Internet of Things and organizational performance in the Tanzanian banks

Simeo Kisanjara
Faculty of Science and Technology (FST), Computing Science Studies (CSS), Mzumbe University, Mzumbe-Morogoro, United Republic of Tanzania

Abstract

Purpose – The adoption of the Internet of Things (IoT) as a new technology is gaining traction in many business organizations in developing countries. The purpose of this study is to assess the effect of IoT on the organizational performance of Tanzanian banks.

Design/methodology/approach – For data collection, this study used a quantitative approach with a questionnaire. A total of 342 respondents were considered, with an 82.16% response rate. AMOS software was used to analyze data using structural equation modeling (SEM) as the primary technique.

Findings – The results revealed that the majority of the hypotheses tested in this study have a significant effect on organizational performance, as indicated by their *p*-value of 0.05. However, there is no statistically significant effect of performance expectancy on organizational performance by lowering IoT operation costs. Furthermore, the availability of IoT has no discernible effect on organizational performance by improving service quality.

Practical implications – The findings of this study inform policymakers to reformulate information and communication technologies policy to clearly spell out the adoption and implementation of the IoT as a new technological innovation for providing services not only in the banking sector but also in other service delivery organizations. In particular, the policy should have a clear vision of implementing an appealing, conducive and positive, meaningful service delivery environment, as well as achieving appropriate, successful, effective and sustainable organizational performance

Originality/value – As a result, this paper contributes to a better understanding of the factors (including performance expectancy, effort expectancy and accessibility) of IoT on organizational performance by influencing operational costs, service delivery speed and service quality. These factors were not adequately addressed in previous related studies, and they have a significant influence on organizational performance levels in Tanzanian banks.

Keywords Internet of Things, SEM, Tanzanian banks, Internet, Performance, Organizational performance

Paper type Research paper

1. Introduction

Organizations today are generally structured differently than they were a year ago. Organizations have been working and changing over time due to changes in a variety of factors, such as customer demands and/or expectations and technology (Banham, 2010). As technology advances, many organizations are shifting from traditional or manual methods of providing services to modern and/or electronic methods, allowing them to gain a competitive advantage (Laudon and Laudon, 2006). Furthermore, customer expectations and the rapid change of technology have been factors that have caused organizations to change (Heizer and Render, 2011).

Customers, according to the Theory of Constraints, expect to receive services that meet their needs regardless of the price they are willing to pay (AGI, 2001). In this regard, organizations have been working hard to reduce operational risk while providing services that effectively and efficiently meet the needs of their customers. According to the market rule, providing services that do not meet customer demands and/or expectations causes a specific organization's expectations to deteriorate (Ruhl, 1997). As a result, organizations have been working hard to implement the Internet of Things (IoT) to improve their working environment, which leads to better or more consistent services, thereby boosting organizational performance.

Organizational effectiveness and efficiency have become watchwords in the implementation of modern technology in many organizations. Organizations have been working hard to identify techniques that improve the working environment to improve organizational performance while meeting customer demands and/or expectations (Mothobi, 2002; Heizer and Render, 2011). As a result, several techniques for improving performance have been identified. The techniques include the implementation of platforms in specific areas that operate independently. Web-based technologies/platforms, smart systems, sensor use and management information systems are examples of such technologies/platforms. Thus, it is now critical to implement the most recent technology, the IoT, which has proven its existence globally in the form of a network

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of machines or devices that can interact with one another to improve organizational performance.

Abhishek *et al.* (2019) that the IoT is a type of "universal global neural network" in cloud computing that connects various things (Sharma and Tiwari, 2016). In 1982, a modified Coca-Cola machine was connected to the internet with the capability of monitoring and reporting the status of drinks contained (Farooq *et al.*, 2015). However, in his internet taxonomy in 1999, Bill Joy provided a hint about device-to-device communication (Lin *et al.*, 2008). The term "Internet of Things" was coined by Kevin Ashton in the same year to describe a network of interconnected devices (Jason *et al.*, 2009). The IoT is a network of intelligently connected devices and systems comprising of smart machines interacting and communicating with other machines, environments, objects and infrastructures, as well as radio frequency identification. Sensor network technologies have been evolving in response to emerging digital challenges. As a result, the IoT is crucial in determining the effects on organizational performance.

The IoT has only recently emerged (Keith, 2016). However, visions of machines communicating with one another have existed since the early 1800s. Since the invention of the telegraph (the first landline) in the 1830s and 1840s, machines have been providing direct communications. The first radio voice transmission, dubbed "wireless telegraphy," occurred on June 3, 1900, providing another necessary component for developing the IoT since the development of computers began in the 1950s.

The internet, which became a key component of the IoT, began as part of the Defense Advanced Research Projects Agency in 1962 and evolved into ARPANET in 1969. Commercial service providers began supporting the public use of ARPANET in the 1980s, allowing it to evolve into our modern internet. The Department of Defense provided a stable, highly functional system of 24 satellites in early 1993, making global positioning satellites a reality. This was quickly followed by the launch of privately owned commercial satellites into orbit. As a result, satellites and landlines provide basic communications for much of the IoT.

People in the digital age interact with sophisticated computing devices. The internet is now a basic human requirement, particularly in modern cities and metropolitan areas (Chander *et al.*, 2019). An educated person feels helpless and unable to understand and follow events in the absence of the internet. Most people nowadays rely on machines. Individuals' connections to one another, their lifestyles and their livelihoods have changed dramatically. It has also encouraged service improvement in a variety of organizations, such as business and education (Ersue *et al.*, 2014). It is argued that information can be easily shared via internet computers, thereby improving communication. As a result of the widespread use of the internet and wireless devices, the adoption of IoT for significant organizational performance arose.

In Tanzania, some organizations are currently adopting IoT as communicating technology, which has been gradually increasing over time. According to Mulamula *et al.* (2019), the widespread use of information and communication technologies serves as a mechanism for communication and information sharing among organizations. However, in Tanzania, utilization has led to the gradual adoption of IoT technologies such as machine-to-machine technology (M2M). M2M, which is an integral part of the IoT, connects multiple machines, devices and appliances and uses multiple networks. According to Mulamula *et al.* (2019), IoT is more efficient and cost-effective for organizations than other technologies.

According to Brous *et al.* (2019), organizations that adopt IoT create new opportunities to provide services in an efficient and effective manner. Despite the obvious benefits of IoT, particularly when adopted by organizations, there have been few studies conducted to investigate the effects of IoT on organizations in Tanzania. Understanding the effects of IoT among Tanzanians is therefore critical for restructuring the ways organizations work to improve performance.

1.1 Statement of the problem

The advancement of information and communication technologies (ICTs) has had a significant impact on modern life. It has been observed that the IoT, as a component of ICTs, has made significant contributions to this era of science and technology (Oburu, 2016; Musyimi, 2014). For example, IoT improves a company's competitive advantage (Oburu, 2016).

According to Madushanki *et al.* (2019), the IoT improves organizational and business industry processes by reducing human intervention through automation and thus increasing performance. However, Omollo (2016) and Kitime *et al.* (2019) argue that IoT has little impact on organizational performance and only reduces operational risks. Furthermore, Gerritsen (2018) and Rejeb *et al.* (2021) contend that IoT causes performance losses in organizations due to the high failure rate of its initiatives, high operating costs and lack of user acceptance.

The effects of IoT implementation on organizational performance are not clearly explained based on these arguments. This is due to a scarcity of literature describing the impact of IoT on organizational performance dimensions. The theory of performance improvement (TOPI) states that introducing organizational change without precisely specifying and addressing the affected performance dimensions is pointless because change can occur in the organization while performance declines (Sungau, 2013). In this regard, there is a need to specify the effect of IoT on performance dimensions so that organizations can understand them before implementing IoT, which, in turn, led to organizational change.

