Research Article

Data Management in the Internet of Things (Challenges and Opportunities)

Peter Nnenna Holliness¹*, J.C. Ogbu², Ibrahim Salihu Yusuf¹, Ogbu Gift² and O.O. Patrick³

¹Department of Library and information science, Ahmadu Bello University Zaria, Nigeria

²Department of microbiology, university of Abuja

³Veritas University

*Corresponding Authorr
Peter Nnenna Holliness, Department of Library and information science, Ahmadu Bello University Zaria, Nigeria.

Abstract
This study looks at the role proper management of data (The internet of things (loT))and it's significance in the finance industry using Polaris Bank as a case study. The study uses a survey approach for data collection. Some of the challenges taken into consideration were related to security, privacy, reliability, scalability and stability. The benefits of IoT align with Polaris Bank strategic goals by improving customer experiences, driving operational efficiency fostering innovation, enhancing security and enabling Data driven decision making.

1. Introduction

Recently, traditional industries have begun to step up for a new technology of financial technology (FinTech) embraced by the internet of things (IoT). The requirements of FinTech and IoT need to be integrated into new business environments. The Internet of Things is becoming more popular worldwide. It has transformed the banking sector and financial management seamlessly for all and sundry despite their difficulties. The Internet of Things (IoT), the network of networks, is typically associated with many sensors connected through information and communication infrastructure to provide value-added services. It is one of the hot concepts to have emerged since the 1960s. It is a hard-core technology that has rapidly conquered the IT industry of the new generation [1]. This IoT aims to create a better world for the human species, where the objects around us understand the comments and act accordingly without any explicit instructions. Highly on the rise, it has been observed to control areas and bring them ultimately under its influence. It tends to obtain powerful computing tools via cloud computing. It is pointed as an intelligent technology which includes sensing, identification and intelligence. It can be used in pattern identification areas like sensing, collecting and processing information, and communication. All these operations have been controlled through remote smart devices connected to the internet. The Internet of Things (IoT) is slowly gaining ground. Objects are fitted with some form of readability and traceability through the properties of barcodes, QR codes, RFID, active sensors and IPv6. People are becoming part of a digital global network driven by personal interests.

Further, the whole operation will be performed using interfacing sensors, Zigbee modules or Wi-Fi, a camera with a microcontroller and Raspberry Pi. In this effect, microcontrollers, microprocessors, actuators and sensors are physical devices that directly communicate with the internet. They work by using the gateway of IoT. This entire infrastructure is called the infrastructure of IoT. The intelligent farm embedded with the systems of IoT is called the connected farm as it could support the devices in a wide range from diverse device manufacturers in the agricultural field.

The banking industry, specifically Polaris Bank, is one of the most complex and sensitive industries that experience enormous changes daily. Like many other businesses, Big data is a severe problem; data management and real-time monitoring fraud issues are more massive challenges in this sector due to the vast quantity of data coming swiftly and rapidly from different devices in structured and unstructured formats, waiting for instantaneous treatments and decisions. Most financial institutions and banks try to innovate and diversify payment processes to make improving their digital skills more challenging and secure. Understanding customer behaviours also become a successful key factor in the market at the same time; that's why the Internet of Things (IoT) can be the best solution to solve the issue of collecting and sharing data via the Internet among different "things", as devices and objects (Sensors, ATMs, POS, Smartphones, Computers, payment gateways (e-commerce), notebooks, etc.). The architectural and technical sides still need to be solved since conventional database management systems and existing banking systems can no longer handle and process this massive volume of data in sufficient real-time.

