

Perceived Influence of the Internet of Things on Implementation and Management of Big Data in Office Environments in University of Nigeria, Nsukka

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Abstract

The purpose of this study was to ascertain the extent of implementation of the internet of things (IoT) and how IoT was viewed to affect the administration of big data in office settings in University of Nigeria Nsukka (UNN). The investigation was conducted using a descriptive survey design. Fifty employees from the e-learning centre, main library, bursary, old library, management information system, and Zenith ICT Centre all in UNN made up the study's population. The main tool for gathering data for the study was a structured questionnaire. Experts validated the instrument, and the final version was created by incorporating their recommendations and modifications. The instrument was trial tested with the same type of respondents in Federal University of Technology, Owerri and Imo State University, all in Imo State and a reliability coefficient of 0.77 was ascertained. The data collected were analyzed using mean and standard deviation to determine the current state of implementation, factors to consider and perceived impact of IoT in big data management practices in UNN. The findings indicated a poor state of availability and utilization of IoT devices in the offices. It also revealed that the staff (respondents) have an appreciable knowledge of the important factors to consider and the positive influence of IoT in big data management in modern offices. It was therefore, recommended that management support is required to acquire modern IoT-integrated electronics, technology and regular performance improvement of personnel involved for mega changes in offices.

Keywords: Internet of Things, Big Data, Management, Practice, Modern Office, University of Nigeria Nsukka

Introduction

Many facets of life, including the way we work and manage data in offices, have changed significantly as a result of the quick development of technology. The Internet is defined by Comer (2017) as “a global system of interconnected computer networks that use a protocol suite to link devices worldwide.” According to Tannenbaum and Wetherall (2020), the Internet “is a worldwide system of interconnected computer networks that use the standard Internet Protocol Suite (TCP/IP) to serve billions of users worldwide.” Today, the internet has become a global phenomenon that is difficult to define comprehensively. However, a number of definitions have been put forward. For instance, the Internet is defined by Kurose and Ross (2020) as a network of networks that enables the

interconnection of devices that span the globe.

According to this study, the Internet functions as a worldwide system that makes it easier to connect for a variety of purposes, including social networking, e-commerce, data management, communication, and information retrieval. These days, the Internet affects all facets of our lives, including communication, business operations, entertainment, social interactions, commerce, security, and higher education, among other things. Based participation by the researchers with foreign institutions it was found that numerous academic institutions worldwide, such as Cornell, Oxford, Wisconsin, and the University of Leeds, are increasing their investments in information technology (IT), particularly the internet, and actively

encouraging internet usage. The revolutionary idea of the Internet of Things (IoT) has its roots in the Internet, a global network that links computers and makes information sharing easier. The IoT increases the reach of the internet by allowing physical items to be easily connected and share data, and revolutionizing various aspects of our lives.

The IoT as opined by Cisco Systems (2016) is “a network of physical objects accessed through technology that allows objects to be sensed or controlled remotely across existing network infrastructure.” Gubbi et al (2018) described the IoT as a wide range of devices, from everyday objects to industrial equipment, creating a networked ecosystem that enables intelligent and autonomous interactions. The IoT is a network of interconnected devices that collect and exchange data, which contributes to the generation and utilization of big data. In this study, the Internet of Things refers to the network of physical objects or objects embedded with sensors, software, and connectivity capabilities, facilitating the collection and exchange of data over the Internet. Data from these interconnected things is routinely gathered, examined, and used to take action, offering a plethora of intelligence for decision-making, management and planning. Big data, to Marr (2015), refers to “extremely large datasets that may be analyzed computationally to reveal patterns, trends, and associations, especially relating to human behaviour and interactions.” Gartner (2020) operationalizes big data as high-variety information assets that demand cost-effective, innovative forms of information processing for enhanced insight and decision-making. In this study, big data refers to extremely large and complex datasets that can be easily managed, processed, or analyzed using advanced technology for management decision making.

Management is viewed by Drucker and Maciariello (2014) as the process of coordinating and overseeing the activities of individuals and groups within an organization to achieve predetermined goals effectively and efficiently. Management is the process of

planning, organising, leading, and controlling resources to achieve organisational goals effectively and efficiently (Griffin & Moorhead 2019). With reference to this study, management is the process of planning, organising, coordinating, and controlling resources and activities to achieve specific goals the effective and efficient utilisation of data for decision-making and operational purposes, known as data management.

