable development decisions. For instance, AI can be used to optimize resource usage, predict and prevent natural disasters, and develop sustainable agriculture practices. Additionally, AI can help develop personalized education and training programs, improve healthcare outcomes, and enhance the efficiency of social services. As the world continues to grapple with the challenges of poverty, inequality and climate change, AI can be a powerful tool in the pursuit of sustainable development. By harnessing the power of AI, we can create a more equitable, just, and sustainable future for all, and achieve the United Nations' Sustainable Development Goals (SDGs) [15].

Alexa
Alexa is a sophisticated virtual assistant developed by Amazon, designed to simplify users' lives by providing effortless interaction with various devices, services, and information sources. With Alexa, users can control smart home devices, play music, set reminders, access news updates, and order products from Amazon. Alexa's virtual assistant capabilities also enable users to engage in conversational interactions, including jokes, games, and trivia. Additionally, Alexa integrates with third-party skills and apps, expanding its capabilities and allowing users to book flights, order food, or hail a ride. Through its virtual assistant features, Alexa streamlines daily tasks and enhances users' overall experience.

Alexa is a cutting-edge conversational AI model that leverages advanced technologies like natural language processing, machine learning, and deep learning. This AI model enables Alexa to recognize context and intent behind user queries, providing personalized recommendations and responses. Alexa's AI model also learns user preferences and adapts to their behavior, understanding nuances of language, including idioms and colloquialisms. Continuously improving its performance through data-driven updates, Alexa's AI model ensures accurate and helpful responses. By analyzing vast amounts of data, Alexa's AI model enhances its knowledge graph, allowing it to answer complex questions and provide insightful information [16].

Alexa is a voice service integrated into various devices, including Amazon Echo smart speakers, Fire TV, and third-party products like smart thermostats and speakers. Through its voice service, Alexa allows users to interact with devices using voice commands, eliminating the need for manual controls. With Alexa, users can

control multiple devices with a single voice command, access a wide range of skills and apps, and receive voice feedback and responses. Alexa's voice service also enables seamless transitions between devices, maintaining a consistent experience across the user's ecosystem. Whether at home, in the office, or on-the-go, Alexa's voice service provides effortless interaction and control [17].

Alexa is a comprehensive smart home hub, connecting and controlling compatible devices from various manufacturers. As a smart home hub, Alexa enables users to control lighting, temperature, security, and entertainment systems, automate routines and scenes, and monitor energy consumption. Alexa's smart home capabilities also allow users to receive notifications and alerts for device activity and integrate with popular smart home protocols like Zigbee and Z-Wave. With Alexa, users can expand compatibility through skills and integrations with third-party devices, creating a seamless and interconnected smart home experience. By streamlining smart home control and automation, Alexa enhances users' convenience, comfort, and peace of mind.

Chatbot

A chatbot is a software application designed to simulate conversation with human users, either through text or voice interactions. It is a type of artificial intelligence (AI) technology that uses natural language processing (NLP) and machine learning (ML) algorithms to understand and respond to user inputs. Chatbots can be deployed in various messaging platforms, websites, mobile apps, and even in physical devices such as robots and smart speakers. They are typically used to provide customer support/customer service by handling inquires, provide information about services, and assist in booking appointment, improving response time and reducing the need for human intervention. Chatbots can be classified into two main categories: rule-based chatbots and AI-based chatbots. Rule-based chatbots use pre-defined rules to generate responses, whereas AI-based chatbots use machine learning algorithms to learn from user interactions and improve their responses over time [18].

Chatbot is a computer program that uses natural language processing (NLP) and machine learning (ML) to generate human-like responses to user inputs. It is a type of conversational AI technology that is designed to mimic human conversation, either through text or voice interactions. Chatbots can be used in various applications, including customer service, technology support, language translation, and even entertainment. They can be integrated with various platforms, such as messaging apps, websites, mobile apps, and social media platforms. Chatbots use various techniques, such as keyword extraction, sentiment analysis, and intent identificatio, to understand user inputs and generate relevant responses. They can also use machine learning algorithms to learn from user interactions and improve their responses over time. Some chatbots are designed to be task-oriented, while others are designed to be more conversational and engaging. Chatbots have the potential to revolutionize the way humans interact with technology and access information and services.

