The ASIAN BULLETIN OF BIG DATA MANAGMENT
Vol. 3. Issue 1 (2023)
https://doi.org/ 10.62019/abbdm.v3i1.26.

Big Data Analytics Technology Adoption in Kenya Insurance Industry: A Systematic Literature Review

Maryam Saeed, Noman Arshed

Chronicle

Received: Sept 3, 2023
Received in the revised format: Sept 26, 2023
Accepted: October 9, 2023
Available online: October 10, 2023

Maryam Saeed is currently affiliated with Department of Banking and Finance, University of Management & Technology Lahore, Pakistan.
Email: maryamsaeed566@gmail.com

Noman Arshed is currently affiliated with Department of Economics, University of Education Lahore, Pakistan.
Email: noman.arshed@ue.edu.pk

*Corresponding Author

Abstract

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 IoT, Big Data, and InsurTech. In order to boost insurance coverage in Kenya, this study examines the problems with and potential solutions to big data analytic. In order to identify the themes and factors pertaining to problems and solutions in implementing big data analytic in Kenya's insurance business, this study used a systematic literature review methodology. 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. This report outlined many obstacles to big data analytic adoption in the Kenyan insurance sector as well as potential remedies. The proposals could help policymakers improve the insurance industry service delivery. This study will help the insurance sector to adopt the solution while implementing this technology in their organization which will be very beneficial in terms of customer engagement, customer satisfaction, customer need analysis, customized policy plans, idenfication of bogus claims and many more.

Keywords: InsurTech, Big data Analytics, Cloud Computing, Insurance Industry, Digital Technologies.

INTRODUCTION

The insurance industry is instrumental in economic growth through enabling protection, capital creation and promoting commerce. However, there has been a decline in the insurance industry's profitability in Kenya. This insurance penetration not only provides protection against risk but also boost the GDP and employment. This insurance penetration can be enhanced by adopting technology which implementation is not easy in Kenya as it has some challenges. These challenges are explored along with solutions in this study by using SLR methodology in Kenya context. Companies that provide risk management through insurance contracts make up the insurance industry. The fundamental idea behind insurance is that one party—the insurer—will make a financial commitment to cover a future catastrophe that is unpredictable. In the meanwhile, another party—the insured or policyholder—pays the insurer a lower premium in exchange for that security against that hazy future event. Everyday living

requires insurance, and it plays a significant role in the economy. The Association of British Insurers (ABI) estimates that 314,000 people are employed by the UK's third-biggest and largest insurance market, which is also the largest in Europe. The Code of Hammurabi, which was written in what is now Iraq, included ancient Babylonian regulations, some of which dealt with "bottomry," or a loan secured by maritime insurance. To finance his shipment, a merchant would borrow money and may pay an additional fee to ensure that the loan would not need to be returned in the event that the ship sank. In order to prevent their cargo from being completely destroyed if one of their vessels sank during a perilous river voyage, Chinese traders began mixing their commodities across several vessels about the same period. A few thousand years later, the Romans created insurance for the first time as a commercial contract rather than a means of transporting commodities. With the establishment of guilds or "benevolent societies" to support the families of deceased members, the ancient Greeks and Romans jointly established the first health and life insurance policies.

In the 14th century, Genoa pioneered the creation of insurance contracts as a distinct legal entity, unrelated to loans or other transactions. Here, in 1347, is where the earliest insurance transaction is recorded. Farmers in the Alps established mutual help groups from the beginning of the 16th century, promising to take care of one another in the event that their animals or loved ones became ill. Instead of being something to be bargained on, risk is seen as something that should be shared in this system. Edward Lloyd established a coffee shop in 1687 on Tower Street, close to the London docks. The shop had a reputation as a gathering point for rumors about the epidemic, the Great Fire of London, ships arriving and departing, and what they were carrying. Betting was done on whether or not they would arrive safely. The "Lloyds List" newsletter, which contained news on port arrivals and departures, was first published by Edward Lloyd when he started to establish a network of reporters and informers. Insurers at the coffee shop would draft a contract and have the customer sign it below if they wanted to insure a ship; this is how the word "underwriter" came to be used.