The Internet of Things (IoT) has officially moved beyond hype. IoT is now widely known and defined - putting data-gathering sensors on machines, products and people and making the data

available on the Internet - and companies are already using IoT to drive upgrades in operational performance, customer experience and product pricing. Gartner predicts 25 billion IoT data-gathering endpoints will be hooked up internationally by 2020. While IoT is delivering on its promise in many industries, many bankers still need help finding value in finance, an enterprise in large part constructed on intangibles. This study, therefore, aims to explore potentials and problems related to the Internet of Things & its applications in the banking industry with Polaris Bank in focus. This reviews the various challenges and opportunities associated with the applications of the Internet of Things in managing data, specifically in the finance industry. This research uses secondary sources gathered from existing academic literature such as journals, books, articles, magazines, the internet, newsletters, company publications and whitepapers.

This research's applications are finance, data management, monitoring and controlling. Some challenges considered for reviewing the Internet of Things applications are software complexity, security, lack of supporting infrastructure and technical skill requirements. Around the world, billions of devices are connected. These devices share the information on the cloud with the bank's permission, allowing the entire customer to view the account details and providing access power while using smart devices. It is the easiest way to communicate with the customer and convey personal information through messages and alerts awaiting work.

2. Methodology
2.1. Research Approach
Research is the process of collecting, analyzing, and interpreting data in order to understand a phenomenon (Leedy & Ormrod) but could sometimes be mistaken for information gathering, documentation and management but far beyond Researching is a systematic process that allows collection, analysis and interpretation of data for concise understanding. There are three major approaches to researching (Qualitative approach, Quantitative approach and Mixed approach). For this research, we would be utilizing the Quantitative approach. This method deals with quantifying and analysis variables in order to get results. It involves the utilization and analysis of numerical data using specific statistical techniques to answer questions like who, how much, what, where, when, how many, and how.

2.2. Quantitative Approach
Quantitative Approach to researching emerged from the need to quantify data and has since dominated western writings. Mostly independent of the researcher, Quantitative research objectively measures reality through data objectivity. Quantitative research involves data collection to quantify information subject to statistical treatment to support or oppose knowledge claims. Here, Experimentation is barely possible and control is limited. Of the various quantitative approaches, Survey research was being used. Survey research according to Sukamolson, encompasses the use of scientific sampling method with a designed questionnaire to

measure a given population's characteristics through the utilization of statistical methods. Data were gathered from respondents representing the population using open ended questions. Survey research could mean
- to examine as to condition, situation, or value-appraise;
- to query (someone) in order to collect data for the analysis of some aspect of a group or area;
- to determine and delineate the form, extent, and position of (as a tract of land) by taking linear and angular measurements and by applying the principles of geometry and trigonometry;
- to view or consider comprehensively;
- to inspect, scrutinize.
The survey is a quantitative form featuring questions related to the research content. The form varies according to the subject of the research.

2.3. Justification
Performing Quantitative research, precisely Survey method was straightforward, this research approach with the development of computer aided statistical programs eases processing and analysis of the data obtained from surveys, hereby producing more accurate and precise result necessary for investigating the challenges and importance of the subject. It should also be noted that the according to accuracy and usefulness of the data obtained in the survey would depend on few assumptions including ensuring (i). all variables to be measured are conceptualized understandably (ii) Pollsters had no effect on the survey (iii) that respondents understood and answered the questions correctly. The assumptions were properly noted and ensured in our research.

Another aspect visa-à-vis the quantitative research is worth mentioning which is positivism that underpins quantitative research. Weber (2004) mentioned his colleague, Jorgen Sandberg, who has characterised the positivism that in positivism, person and reality are separate; objective reality exists beyond the human mind; research methods are statistics and content analysis; validity-data truly measures reality; reliability-research results can be reproduced; research object has inherent qualities that exist independently of the researchers The quantitative findings are likely to be generalised to a whole population or a sub-population because it involves the larger sample which is randomly selected.

2.4. Research Design
The research design is the Case Study design with Polaris bank being the case study. This research design explains an involvement in a deep exploration, investigation and analysis of a particular case in order to unwrap concise and important information good enough for a meaningful conclusion. Describing this research design would require the following steps:
Research Questions definition – Research questions should be constructed that should be answered through the study.

