

IoT Adoption Challenges and Solutions in Kenya

Dr. Maryam Saeed (University of Management & Technology, Pakistan)

Email: maryamsaeed566@gmail.com

Dr. Noman Arshad (Sunway University, Malaysia)

Email: noumanarshed@gmail.com

Abstract

Background: The idea of insurance was discovered several millennia before Christ (BC). In the second and third millennia BC, traders from China and Babylonia practiced shifting or dispersing risks. Today, insurance is the foundation of the economy, but expanding its penetration is difficult in emerging nations. The fourth insurance industry revolution in the developed world was sparked by the recent advent of Blockchain, IoT, Big Data, and InsurTech.

Objective: In order to boost insurance coverage in Kenya, this study examines the problems with and potential solutions to Blockchain.

Research Methodology: In order to identify the themes and factors pertaining to problems and solutions in implementing Blockchain in Kenya insurance business, this study used a systematic literature review. In order to find pertinent material from Google Scholar, a number of keywords were employed. The filtered studies were examined based on inclusion and exclusion standards.

Findings: This report outlined many obstacles to Blockchain adoption in the Kenya insurance sector as well as potential remedies. The proposals could help policymakers improve the insurance industry service delivery.

Keywords:

Blockchain, Insurance, IoT, Kenya, Digital Finance

JEL Classification:

G22

Received: 30th July 2024 | Revised submission: 18th Oct 2024 | Accepted: 20th December 2024

1. Introduction

The rise of digital technologies driven by the fourth industrial revolution (Industry 4.0) enables this but also poses new risks to insurers. Additionally, IoT can be used to implement usage-based insurance (UBI) systems that take into account driver behaviors, such as location and vehicle speed, to calculate premiums based on actual risk factors. Furthermore, IoT can improve behavior and reduce risks by using sensors to detect and monitor actions, leading to better overall behavior from individuals. IoT also allows for continuous monitoring and analysis of clients' health, enabling insurance companies to provide personalized and timely services. In the healthcare sector, IoT can help health insurance companies modify their business processes to provide better service to customers (Binu et al., 2019). The adoption of IoT technology for flood and drought disaster management in Kenya faces several challenges. A survey conducted in Kenya revealed that factors such as perceived knowledge, perceived ease of use, and relative advantage significantly influence the adoption of IoT technology in flood and drought disaster management. However, self-efficacy and referent's influence were found to be moderately significant in explaining the behavioral intention to adopt IoT for disaster management. On the other hand, perceived declining cost, facilitating conditions, and utilitarian outcome were found to be least significant in influencing the adoption of IoT technology (Bhatia et al., 2021). To address these challenges, the research recommends improving gender-inclusive specialized ICT skills, increasing academia-industry linkages, and establishing regulatory interventions that support the implementation of IoT and other emerging technologies in Kenya. In the agricultural sector, factors such as cost, illiteracy, ICT skills, quality of information, and gender were found to influence smallholder farmers' decision on adopting ICT-in-agriculture innovations (Awuor & Rambim, 2022). For internet banking adoption, factors such as awareness, website security, and website features were found to affect the adoption of internet banking in Kenya (Tan & Teo, 2000). In the manufacturing sector, the adoption of advanced manufacturing technologies (AMTs) was found to be low in Kenya, with companies investing in at least two types of AMTs. These findings highlight the importance of considering various factors when promoting the adoption of IoT technology in different sectors in Kenya.

The use of IoT in the insurance industry has been gaining momentum globally. In Kenya, IoT has the potential to revolutionize the insurance sector by providing contextual and relevant data for insurers. IoT-enabled devices such as sensors, smartphones, and wearable gadgets can generate vast amounts of data that can be used for various purposes in insurance, including detecting incidents such as fire and water clogging (Ramnathan et al., 2020). This data can be used by insurance underwriters to assess risks, process insurance policies dynamically, and calculate premiums based on actual behavior and usage (Manral, 2015). Additionally, IoT can help insurance companies improve their service models and provide better services to customers in the healthcare sector. However, the implementation of IoT in the insurance industry also comes with challenges and risks that need to be addressed.