The Great Fire of London in 1666, which destroyed more than 13,000 homes, launched property insurance into the spotlight. When Sir Christopher Wren rebuilt London after the catastrophe, he incorporated a location for "the Insurance Office". Accident insurance was created in the latter part of the 19th century. The Railway Passengers Assurance Company was established in 1848 in England to provide protection against the increased number of deaths on the railway system. It operates similarly to life insurance today. The Society of Lloyd's was founded by a group of insurers who frequented Edward Lloyd's coffee shop 80 years after he opened it. Today, one of the most recognizable names in insurance is Lloyd's of London. The government of Kenya has set out to undertake a number of programs as part of its long-term development strategy, Vision 2030, which aims to foster socio-economic growth and elevate Kenya to middle-income status. The Big 4 development plan, which the government unveiled in 2018 to support Vision 2030, sought to solve concerns with access to affordable housing, universal healthcare, food security, and the ongoing promotion of financial inclusion initiatives, including insurance.

Technology adoption in insurance sector is necessary to keep the operation and services fast. There are many advance technology but bigdata analytic is trending one in world. The often challenging process of analyzing large amounts of data to find information that might assist businesses in making wise decisions about their operations, such as hidden

patterns, correlations, market trends, and consumer preferences, is known as big data analytic. As per the International Telecommunication Union (ITU) report, Kenya is working on strategies to adopt big data technologies. The government of Kenya has also applied electronic systems in numerous state-owned institutions to make better public service delivery. M-pesa was introduced in Kenya in 2007, bringing Kenya on the world map as an African Information Communication and Technology (ICT) hub. Many mobile phone companies in Kenya are making alliances with the financial sector regarding electricity, insurance, travel, and health insurance payments. Kenya's Credit Reference Bureau (CRB) gathers enormous amounts of data from banks, financial institutions, and utility service providers (Kenya Power, water services, and phone companies) in order to track customer financial records and evaluate their creditworthiness for sharing with other businesses, such as the insurance industry. There is still a dearth of research on Big Data utility facilitation in Kenya (Maina & Erima, 2018).

In Kenya, the subject of big data analytic is expanding quickly due to the need to make better use of the massive volumes of data being produced by corporations, governmental institutions, and other organizations. A few significant advancements and trends in big data analytic in Kenya are listed below: Adoption of big data analytic by businesses: Many Kenyan businesses are engaging in big data analytic in order to comprehend the buying habits of customers, improve operational performance, and make data-driven decisions. As a result, there is now a greater need for data scientists and analysts that can interpret and analyze massive databases.

Initiatives by the government: The Kenyan government has launched several programmes to use big data analytics to promote public safety, decrease corruption, and improve service delivery. For instance, in order to increase access to government services, the government created the National Integrated Identity Management System (NIIMS), which gathers biometric data on people. Infrastructure investment: Kenya has invested much in digital infrastructure, including mobile networks and fast internet access. Due to this, organizations are now able to collect and analyze huge amounts of data in real-time, which has sparked the development of innovative data analytic solutions.

Emerging firms

Big data analytic-focused startups are popping up more and more in Kenya, using cutting-edge technology like machine learning and artificial intelligence to give governments and enterprises information. Some of these firms are targeted at certain industries, like healthcare or agriculture, while others are more all-encompassing. Overall, big data analytic is expected to significantly contribute to the economic and social advancement of Kenya, and the nation is well-positioned to benefit from this expanding industry. Big data analytics is becoming increasingly significant in Kenya's insurance sector as companies strive to make sense of the enormous volumes of data they gather to better understand consumer behaviour, detect risk indicators, and streamline underwriting and claims procedures. The Kenyan insurance sector uses big data analytic in the following ways:

Customization

Because insurers employ data analytics to better understand their customers' requirements and preferences, it is now feasible to create insurance plans uniquely suited to each customer's wishes and preferences. For instance, an insurer may utilize information on a client's driving patterns to create a personalized auto insurance plan that charges less for careful drivers. Fraud detection: The identification of fraudulent insurance claims is another application of data analytic. As an example, many claims submitted by the same person or a high frequency of claims in a certain location are trends and anomalies that insurers can spot by analyzing vast databases.