Data management is a set of practices that support the transformation of data into information and knowledge (Aiken, 2015). Data management is the development and execution of architectures, policies, practices, and procedures that properly manage the full data lifecycle needs of an establishment (DAMA International, 2017). In this study, data management refers to various activities such as data collection, storage, retrieval, integration, disposal, transformation, security, and analysis in a structured and efficient manner for an establishment. The goal of data management is to ensure that data is accurate, consistent, and accessible for decision-making and business operations in an office.

The office is viewed by Barnes and Wagner (2016) as an avenue or designated space for capturing, processing, storing, retrieving, and dispatching transactional information. Robertson and Cooper (2019) described the office as a dynamic space that supports individual and collaborative work, fosters creativity, and enhances employee well-being. The office serves as a central hub for communication, collaboration, and productivity within an institution. University of Nigeria, Nsukka has many offices occupied by office workers for the management of data for efficiency. The integration of Internet of Thing (IoT) technologies has the full potential to transform big data management in office environment in the university into a dynamic, real-time, and data-rich ecosystem. The adoption, implementation and utilization of advanced technologies of internet of things for the exchange of big data management has

not been effective in the University of Nigeria. This might be a result of the cost of acquiring, implementing and maintaining the Internet of Things' electronic and Internet technologies for connectivity, among others. Following the experiences of the researchers, traditional system of data management in various offices is characterized with loss of data, linkages, alteration which cause delay in decision making and effective dissemination of information. governance policies, and the adoption of data analytics techniques. The identified challenge lies in the absence of studies to ascertain the perceive outcome of a comprehensive framework on effectiveness of the integration, utilization of IoT technologies into the big data management practices of offices at the University of Nigeria Nsukka. This study seeks to examine perceived influence of the internet of things on implementation and management of big data practices in office environments in university of Nigeria, Nsukka.

Literature Review

Studies on the adoption of IoTs in institutions and enterprises in developing nations (Susilowati et al, 2021; Darvazeh et al., 2022) revealed that due to the young nature of the invention, previous research has mostly linked human resources to information technology rather than IoT. Lugman and Van Belle (2017) found that developing nations such as Nigeria experience serious challenges in IoT adoption such as unreliable infrastructure, connectivity and maintenance costs. Wees et al. (2016) reported a general slow adoption of IoTs while Zhou et al. (2017) revealed that developing markets will become essential drivers of technological innovation in products and systems when IoT is fully adopted. Findings by Mothobi and Gillwald (2018) revealed that there is a lag in ICT adoption in many parts in Africa's social, economic and academic activities. Mothobi and Gillwald (2018) further compared some African countries with South Africa having the most internet users who account for only half of the population which improved on

their revenues. Other studies, including Ogbuabor (2020) on data management, and Upasana and Msibi (2021) on the benefit of implementing IoTs, were reviewed.

Regarding the best practices for integrating the Internet of Things into big data management, research by Akande and van Belle (2013) showed that the ICT environment is constantly evolving, and institutions may find it challenging to stay up to date due to security regulations, policies, and laws that must adapt to these changes. Brown (2017) found that implementation enables monitoring performance metrics, gathering user feedback, and implementing necessary updates or enhancements to optimize IoT operations. Smith (2018) found that it involves integrating IoT devices and systems with existing infrastructure and processes to ensure smooth operations, which will enhance mega change. Johnson (2019) found that implementing IoTs enhances accurate and reliable data for making informed decisions and deriving meaningful insights from big data. Studies by the following scholars: Zhang et al. (2015); Wang et al. (2016) as well as Li et al. (2017) found that IoTs adoption advanced analytics techniques for extracting valuable insights from IoT big data. Wees et al. (2024) found implementing IoTs with functioning security enabled access control mechanisms of big data management efficiency.

Furthermore, a study by Smith et al. (2018) on the perceived impact of IoT on big data management methods discovered that IoT has a beneficial impact on data analysis, created data, and decision-making procedures. The use of IoT technology has increased the efficacy and efficiency of data processing in offices, claim Smith et al. (2018). According to Ogbuabor's (2020) findings, IoT improved the well-managed storage and organization of gathered data, as well as the availability of specialized staff or teams in charge of managing big data management in an office setting. According to submissions and findings by Jones and White (2017), Smith and Johnson (2018), Lee et al. (2019), Williams et al. (2019), and

Davis (2021), IoTs make it easier to capture, process, and make decisions quickly. The researchers were directed by the studied literature on the conceptual framework and study discussion were informed by the examined literature.