2. Literature Review

The challenges of implementing IoT in the insurance industry in Kenya include lack of staff involvement, bureaucratic structures and procedures, poor communication of deliverables, and lack of clear guidelines in implementation (Kajwang, 2022). Additionally, the challenges include lack of

self-motivation, a person's life circumstances, lack of information about learning possibilities, a shortage of employees, inadequate notification and communication regarding study days, and lack of support (Munge & Kitiabi, 2017). These challenges hinder the effective implementation of IoT in the insurance sector in Kenya. Author took out the following data from the involved papers: author name, year of publication, country of publication, publication type and findings. Consequently, a narrative synthesis of the derived information was attained. Table 1 denotes to included literature like article, conference or book along with methodology and year. Table 2 denotes challenges and solutions derived after reviewing the selected studies.

Table 1 Characteristics of reviewed IoT adoption studies in Kenya insurance sector

No.	Journal name/Book Conference Name	Paper topic/Book/Conference paper Name	Methodology	Year	Author
1	Third World Quarterly	The economics of the Internet of Things in the Global South	Exploratory	2016	(Nir, 2016)
2	International Journal of Agriculture Sciences	Internet of Things: Applications to Developing Country Agriculture Sector		2018	(Lalitha et al., 2018)
3	International Conference On Cyberspace Governance – Cyberabuja	Internet of Things for Africa: Challenges and Opportunities		2015	(Maryleen & Okereafor, 2015)
4	Materials Today Proceedings	Healthcare Assistance to COVID-19 Patients using Internet of Things (IoT) Enabled Technologies,		2021	(Naveen et al., 2021)
5	Proceedings of the 2nd International Conference on Future Networks and Distributed Systems	IoT standardization,		2018	(saleem et al., 2018)
6	International Conference on Electro-Technology for National Development	Enabling smart agriculture in Nigeria: Application of IoT and data analytics		2017	(Elijah et al., 2017)
7	International Conference on Applied System Innovation	Investigating awareness and potential contributions of IoT in the East African Community		2017	(Emmanuel et al., 2017)
8	International Journal of Critical Infrastructure Protection	Cyber Security Challenges for IoT-based Smart Grid Networks		2019	(Kimani et al., 2019)
9	Africa Habitat Review Journal	Adoption of Internet of Things in The Construction Industry: A Comparative Case Study of Construction and Manufacturing Industries in Kenya		2021	(Isaiah, 2021)

Table 2 IoT adoption in Kenya Insurance Industry: Issues & Solutions

Studies	Issues	Solutions
Study 1	<ul style="list-style-type: none"> • Infrastructural like connectivity and battery life, low bandwidth • Security like cyber-criminals • Interoperability and standardization. • Laws on privacy issue • Lack of human capital 	<ul style="list-style-type: none"> • Nil

Study 2	<ul style="list-style-type: none"> • Availability of internet • IoT services and products to at low cost • connectivity costs • Interoperability and standards • High chances of dos/ddos attacks for IoT devices 	<ul style="list-style-type: none"> • Nil
Study 3	<ul style="list-style-type: none"> • Connectivity • Power • Privacy and security concerns. • Laws • Bandwidth and costs 	<ul style="list-style-type: none"> • Nil
Study 4	<ul style="list-style-type: none"> • Because of security and privacy concerns, this technology cannot be used in India's healthcare system. 	<ul style="list-style-type: none"> • Nil
Study 5	<ul style="list-style-type: none"> • IoT is in infancy stage in Kenya • Non-regulation • Security and privacy issues • IoT device interoperability 	<ul style="list-style-type: none"> • Nil
Study 6	<ul style="list-style-type: none"> • Rural illiteracy • Infrastructure issues • Human capital shortage 	<p>Bringing together data scientists, engineers, agriculturists, veterinarians, programmers, and business analysts to solve IoT implementation issues.</p> <ul style="list-style-type: none"> • Involve the business sector in developing inexpensive farm management software and IoT policies.
Study 7	<ul style="list-style-type: none"> • The general population is unaware of IoT initiatives. • Comparative lack of superior analytical capabilities 	<ul style="list-style-type: none"> • Nil
Study 8	<ul style="list-style-type: none"> • No uniform language or standards for IoT devices. • Security risk • Limited computational power and memory • Battery-powered gadgets • Legal void • Lack of high-speed network causes latency • Protection of personal data • Skill and experience shortage 	<ul style="list-style-type: none"> • Nil
Study 9	<ul style="list-style-type: none"> • Hefty implementation fees • Non-regulation • Lack of collaboration between it, operations, and R&D. 	<ul style="list-style-type: none"> • Governments may encourage IoT adoption by subsidising and cutting communication rates, lowering IoT deployment costs.