Select the case study (In our case, Polaris Bank) – The decision to select the particular case study must be justified Specify subject of analysis – Relevant subject which aligns with research questions

should be defined Data collection & analysis – Information related to IoT and data management implementation should be collected and analyzed systematically. Information from various sources apart from the primary source can also be collected for comparative analysis. This could allow cross verification.

Present a narrative – A narrative that outlines details of the study including findings supported by evidences should be presented Provide Challenges and opportunities – Challenges within the context to be explained should be highlighted and explained to allow full understanding Limitations, Conclusions and Recommendations – Summarily, mention the limitations encountered during the study, recommendations for the sector's stakeholder and other researchers. Then conclude on the research.

3. Polaris Bank as the Case Study.
Polaris' bank is an abridged bank that was founded to take over all the assets and liabilities of the defunct Skye Bank. Skye Bank was liquidated due to the issue of corporate governance and the erosion of the bank's capital by bad loans created and granted by the bank's management. Surprisingly, Polaris' bank witnessed a complete turnaround in the first year of operation, which happened to be year 2019, to pose a profit in excess of N27.5billion [2].

Polaris banks representing an high profile party in the finance industry was purposively chosen as it represents one of the largest deposit money banks in Nigeria and have been a major player within the industry over the past decade [3]. Furthermore, their scale of operations and significant customer bases imply potentially major fraud risks, thereby making them ideal candidates for assessing forensic accounting adoption [4-26].

4. Data collection
Survey method was used for data collection. It was judged the easiest and would produce the best result with the audience being right. Survey development process was divided into four stages problem definition, question writing, taking opinions of experts and pre application. Survey means would expand our reach, getting large quantity of data. This technique has made major contributions to sociology, education and medics. It has a massive possibility to reach many persons, families or entities with more accurate data obtained.

5. Data analysis
Through this research, qualitative information from descriptive analysis can explain the tendency, ways of thinking, limitations and opportunities of the subject.

Descriptive analysis involves aggregative and explaining interests, theories, proposals or a combination of these based on available statistics, information or records. Its quantifiable data means it can statistically analyze a sample, show connections, trends and in turn infer overtime from information gathered. This analysis allows conversion of raw data into a form easy to interpret and understandable to a reader of any level. This form helps to describe in a means constructive enough to tick every required condition. There are categories for this analysis with each category useable for a variable at a chosen time.

➢ Before Description And Presentation, Information Would Always Go Through These Processes
• Data Collection – Here data relevant to the analysis are collected. This data would include Storage capacity of data management devices, How much data IoT devise generates, etc
• Data Cleaning – This ensures error free and accurate data. Outliers are removed and every form of inconsistency that could affect results of the analysis are normalized.
• Data Distribution – This could be important in understanding patterns in challenges associated with data management or the opportunities residing here.
• Descriptive findings – Key finding from the analysis should be summarized with key points highlighted. The challenges, opportunities, should be mentioned
• • Limitations and recommendations – Since there is no perfect study, The limitations of the work done or data available should also be mentioned with recommendations suggesting what could be done with subsequent areas for research listed.

Descriptive analysis for this subject would effectively interpret data enough to have the challenges and opportunities presented, thereby offering important insights stakeholders in the finance sector.

6. Ethical Considerations and Measures to Ensure Data Privacy and Confidentiality
Confidentiality and privacy is not an absolute. It exists only relative to the person from whom we wish to keep something hidden. In general, privacy is dependent on the context and relationship between giver and receiver of data, and also on the use to which the data will be put. Indeed, public attitudes to privacy can change rapidly, often in response to reports of data leaks. Such fluctuations can have an adverse effect on the value of data sets if they allow people to opt in or opt out of being included.