Furthermore, despite the documented potential and popularity of IoT adoption, organizations implement the technology haphazardly and, for the most part, nonexistently, particularly in developing countries (Vermesan and Friess, 2015, p. 25). Furthermore, the mixed performance results of organizations that have implemented IoT lead to the conclusion that there is still a knowledge gap regarding the influence of IoT on organizational performance (Macik, 2017; Brous *et al.*, 2018). As a result, by determining and explaining the effect of IoT on organizational performance dimensions in service organizations, this study fills a gap in the literature.

1.2 Study objectives

The overall objective of this study is to assess the effects of IoT on the organizational performance of Tanzanian banks.

Specific objectives are as follows:

- To assess the effect of the IoT on operational costs in Tanzanian banks.

- To assess the effect of the IoT on service delivery speed in Tanzanian banks.
- To assess the effect of the IoT on the quality of service (QoS) in Tanzanian banks.

2. Review of related literature

This section reviews related theories and previous studies to identify the existing knowledge gap.

2.1 Theoretical review

The section presents the relevant theories that guide this study and establishes a clear relationship between the study concepts. The theories of IoT technology adoption and performance improvement are presented. The acceptance of these technologies by users is an understudied aspect of IoT applications. Based on this situation, UTAUT and later UTAUT2 theoretical models are required antecedents of information technology adoption theory (Venkatesh *et al.*, 2003: 425–478, Venkatesh *et al.*, 2012: 157–178). UTAUT plays an important role in the acceptance of IoT in the organizational context by introducing the concepts of performance expectancy and expected effort. Performance expectancy, as contributed by UTAUT, has a significant impact on behavioral intention to use IoT effectively and efficiently, resulting in improved organization performance (OP) in service delivery as the study's goal (Mcik and Mcik, 2016, pp. 193–213; Macik, 2017). Similarly, the theory asserts that expected effort is another construct that has a significant impact on behavioral intention to use IoT for quality service delivery in the organization.

The TOPI is another important and considered theory in this study. According to TOPI, performance is a system's valued output in the form of goods or services (Sungau, 2013). The performance of goods or services is typically measured in terms of quantity, time and quality features of measures (Rummler and Brache, 1995). This theory makes a significant contribution because it defines performance as the study's goal. Furthermore, it was argued that in an organization, simply satisfying customers is insufficient to improve OP. In this case, it was determined that improving organizational processes through the application of relevant techniques was required. Thus, among the techniques, the use of IoT technology has been suggested as a suitable technique for improving organizational performance, which can be determined by service quality, service delivery and operational cost.

2.2 Empirical review

2.2.1 Factors of Internet of Things and its effect on organization performance

The adoption of the IoT in service delivery organizations is the process of accepting and implementing IoT technology with the goal of improving organizational performance in terms of service quality, delivery speed and operational costs. However, the extent to which IoT technology is used/adopted is determined by the unique context, potential adopters and the nature of the technology (Njenga, 2011). According to UTAUT, the nature of IoT technology influences organizational performance in terms of performance expectation, expected effort and accessibility in relation to user/adopter behavior, as explained below (Venkantesh *et al.*, 2003).

2.2.1.1 Performance expectancy. Performance is one of the factors that have a significant impact on the use of IoT in an organization, leading to good performance. The degree to which individuals believe that the use of technologies will result in performance gains is referred to as performance expectancy (Venkantesh *et al.*, 2003). This can also be interpreted as the perceived utility of the technologies. According to Puspitasari *et al.* (2019), technological perception, increasing effectiveness, productivity and ease of getting information are good measures of performance expectancy toward the use of IoT leading to organizational performance. It is expected that IoT will use change performance measurement of service quality (Archetti *et al.*, 2015). IoT usage is expected to alter perceptions of service delivery speed, such as perceiving rapid infrastructure transformation into reliable and appropriate infrastructure (Paul *et al.*, 2018). Furthermore, the infrastructure characteristics of IoT significantly reduce operational costs in terms of time and expenses (Aono *et al.*, 2016), as traditional methods of providing services to customers can be used. For example, the use of physical movement in delivering services, such as vehicles and airplanes, can save significant time and money. As a result, IoT is expected to provide users with information on operational costs, time, environmental impact and perceived service quality (Archetti *et al.*, 2015).

2.2.1.2 Effort expectancy. The degree to which users believe the technologies are simple to use for organizational performance is referred to as effort expectancy. This can also be interpreted as the perceived utility of the technologies. Puspitasari *et al.* (2019) define effort expectancy as ease of interaction, ease of learning, ease of use and ease of becoming an expert. It is argued that users work hard with a specific technology to achieve significant results when such technology requires less effort to interact. For example, in a service organization, less effort is expended so that the user can continuously make data available remotely for customers to access in a timely and cost-effective manner (Ahlborn *et al.*, 2010). Organizations in the service delivery industry are increasingly leveraging IoT to operate more efficiently, better understand customers to deliver enhanced customer service, improve decision-making and increase business value (Gillis, 2021).

Thus, users who feel at ease interacting with such technology improve the organization's performance by saving time and money, increasing employee productivity and generating more revenue.

2.2.1.3 Accessibility. Using new trend technologies in service delivery organization could provide alternative ways of managing customer records while also improving the service quality. This is only possible if and only if such technology is widely available. Various organizations face numerous challenges related to IoT accessibility, such as complex systems, a lack of knowledge and skills to operate the technology, a lack of access to information and a lack of data standards that allow the exchange of IoT data (Mohammed and Ahmed, 2019). Because of the challenges associated with IoT adoption and use, organizations end up implementing IoT on an *ad hoc* basis without developing skills and knowledge on how to access the technology. Furthermore, the technology can

be adopted in patches, resulting in low uptake. As a result, IoT becomes meaningless and, at times, increases operational costs by lowering service quality as a source of poor performance in the organization. The availability of IoT will make users'/employees' lives easier by anticipating and meeting the needs of customers and individuals for significant organizational performance (Sarin, 2016).

2.2.2 Indicators of organization performance

OP refers to the extent or level to which an organization achieves its goals (Lin *et al.*, 2008). When the organization takes any action, its effectiveness and efficiency are measured (Sungau, 2013). The situation in which the organization achieves aligned objectives and customer requirements are referred to as effectiveness. While efficiency refers to the use of organizational resources to produce expected services to meet the needs of customers. The following is a review of the effect of IoT on organizational performance indicators/measures.

2.2.2.1 The quality of service. QoS refers to a network's ability to provide a more suitable or appropriate service to an application (Subash and Ramya, 2019). QoS is a critical factor in the delivery of services through the use of IoT. According to some, QoS is determined by how much the user benefits from the service. Thus, by taking various aspects of QoS into account, the IoT can be realized to provide efficient service for improving organizational performance.

Several studies have been conducted to address the factors influencing IoT on organizational QoS. Roy *et al.* (2018), for example, identified the factors influencing QoS in disruption tolerant networks (DTNs) and discovered that delivery ratio, packet drop, congestion, selfishness, fairness, queuing delay and jitter influence QoS management in DTNs as IoT. Subash and Ramya (2019) discovered QoS metrics for IoT, such as throughput and efficiency, bandwidth, packet loss, delay and packet delivery ratio. Despite the fact that various IoT factors that influence QoS have been studied in the literature, these factors are limited to technological aspects, leaving other important aspects, such as human behaviors as IoT users/adopters, which have significance contribution on QoS.

2.2.2.2 The operational cost. Maintaining your business's efficiency is critical to minimizing costs and maximizing profits.