Risk assessment

Insurers are utilizing data analytic to better precisely analyse risk, enabling them to more efficiently price insurance and reduce losses. For instance, an insurance may analyse the likelihood of damage from floods or other natural catastrophes and modify rates as necessary using data on weather patterns and past claims data.

Processing of claims

Data analytic are also being utilized to speed up and increase the precision of claim processing. Insurance companies may lower fraud and mistakes and process claims more rapidly by automating the claims process and analyzing data to determine the authenticity of claims. Overall, big data analytic is revolutionizing the Kenyan insurance market by helping insurers better understand their clients, calculate risk more precisely, and boost productivity. We may anticipate seeing even more cutting-edge applications of data analytic in Kenya's insurance sector as the volume of data keeps increasing. As per many studies published in google scholar database, few specific articles derive from keyword of this topic. Mostly this technology is discussed in financial or other sectors but not specific to insurance sector. Insurance sector is too behind in adopting advanced technology compared to banking or capital market. This study specifically targets the insurance sector in the context of Kenya where technology and insurance penetration is less than in other developing or developed countries.

Big data analytic has gained significant interest in the insurance industry in Kenya. It has been recognized as a crucial tool for decision-making and planning for insurance companies, enabling them to achieve long-term business success and meet economic projections (Jackson et al., 2018). The low penetration levels of insurance in Kenya have been attributed to negative perceptions among potential customers (Charles, 2016). To address this, machine learning models have been used to predict the uptake of insurance, with tree-based classifiers such as Random Forest showing robust performance (Nelson, 2021). The growth of health insurance in Kenya has been steady, with increasing premiums, claims, and expenses for insurance companies (Evans, 2020). Additionally, the effect of insurance risks on the financial performance of insurance companies in Kenya has been studied, with credit risk, liquidity risk, solvency risk, and underwriting risk found to have a negative impact. Overall, big data analytic and understanding customer perceptions are important for the growth and profitability of the insurance industry in Kenya.

BACKGROUND

The idea of insurance has been around since several years BC. In line with this, in the third and second millennia BC, traders in China and Babylonia used methods for shifting or dispersing risks. Chinese traders traveled over perilous rivers, therefore they spread their goods among several containers to reduce the damage in the event of a vessel capsize. Around 1750 BC, the Babylonians invented a system that was later followed by early Mediterranean merchants aboard ships and codified in the Code of Hammurabi. In exchange for the lender's promise to cancel the debt if the shipment was stolen or lost at sea, a merchant who accepted a loan to pay for his or her shipment would pay the lender extra money. The people of Rhodes made up the "general average" around 800 BC. In Second Industrial Revolution Insurance 2.0, the development of the telegraph and electricity during this time period increased the networks for transportation and communication. Machines had to be made out of materials like copper, steel, or aluminum, which broadened the idea of an industry, particularly the chemical sector (Schwab, 2017). In Third Industrial Revolution Insurance 3.0, The offered computer-based apps assist the operations of the company. The early computer applications were actuarial and statistical, and subsequently, various applications for the administration and control of insurance operations were introduced. The majority of independent agents adopted desktop computer-based automation solutions to increase efficiency and save expenses from the early 1980s through the mid-1990s. Automation has been a focus of Acord, a non-profit American organization that sets standards for the insurance sector. The association includes businesses, agents, vendors, providers of solutions, associations, and other interested parties. They offer electronic data interchange (EDI) and standard formats (Nelson et al., 2005). In Fourth Industrial Revolution (Insurance 4.0), A new revolution was sparked by telecommunications networks, notably the internet. The fourth industrial revolution in insurance was sparked by the development of the internet of things (objects) and cutting-edge software applications, together with the automation of the machinery used in the operating environment. Drones, the Internet of Things, cloud computing, artificial intelligence, blockchain technology, and big data analytics are just a few of the technologies that make up InsurTech (Kagermann et al., 2013).