Sustainable Development

Sustainable development is a holistic and integrated approach to achieving economic, social, and environmental well-being for present and future generations. It covers a broad range of principles, practices, and policies that aim to balance human needs with the protection of the natural environment. Sustainable development recognizes that economic growth, social justice, and ecological balance are interconnected and interdependent, and that long-term prosperity requires a balanced and integrated approach. It involves the management of resources, the optimization of economic processes, and the protection of natural systems to ensure that human activities are environmentally sustainable, socially just, and economically viable. Sustainable development is a dynamic and evolving concept that requires continuous innovation, adaptation, and learning to address the complex challenges facing humanity [19].

Sustainable development can be seen as a development model that prioritizes the well-being of people and the planet, while promoting economic growth and social progress. It recognizes that the world's resources are finite and that human activities have a significant impact on the environment, society, and the economy. Sustainable development seeks to reduce poverty, inequality, and environmental degradation, while promoting green consumption patterns, renewable energy, and maintainable agriculture. It involves the integration of economic, social, and environmental considerations in decision-making processes, and the development of policies and practices that support sustainable development outcomes. Sustainable development requires the active participation of governments, businesses, civil society, and individuals to achieve a more just, equitable, and sustainable world. It is a long-term vision that requires short-term actions to ensure a sustainable future for all [20].

Community Engagement

Community engagement is the process of building and maintaining relationships between organizations, institutions, and community groups to promote mutual understanding, trust, and collective action. It involves the active participation of community members, organizations, and stakeholders in decision-making processes, project development, and problem-solving activities. Community engagement recognizes the value of community knowledge, expertise, and perspectives in shaping programs, policies, and services that affect the community. It encompasses various forms of engagement, including public outreach, community-based research, participatory planning, and collaborative governance. Community engagement is essential for building strong, resilient, and sustainable communities, as it fosters social capital, promotes collective ownership, and supports the development of inclusive and responsive programs and services [21].

Community engagement is the process of fostering meaningful connections and collaborations between community members, organizations, and institutions to promote social change, improve outcomes, and enhance the quality of life. It involves the co-creation of knowledge, resources, and solutions that address community-identified needs and priorities (Leal, Yang, Eustachio, Azul, Gellers, Gielczyk & Kozlova,2023). Community engagement recognizes the community as a vital partner in the development and implementation of programs, policies, and services. It encompasses various approaches, including community-based participatory research, collaborative leadership, and social entrepreneurship. Community engagement is critical for addressing complex social issues, promoting health equity, and supporting community development. It requires a deep understanding of community dynamics, cultural competence, and the ability to build trust and facilitate inclusive decision-making processes [22,23].

Capacity Building

Capacity building means the process of enhancing the abilities, skills, and capacities of individuals, organizations, and communities

to achieve their goals and improve their performance. It involves the development of knowledge, skills, and attitudes that enable individuals and organizations to better manage their resources, adapt to changing circumstances, and address complex challenges. Capacity building can take many forms, including training and education, mentorship and coaching, organizational development, and community mobilization. It is a critical component of sustainable development, as it enables individuals, organizations, and communities to take ownership of their development processes and address the social, economic, and environmental challenges they face. Capacity building is a long-term process that requires commitment, resources, and support from various stakeholders [24].