Examining the perceived impact of big data management techniques and the deployment of the internet of things (IoT) in office settings at the University of Nigeria, Nsukka, is the primary goal of this study. The study specifically sought to ascertain the assess the current condition of big data management in the offices; perceived impact of IoT on big data management at the University of Nigeria, Nsukka (UNN); and ascertain the perceived influence of IoT on big data management implementation.

Research Questions

The following research questions guided the study:

1. What is the current state of adoption of IoTs for big data management in offices in University of Nigeria, Nsukka?
2. What are the important factors to consider in implementing IoT in big data management practices in the University of Nigeria, Nsukka?
3. What is perceived influence of IOTs on big data management practices in the University of Nigeria, Nsukka?

Methodology

The research design used in this study was a descriptive survey. The study was carried out in the University of Nigeria, Nsukka (UNN). The study's population was 50 participants through purposive sampling. IT administrators who worked in the designated office settings where the internet of things should have been implemented were randomly chosen. The Innovation Centre, Centre for Distance & E-learning, Nnamdi

Azikiwe Library, Management Information System (MIS), and Zenith ICT Centre were the office settings where the study was conducted at the University of Nigeria, Nsukka.

A structured questionnaire created by the researchers based on a survey of the literature served as the data gathering tool. The research question guided the construction of the questionnaire. Three experts from the University of Nigeria Nsukka's Department of Business Education, one from Computer and Robotic Education, and a staff from Tenace ICT, all conducted face validity checks on the instrument. Their suggestions were taken into consideration when creating the final version of the survey. Trial testing was used to determine the instrument's reliability. Twenty copies of the survey were distributed to the ICT departments of Imo State University, Federal University of Technology, Owerri, and Imo State. These universities were selected because they have traits in common with the UNN offices but are not part of the study.

With the assistance of two research assistants, the researchers distributed fifty (50) copies of the questionnaires to the respondents, who then retrieved them. The following Likert scale was applied to code the responses: SA = 4, A = 3, D = 2, SDA = 1. The mean and standard deviation descriptive statistics were used to assess the data gathered from the respondents. A mean benchmark of 2.50 was used as the decision criterion for acceptance. As such items with mean ratings of 2.50 or higher were accepted, while items with mean ratings below 2.50 were not accepted.

Results

Research Question 1: What is the current state of adoption of IoTs for big data management in offices in University of Nigeria, Nsukka?

Table 1: The Mean Scores and Standard Deviation of Responses of the Respondents on the Current State of Big Data Management in Modern Offices.

S/N	Item Statement	SA	A	DA	SDA	Mean	Std. Dev.	Decision
1.	IoT devices for big data management are not installed in the offices	20	21	8	1	3.20	.782	Accepted

2.	IoT devices are not effectively utilized within office environment for big data management.	12	30	8	-	3.08	.634	Accepted
3.	The storage and organization of collected data within the office are well managed using IoT devices.	4	2	10	32	2.04	.605	Not Accepted
4.	Offices have not established processes for collecting, storing and dispatching large volumes of data through IoT.	13	27	9	1	3.04	.727	Accepted
5.	IoT devices have not been integrated in to offices due to the attitude of the university administration	13	31	5	1	3.12	.659	Accepted
6.	Office frequently performs traditional and ICT data analysis to derive insights or make informed decisions.	14	28	8	1	3.12	.659	Accepted
7.	There is lack of satisfaction with the current state of big data management practices within offices.	4	29	16	1	2.72	.640	Accepted
8.	There are dedicated personnel or teams responsible ready for big data management using IoT within office	7	31	12	-	2.90	.614	Accepted
9.	There are on-going initiatives that will enhance big data management practices within offices.	10	28	12	-	2.96	.728	Accepted

Source: Field Data, 2023.

Std. Dev. = Standard Deviation; SA= Strongly Agree; A= Agree; DA= Disagree; SDA= Strongly Disagree

Table 1 shows the mean and standard deviation responses of respondents on the current state of big data management in offices in UNN. All the items in the table, except item 3, had mean responses ranging from 3.20 to 2.72 and were accepted as they fall within the acceptance mean requirement of 2.5 and above. Item 3, which reads “the storage and organization of collected data within the office are well managed using IoT devices,” had a mean of 2.04 and therefore was not accepted to be true. The responses generally indicated a poor state of availability and utilization of IoT devices in offices in UNN.