Staffing, waste, maintenance and energy costs can all have a significant impact on your company's profitability (Sungau, 2013). Implementing and relying on an IoT system is one efficient way to reduce business costs. Reducing operating costs in a large organization can be a long and difficult process. To remain competitive, any large corporation must maximize efficiency, and thus, increase profits. For example, interoperability and high-speed communication among interconnected devices and systems reduce response time and human labor, increasing productivity and efficiency while lowering operational costs (Angelova *et al.*, 2017). When it comes to cost reduction in an organization, IoT can help in a variety of ways. In the manufacturing industry, for example, IoT reduces maintenance costs by using predictive maintenance principles. In service delivery organizations, it is argued that IoT reduces costs by shortening service delivery times, increasing effectiveness and efficiency and reducing operational time while increasing revenue opportunities (Howarth, 2017). Thus, investigating the impact of IoT on operational costs is critical for improving organizational performance in service delivery in Tanzania.

2.2.2.3 The service delivery speed. The data collected by IoT provides an unprecedented opportunity to solve large-scale problems in those application domains to deliver services; examples include precision agriculture, environmental monitoring, smart health, smart manufacturing and smart cities (Bertino *et al.*, 2015). Today, the IoT has evolved into a heterogeneous and highly distributed structure capable of meeting the daily needs of individuals and organizations. The rapid development of IT-based technologies such as IoT and cloud computing can accelerate the delivery of services such as health care and their support.

Service delivery is one of the performance indicators in organizations that provide services to customers that must be closely monitored due to significant changes in customer expectations.

For example, many organizations are now using advanced technologies such as IoT to address the so-called contactless delivery (Nicastro, 2021). It is argued that contactless is now a requirement for many organizations to deliver services as the next step in becoming competitive and keeping customers happy and confident. Many organizations are using IoT tools to accelerate and remotely monitor the delivery of services to customers. According to Nicastro (2021) research, a real-world example from Makino, a global manufacturer of metal-cutting and electrical discharge machining, demonstrates how IoT can help companies achieve predictive maintenance as part of a service transformation strategy. Makino uses an IoT business connector to quickly receive and operationalize device data and deliver observations on the condition of its machines. In this case, the company was able to accurately predict any equipment failures and act quickly before the failure occurred.

2.3 The conceptual framework development

Based on various perspectives from the literature, the overall hypothesis that was developed is that OP can be improved if the organization implements a modern technological mechanism for improving ways of working. According to a literature review, expected effort, performance expectation and accessibility of IoT as technological and human characteristics improve OP by influencing service quality, operational cost and delivery speed.

Figure 1 depicts the relationship between independent and dependent constructs, which has been operationalized as shown in Table 1.

Figure 1 A conceptual framework based on literature review

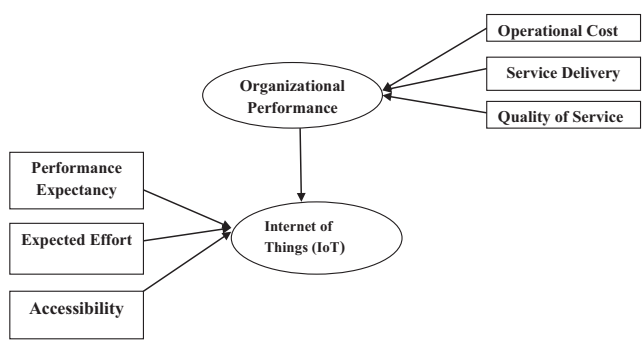

Table 1 Operationalization of variables

Factor/variable	Explanations
Performance expectancy (TAM and UTAUT)	According to Eman *et al.* (2020) defined performance expectancy as "the degree to which the user expects that using the system will help him or her to attain gains in job performance. Performance expectancy determines whether IoT aids in performance enhancement (Venkatesh *et al.*, 2003; Thong and Xu, 2012)
Effort expectancy (TAM and UTAUT)	Determine whether IoT is simple to use and requires little effort to improve service delivery (Wu and Wang, 2005). It is the degree of ease associated with the use of the system Eman *et al.* (2020)
Accessibility (UTAUT)	Determine and ensure the levels of availability of IoT facilities and platforms for the acceptance, adoption and use of IoT to significantly improve the organization's service delivery performance (Kisanjara *et al.*, 2020; Nor *et al.*, 2018)

2.4 Operationalization of variables

The independent variables have been operationalized in relation to the dependent variable using the conceptual framework in Figure 1. This study used effort expectancy, performance expectancy and accessibility as important predictors of behavioral intention to use IoT among Tanzanian bank users (Nyesiga *et al.*, 2017). These factors have been used in several studies that focus on the adoption and use of specific technologies, such as the use of IoT, smartphones, mobile commerce and smart homes (Catherine and colleagues, 2017; Sodiq and Olawale, 2018; Sail and Danish, 2018; Patricio *et al.*, 2019; Almetere *et al.*, 2020; Jose-Maria *et al.*, 2020).

2.5 Hypotheses development

Acceptance and utilization of IoT technology is a success for organization work to ensure performance in service delivery organizations. It is argued that there must be significant gains in using technology, particularly IoT, in service delivery organizations (Wu and Wang, 2005). As a result, in order for IoT to effectively and efficiently increase the level of OP in terms of (operational cost, speed of service delivery and QoS), it is critical that employees or users accept and use IoT beyond the maximum in the organization (through performance expectation, effort and accessibility) (Venkatesh *et al.*, 2012). As a result, the following hypotheses are advanced:

H1. There is a significant relationship between IoT performance expectancy and organizational performance by lowering operational costs.

Utilization perception, increasing effectiveness and perceived benefit of IoT ensure that it receives user support and expands usage (Wu and Wang, 2005; Puspitasari *et al.*, 2019). The user of a particular technology anticipates benefits such as reduced operating costs and saved time (Lee and Shin, 2004, 2019).

Performance expectancy in the context of IoT refers to the degree to which students believe that using IoT technologies will improve their productivity and performance (Eman *et al.*, 2020). In other words, consumers will use technology if they believe it will improve their performance. As a result, employees/users will work effectively and efficiently, lowering operational costs:

H2. There is a significant relationship between IoT performance expectancy and organizational performance when service delivery speed is increased.

Utilization perception, increasing effectiveness and perceived benefit of IoT ensure that it receives user support and expands usage (Wu and Wang, 2005; Puspitasari *et al.*, 2019).

Performance expectancy is a reliable predictor of behavioral intention in the context of technology adoption and usage (Lee and Shin, 2019). PE is similar to TAM's postulated perceived usefulness and the relative advantage of DOI, both of which lead to motivation to use the technology. For example, in the case of IoT Employees in banks, for example, who provide services to customers will use smart and interactive facilities and platforms to speed up service delivery (Eman *et al.*, 2020). Customers will thus receive services and products very quickly with the help of IoT facilities and platforms in the context of banks:

H3. There is a significant relationship between IoT performance expectancy and organizational performance by increasing service quality.

Utilization perception, increasing effectiveness and perceived benefit of IoT ensure that it receives user support and expands usage (Wu and Wang, 2005; Puspitasari *et al.*, 2019).

Performance expectancy, also known as perceived usefulness, has been discovered to be a significant predictor of behavioral intent to adopt IoT (Davis, 1989). Similarly, performance expectancy, which is heavily influenced by indicators such as perceived usefulness, intrinsic and extrinsic motivation, job-fit and the relative advantage of IoT, has an impact on organizational performance by increasing service quality (Sodiq and Olawale, 2019). Users/employees will be interested, committed and motivated to work through IoT platforms and facilities, putting the organization in a position to provide quality services to customers and gain a competitive advantage:

H4. There is a significant relationship between expected effort in using IoT and organizational performance as measured by lower operational costs.

Less effort feelings the ease of learning and use of IoT systems is as important as the system's usefulness (Venkatesh *et al.*, 2012). Expected effort through the ease of use of IoT has an effect on organizational performance by lowering operational costs. It is argued that there are relationships between the effort put forth at work by IoT users, the performance obtained as a result of that effort and the rewards received as a result of that effort, as well as the amount of money and time invested (Sodiq and Olawale, 2019). These will have a positive impact on the users' perception and acceptance of the system. If the user dislikes the system, his or her acceptance level will be low,

negatively impacting the individual's engagement level and leading to increased operational costs:

H5. The expected effort in using IoT has a significant effect on organizational performance by increasing service delivery speed.