Capacity building can be defined as the process of strengthening the abilities and capacities of individuals, organizations, and systems to achieve sustainable outcomes and address development challenges. It involves the identification of capacity gaps and the development of strategies to address them through targeted interventions and support. Capacity building encompasses various dimensions, including institutional capacity, human resource capacity, and systemic capacity. It recognizes that capacity development is a continuous process that requires ongoing learning, adaptation, and innovation. Capacity building is essential for addressing complex development challenges, such as poverty reduction, climate change, and social inequality. It requires a holistic and integrated approach that takes into account the social, economic, and environmental context in which individuals, organizations, and communities operate [25].

Theoretical Framework
This study is anchored on Fourth Industrial Revolution (4IR) theory, proposed by Klaus Schwab in 2016. The Fourth Industrial Revolution (4IR) theory talks about the current era of technological advancements and societal shifts that are transforming the way people live, work, and interact. This theory is relevant to the present study because it contextualizes the transformative power of AI within a broader technological revolution. The 4IR theory explains how AI-driven technologies converge physical, digital, and biological systems, leading to significant changes in industries like hospitality. This is relevant because it helps understand the far-reaching implications of AI adoption in hospitality sector in Southeast, Nigeria, including potential shifts in operational processes, customer interactions, and environmental practices. The 4IR theory provides a lens to examine the interplay between technological innovation, sustainability, and industry development.

The 4IR emphasizes the use of Smart technologies, such as IoT devices and artificial intelligence algorithms, to enhance operational efficiency. These technologies can automate processes, monitor energy consumption in real time, and optimize resource usage, leading to more sustainable operations in hospitality. Therefore, 4IR is relevant to study in promoting operational efficiency, and sustainability by using artificial intelligence in the hospitality industry.

Empirical Review
Several studies have been done on artificial intelligence and sustainability in both Nigeria and the rest of the world. Some of these studies are stated below.

Su and Wu (2024) examined digital transformation and enterprise sustainable development in China. Based on the panel data of Chinese listed companies from 2012 to 2022, this study examined the relationship between enterprise digital transformation and enterprise sustainable development, as well as the mediating role of enterprise core competence between the two. The study showed that enterprise digital transformation had a significant and positive impact on enterprise innovation capability, indirectly contributing to the sustainable development of enterprises.

Erin, Bamigboye and Oyewo (2022) examined sustainable development goals (SDG) reporting: an analysis of disclosure from Nigeria. The study adopted survey method and content analysis technique to analyze corporate SDG reporting of the selected firms. The study examined the top-50 listed firms in Nigeria based on their market capitalization. Questionnaires were distributed to financial managers of the top-50 listed firms and staff of the big four audit firms from the governance and sustainability department. The result of the survey revealed that lack of regulatory framework and voluntary disclosure are the major factors that contributes to low level of SDG reporting by Nigerian firms. Also, the result of the content analysis showed poor reporting on SDG activities. The result of the research survey indicated that voluntary disclosure, lack of management commitment and lack of regulatory enforcement accounts for low SDG disclosure by the selected Nigerian firms.

Kar, Choudhary and Singh) carried research on how an artificial intelligence impact sustainability: A systematic literature review from India. This study offered a comprehensive review of AI and sustainability and suggested future research scope. The review was focused on different used cases in industries like construction, transportation, healthcare, manufacturing, agriculture, and water. The systematic review was based on 287 papers selected out of 8341 search results with an application of PRISMA based method. Out of all the techniques used in sustainability regression, RL and DSS-based AI models were more popular than others. The review also provided directions surrounding which industrial sectors are using which methods for incorporating sustainable development practices in their organization [26].

Liengpunsakul investigated Artificial intelligence and sustainable development in China. Using the latest data of 193 countries around the world, the paper analyzed the implication of AI on sustainable development both at the global and regional levels. Broadly, a strong positive relationship between the government AI readiness and progress toward SDGs was observed. When classifying the SDGs into four dimensions including economy, society, environment, partnerships, and government, AI readiness was found to have a strong relationship with economy followed by the society dimension, whereas there are no clear relationships with the environment and partnerships dimensions [27].