However, the respondents indicated in the affirmative to Item 9 that “there are on-going initiatives that will enhance big data management practices within offices.” The standard deviation ranged from 0.782 to 0.605 indicating that the respondents were not far from each other in their opinions.

Research Question 2: What are the important factors to consider in implementing IoT in big data management practices in the University of Nigeria, Nsukka?

Table 2: Perceived Important Factors for Implementing IoT in Big Data Management Practices in the University of Nigeria, Nsukka.

S/N	Item Statement	SA	A	DA	SDA	Mean	Std. Dev.	Decision
10.	Selecting compatible IoT devices with existing systems is essential for successful implementation.	14	33	2	1	3.20	.606	Accepted
11.	Data privacy and security are highly important when implementing IoT technologies for big data management within the office.	18	30	1	1	3.30	.614	Accepted
12.	Ensuring IoT-generated data is accurate, reliable, and aligned with your office's objectives and needs is critically important.	16	32	1	1	3.26	.600	Accepted
13.	Collaboration between multiple departments or teams is essential for the successful implementation of IoT in big data management.	15	31	3	1	3.20	.639	Accepted
14.	Periodic system upgrades to ameliorate breach of security.	16	27	5	2	3.14	.756	Accepted

Source: Field Data, 2023. Std. = Standard Deviation; SA= Strongly Agree; A= Agree; DA= Disagree; SDA= Strongly Disagree.

Table 2 shows the responses on the perceived important factors for implementing IoT in big data management. Items 10 to 14 with the mean ranges from 3.30 – 3.14 have been accepted as they fall within the acceptance mean requirement of 2.50 and above. This indicates that the respondents affirm that selecting compatible IoT devices with existing systems, data privacy and security, ensuring that IoT-generated data is accurate, collaboration between multiple departments and periodic system upgrades are all important to consider in the implementation of IoT in big data management practices. The standard deviation ranges from 0.756 to 0.600 implying that the respondents did not vary widely in their perception and response to the items.

Research Question 3: What is the perceived influence of IoT on big data management practices in the University of Nigeria, Nsukka?

Table 3: Mean and Responses of the Respondents on Perceived Influence of IoT on Big Data Management Practices.

S/N	Item Statement	SA	A	DA	SDA	Mean	Std. Dev.	Decision
15.	The utilization of IoT technologies will positively influence data collection, processing etc. within your office.	10	33	4	3	3.00	.728	Accepted
16.	IoT-generated data will improve the efficiency and effectiveness of data analysis within office.	10	31	7	2	2.98	.714	Accepted
17.	IoT-generated data will be more accurate and informative for decision-making	11	34	5	-	3.12	.558	Accepted

	compared to traditional data sources.							
18.	Officials from various offices are effectively leveraging IoT technologies to enhance big data management practices.	6	32	10	2	2.84	.681	Accepted
19.	Academic staff plays a significant role in utilizing IoT-generated data for improving big data management within your office.	12	30	8	-	3.08	.634	Accepted
20.	IoT technologies will continue to positively influence big data management practices within the office.	14	30	6	-	3.16	.618	Accepted
21.	IoT offers improved data protection for Big Data Management.	12	32	6	-	3.12	.594	Accepted

Source: Field Data, 2023. Std. = Standard Deviation; SA= Strongly Agree; A= Agree; DA= Disagree; SDA= Strongly Disagree.

Table 3 shows the perceived influence of IoT on big data management practices in UNN. Items 15 to 21 with the mean ranges from 3.16 to 2.84 have been accepted as they fall within the acceptance mean requirement of 2.50 and above. The results indicate that the respondents affirm that the utilization of IoT positively influences data collection and processing, improves the efficiency and effectiveness of data analysis within office, generates more accurate and informative data for decision-making compared to traditional data sources, offers improved data protection for big data management, provides a leverage for officials from various offices and enhances academic staff role in big data management. The standard deviation ranged from 0.728 to 0.558 indicating that the respondents were not far from each other in their opinions.