The use and acceptance of implemented IoT have an impact on service delivery to customers within the organization. It is argued that effort expectancy is directly related to customer and employee use of IoT in banks. This is because how easy or difficult it is to retrieve relevant information with IoT to speed up service delivery is likely to influence user and employee adoption of IoT (Sodiq and Olawale, 2019). For example, if users/employees perceive less effort, ease of learning and ease of use of IoT systems, efficiency and effectiveness in using IoT increase, resulting in faster service delivery to customers (Eman *et al.*, 2020). As a result, Lee and Shin (2019) confirmed that the more effort consumers expend to use IoT technology, the less likely they are to use and adopt this technology, resulting in rapid delivery of service banks to customers. As a result, the organization's customer satisfaction improves:

H6. There is a significant relationship between expected effort in using IoT and organizational performance by increasing service quality.

Less effort feelings the ease of learning and use of IoT systems is as important as the system's usefulness (Venkatesh *et al.*, 2012). These factors lead to enjoyment and fulfillment in doing work, which increases employee engagement in providing quality services to customers (Heijden, 2016; Kueh and Voon, 2007). According to Chipeva *et al.* (2018), technologies are more likely to be adopted by users if they are understandable and simple to use. It is argued that the ease of use of IoT in banks, for example, helps to provide quality services. As a result, employees and customers realize that it is very simple to use IoT platforms and facilities, and there is a high possibility of success in providing quality services, which, in turn, increases organizational performance (Sodiq and Olawale, 2019):

H7. The availability of IoT has a significant effect on organizational performance by lowering operational costs.

The ease of interaction and access to information provided by available IoT platforms and facilities are critical in the acceptance, adoption and use of IoT systems (Venkatesh *et al.*, 2012; Kisanjara *et al.*, 2020). These aspects assess the accessibility of IoT and are critical for its adoption and success in reducing operational costs of the organization, ultimately leading to profitability. The timely availability and accessibility of IoT platforms and facilities provide insights into potential operational improvements, such as reduced unnecessary labor and lower operational costs (Brous *et al.*, 2019). As a result, operational costs have a direct impact on organizational performance in Tanzanian banks due to the status of IoT accessibility:

H8. There is a significant relationship between IoT accessibility and organizational performance by increasing service delivery speed.

Technology accessibility can be measured by the ease of interaction and information retrieval (Nur *et al.*, 2018; Njenga, 2011). Through these factors, users can use the available IoT platforms and facilities to accept, adopt and use IoT systems for the organization's success, resulting in faster service delivery to customers (Venkatesh *et al.*, 2012; Kisanjara *et al.*, 2020). According to Sodiq and Olawale (2020), despite the increasing accessibility of IoT platforms and facilities, the adoption rate appears to be low. However, while IoT accessibility has no direct relationship with IoT adoption, it has a significant effect on organizational performance after IoT use, leading to faster service delivery:

H9. There is a significant relationship between IoT accessibility and organizational performance by improving the service quality.

Failure to gain access to technological platforms and facilities is detrimental to the organization (Bakar, 2013). The study's goal of successfully accessing and using IoT effectively and efficiently will change and improve the organization's performance in terms of the QoS it provides. Access to IoT platforms and facilities for information and data exchange implies that it will be easier to gain insights into things and facilitate the provision of service quality to customers and product performance in organizational performance (Puspitasari *et al.*, 2019).

Access to the IoT and the increasing saturation of its platforms and facilities motivates users to work effectively and efficiently in providing quality services, which improves organizational performance (Patricio *et al.*, 2019).

3. Method

The purpose of this study was to assess the effects of IoT on organizational performance in Tanzanian banks. This section describes the study area, the sampling procedure and sample size, as well as the data collection procedure. Other issues addressed include data analysis techniques, validity and reliability measures and ethical considerations.

3.1 Study area

This study focused on five Tanzanian banks, including KCB Bank in Mwanza, CRDB Bank in Dar es Salaam, Exim Bank in Mbeya and NMB Bank in Dodoma. Tanzanian banks were chosen for the study for several reasons. First, they are organizations that provide immediate and direct services to customers. Second, these are the areas where privacy and security are critical, necessitating the use of advanced technology such as IoT to manage, simplify, secure and control the delivery of services to customers. As a result, the IoT is thought to be very important and desperately needed in this area.

3.2 Sampling and sample size

Data for this study were gathered from a diverse sample of employees and customers who receive services from Tanzanian banks. The reason for collecting data from a diverse sample is that this study wanted to capture in-depth information from a broad perspective to assess the effects of IoT on organizational performance, including Tanzanian banks. Measuring

performance, which is the study's goal, necessitates information from customers who receive such services as well as use IoT, as well as employees who use IoT directly in delivering services to customers.

This study was also aimed at generalizing its findings to other organizations with similar characteristics. In this case, the questionnaires were distributed to a total of 342 respondents (100 employees and 242 customers). The reasons for using a sample size of 342 respondents are as follows: first, the major analysis technique used in this study is structural equation modeling (SEM). SEM necessitates sample sizes ranging from 100 to 400. (Hair *et al.*, 2014). Second, because the study used a cross-sectional survey design with a quantitative method, the results of this study can be applied to other banks with similar characteristics (Harwell, 2011). For these reasons, a sample size of 342 is appropriate for this study. Out of 342 respondents, 281 (92 employees and 189 customers) provided complete responses, and this is the sample size used in the analyses. The overall rate of questionnaire return was 82.16%, with an effective rate of 75.2%.

Respondents were chosen using heterogonous sampling techniques such as probability and non-probability sampling. As the employee list was established prior to the start of data collection, a simple random sample was used to select 92 employees from three service delivery originations (Saunder *et al.*, 2012). Purposive sampling was used to select 189 customers who receive services from the respective organizations on a regular basis. The purposeful sampling technique was used to select the sample based on the population size, time constraints and unique characteristics of each sample (Kisanjara *et al.*, 2020). The purpose of using the maximum like sampling technique is to allow for generalizations of study findings.

3.3 Data collection procedure

In both types of samples, standardized questionnaires were used to gather primary data for this investigation. The conceptual framework and research goals of the current study were used to design the data-gathering tools. This method was adopted because this study used a cross-sectional survey methodology to simultaneously gather data from Tanzanian banks that were distributed geographically throughout Tanzania (Gable, 1994). The demographics of respondents and each of the study's distinct research objectives were taken into consideration when creating the questionnaire tool. It took into account every element encapsulated in a conceptual framework, including dependent variables and dependent variables serving as indicators of organizational effectiveness. The in-depth explanations, which are also included in a survey in Appendix, are as follows:

Question 1: respondent's demographic information (sex, age, educational level and year of experience in IoT). These provided an overall picture of how suitable the research population was. The adoption and use of IoT technology were also expected to be somewhat influenced by a certain sort of respondent. Determine how performance expectations for using IoT platforms and facilities will affect enhancing organizational performance. This section aims to provide greater insight into how IoT performance expectations affect organizational operational costs, service delivery speed and service quality. Question 3: evaluate the impact of effort expectation in using IoT platforms and facilities on organizational performance improvement. This section will delve deeper into the impact of effort expectancy as an IoT characteristic on service delivery speed, service quality and organizational operational costs. Question 4: evaluate the impact of IoT platforms and facility accessibility on improving organizational performance. This section will delve deeper into the impact of accessibility as an IoT characteristic on service delivery speed, service quality and organizational operational costs.

Question 5: assess the contributions of service delivery speed, service quality and operational cost indicators on organizational performance in relation to IoT characteristics in banks, such as performance expectancy, effort expectancy and accessibility.