Alkatheiri ascertained artificial intelligence assisted improved human-computer interactions for computer systems in Saudi Arabia. Human-Computer Interaction has gradually merged its scientific interests to improve the usability and the technical understanding and technique of computer systems. Artificial intelligence (HCI-AI) based problems in human-computer interactions showed to identify the relationship between cognitive knowledge and the comprehension of natural and artificial intelligence forms. The models described the relationship between HCI research and the conception of interactions between humans and computers. A model of the planning and controlling numerous tasks at medical reception and the hypothesis illustrated the relationships defined. It was found that that Human-Computer Interaction has a statistical positive relationship with Community Engagement.

Endurance, Eunice, Anthonia and Sebastine examined Integration of Artificial Intelligence Tool (Ai-Chatbot) into Teaching and Learning: A Panacea for Improving Universities Educational and Administrative Duties in South-South, Nigeria. The study adopted a descriptive survey research design. The population of the study is 252,000 public universities students in South-South (Delta state, Edo State and Bayelsa). The sample size used was 399 respondents (274 students, 67 lecturers and 58 admin staffs) in the state and federal universities in the states. The instrument used for data collection was AICHATBOTSQ (AI-chatbot structured questionnaire) consisting of 20 items. Data gathered were analyzed using mean, standard deviation and analysis of variance (ANOVA). The study found that there is a statistically positive significant correlation between chatbot and capacity building in Southern Nigeria. Further findings showed that there is no significant difference in the mean rating of respondents on the need for AI-chatbot in teaching and learning as well as performing administrative tasks among universities in South-South; there is little availability of AI-chatbot technology in handling universities administrative duties; and, the findings shows that poor internet facilities, instabilities in governance, inadequate funding, poor electricity supply among others are factors inhibiting implementation of AI-chatbot towards administrative duties among universities in South-South, Nigeria.

Gap in Literature
This study identifies significant research gaps, including methodological, variable, geographical, and periodic disparities. Given the limited and disparate existing literature, this research aims to bridge these gaps by adopting a tailored approach, exploring relevant variables, and focusing on a specific context, thereby contributing to the existing knowledge base.

Methodology
Research Design
This study employed descriptive survey research design. The study adopted primary source of data and secondary source of information. The study employed random sampling probability technique in selecting 15 hotels in Southeast, Nigeria.

Population of the Study
The target group for this study is comprised of 304 staff of the selected 15 hotels. The list of the selected hotels and their locations can be seen in appendix 1. The hypotheses were tested with Pearson Product Moment Correlation Coefficient on Statistical Packages for Social Science (SPSS version 27) at 5% level of significance.

Result and Discussion
Analysis of Research Questions One
How does the use of alexa software influence community engagement of hospitality sector in Southeast, Nigeria?

Table 1: Investigative Question on the Relationship between Alexa and Community Engagement of Hospitality Sector in Southeast, Nigeria.

S/N	ITEM	N	MEAN	REMARK
A Alexa				
1	I like its interface because it is consistent	304	3.58	Accepted
2	It is easy to customize the system	304	2.34	Rejected
3	It is easy to check-in and check-out. using the app	304	4.02	Accepted
4	The hotel's customer support team to digital services is responsive	304	3.60	Accepted
B Community Engagement				
5	It is easy for community members to book event space at the hotel	304	1.98	Rejected
6	The hotel is not welcoming to groups and organizations	304	4.27	Accepted
7	The hotel is collaborative with other local organizations and busi-nesses	304	2.01	Rejected
8	The hotel's community engage-ment goals are transparent	304	3.66	Accepted

Source: (Field Survey, 2024)

In table 1, all the items were addressing the first research question which is "What is the relationship between Alexa and Community Engagement of hospitality sector in Southeast, Nigeria?" From the data analysis, items 1, 3, 4, and 6 obtained a mean rating above the criterion mean of 3.0 and items 2, 5, and 7 obtained a mean rating below the criterion mean of 3.0. The result of the analysis indicated that majority of the respondents supported that alexa relates with community engagement of hospitality sector in Southeast, Nigeria.