To increase insurance penetration, this research will examine the problems and potential solutions associated with using big data analytics in the Kenyan insurance sector. Following are some ways to find a solution for this key goal:

- To evaluate the literary perspective on the difficulties in Big Data Analytics adoption in Kenya.
- To evaluate the literary viewpoint on Kenya's potential use of big data analytics.

LITERATURE REVIEW

InsurTech adoption in the global insurance sector has gained significant attention and is driving technological advancements in the industry. InsurTech refers to the application of technical advancements to enhance the effectiveness of the insurance sector. Studies have shown that the development of InsurTech has improved the technological innovation of insurance companies. InsurTech has also been found to reduce information asymmetries in the insurance sector, particularly in the motor insurance sector, by

enabling precise risk assessment based on factors such as driving habits and patterns. InsurTechs have played a fundamental role in transforming the insurance sector by driving innovations and creating a dynamic user-centric ecosystem. Furthermore, InsurTech has reshaped the market structure of traditional insurance sectors, reducing market concentration and helping traditional insurers lower entry barriers and operating costs. Overall, InsurTech adoption is revolutionizing the global insurance sector by improving technological innovation, reducing information asymmetries, and transforming market structures (Urvashi, 2022).

Big data analytics adoption in the global insurance sector has revolutionized data management and underwriting practices. The use of machine learning and big data tools has enabled insurers to analyze large amounts of data and gain valuable insights for customer segmentation, fraud detection, and claim processing. The digitization of claims processes using big data and analytics has significantly impacted insurers' underwriting practices, allowing them to transition from "understand and protect" to "predict and prevent". Furthermore, big data analytics has proven to be effective in detecting and preventing claims fraud, leading to enhanced outcomes and reduced costs. The availability of abundant datasets and advanced data-processing techniques, such as machine learning, has opened up new opportunities for the insurance sector, prompting insurers to react and embrace digitization. Overall, big data analytics has the potential to reshape the insurance industry by leveraging technology and data to improve decision-making and operational efficiency (Melanie, 2021).

Big data analytic (BDA) in the insurance industry in Kenya has been a subject of controversy and little analysis. However, there is limited information available on how insurance practices are changing due to BDA adoption. In Kenya, the adoption of cloud computing services in insurance companies is relatively low, indicating a lack of awareness and trust in cloud-based systems. The health insurance sector in Kenya has experienced significant growth due to liberalization and increased medical costs, with both government and private insurers providing coverage. Mobile insurance (M-insurance) has had a positive impact on microfinance institutions' performance in Kenya, improving outreach, portfolio quality, investment, earnings, and access to finance for clients. The effect of insurance risks, such as credit risk, liquidity risk, solvency risk, reinsurance risk, and underwriting risk, on the financial performance of insurance companies in Kenya has been assessed, with recommendations for risk management and policy estimation techniques (Benedict et al., 2023).

In order to investigate the impact of big data analytic on Kenyan telecommunications companies, a descriptive research approach was used with Safaricom, Airtel, and Telkom Kenya. According to a research, big data from social media helps telecommunications companies control customer attrition, improve service delivery, guide the creation of new products, and produce targeted offers that increase sales. It improves customer interaction and highlights issues that prevent telecom companies from realizing their full potential, such as a lack of appropriate analytics tools and personnel skill sets (John & Assumpta, 2018). The Technical University of Kenya (TUK) and Strathmore University (SU) undertook research to determine the impact of big data analytics on the organizational performance of both institutions.