Personal privacy runs up against the importance of using data to promote the wider good: sometimes it is unethical not to use available data. We decided to strike a balance between different kinds of risks and different kinds of gains. Striking such a balance would be straightforward enough since the risks and gains were clear and measurable. To ensure data privacy and confidentiality means were put in place including secure multiparty computation, trusted third-party systems. We also had full compliance with the GDPR Regulations.

7. Limitations of the Chosen Methodology
Given the strengths, the quantitative research methodology has limitations too. The weakest point of this methodology is low response rate, This could be disappointing and frustrating. Closest to it is responders not understanding the questions or

not remembering the answer, thereby giving random answers, this would lead inaccurate result. Also, The positivism research paradigm leaves out the common meanings of social phenomenon. It also fails to ascertain deeper underlying meanings and explanations. Another limitation of quantitative research is that the positivism cannot account for how the social reality is shaped and maintained, or how people interpret their actions and others. In quantitative language testing research, it is found that the studies just investigate and estimate the language skills, proficiency, scoring, and so on. The quantitative research paradigm overlooks the respondents' experiences and perspectives in highly controlled settings because there lacks a direct connection between researchers and the participants when collecting data. As a result, the data obtaining method becomes objective.

8. Introduction and Background Questions
Data Security and Privacy: ensuring security and privacy of customer data is a top priority. Polaris Bank protects against unauthorized access, data breaches, and cyber threats.
Polaris Bank often has diverse IT systems and legacy infrastructure. Integrating data from different sources, including core banking systems, online platforms, and third-party applications, can be challenging.

Data integration is merging and integrating data from various sources to create a cohesive view within an organization. It entails using different methods to combine data from multiple databases, applications, and systems into a coherent and understandable format. The aim is to enable smooth data access, analysis, and reporting throughout the company. For banks such as Polaris, data integration is essential to the modernization and optimization of their data management strategies. It encourages a more comprehensive and practical approach to data handling, which is necessary to achieve operational excellence, comply with regulations, and meet customer expectations. Referring to official statements or communications from Polaris Bank or industry reports is advised for the most accurate and current information on the bank's specific data management strategies.

As digital banking grows, so does the risk of fraudulent activities. Polaris Bank uses advanced data analytics tools and machine learning algorithms to detect patterns indicative of fraud and implement preventive measures. Data encryption and security measures can be used to protect sensitive customer data, put robust data encryption protocols in place, And stop unwanted access by using multi-factor authentication, secure networks, and firewalls. Fraud detection capabilities can be improved by utilizing AI and machine learning algorithms. These technologies can increase detection accuracy and adjust to changing fraud patterns. Implement safe customer authentication procedures such as biometrics and secure tokens to confirm identities and stop unwanted access. Auditors should perform routine internal and external audits to find potential improvement areas and evaluate vulnerabilities.
They should also proactively conduct risk assessments to handle

new compliance concerns and threats. Staff should be provided with security best practices training and raise awareness of possible fraud risks. A vigilance culture should be promoted, and the reporting of any questionable activity. It is imperative to acknowledge that the efficacy of fraud detection and prevention tactics is contingent upon ongoing oversight, flexibility in response to dynamic threats, and a thorough, multifaceted methodology. It's best to contact Polaris Bank directly or refer to their official publications and reports for detailed and current information on their data management practices. There should also be cooperation with Enforcement agencies to investigate and prosecute fraud cases and forge strong working relationships. Knowledge can also be exchanged with colleagues in the field to counter new threats jointly.

9. Data-Related Challenges
Maintaining high data quality is crucial for effective decision-making. Only accurate or complete data can lead to errors in financial reporting, customer dissatisfaction, and regulatory non-compliance. Polaris Bank invests in data cleansing, validation, and quality assurance processes.

• **Incomplete Data**
There may be instances of missing or incompletely recorded information in Polaris Bank's data. This may result in gaps in knowledge about transaction histories, client profiles, or other vital data points.