Analysis of Research Question Two
How does the use of chat box applications influence Capacity Building of hospitality sector in Southeast, Nigeria?

Table 2: Investigative Questions on Chatbot and Capacity Building of Hospitality Sector

S/N	ITEM	N	MEAN	REMARK
A	Chat Box			
1	I like chatbot responses because they are easy to understand	304	3.22	Accepted
2	Conversation with chatbot is natural	304	1.28	Rejected
3	I am willing to provide feedback to im-prove chatbot	304	3.27	Accepted
4	Chatbot is not effective in handling com-plex issues	304	3.42	Accepted

B	Capacity Building			
5	In the past three years, my organization has engaged some capacity building initi-atives	304	1.92	Rejected
6	My hotel identifies and priorities capacity building needs	304	4.11	Accepted
7	My organization ensures that its capacity building aligns with its strategy	304	3.33	Accepted
8	This institution does not address the is-sues of scalability and sustainability in capacity building	304	3.66	Accepted

Source: (Field Survey, 2024)

Analysis of Research Hypotheses One
HO1: The use of Alexa applications does not influence community engagement of hospitality sector in Southeast, Nigeria.
Ha1: The use of alexa influences significantly community engagement of hospitality sector in Southeast, Nigeria.

Hypotheses Testing
Decision Rule
Reject the null hypothesis and accept the alternate if P-value < 0.05; if otherwise, accept the null Hypothesis.

In table 2, all the items were addressing the first research question which is "Does Chatbot correlate with Capacity Building of hospitality sector in Southeast, Nigeria? From the data analysis, items 9, 11, 12, 14, 15 and 16 obtained a mean rating above the criterion mean of 3.0 and items 10 and 13 obtained a mean rating below the criterion mean of 3.0. The result of the analysis indicated that majority of the respondents supported that Chabot relates with capacity building of hospitality sector in Southeast, Nigeria.

Table 3: Result of Pearson Correlation

		Alexa	Community Engagement
	Pearson correlation	1	.782**
	Sig. (2-tailed)		.000
Alexa	N	304	304
	Pearson correlation	.782**	1
Community Engagement	Sig. (2-tailed)	.000	
	N	304	304

Source: SPSS ver. 27 Outputs.

Hypothesis Two
Ho: Chatbot does not influence capacity building of hospitality sector in Southeast, Nigeria.
Ha: Chatbot influences significantly capacity building of hospitality sector in Southeast, Nigeria.

Discussion of Finding
Table 1 showed that there exists a statistically significant positive correlation between Alexa and Community Engagement of hospitality industries in Aba, Abia State, Nigeria. The correlation result is confirmed when; r = 0.782, n = 304 and p value of 0.000 (p<0.05). Therefore, the study accepted the alternate hypothesis and concluded that the use of Alexa software positively influenced community engagement of hospitality sector in Southeast, Nigeria. This result is harmonious with the result of Alkatheiri (2021) in the study on artificial intelligence assisted improved human-computer interactions for computer systems in Saudi Arabia. This implies that as Human-Computer Interaction (HCI) increases, Community Engagement also increases, indicating that effective HCI like alexa can lead to greater community participation and involvement of hospitality sector in Southeast, Nigeria.

Additionally, Table 2 shows that there is a statistically positive significant correlation between chatbot applications and capacity building of hospitality sector in Southeast, Nigeria. This result is confirmed when; r = 0.923, n = 304 and p value of 0.000 (p<0.05). Therefore, the study accepted the alternate hypothesis and established that chatbot applications positively influenced capacity building of hospitality sector in Southeast, Nigeria. This finding is in congruence with the result of Endurance, Eunice, Anthonia, and Sebastine (2021) examined Integration of Artificial Intelligence Tool (Ai-Chatbot) into Teaching and Learning: A Panacea for Improving Universities Educational and Administrative Duties in South-South, Nigeria. This implies that as chatbot usage increases, capacity building also increases, indicating that chatbots can be an effective tool for enhancing the skills and abilities of individuals and organizations in Southeast, Nigeria, leading to improved performance and sustainability.