In their article from 2020, Wafula and Kurgat explored the promise of big data analytics in Kenya's insurance industry as well as the obstacles to adoption, such as poor data quality, outdated systems, and little resources. The use of big data analytics in the Kenyan insurance sector was explored by Nyamwange et al. (2020), who also looked at challenges with data quality, outdated systems, and a lack of qualified personnel. Data quality and completeness, legacy systems, data privacy and security, resource constraints, and a lack of expertise are some of the issues that Githae (2019) mentions when describing the obstacles the Kenyan insurance sector has when adopting data analytics. Big data analytics' potential for risk management in the Kenyan insurance sector is discussed by Muigai et al. (2019), along with the implementation hurdles it faces due to data quality, outdated systems, and other factors.

The Insurance Regulatory Authority of Kenya (IRA) recognized the absence of accurate and high-quality data as a major issue confronting the Kenyan insurance sector. Insurers' access to data of varying quality made it challenging to draw meaningful conclusions from the data, according to the research. According to a research conducted by the Association of Kenya Insurers (AKI), legacy systems are a serious obstacle to adopting big data analytics in the insurance industry. According to the survey, many Kenyan insurers still rely on antiquated technology that is incompatible with contemporary analytics tools. In a study, PwC Kenya brought up the concern of data security and privacy.

According to the research, there is a need for enhanced data protection rules and processes since insurers are collecting an increasing quantity of sensitive customer data, which raises the danger of data breaches. Limited resources and skill sets were found to be the two biggest obstacles confronting Kenya's insurance sector in research by Deloitte East Africa. According to the survey, many insurers lacked the funding and staff needed to apply advanced analytics techniques. Another research by McKinsey & Company found that a major obstacle to integrating big data analytics in Kenya's insurance market was the lack of qualified people. According to the report, insurers should spend money on training to produce a workforce that is proficient in using big data analytics. Quality of data is a

The project used data analytics and data science, and its objective was to use big data analytics for the sustainability of SMEs' performance in Kenya following the COVID-19 epidemic. Complex Adaptive Systems and Strategic Choice Theory serve as the study's guiding theories. The researchers' investigation employed a descriptive survey approach. Each SME's operations, finance, customer service, and supply chain managers were surveyed to obtain data. 222 responses came from the intended audience. Data analysis employed descriptive statistics, such as frequencies, percentages, means, and standard deviation. The relationship between the variables was determined using multiple rules and Pearson correlation. Tables, charts, and graphs were used to present the data. The study sought to determine whether data science has an impact. The average data science score is 3.8 (standard deviation: 0.8895), while business intelligence scores are 3.9 (standard deviation: 0.851), machine learning scores are 3.7 (standard deviation: 0.928), and machine learning scores are 3.8 (standard deviation: 0.8895). In order to give underwriters a head start on any potentially fraudulent activity, insurance firms should take use of the opportunities provided by technology.

SMEs can handle a number of unexpected challenges to competitiveness with Data Science drivers like Business Intelligence and Machine Learning. In order to improve the performance, survival, and expansion of SMEs, they also created a legal framework that protects data on data analytics (Kajwang, 2022). Big data readiness, or the degree of preparedness and desire to utilize big data, is the focus of the big data research community. Then, the Big Data Readiness Index (BDRI) is applied to every African nation. According to the analysis's results, coastal nations like South Africa, Kenya, and Namibia as well as islands like Mauritius have comparatively high BDRI ratings (Joubert et al., 2023).

The Kenyan insurance industry faces both challenges and opportunities in a global context. The industry has experienced financial reforms, technological advancements, and globalization, affecting its efficiency, productivity, market structure, and performance. Challenges include low insurance penetration due to lack of knowledge and awareness, negative perceptions, cultural and religious beliefs, inappropriate products, and limited distribution channels. Other challenges include regulatory hitches, excessive claims, fraud, and competition. However, there are opportunities for growth, such as enhancing internal control mechanisms, developing sustainability strategies, and improving the dissemination of information through mobile technology. Strategies to address these challenges and enhance insurance uptake include improving distribution channels, consumer education, reviewing products, and improving service standards. Collaboration among stakeholders, including the Insurance Regulatory Authority and the Association of Kenya Insurers, is crucial for implementing these strategies and addressing the identified factors.