• **Inconsistent Data**
It can be challenging to integrate and analyze information cohesively when there are discrepancies in the data's formatting, units, or terminology. Accuracy depends on standardizing data across multiple departments and systems.

• **Data Duplication**
Duplicate records can skew analysis and influence decision-making, particularly in customer databases. Maintaining accurate customer information requires locating and fixing duplicate entries.

• **Data Entry Errors**
Human error can introduce Inaccuracies during data entry procedures. Errors in typing, data entry, or other administrative tasks can jeopardize the accuracy of customer and financial information.

10. Ways to Improve Data Quality and Accuracy
• **Data Governance Framework**
Establishing a solid framework for data governance guarantees that the organization's policies, practices, and roles for managing and preserving data quality are uniform.

• **Automated Data Validation**
By reducing the possibility of erroneous data entering the system, automated tools for data validation can help find and fix errors in real-time.

• **Frequent Audits and Quality Checks**
Monitoring the data through frequent audits and quality checks

enables quickly finding and fixing problems. This entails checking the consistency, accuracy, and completeness of the data.

• Employee Training
To improve staff members' abilities in data entry, validation, and quality assurance, continuous training should be given to them. This reduces human error.

• System Integration
A more accurate and comprehensive view of information can be promoted by minimizing discrepancies in data formatting and structures through the smooth integration of multiple systems within the bank.

Overcoming these obstacles requires an all-encompassing strategy incorporating technological advancements and an organizational commitment to a data-quality culture. Polaris Bank can increase the dependability of its data management procedures and facilitate better decision-making and customer service by continuously emphasizing data quality and accuracy.

11. Data Analysis to Improve its Banking Services
The volume of data that is being generated is immense, and Polaris Bank ensures that its data infrastructure can scale to accommodate growth. Scalability challenges can arise when existing systems need help handling increased data loads efficiently, taken through constant investment.

• Data Collection
 Through client transactions, such as fund transfers, withdrawals, and deposits, banks gather data. The bank obtains personal and financial data from clients who open new accounts or apply for financial products. Banks collect information from digital channels, such as website visits, mobile app usage, and online transactions, as online and mobile banking use grows.

• Data Storage
Banks commonly store data in scalable, secure databases to maintain the integrity and confidentiality of client information. Polaris Bank can scale its infrastructure in response to demand by utilizing cloud technologies for effective and adaptable data storage. Sophisticated security measures, including encryption and access controls, are implemented to guard against unauthorized access and breaches of sensitive customer data.

• Data Analysis
Banks can customize services and products for particular groups by using data analysis to find customer segments with comparable needs and behaviours. Advanced analytics can improve security protocols by spotting anomalous patterns of fraudulent activity.

Data analysis is essential for determining a customer's creditworthiness, which helps with risk management and loan approvals. Banks use data analytics to streamline internal procedures, increase productivity, and lower operating expenses.

• Customer Relationship Management (CRM)
Banks can provide individualized services and product recommendations based on customers' unique preferences and behaviours by analyzing customer data. To pinpoint areas for development and raise general customer satisfaction, banks may also gather and examine input from their clients. Banks can use data analysis to create focused marketing campaigns to target particular audiences.

It's crucial to remember that banks, including Polaris Bank, must follow data protection laws and prioritize the security and privacy of client information. Polaris Bank's data governance policies and practices may include details on the techniques and tools used. Refer to Polaris Bank's official communications or contact the bank directly for the most accurate and current information.

12. IoT and Banking Integration
IoT facilitates organizations' data management, knowledge management, communication, cooperation, information access, and strategic management. The Internet of Things fundamentally alters the nature and use of technology in businesses. IoT's potent strategic and tactical tools can significantly benefit organizations by enhancing and bolstering their competitiveness when applied and utilized appropriately. IoT helps shape inter-organizational coordination by enabling organizations to reduce costs and increase capabilities. IoT use can help reduce coordination costs and boost outsourcing within businesses. IoT is a tool for learning and exchanging information. IoT will benefit Polaris Bank by lowering transaction costs and improving quality control.