3.4 Data analysis technique

In this study, data were analyzed using SEM, specifically confirmatory factor analysis (CFA) via AMOS 19. CFA results enabled the evaluation of correlations between latent variables representing constructs. However, the main purpose of using CFA is to enable the calculation of composite reliability (CR) and AVE values to assess construct validity and reliability issues in this study. SEM test was used to evaluate the direct and indirect impact of independent variables (performance expectation, expected effort and IoT accessibility) on the dependent variables of organizational performance (operational cost, service quality and service delivery speed) (Hair *et al.*, 2014; Hsu and Lin, 2018). This was accomplished by using SEM to test the hypotheses that had been developed (Fuchs, 2008; Nour and Almahirah, 2014).

3.5 Ethical consideration

As follows, this study considered and addressed research ethics: first, the author obtained permission from the Tanzanian banks where the research was conducted. As this is academic research, the Mzumbe University Directorate of Research and Publication issued an introductory letter to the respective organizations. Second, based on the information provided in the questionnaire, the study adhered to any participants' privacy and security. They requested to participate by willingly providing information. There was no coercion used to obtain data from respondents, and any respondent was free to withdraw from the study at any time. Furthermore, the purpose of this study was clearly stated, as the data is required for academic purposes to motivate respondents to provide information confidently.

4. Presentation of results

This section presents the analysis results as guided and described in the methodological section.

The analysis focused solely on the validity and reliability tests using CFA and the hypotheses testing using SEM to assess the direct and indirect effect of IoT variables on organizational performance indicators as the phenomenon under study.

4.1 Reliability and validity testing using confirmatory factor analysis

Cronbach's alpha and CR (also known as Jöreskog's rho) were used to assess all constructs used in SEM to determine the study's reliability and validity. The findings showed adequate reliability and validity. Using both criteria, the reliability of all constructs meets the established requirements. Values of alpha and CR are distributed throughout. As shown in Table 2, six were suggested as acceptable in exploratory research (Hair *et al.*, 2011, p. 145; Hair *et al.*, 2013, p. 7).

CFA was used to assess the validity measure. This was done to determine the correlation between the latent constructs and finally calculate the so-called CR and AVE values, which show the CFA model fit. The convergent validity of used measures for all constructs is greater than 0.5, which is greater than the suggested value of 0.5 by Fornell and Larcker (1981, 39–50).

4.2 Hypotheses testing using structural equation modeling

During data analysis, the hypotheses developed and presented in Section 2.5 were tested using SEM. The SEM of assessing the effect of the IoT on Tanzania bank performance was carried out.

4.2.1 Performance expectancy and organizational performance

Table 3 shows that the estimated relationship between IoT performance expectations and operational costs in Tanzanian banks is 0.087, with a *p*-value of 0.260. This implies that there is no significant effect of performance expectations on organizational performance in Tanzania banks by lowering operational costs ($p > 0.05$). As a result, *H1* is accepted. Similarly, the results in Table 3 show that performance expectancy in using IoT has a significant effect on service delivery speed in Tanzanian banks, with a relationship of 0.12 and a *p*-value of 0.043. This means that performance expectations influence organizational performance by increasing the speed with which services are delivered to customers. Furthermore, the relationship between performance expectancy and organizational performance is 0.321, with a *p*-value of 0.001. As a result, *H3* is accepted. This means that Tanzanian banks' performance expectancy in using IoT improves the QoS provided to customers.

4.2.2 Effort expectancy and organizational performance

According to Table 3, the assessment for the relationship between effort expectancy in using IoT and the performance indicators such as operational cost, service delivery speed and service quality in Tanzanian banks is 0.211, 0.325 and 0.151, respectively. The respective *p*-values are 0.034, 0.011 and 0.043. This implies that there is a statistically significant effect of effort expectancy in using IoT in Tanzanian banks by lowering operational costs and increasing service delivery speed and service quality. As a result, *H4*, *H5* and *H6* are acceptable.

4.2.3 Accessibility and organizational performance

When the estimated relationship between accessibility and operational cost is 0.152 and the *p*-value is 0.044, the *H7* is accepted. As a result, the availability of IoT has a significant impact on organizational performance in Tanzanian banks by lowering operational costs. Furthermore, the *H8* is accepted because the estimated value is 0.776 and the *p*-value is 0.003. As a result, increasing service delivery speed has a significant impact on organizational performance in Indian banks. However, the *H9* hypothesis is rejected ($p > 0.05$) when the estimated relationship between IoT accessibility and service quality is 0.061 and the *p*-value is 0.168. As a result, there is no discernible effect of accessibility on organizational performance in Tanzanian banks by lowering the QoS provided to customers.

Table 2 Reliability and convergent validity of values measured in CFA

	Reliability		
Construct	**Cronbach's alpha**	**Composite reliability (CR)**	**Convergence validity (AVE)**
Performance expectancy	0.787	0.712	0.510
Effort expectancy	0.921	0.901	0.590
Accessibility	0.832	0.729	0.055

Table 3 Regression weight: default model

			Estimate	SE	CR	*p*	Decision
Operational cost	←	Performance expectancy	0.087	0.125	−1.22	0.260	Rejected
Service delivery speed	←	Performance expectancy	0.12	0.020	2.25	0.043**	Accepted
Quality of service	←	Performance expectancy	0.321	0.040	1.78	0.001***	Accepted
Operational cost	←	Effort expectancy	0.211	0.230	3.45	0.034**	Accepted
Service delivery speed	←	Effort expectancy	0.325	0.021	2.43	0.011**	Accepted
Quality of service	←	Effort expectancy	0.151	0.001	1.65	0.043**	Accepted
Operational cost	←	Accessibility	−0.152		1.32	0.044**	Accepted
Service delivery speed	←	Accessibility	0.776	0.221	2.12	0.003***	Accepted
Quality of service	←	Accessibility	0.061	0.114	−1.42	0.168	Rejected

Note: ** and *** indicate significance levels at 5 and 1%, respectively

5. Discussion

5.1 Performance expectancy and organizational performance

According to the study's findings presented in Table 3, there is no significant relationship between performance expectancy among IoT users and performance in Tanzanian banks in terms of operational costs. The hypothesis stated as "there is a significant relationship between IoT Performance expectancy and organizational performance by lowering operational costs" *is not supported as p-value is* > 0.05. This implies that performance in using IoT in Tanzanian banks determines the behavioral intention to adopt and consequence of the use of IoT facilities and platforms and has been justified as the strongest predictor of BI to use technology. It is indirectly related to operational cost in Tanzanian banks. Several studies, however, praised the performance expectancy factor as essential for motivating customers to use IoT by lowering operational costs in banks, resulting in high performance (Cho and Sagynov, 2015; Tatnall and Davey, 2017). Other previous studies have found that ease of use, as a feature of performance expectancy, significantly influences behavior intention in using IoT as a new technology in banks to improve performance (Del Giudice *et al.*, 2016; Fatehi *et al.*, 2020). As a result, the findings are contradictory in the sense that previous studies were conducted in contexts where IoT adoption has been rapidly increasing in comparison to Tanzania. The current study also used a heterogeneous sample and sampling techniques, which allowed researchers to collect in-depth information from a wider range of perspectives than previous similar studies.

In the same vein, the findings of this study discovered that performance expectations have a significant effect on Tanzanian bank performance by increasing service delivery speed. The hypothesis stated as "there is a significant relationship between IoT performance expectancy and organizational performance when service delivery speed is increased" *the hypothesis is supported because the p-value is* < 0.05. Also, it is well acknowledged that this hypothesis is supported in the sense that service delivery speed is directly proportional to performance. For instance, similar findings by Howarth (2017) and Nicastro (2021) support the notion that users of IoT have a positive effect on increasing service delivery speed, and thus, improving organizational performance. In a similar vein, Puspitasari *et al.* (2019) assert that productivity and ease of access to information are good indicators of performance expectancy toward the use of IoT, leading to the high speed of service delivery to customers to improve performance. For example, Upadhyay *et al.* (2019) discovered that performance expectancy in using IoT is a critical factor for customers to effectively use bank IoT services. Therefore, IoT usage and bank performance have a direct and significant effect on increasing service delivery speed to customers.