The use of big data analytics in the insurance business has been met with resistance in several research focused on Kenya (Bishwati et al., 2019; Revathi, 2020). These studies have outlined a number of issues and difficulties in changing the insurance industry. These studies have examined the issues in the mentioned domain. There haven't been many studies that have attempted to link the issues with potential fixes, though. The SLR approach was employed in this study to include the issues raised and the suggested fixes in table 1 and table 2.

METHODOLOGY

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

Eligibility criteria

All primary studies like literature and conference proceedings, reported challenges and solutions in adopting big data analytics in Kenya's financial sector, including the insurance sector in Table 3.

Table 1.
Characteristics of the included studies

No.	Journal name/Book/ Conference Name	Paper topic/Book Conference paper Name	Methodology	Year	Author	Technology
1	Digital Technologies for Information and Knowledge Management.	Facilitating Big Data Utility in Kenya		2021	(G. K. Maina & Erima, 2018)	
2	University of Nairobi, School of Business,	Strategies Adopted By Kenyan Insurance Companies To Alleviate Low Insurance Penetration.		2013	(Gitau, 2013)	
3	IMIA Yearbook of Medical Informatics.	Challenges and Potential Solutions for Big Data Implementations in Developing Countries.	Exploratory Study	2014	(Luna et al., 2014)	Bigdata Analytics Technology
4	IT Professional	Big Data Solutions for Micro-, Small-, and Medium-Sized Enterprises in Developing Countries.		2019	(Rojas-Torres & Kshetri, 2019)	
5	The International Journal of Engineering & Science	Diffusion of Big Data and Analytics in Developing Countries		2017	(Micheni, 2015)	

6	Communications of the Association for Information Systems	Big Data and Public Health: Challenges and Opportunities for Low and Middle Income Countries	2019	(Sahay, 2016)
7	Global Journal of Health Science	Prospects of Big Data Analytics in Africa Healthcare System.	2020	(Akinnagbe et al., 2018)
8	International Journal of Business Information Systems,	Are enterprises ready for big data analytics? A survey-based approach	2017	(Brock & Khan, 2017)

Table 2.

Bigdata Analytics technology adoption in Kenya Insurance Industry: Issues & Solutions

No. of Study	Issues	Solutions
1	• Need for integration to merge different formats of big data • Shortage of qualified and skilled people to analyze & interpret big data • Lack of infrastructure like storage capacity, updated software • privacy, security • legislation • negative perception	• Cloud computing can solve the issue of storage • Govt. support
2	• lack of innovation and creativity culture • the low purchasing power of the majority of the population • low insurance knowledge of agents • limited usage of technology • lack of awareness of insurance benefits & technology usage • communication barriers in terms of the English language	• improvement of the standard of living • introducing new innovative products, including micro-insurance, by using technological advancements • new target segments like youth and low-income earners

3	• lack of the storage • computing capacity and communications infrastructure required to organize and integrate the amount of information generated in a big data project • Shortages in electrical grids and telecommunication networks • BD deployments demand IT administration and application developer skills which is scarce in Kenya. • Integration of data from many different sources is also a great challenge. • Security infrastructure and privacy • legal policies for the protection of data.	• Using computer clusters, Apache Hadoop is a framework for processing massive volumes of data. • IaaS and open-source software are suggested as solutions for infrastructure problems. • A large number of data scientists might be trained to address the labor deficit. Create guidelines and legal frameworks to protect the security and privacy of sensitive data.
4	• Big data needs to be used effectively, thus organizations need to be able to manage collaboration across many departments and groups. • insufficient human resources to efficiently use big data.	• Nil
5	• Low degree of digitization in Kenya. • The hardware, software, and other technological applications available to produce and disseminate pertinent data and information are restricted. • To manage data mining and analysis methods and systems, it need technical expertise to handle accurate and usable data. • Privacy is also challenging in this technology. • As organizations implement Big Data, data should be treated as a strategic asset. However, management problems have developed as a consequence of insufficient regulations and directions for the administration and security of the data. • Legal regulations should specify privacy laws and preserve the competitiveness of enterprises in the private sector that are willing to share data (Elyjoy, 2015).	• Nil
6	• Because big data efforts involve a wide range of stakeholders, technical platforms, and data kinds, the infrastructure needed to achieve them is complicated. • These infrastructures require a lot of resources, as well as money and knowledge from around the world. • Extreme problems to governance exist in some nations. • There are currently not enough people working in data analytics and visualization.	• Nil