The core banking upgrade from Flexcube version 12.2 to version 14.7 has started. Customer service, security, and design-based efficiency gains will all be handled by this. The Polaris Bank has begun a thorough updating of its core banking system to a more recent version. The bank emphasizes that this upgrade is a strategic initiative to improve important aspects of banking operations rather than just a technical update. Version numbers 12.2 to 14.7 precisely point to a significant upgrade, and the word "by design" emphasizes that the enhanced system's efficiency, security, and customer support have been purposefully included.

Banks worldwide are actively investigating the dynamic field of IoT technology integration into banking operations to improve customer service and security. A significant process has been set in motion, beginning with a substantial upgrade in the core banking system from Flexcube version 12.2 to version 14.7. This upgrade is expected to improve customer service, security, and operational efficiency as inherent features of the new design.

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12.1. IoT Solutions for Data Management

The Internet of Things is a natural solution to addressing the limitations and challenges in data management within Polaris Bank's digital banking operations. A brief on these solutions are:

Real-time Data Collection: IoT devices help to provide real-time data from various sources, such as customer transactions, ATM usage, and branch activities.

Enhanced Customer Insights: IoT devices help to gather data on customer behaviour, preferences, and interactions with digital banking channels.

Security and Fraud Prevention: IoT devices help improve digital banking security measures.

Transaction Security: IoT devices can play a role in securing digital transactions by providing additional layers of authentication and authorization, such as through biometric data or device-based verification.

Smart ATMs and Devices: IoT is integrated into ATMs and other banking devices, allowing for remote monitoring, predictive maintenance, and efficient management of these assets.

13. Compliance and Regulations

Like any financial institution, Polaris Bank engages with legal and compliance experts, stays updated on regulatory changes, and adopts a proactive approach to address the evolving landscape of data-related regulations in Nigeria, especially in the context of IoT implementation.

It impacts in various ways, such as Data Security Challenges, Privacy concerns, Data Governance, Regulatory Impact, Data Localization and Risk Management.

13.1. Some Data-Related Regulations in Polaris Bank

• **Data Protection and Privacy**
The National Information Technology Development Agency (NITDA) in Nigeria issues guidelines on protecting data, which Polaris Bank complies with. Polaris Bank also adheres to the Nigeria Data Protection Regulation (NDPR), which outlines the steps for processing personal data correctly.

• **Central Bank of Nigeria (CBN) Regulations**
The Central Bank of Nigeria (CBN) gives procedures to be followed in various aspects of the day-to-day running of Polaris, including the management of data, security, and prompt reporting.

• **Consumer Protection Framework**
Compliance with guidelines relating to protecting consumer interests, such as transparency and conflict resolution, is essential for ensuring compliance.

• **Cybersecurity Requirements**
There are CBN-issued rules for financial institutions relating to Cybersecurity. Polaris Bank is required to implement means to ensure the Confidentiality, Integrity and Availability of customer data.

Navigating data-related regulations is critical for banks, including Polaris Bank, operating in the Nigerian banking industry. Implementing IoT (Internet of Things) technologies can have implications for compliance, and banks must carefully consider how these technologies align with regulatory requirements. Here are vital considerations regarding data-related regulations and the potential impact of IoT on compliance for Polaris Bank:

14. Impact of IoT on Compliance

• **Security of Data**
IoT devices have the potential to gather sensitive data; therefore, making sure end-to-end encryption is implemented is essential to maintaining customer privacy and adhering to data protection laws. Protecting sensitive data from unwanted access can be achieved by implementing strong access controls and authentication methods for Internet of Things devices.

• **Data Governance**
Ensuring compliance with regulatory standards is ensured by establishing clear policies for data ownership, usage, and retention around IoT data.