Another measure of performance in Tanzanian banks is QoS, which has changed considerably as a result of IoT adoption among clients and staff. The hypothesis that "there is a significant association between IoT Performance Expectancy and organizational performance via boosting service quality" is supported by the study's findings, which are shown in Table 3, as the p-value is less than 0.05. This is due to the direct correlation between performance expectancy and the caliber of service offered by Tanzanian banks. These findings are consistent with the findings of Roy *et al.* (2018), who stated that performance expectancy in using IoT among users has a significant influence on QoS as a measure of organizational performance. As a result, as employees and customers in Tanzanian banks gain confidence by realizing the benefits of using IoT, the QoS provided by the banks improves.

5.2 Effort expectancy and organizational performance

The results of this study indicate that effort expectancy is a further factor that significantly affects the performance of Tanzanian banks. Through the use of IoT, employee and customer effort expectations have improved organizational performance indicators like operational cost, service delivery speed and service quality. According to the study's results, which are presented in Table 3, "there is a significant relationship between expected effort in using IoT and organizational performance as measured by lower operational costs" as hypothesized. The ease of use of IoT lowers the operational costs of banks in terms of both time and money, as indicated by the fact that the p-value is less than 0.05, which supports this hypothesis. Similar research indicates that the effort required to use IoT is related to providing services to customers at a lower cost (Archetti *et al.*, 2015; Brous *et al.*, 2018). Similar to this, it is claimed that relationships exist between IoT users' efforts at work, the results attained as a result of those efforts and the rewards attained as a result of those efforts, as well as the sum of money and time invested (Sodiq and Olawale, 2019). Therefore, effort expectancy is taken into account when IoT is adopted and used in service delivery organizations to significantly improve performance.

The results of the study showed that the speed of service delivery is another sign of organizational performance in Tanzanian banks. It is hypothesized that "the expected effort in using IoT has a significant effect on organizational performance by increasing service delivery speed," as shown by the study's findings in Table 3. With a p-value of 0.05, this hypothesis is supported, indicating that Tanzanian banks' customers always receive faster service when using IoT tools and platforms. For example, Chipeva *et al.* (2018) supports the findings of this study by establishing that understandable and simple-to-use technologies are effort expectancy factors that positively influence users to adopt and use such technology effectively and efficiently for performance improvement. It is argued that the ease of use of IoT in banks, for example, contributes to faster service delivery (Eman *et al.*, 2020). According to Lee and Shin (2019), the more effort consumers expend to use IoT technology, the less likely they are to use and adopt this technology, resulting in faster delivery of service banks to customers. As a result of the study's findings, it is reasonable to conclude that IoT should be implemented in Tanzanian banks in such a way that it requires less effort to perform to motivate and encourage users to use it for increasing service delivery speed, thereby improving organizational performance.

The results of this study showed that customer service quality is a significant predictor of organizational performance. Using the findings of this study, it is hypothesized that "there is a significant relationship between expected effort in using IoT and organizational performance by increasing service quality".

As the p-value is less than 0.05, this theory is supported. This is due to the fact that IoT effort expectations in Tanzanian banks have a big direct impact on organizational performance by improving the service quality. UTAUT theory lends support to the study's findings; for instance, Venkantesh *et al.* (2003) argued that effort expectancy has a significant impact on the use of IoT in the organization, which boosts performance by speeding up service delivery to customers. Additionally, the ease of use of IoT encourages users to enjoy and find fulfillment in their work, which raises employee engagement in offering customers high-quality services (Heijden, 2016; Kueh and Voon, 2007). For improved service quality, it is crucial to think about the effective and efficient adoption and use of IoT in Tanzanian banks.

5.3 Accessibility of Internet of Things and organizational performance

Making IoT available is a different matter from having it adopted by various organizations.

This is accurate because Table 3 findings from the study show that IoT accessibility among users – including clients and employees – has a sizable effect on costs associated with running a business. The hypothesis states that "the availability of IoT has a significant effect on organizational performance by lowering operational costs", according to the hypotheses. This is so because the p-value is less than 0.05, indicating that having access to IoT platforms and facilities would save time and money and result in lower costs. The findings of Brous *et al.* (2019), who contend that prompt availability and accessibility of IoT platforms and facilities provide insights into potential operational improvements like decreased unnecessary labor and lower operational costs, lend support to the findings of this study. Similar to this, Sadiq and Olawale (2019) contend that the availability of IoT platforms and facilities results in work that is streamlined, which may require higher operational costs.

Additionally, as shown in the study's findings in Table 3, the availability of IoT platforms and facilities affects how quickly services are delivered as a measure of bank performance. According to the hypothesis, "IoT accessibility has a significant effect on organizational performance by accelerating service delivery" because the p-value is < 0.05. This is due to the fact that the speed of service delivery depends on how IoT platforms and facilities are actually used in Tanzanian banks. Mohammed and Ahmed (2019) make a similar argument that IoT accessibility challenges like complex systems, a lack of technical expertise and skills and restricted access to IoT data result in subpar organizational performance. Similarly, according to Fatehi *et al.* (2020), performance in banks, particularly high operational costs and speed of service delivery, is currently influenced by the inaccessibility of IoT in Africa.

The study's final hypothesis is that "IoT accessibility and organizational performance by improving service quality" are significantly correlated. The p-value is greater than 0.05, so this is not supported. Furthermore, it implies that the availability of IoT in Tanzanian banks has no impact on the level of service. The study's final hypothesis further states that IoT accessibility and performance in Tanzanian banks have no discernible impact on service quality as a performance indicator. These results are at odds with those of Sarin (2016), who discovered a statistically significant relationship between IoT accessibility and product and service quality as a metric of performance in the context of banks. As a result, the contradiction of these findings is due to the unique context, potential adopters and nature of the technology used.

6. Conclusion

The purpose of the current study is to assess how IoT has affected organizational performance in Tanzanian banks. The research was restricted to a total population of 189 customers and 92 employees from different Tanzanian banks, making up the sample size of 281. The results show that IoT significantly affects how well organizations perform when providing services. When providing services to customers, employees prefer to use IoT because it is easy to use, saves time and results in faster service delivery and higher service quality. Customers also favor IoT banking services because they are easy to use, save time and effort and produce higher service quality.

The findings also demonstrate how the adoption of IoT banking services, which have a significant impact on organizational performance and lead to lower costs and quicker service delivery, is influenced by the availability of IoT infrastructures. IoT as a new technology needs to have effort expectancy, performance expectancy and accessibility to have a significant impact on organizational performance in Tanzanian banks. Customers are, therefore, anticipated to use IoT banking services as a result of their willingness to pay for prompt, high-quality services.

7. Research implication, limitations and recommendation

7.1 Practical implication

Practically, the study's findings provide a basis for creating new regulations or strategies for implementing the IoT as a cutting-edge technological innovation for service delivery in other service delivery organizations as well as the banking industry. The study's findings highlight IoT factors that should be taken into account when IoT is adopted and implemented for enhancing organizational performance. It is anticipated that these findings will serve as a foundation for economic growth in Tanzania's financial institutions, helping them attract more clients, make more money and maintain their competitiveness. Additionally, society will gain from the services, such as loans and market share, and as a result, production from their investment activities is anticipated to rise.