3. Research Methodology

Literature review discussing the challenges and solutions in adopting InsurTech in Morocco are analyzed by using SLR methodology wherein keywords mentioned in table 3 are opted to search relevant article meeting including and excluding criteria mentioned in table 4. Systematic literature review identifies, selects, and critically appraises research in order to answer a clearly formulated question (Dewey & Drahota, 2016).

Table 3 Keywords Selections

IoT	Literature and conference proceedings on IoT in the Kenya financial industry, particularly insurance and health insurance. Past works available since 2015 Primary and secondary research	Studies not in English Magazine, newspaper, thesis, report data Studies in non-financial fields including education, manufacturing Large-scale data analytics and other technologies	Papers publishing platforms such as Google scholar and emerald were opted as the exploring means for this review. Following blend of search, terms are applied: IoT* AND (health insurance* OR insurance sector*) AND (challenge* OR obstacle* OR issue* OR disadvantage* OR threat). The exploration was carried out between 2012 to 2020.
------------	--	---	---

Table 4 Selection Criteria

Technology	Criteria	Kenya
InsurTech	Identification	15
	Screening	14 after removing 1 duplicate
	Eligibility	13 after removing 1 archive
	Included	9 after removing 4 full text articles

4. Findings of the included studies

Many issues and solutions are derived from literature reviewed using systematic literature techniques. Issues and solutions are further categorized under sub-heading by using content analysis. Table 45 provides the challenges faced by the insurance industry, while some prominent solutions are pointed in Table 46, derived after reviewing the repeating nature of challenges and solutions.

First challenge is relating to infrastructure. Most satellites cannot handle real-time video transmission due to bandwidth requirements (Nir, 2016). Existing IoT-sensors, mobile data, and software licence fees are expensive. Radio, WiFi, and GPS should be cheaper IoT devices (Maryleen & Okereafor, 2015). Second, privacy and security. No data privacy laws exist. IoT devices can be hacked due to weak security protocols and encryption. IoT devices risk DoS/DDOS attacks (denial-of-service/ distributed denial-of-service). IoT security breaches cost device manufacturers or customers. Incident investigation, consumer impression, brand reputation, financial loss, and public safety issues (Kimani et al., 2019). Since many sectors use different standards, interoperability and standardisation are the third issue. Data from various sources and devices needs standard interfaces (Maryleen & Okereafor, 2015). IoT devices have many components, data layers, languages, and supporting hardware and software, which limits interoperability (Saleem et al., 2018).

Fourth is a labour shortage. Lack of sophisticated analytical capabilities and big data engineers and scientists is limiting IoT profit potential (Nir, 2016). Supporting IoT devices requires experienced staff (Kimani et al., 2019). Algorithms and applications require embedded IoT, Python, R, Java, and MATLAB programming. AWS, Azure, and Watson should be taught to kids (Elijah et al., 2017). Kenya lacks electricity for insurance companies and IoT. Unregulation is the sixth issue. Developing nations need IoT laws (Naveen et al., 2021). Kenya is young, the seventh issue. Eighth, rural digital illiteracy is cause of less adoption of technology. IoT adoption's ninth obstacle is ignorance/awareness. The tenth obstacle is limited processing power (MB memory and instruction execution speed). Eleventh difficulty is regarding to battery-powered devices. Battery power limits IoT devices. Wireless power delivery research includes magnetic resonance, laser, ultrasound/ultra-wave, and radio frequency (Kimani et al., 2019). Twelveth obstacle is regarding to no high-speed network. Finally, IT, operations, and R&D don't work together. Local farmers need more R&D industry engagement to revolutionise agricultural insurance. Data scientists, engineers, agriculturists, veterinarians, programmers, and business analysts must collaborate on an IoT-based insurance framework. Small and large farmers need affordable farm management software from the government and business sector (Elijah et al., 2017). The government can lower IoT deployment costs by subsidising and lowering communication rates.