In-depth data mapping and categorization exercises help determine the kinds of data that Internet of Things devices gather and guarantee that sensitive data is appropriately managed.

• **Consent Management**
Obtaining users' explicit and informed consent is essential for compliance with data protection requirements if IoT devices gather personal data.

Other impacts include its implementation of Security Measures, Audit trails, and managing consumer and third-party risks, amongst others.

15. Mitigations Strategies for Challenges:

Robust security mechanisms, such as encryption, secure access restrictions, and frequent security audits, can be adopted to address data security concerns related to IoT to preserve data confidentiality and integrity. To address privacy issues, Polaris Bank must also ensure it transparently communicates with customers and obtains their express approval before implementing privacy-preserving measures. Regarding government rules, the bank might plan to keep updated and adjust to changes in the regulatory environment by forming a specialized compliance team.

In conclusion, Polaris Bank needs to incorporate IoT technologies while closely monitoring the laws about data in the Nigerian banking sector. Managing IoT-related difficulties in a compliant way requires putting strong security measures in place, guaranteeing privacy compliance, and keeping up with legal changes.

16. Benefits of the Adoption of IoT in Data Management

In several ways, Polaris Bank can profit from adopting Internet of Things (IoT) solutions for data management. Still, it's essential to weigh the return on investment (ROI) to ensure the implementation aligns with the bank's strategic objectives. When Polaris Bank adopts IoT technologies for data management, the following factors should be taken into account for ROI:

• Cost of Implementation

The up-front expenses related to purchasing and using IoT platforms and devices for data management must be assessed. This covers the price of software integration, data storage options, communication infrastructure, and sensors. Remember to account for the costs associated with IoT device installation and IoT solution integration with the bank's current data management systems.

• Gains in Operational Efficiency

We need to evaluate how IoT solutions improve data processing and analysis capacity. Analyze the efficiency improvements in enhanced decision-making, real-time monitoring, and quicker data collecting. Think about how IoT can help streamline procedures, cut down on manual intervention, and improve internal workflows for data management.

• Enhanced Precision and Quality of Data

We need to ascertain how IoT technologies support data integrity and accuracy preservation. Improved decision-making and more trustworthy insights can result from higher data quality. It is imperative to assess the possible decrease in errors and system outages linked to enhanced data administration via Internet of Things technologies.

• Enhancements to the Customer Experience

We should examine how data-driven insights from IoT contribute to customized client experiences. Think about ways to increase client loyalty, satisfaction, and involvement. Examine whether IoT-based data management systems improve customer service and speed up the response to queries, resulting in happier customers.

• Possibilities for Revenue Generation

Think about the possibility of launching new financial services or products based on information from the Internet of Things data. Evaluate the role that IoT plays in recognizing consumer demands and market trends. Analyze how IoT data can be used to find cross-selling opportunities and boost income.

• Scalability

Examine the scalability of IoT solutions to meet changing business needs and future data expansion. By assessing the compatibility of IoT solutions with industry standards and upcoming technologies, you can determine how long-lasting they will be.

• Key Performance Indicators (KPIs)

Establish KPIs for income creation, security, customer experience, and data management effectiveness. These KPIs will be used as standards to gauge how well the IoT deployment performs. To determine the IoT solutions' continued success and return on investment (ROI), regularly track and evaluate performance against predetermined KPIs.

Other considerations are the price of employee training and change management, resource optimization, and a few more.

Polaris Bank may make well-informed judgments on deploying IoT solutions for data management and ensure the investment aligns with the bank's overall strategic goals by carefully weighing these factors. Doing a thorough cost-benefit analysis and periodically reviewing the effectiveness of IoT solutions are crucial to maximize the impact on data management.

17. How IoT would improve Polaris

The benefits and ROI of IoT align with Polaris Bank's strategic goals by improving customer experiences, driving operational efficiency, fostering innovation, enhancing security, and enabling data-driven decision-making. Implementing IoT technologies positions Polaris Bank as forward-thinking and customer-centric, contributing to long-term success in a competitive financial landscape.