7.2 Theoretical implication

There are very few studies that follow theoretical aspects of the IoT in banks in relation to organizational performance as service delivery industries, according to the researchers. The study's findings provide a theoretical link to explain how Tanzanian banks and other service-delivery organizations perform. The results of this study looked at the IoT characteristics that have a big impact on how Tanzanian banks perform as an organization. Then it goes on to explain how operational costs, service delivery times and service quality can all be used to gauge an organization's performance. Furthermore, this study has added to the existing literature on the relationship between IoT and organizational performance

in Tanzanian banks. The accessibility of IoT was also added as a new factor in this study that was not previously considered. As evidenced by the fact that improved organizational performance results from the effective and efficient adoption and use of IoT in banks. The results of this study support the adoption and use of IoT for improving organizational performance by all Tanzanian banks and other financial institutions with similar characteristics in this situation.

7.3 Limitation and recommendation

The current study may, therefore, be valuable for future investigations into IoT in Tanzanian banks. IoT factors and performance indicators are scarce in this study; more IoT factors and performance indicators are advised for future studies. Additionally, only 342 respondents were used in this study's analysis because SEM was used; larger sample sizes are still advised for future studies based on SEM assumptions.

References

Abhishek, M., *et al.* (2019), "A detailed study of an internet of things", *(IoT) International Journal of Scientific & Technology Research*, ISSN 2277-8616, Vol. 8 No. 12.

Ahlborn, T.M., Shuchman, R., Brooks, C.N., Harris, D.K., Burns, J.W., Roussi, C., Dobson, R., Vaghefi, K. and Oats, R.C. (2010), "An evaluation of commercially available remote sensors for assessing highway bridge condition", *Journal of Bridge Engineering*, Vol. 17 No. 6, pp. 886-895.

Almetere, E.S., Kelana, B.W.Y. and Mansor, N.N.A. (2020), "Using UTAUT model to determine factors affecting internet of things acceptance in public universities", *International Journal of Academic Research in Business and Social Sciences*, Vol. 10 No. 2, pp. 142-150.

Angelova, N., Kiryakova, G. and Yordanova, L. (2017), "The great impact of internet of things: on business", *Trakia Journal of Sciences*, Vol. 15 No. 1, pp. 406-412.

Aono, K., Lajnef, N., Faridazar, F. and Chakrabartty, S. (2016), "Infrastructural health monitoring using self-powered internet-of-things", *2016 IEEE International Symposium on Circuits and Systems (ISCAS)*, pp. 2058-2061.

Archetti, F., Giordani, I. and Candelieri, A. (2015), "Data science and environmental management in smart cities", *Environmental Engineering and Management Journal*, Vol. 14 No. 9, pp. 2095-2102.

Bakar, R.A. (2013), "Understanding factors influencing employee engagement: a study of the financial sector in Malaysia".

Bertino, E., Choo, K.R. and Nepal, S. (2015), "Internet of things (IoT): smart and secure service delivery", *Transactions on Internet Technology*, Vol. 16 No. 4, pp. 1-7.

Brous, P., Herder, P.M. and Jenssen, M. (2019), "The dual effects of the internet of things (IoT): a systematic review of the benefits and risks of IoT adoption by organizations see discussions, stats, and author profiles for this publication at", available at: www.researchgate.net/publication/333265121

Chipeva, P., Cruz-Jesus, F., Oliveira, T. and Irani, Z. (2018), "Digital divide at individual level", Feb, 2020, E-ISSN: 2222-6990 © 2020 HRMARS, Vol. 10 No. 2.

Davis, F.D. (1989), "Perceived usefulness, perceived ease of use, and user acceptance of information technology", *Mis Q*, Vol. 13, pp. 319-340.

Fatehi, F., Samadbeik, M. and Kazemi, A. (2020), "What is digital health? Review of definitions", *Studies in Health Technology and Informatics*, Vol. 275, pp. 61-71, doi: 10.3233/SHTI200696.

Fornell, C.D. and Lacker, D.F. (1981), "Evaluating structural equation models with unobservable variables and measurement error", *Journal of Marketing Research*, Vol. 18, pp. 39-50, doi: 10.2307/3151312.

Fuchs, C. (2008), "Brand positioning through the consumers' lens", Doctoral dissertation, uniwien, Veinna.

Gable, G.G. (1994), "Integrating case study and survey research methods: an example in information systems", *European Journal of Information Systems*, Vol. 3 No. 2, pp. 112-126.

Hair, J.F., Jr., Black, W.C., Babin, B.J. and Anderson, R.E. (2014), *Multivariate Data Analysis*, 7th ed., Pearson Prentice Hall, Upper Saddle River, NJ.

Heizer, J. and Render, B. (2011), *Operations Management*, 10th ed., Pearson Prentice Hall, Upper Saddle River, NJ.

Hsu, C.L. and Lin, J.C.C. (2018), "Exploring factors affecting the adoption of internet of things services", *Journal of Computer Information Systems*, Vol. 58 No. 1, pp. 49-57, doi: 10.1080/08874417.2016.1186524.

Ir, M.D., Johari Dato Mohd Ghazali, R., Hazilah Abd Manaf, N., *et al.* (2011), "Hospital waiting time: the forgotten premise of healthcare service delivery?", *Int J Health Care Qual Assur*, Vol. 24 No. 7, pp. 506-522.

Jose-Maria, R.R., *et al.* (2020), "Future internet Article considerations on the implications of the internet of things in Spanish universities: the usefulness perceived by professors", *Journal of Future Internet*.

Kisanjara, S.B., Tossy, T.M. and Msanjila, S.S. (2020), *Modeling E-learning Implementation in Tanzanian Universities*, Mzumbe University.

Laudon, K. and Laudon, J. (2006), *Management Information Systems: Managing the Digital Firm*, 9th ed., Prentice Hall, Upper Saddle River, NJ.

Lee, W. and Shin, S. (2019), "An empirical study of consumer adoption of internet of thingsservices", *International Journal of Engineering and Technology*, *Innovation*.

Lin, C.H., Peng, C.H. and Kao, D.T. (2008), "The innovativeness effect of market orientation and learning orientation of business performance", *International Journal of Manpower*, Vol. 29 No. 8, pp. 752-772.

Mohammed, D. and Ahmed, M. (2019), "IOT service utilization in healthcare", PublishedMarch 25th 2019: June 12th 2019, doi: 10.5772/intechopen.86014.

Nour, M.I. and Almahirah, M.S. (2014), "The impact of promotional mix elements on consumers purchasing decisions", *International Business and Management*, Vol. 8 No. 2, pp. 143-151.

Nur, IN., Lawrence, A. and Rani, A.B. (2018), "The influence of internet of things on employee's engagement among generation Y at the workplace", *SHS Web of Conferences* Vol. 56, p. 03003, doi: 10.1051/shsconf/20185603003.

Nyesiga, C., *et al.* (2017), "Effort expectancy, performance expectancy, social influence and facilitating conditions as

predictors of behavioural intentions to use ATMS with fingerprint authentication in Ugandan bank", *Global Journal of Computer Science and Technology: Network, Web & Security*, Vol. 17 No. 5.

Patricio, et al. (2019), *Explaining Performance Expectancy of IoT in Chilean SMEs*, Springer Nature Switzerland.

Paul, B., Marijn, J. and Paulien, H. (2018), "Internet of things adoption for reconfiguring decision-making processes in asset management", available at: www.emeraldinsight.com/1463-7154.htm

Puspitasari, N., Firdaus, M.B., Haris, C.A. and Setyadi, H.J. (2019), "An application of the UTAUT model for analysis of adoption of integrated license service information system: the fifth information systems international conference", *Procedia Computer Science*, Vol. 161 No. 2019, pp. 57-65.

Rejeb, A., Rejeb, K., Zailani, S., Treiblmaier, H. and Hand, K.J. (2021), "Integrating the Internet of Things in the halal food supplychain: a systematic literature review and research agenda", Elsevier B.V. This is an open access article under the CC BY-NC-ND license, available at: http://creativecommons.org/licenses/by-nc-nd/4.0/

Rummler, G.A. and Brache, A.P. (1995), *Improving Performance: How to Manage the White Space on the Organization Chart*, 2nd Ed, Jossey-Bass, San Francisco.