Findings, Conclusion and Recommendations
Summary of Findings
I. The findings of research hypothesis one showed that the use of Alexa software positively influenced community engagement of hospitality sector in Southeast, Nigeria.
II. The findings of research hypothesis two also showed that chatbot applications positively influenced capacity building of hospitality sector in Southeast, Nigeria

Conclusion
Notably, this research pioneers an investigation into the intersection of Artificial Intelligence and Sustainable Development in the hospitality sector of Nigerian, offering valuable insights for policymakers, practitioners, and scholars.

The use of artificial intelligence is positively linked to sustainable development in Southeast, Nigeria, suggesting that AI can be a key driver of economic, social, and environmental sustainability in the region. This study concluded that the use of chat box software and Alexa applications positively influenced community engagement and capacity building of hospitality sector in Southeast, Nigeria. In addition, the study identified that effective Alexa and Chatbot utilization can foster Community Engagement and Capacity Building, respectively, ultimately driving Sustainable Development in hospitality sector.

In conclusion, artificial intelligence has shown significant potential to advance sustainability by optimizing energy usage, reducing waste, enhancing customer satisfaction, and fostering data-driven decision-making in the hospitality industry. The industrial revolution with the aid of 4IR tech can help hospitality firms achieve sustainability objectives.

Contribution to Knowledge

This study contributes to the existing body of knowledge by providing empirical evidence on how artificial intelligence applications (such as Alexa and chat box software) influences community engagement and human capacity building enhancing sustainable development in the hospitality sector. The findings provide a foundation for future research on AI-driven sustainable development strategies in the hospitality sector, particularly in developing economies.

Recommendations

Considering the findings and conclusions of the study the following recommendations were suggested.

I. Hospitality sector in Southeast needs to leverage chatbot technology to support and enhance capacity building initiatives, leading to improved skills and performance.

II. Government needs to prioritize the design and development of user-friendly and interactive technologies to enhance community engagement and participation of hospitality sector in Southeast, Nigeria.

III. Businesses should prioritize training staff to effectively use AI and interpret data analytics, which can significantly contribute to more sustainable operations.

IV. Nigerian government should establish industry-wide guidelines and sustainability standards to ensure AI implementations are ethically and environmentally responsible

Future Studies

Based on study conclusion and recommendations, the researchers suggest further studies to focus on ways to reduce the environmental impact of AI by improving the energy efficiency of these systems. Future research is required on how AI impacts sustainability across other industries, agriculture sectors, supply chain sector and retail sectors across geography in Nigeria.

Practical Implications of the Study

By studying artificial intelligence (AI) and sustainability in the hospitality industry are significant in providing actionable insights for improving both environmental impact and operational efficiency. By adopting AI-enabled IoT devices, the hospitality industry can achieve real-time monitoring and automation of resource use, reducing unnecessary consumption and costs.

Appendix 1
Selected Hotels in Southeast, Nigeria

S/N	Hotels	Staff Strength
1	Lekota Spring Hotel	21
2	Don Eric's Hotel and Suites	26
3	Abia Hotel Ltd	19
4	Benidon Hotels and Resort	13
5	Binez Hotels Ltd	22
6	Ibiza Hotel and Resorts	38
7	Crest Hotels Ltd	18
8	Donesto Grand Hotels	12
9	Emanet Hotels and Suites Ltd	11
10	Gallery Hotel	23
11	Heartland Holiday Resort	18
12	Hotel De La Paix	29
13	Hotel Du Golf	20
14	Terminus Hotel	18
15	The Addrex Hotel & Suites	16
TOTAL 304		

Source: (Authors Own Creation)

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