Discussion of Findings

The study showed the current state of big data management within the University of Nigeria, Nsukka's offices as: IoTs devices for big data management are not installed in the offices, IoTs devices are not effectively utilized within office environment for big data management. The storage and organization of collected data within the office are not well managed using IoTs devices, offices have not established processes for collecting, storing and dispatching large volumes of data through IoTs, IoTs devices have not been integrated in to

offices due to the attitude of the university administration among others. The plausible reasons for this poor state of IoT adoption might be due to limited internet infrastructure, low digital literacy, concerns about data privacy and security, high deployment costs, lack of awareness about IoT applications, and a challenging regulatory environment which are characteristic of developing nations like Nigeria. The findings of this study agreed with the study by Mothobi and Gillwald (2018), which revealed that there is a lag in ICT related devices adoption in many parts in Africa. Finding by Ogbuabor (2020) revealed how IoT was adopted and utilized within the office environment and highlights the establishment of processes for collecting and storing large volumes of data. Submission by Wees et al. (2016) said that IoT is still in nascent stages and growing dynamically but human aspect is the most challenge to adopt IoT in any sector. The study further agreed with the findings by Upasana and Msibi (2021), where it was found that many challenges such as cost, affordability of technological devices, lack of ICT skills, its regulatory environment, and policy and infrastructure prevent the adoption of information and communication technology (ICT) because of its regulatory environment and policy. In another direction, Upasana and Msibi (2021) further revealed that South Africa has forged ahead and various institutions are using

ICT and other devices with the internet to facilitate most of their transactions.

The responses on important factors to consider in implementing IoT in big data management underscore the significance of seamless integration, data protection, data accuracy, interdepartmental cooperation, and continuous improvement. The implementation of the Internet of Things (IoT) in big data management at the University of Nigeria, Nsukka requires careful consideration of best practices. These practices are crucial for ensuring seamless integration, data protection, data accuracy, interdepartmental cooperation, and continuous improvement. Thus, the respondents are unanimous on the importance of these factors in the implementation of IoT in office. This indicates that the respondents have an appreciable knowledge of the demands and importance of IoT for big data management in modern offices, but lack the facilities to effectively implement IoT as indicated by the results from research question one. This finding on important factors to consider is in agreement with that of Smith (2018) who concurred that seamless integration is essential for successful IoT implementation and will enhance management decision making. This involves integrating IoT devices and systems with existing infrastructure and processes to ensure smooth operations. A study by Althoey et al. (2024) claims that implementing IoTs with functioning security enabled access control mechanisms of big data management efficiency in offices. The findings further agreed with Johnson (2019) where accurate and reliable data is crucial for making informed decisions and deriving meaningful insights from big data. Johnson suggests that universities should establish mechanisms to ensure data accuracy, such as regular data validation and verification processes. Universities should continuously evaluate their IoT systems and processes to identify areas for improvement. In line with the study, Brown (2017) concurred that the implementation of IoT will involve monitoring performance metrics, gathering user feedback, and implementing necessary updates or enhancements to optimize IoT operations.

The findings of the present study offer important insights into how IoT integration influences big data management in modern offices. The study found that IoT integration improves data collection and utilization in the office, that IoT-generated data has greatly increased the efficiency and effectiveness of data analysis, that IoT-generated data is more accurate and informative for decision-making than traditional data sources, that the office is successfully utilizing IoT technologies to improve big data management practices, and that, among other things, IoT-generated data is more accurate and informative for decision-making than traditional data sources. This further confirms the assertions of this study that the respondents are well informed about the influence of IoT in modern office practices in big data management. The study's findings are consistent with a study by Zhang et al. (2015) that examined the perceived significance of data security and privacy in IoT big data management practices were found. The study further agreed with Ogbuabor (2020) where the perceived importance of IoTs on storage and organization of collected data with the presence of dedicated personnel or teams responsible for overseeing big data management within the office were studied.

Conclusion

Internet of Things has been identified as one of the emerging technologies to facilitate the management of office information in various institutions. This study ascertained the perceived influence of the Internet of Things on the implementation and management of big data practices in the office environment at the University of Nigeria, Nsukka. The following conclusions were reached in light of the findings: IoT technologies have the potential to improve data management practices; device compatibility, data security, and cross-departmental collaboration are essential components of best practices for IoT implementation; and the current state of big data management at the University of Nigeria requires significant improvements.

The following recommendations were made in light of the study's findings:

- i. To increase the accessibility and effectiveness of big data management, the university should upgrade its data management system with IoTs through its ICT unit.
- ii. Top ICT personnel should start initiatives to educate and teach employees on data security and IoT technology.
- iii. To protect IoT-generated data, the University of Nigeria's ICT section should create and execute data privacy policies and security procedures.

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