7	• administrative rules and management • concerns of culture and privacy • data protection • Applications of big data analytics to healthcare are still in their infancy in Africa. • investments that are being made in big data technologies	• Nil
8	• Scalability	• Nil

Source: Self Constructed

Table 3.
Inclusion/Exclusion Criteria

Criteria	Specified Criteria
Inclusion	The use of big data analytics and InsurTech in the Kenyan financial sector, particularly the insurance industry and health insurance, has faced obstacles that need to be addressed, and there are conferences that have addressed these issues.
Exclusion	Studies available from 2013 onwards Primary studies and secondary studies Studies stated in a language other than English Data from magazines, newspapers, thesis, reports Studies conducted in other than the financial sector like education, manufacturing, Studies that merged big data analytics and other technologies

Data Search and Selection

Research paper publication platforms such as Google scholar and Emerald have opted for this review as the search sources. The following blend of search terms are applied: Big data Analytics* AND (life insurance* OR commercial insurance*) AND (challenge* OR obstacle* OR issue* OR disadvantage* OR threat*). The search was conducted between 2013 to 2021.

Data extraction and data synthesis

The two reviewers independently exclude the following information from the included articles: the name of the author, the year and country of publication, the kind of publication, and the conclusions. The gathered data was then turned into a narrative synthesis.

RESULTS AND DISCUSSION

Many issues and solutions are derived from the literature review using the systematic literature technique in context of Kenya. Issues and solutions are further categorized under sub-heading by using content analysis. Here table 4 provides the common challenges faced by the insurance industry, while some prominent solutions are pointed out in table 5. Issues with interoperability are the first difficulty. Bringing together data from several sources is a very difficult task. Effective information integration necessitates the adoption of standards to ensure system compatibility. The main challenge in ensuring interoperability across various Big Data (BD) repositories is the variation in metadata utilized in one repository compared to other repositories. Integrating data produced by BD initiatives will be more difficult in the absence of standards for this metadata. Granular security measures that secure data at different levels are supported by traditional

database management systems. These safety precautions are typically absent from BD project software (Luna et al., 2014). Security and privacy are the second issue. According to Maina and Erima (2018), organizations are required to safeguard the data they hold from theft and immoral usage. A dearth of necessary human resources is the third issue. There is a lack of competent workers with the necessary Big Data analytics skills when the need for data gathering, analysis, and interpretation of Big Data expanded. Local Kenyan institutions and colleges are not meeting the quality or competence requirements for the Big Data analytics industry. Insufficient storage space is another issue, which causes large data to lose data continuously.

The fourth difficulty is the legal system. Kenya has strong data privacy and security rules, making securing sensitive data difficult. Data breaches and other security risks may come from this, which may cause large financial losses. For the protection of data, there should be laws. It is important to design strategies for the gathering, protection, and utilization of data. Legislation on justice and accountability in the case of cybercrime is also required. The government may support big data entrepreneurship to help entrepreneurs own and profit from their own Big Data analytics capabilities. Institutions, corporate leaders, and big data analytics professionals in Africa must establish and maintain cooperative working relationships in order to exchange or provide access to data for Big Data adoption and utilization. Such international partnerships for skill development are possible. Universities in Kenya must begin teaching students about big data and how to utilize it to solve societal issues. Additionally, the government must spread the word about the advantages of this resource. Governments may also demand that local governments (counties) digitize their operations, resulting in the use of big data (Maina & Erima, 2018).