18. Potential Alignment

• Enhanced Customer Experience

This is achieved through personalizing IoT-enabled devices to provide convenience and proactive issue resolution. Thanks to the Internet of Things devices, Polaris Bank can collect data on client interactions, behaviour, and preferences. The client experience can be improved overall by using this data to provide targeted product suggestions and personalized services.

• Operational Efficiency

This is achieved through optimizing resource usage, reducing energy consumption, enabling predictive maintenance, and streamlining processes from customer onboarding to transaction processing. IoT device integration can improve operational efficiency by offering data analytics and real-time monitoring for various activities. This entails increasing workflow efficiency, decreasing downtime, and optimizing resource utilization.

• Innovative Services and Products

IoT opens opportunities for Polaris Bank to introduce innovative services and products and equally implement IoT solutions that differentiate a bank in the market by showcasing a commitment to innovation. New financial products may result from IoT integration. IoT data can help with risk assessment for lending products and IoT-enabled asset-tracking devices can be integrated into financing solutions

• Risk Management and Security

IoT technologies such as biometric authentication and device-based security enhance fraud prevention measures, improving

the overall security of the digital banking platform, which fosters trust among customers and equally maintains compliance with regulatory requirements by providing accurate and auditable data.

• Data-Driven Decision-Making
This is achieved by analyzing the derived actionable insights; Polaris Bank uses this information to make informed strategic decisions to expand services, optimize operations, or enter new markets. It equally allows Polaris Bank to optimize customer journeys, identifying their pain points and areas for improvement.

In conclusion, how Polaris Bank uses IoT technologies to boost operational effectiveness, customize services, fortify security, spur product innovation, and aid in cost-cutting and sustainability will determine how strategically aligned IoT is with the bank's objectives and how the customer experience is improved. To get a more precise evaluation, looking into Polaris Bank's particular initiatives and implementations would be necessary.

19. Conclusion and Recommendations
From this study we have understood the role proper management of data should play in finance industry. The main purpose of this paper was to investigate the challenges and opportunities associated with the applications of internet of things in data management of finance industries. Some of the challenges taken into consideration were related to security, privacy, reliability, scalability and stability. New opportunities to exploit potential security vulnerabilities were viewed understanding that successful attacks against data management are irredeemable. Security has to be enhanced through proper access control, data confidentiality and user authentication. Technical skill is required for banking to enhance the organizational abilities and to perform the banking functions, solving problems and more. Better supporting infrastructure can be developed with proper internet availability and connectivity. Some of the opportunities were taken for reviewing the applications of internet of things mainly limited by low power wireless sensor, better connectivity, operational efficiency and remote management. Low cost and low power wireless sensor technology are appropriate one to replace wires as communication medium in the banking sector. Better internet connectivity services assisted the bankers in enhancing the farming operations efficiency

The internet of Things has played a vital role in the sharing of various financial related information and resources, managing data perfectly well till when needed. Without IoT, It would have been pretty difficult for the banking sector to manage information most especially with the recent trend of remote or hybrid jobs becoming the new normal. It must be noted that security threats could be a issue due to lack of adequate security supervision, defective incentive in place to detect early warning signals of an attack; lack of mechanism in place for workers; Insider attack; lack of adequate staff, corporate third party agencies; weak policies; lack of appropriate tools and technologies coordination among different banks.

Future studies in this subject must focus on developing a security robust means of IoT-based data management system. With security vulnerabilities evolving each day coupled with transiting of banking to full Remote. We are beginning to have banks without a physical branch such as Opay, Palmpay who offer solutions viable enough, meaning Remote data management could become more herculean. This would become a phenomenon would mean that attention must be paid to this sector.

This paper has taken initial step towards evaluating the roles of IoT in Management of banking data and its full optimization.

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