Table 5 IoT Adoption Challenges in Kenya Insurance Industry

Costly infrastructure (bandwidth availability, importing cost of sensor, licence fee of software, storage, network cost)
Security & privacy
Interoperability and standardization
Lack of human capital
Shortage of electric power
Lack of regulation and policy
Infancy stage in kenya
E-literacy
Lack of awareness
Restricted computing and memory
Battery-powered gadgets
Lack of high-speed network causes latency issues
Lack of collaboration between IT, operations, and R&D

Table 6 IoT Adoption Solutions in Kenya Insurance Industry

Collaboration of data scientists, engineers, agriculturists, veterinarians, programmers, and business analysts to solve iot implementation issues.
The government may include the commercial sector in developing policies to promote iot and low-cost software.
The government may stimulate IoT adoption by subsidising and decreasing connectivity costs

Reference

Awuor, F. M., & Rambim, D. A. (2022). Adoption of ICT-in-Agriculture Innovations by Smallholder Farmers in Kenya.

Bhatia, H., Juneja, D., & Breja, M. (2021). Challenges with Their Solutions for IoT Applications. In Proceedings of the Second International Conference on Information Management and Machine Intelligence: ICIMMI 2020 (pp. 183-190). Springer Singapore.

Binu, P. K., Harikrishnan, A., & Sreejith. (2019). Hadoop Based Architecture for a Smart, Secure and Efficient Insurance Solution Using IoT. Integrated Intelligent Computing, Communication and Security, 211-221.

Dewey & Drahota. (2016). Introduction to systematic reviews: online learning module cochrane training. Retrieved from <https://training.cochrane.org/interactivelearning/module-1-introduction-conducting-systematic-reviews>

Elijah, O., Orikumhi, I., Rahman, T., Abdul, B., Suleiman, A., & Orakwue, S. I. (2017). Enabling smart agriculture in Nigeria: Application of IoT and data analytics. International Conference on Electro-Technology for National Development (NIGERCON) - Owerri, Nigeria.

Emmanuel, B., Jimmy, B. D., & Yi, S. (2017). Investigating awareness and potential contributions of IoT in the East African Community. International Conference on Applied System Innovation (ICASI). doi:10.1109/icas.2017.7988541

Isaiah, G.K., Ahmed, A., & Titus, K. (2021). Adoption of internet of things in the construction industry: A comparative case study of construction and manufacturing industries in Kenya. Africa Habitat Review Journal, 15(4), 1-10.

Kimani, K., Oduol, V., & Langat, K. (2019). Cyber security challenges for IoT-based smart grid networks. International Journal of Critical Infrastructure Protection, 25, 36-49.

Kajwang, B. (2022). CHALLENGES FACING IMPLEMENTATION OF CONTINUOUS DEVELOPMENT PROGRAMS (CPDS) IN THE INSURANCE SECTOR IN KENYA. Journal of Human Resource and Leadership, 7(1), 71-81.

Lalitha, N., & Soujanya, D. (2019, November). Financial sector Innovations: Empowering Microfinance through the application of KYC Blockchain technology. In 2019 International Conference on Digitization (ICD) (pp. 237-243). IEEE.

Munge, Z. N., & Kitiabi, R. (2017). Challenges of strategy implementation by insurance companies in kenya. International Journal of Finance and Accounting, 2(2), 1-22.

Maryleen, A., & Okereafor, D.T. (2015). Internet of Things for Africa: Challenges and opportunities, International Conference on Cyberspace Governance – Cyberabuja.

Manral, J. (2015). IoT enabled Insurance Ecosystem-Possibilities Challenges and Risks. arXiv preprint arXiv:1510.03146.

Naveen, M., Neha, N., Dilip, N., Hemalatha, N., & Bharti, S. (2021). Healthcare assistance to COVID-19 patient using internet of things (IoT) enabled technologies. *Materials today: proceedings*.

Nir, K. (2016). The economics of the Internet of Things in the Global South. *Third World Quarterly*, 38(2), 311-339.

Ramnathan, P. P., Revathy, S., & Mani, V. (2020, May). Smart Property Insurance using IoT. In *2020 4th International Conference on Intelligent Computing and Control Systems (ICICCS)* (pp. 796-800). IEEE.

Saleem, J., Hammoudeh, M., Raza, U., Adebisi, B., & Ande, R. (2018, June). IoT standardisation: Challenges, perspectives and solution. In *Proceedings of the 2nd international conference on future networks and distributed systems* (pp. 1-9).

Tan, M., & Teo, T. S. (2000). Factors influencing the adoption of Internet banking. *Journal of the Association for information Systems*, 1(1), 5.