Sail, S.A. and Danish, R.Q. (2018), "Effect of effort expectancy and perfomancy expectancy on mobile commerce adoption intension through personal innovativeness in Pakistan consumes: Pakistan", *Journal of Commerce and Social Sciences (PJCSS)*, [ISSN:] 2309-8619, Vol. 12 No. 2, pp. 501-520.

Sarin, G. (2016), "Developing smart cities using internet of things: an empirical study", *International Conference on Computing for Sustainable Global Development*, pp. 315-320.

Sodiq, O. and Olawale, O. (2018), "Performance expectancy, effort expectancy, and facilitating conditions as factors influencing smart phones use for mobile learning by postgraduate students of the university of Ibadan", *Nigeria: Interdisciplinary Journal of E-Skills and Lifelong Learning*, Vol. 4.

Subash, K. and Ramya, D. (2019), "Quality of service in the internet of things (IoT) – asurvey", *ReTeLL*, Vol. 21.

Upadhyay, K., Yadav, A.K. and Gandhi, P. (2019), "A review of internet of things from Indian perspective", *Engineering Vibration, Communication and Information Processing*, pp. 621-632, Springer.

Venkatesh, V., Morris, M.G., Davis, G.B. and Davis, F.D. (2003), "User acceptance of information technology: toward a unified view", *MIS Quarterly*, Vol. 27 No. 3, pp. 425-478.

Venkatesh, V., Thong, J.Y.L. and Xu, X. (2012), "Consumer acceptance and use ofinformation technology: extending the unified theory of acceptance and use oftechnology", *MIS Quarterly*, Vol. 36 No. 1, pp. 157-178.

Wu, J. and Wang, S.-C. (2005), "What drives mobile commerce? An empirical evaluation of the revised technology acceptance model", *Information & Management*, Vol. 42 No. 5, pp. 719-729, doi: 10.1016/j.im.2004.07.001.

Further reading

Bill, B. (2020), "Industrial of IoT: machine metrics".

Power Digital Report (2017), "How actionable IoT data reduces operational costs", available at: www.fathym.com/2017/03/02/actionable-iot-data-reduces-operational-costs/

Usak, M., Kubiatko, M., Shabbir, M.S., Viktorovna Dudnik, O., Jermsittiparsert, K. and Rajabion, L. (2019), "Health care service delivery based on the internet of things: a systematic and comprehensive study", *International Journal of Communication Systems*, Vol. 33 No. 2, doi: 10.1002/dac.4179.

Owusu-Frimpong, N., Nwankwo, S. and Dason, B. (2010), "Measuring service quality and patient satisfaction with access to public and private healthcare delivery", *International Journal of Public Sector Management*, Vol. 23 No. 3, pp. 203-220.

Rahim, F., Allahmoradi, H., Salari, F., et al. (2022), "Evaluation of signaling pathways involved in γ-globin gene induction using fetal hemoglobin inducer drugs", *Int J Clin Adv Hematol OncolStem Cell Res*, Vol. 7 No. 3, p. 41.

Barlow, G.L. (2002), "Auditing hospital queuing", *Managerial Auditing Journal*, Vol. 17 No. 7, pp. 397-403.

Mącik, R. and Mącik, D. (2016), "Trust and product/sellers reviews as factors influencing online product comparison sites usage by young consumers", *Managing Global Transitions*, Vol. 14 No. 2, pp. 193-213.

Jason, P. (2005), "Bill joy's six webs", *MIT Technology Review*, Kevin Ashton," That 'Internet of Things' Thing", *RFID Journal*.

SAUNDers, M., et al. (2012), *Research Methods for Business Students*, 4thed Prentice HallFinancial Times, Harlow, p. 18.

Appendix

Figure A1 Questionnaire tool for respondents

I am a Lecturer at Mzumbe University (MU), and I am currently gathering data for my research study. My research's overarching goal is to assess the effect of the Internet of Things (IoT) on organizational performance in Tanzanian banks. You are kindly asked to complete this questionnaire as part of the data collection process. Your participation is completely voluntary, and your responses will be kept private. Thank you very much for taking the time to complete this questionnaire. If you have any questions about the questionnaire, please contact the person listed below for clarification:

Name: Dr. Simeo B. Kisanajara: Tel No.: +255 784727735/756163428

Email: sbkisanjara@mzumbe.ac.tz or simeokisanjara@gmail.com

1.0 Respondent Background Information

1.1 Sex: (Tick) ( ) Male ( ) Female
1.2 Age in years: ( ) 21-30, ( ) 31 -40, ( ) 41 – 50, ( ) 51 < above
1.3 Education Level: ( ) Primary School, ( ) Secondary ( ), Certificate, ( ) Bachelor's Degree, ( ) Master's degree, ( ) PhD
1.4 Years of experience in doing online Business: ( ) below 3, ( ) 4-7, ( ) 8-11, ( )12 -15 ( ) 16<
1.5 Years' experience in working with IoT platforms and facilities: ( ) below 3, ( ) 4-7, ( ) 8-11,( ) 12 - 15 ( ) 16<

Assess the Performance Expectancy in using IoT Platforms and Facilities on Improving Organizational performance

2.0 How much does performance expectancy influence organizational performance? Make use of the scale. 1 denotes Very Low (VL), 2 denotes Low (L), 3 denotes No Idea (NI), 4 denotes High (H), and 5 denotes Very High Quality (VH)

S/N	Performance Expectancy	1	2	3	4	5
2.1	There is a significant relationship between IoT Performance Expectancy and organizational performance by lowering operational costs					
2.2	There is a significant relationship between IoT Performance Expectancy and organizational performance by service delivery speed					
2.3	There is a significant relationship between IoT Performance Expectancy and organizational performance by quality of services					

Assess the Effort Expectancy in using IoT Platforms and Facilities on Improving Organizational performance

3.0 How much influence does effort expectancy have on organizational performance? 1 = Very Low (VL), 2 = Low (L), 3 = No Idea (NI), 4 = High (H), and 5 = Very High Quality (VH))

	Effort Expectancy					
3.1	There is a significant relationship between expected effort in using IoT and organizational performance as measured by lower operational costs					
3.2	The expected effort in using IoT has a significant effect on organizational performance by increasing service delivery speed.					
3.3	There is a significant relationship between expected effort in using IoT and organizational performance by increasing service quality					

(*continued*)

Figure A1

Assess the Accessibility of IoT Platforms and Facilities on Improving Organizational Performance

4.0 To what extent does IoT accessibility influence organizational performance? 1 = Very Low (VL), 2 = Low (L), 3 = No Idea (NI), 4 = High (H), and 5 = Very High Quality (VH))

	Accessibility of IoT	1	2	3	4	5
4.1	The availability of IoT has a significant effect on organizational performance by lowering operational costs.					
4.2	There is a significant relationship between IoT accessibility and					
	organizational performance by improving service delivery speed					
4.3	There is a significant relationship between IoT accessibility and organizational performance by improving service quality					

5. 0 Evaluate the Contributions of the Following Indicators on Organizational Performance

5.1 To what extent do operational cost has improved organizational performance? Please tick that applies.

1. Not Very Effective ( )
2. Not Effective ( )
3. Somehow ( )
4. Effective ( )
5. Very Effective ( )

5.2 To what extent do service delivery speed has improved organizational perfomance? Please tick that applies.

1. Not Very Improved ( )
2. Not Improved ( )
3. Average ( )
4. Improved ( )
5. Very Improved ( )

5.3 To what extent do quality of service has improved organizational performance? Please tick that applies.

1. Not Very Improved ( )
2. Not Improved ( )
3. Average ( )
4. Improved ( )
5. Very Improved ( )

Thank You for your Time and Consideration

Corresponding author

Simeo Kisanjara can be contacted at: simeokisanjara@gmail.com