The unfavorable view of this technology is the fifth difficulty. Their daily business decisions and perception of the facts are devoid of any actual value. The lack of an innovative and creative culture is the sixth challenge. The use of Big Data in Kenya is hampered by a weak data valuing culture. The use of this technology may be hampered by the ignorance, fear, and resistance of competent authorities like managers. Most of the population's low purchasing power, which impacts insurance rates and investment in this cutting-edge technology, is the seventh obstacle. Eight challenge is limited technology usage, which can be enhanced by promoting its benefits in the insurance industry.

The shortage of storage space for big data created by various IoT devices to collect client information, which is useful for an insurance firm for marketing, claim administration, premium policy, and product planning, is the ninth obstacle. The tenth problem is the necessary computer power and communications network or infrastructure to organize and integrate the volume of data produced by a big data project. The eleventh problem is the lack of electricity grids needed to support all business-related technology. Twelfth challenge is the infancy stage of big data analytics applications in Kenya, which will take time to reap full benefits. Last challenge is scalability. Scalability is a barrier to the widespread use of big data analytics since the quantity of data sets can sometimes surpass processing capabilities and unstructured data adds a further level of complexity (Brock & Khan, 2017). Storage, hardware, modern software, and analytics are problems that may be resolved by cloud computing in order to get useful insight from large data.

IaaS in cloud computing and open-source software are the greatest solutions for infrastructure problems. In Kenya, the lack of financing for big data initiatives is a major problem. Due to this, businesses are less able to invest in the tools and personnel that are

needed to complete these projects. Big data projects in Kenya are not supported by a sufficient infrastructure. This includes a lack of data storage facilities, processing capacity, and high-speed internet access. The Kenyan government had to develop a strategy for using this technology in the insurance industry and pass legislation governing consumer data security and privacy. Government initiatives that raise the standard of life for individuals will boost their investment, particularly in the insurance sector. New cutting-edge products, such as micro-insurance and others, should be created to enhance insurance penetration in Kenya. On computer clusters, Apache Hadoop is a framework for processing massive volumes of big data. It addresses the issue of large computer capacity. A large number of data scientists might be trained to address the labor deficit. Universities in Kenya must begin educating students about big data and how to utilize it to solve societal issues.

Table 4.
Bigdata analytics Adoption Challenges in Kenya Insurance Industry

Interoperatability issues
Privacy & security
Human resource shortage
Legislation
Negative perception
Main population has little buying power
Restricted technology use
Storage shortage
IT and communications infrastructure
Grid shortages
Big data analytics in healthcare is relatively new in Africa
Scalability

Table 5.
Bigdata analytic Adoption Solutions in Kenya Insurance Industry

Solutions to storage and infrastructure issues
Customer data privacy and security legislation is needed.
A higher level of life
Introducing new goods like micro-insurance
Platform for distributed data processing (hadoop)
Data scientists are in short supply.
Establish privacy and security policies for sensitive data.

CONCLUSION & POLICY IMPLICATION

Through the use of a methodical literature analysis, this study investigates the problems and potential solutions associated with the use of big data analytic in the Kenyan insurance sector. The investigation identified a wide range of difficulties, and the synthesis connected several answers to the issues raised. Eight papers from the Kenyan insurance market were narrowed down and chosen after utilizing the right keywords. The SLR approach was used to develop the themes and variables that represent the barriers to

big data adoption in the insurance industry and their remedies.The resulting problems and solutions are thoroughly explained in the context of Kenya's financial sector, which includes the insurance sector. Practitioners can use these solutions to increase insurance penetration, which is very low when compared to developed nations like the US, with an insurance penetration rate of about 6%. Financial inclusion and insurance penetration are strongly related, and both contribute to reducing poverty. By conducting primary interviews with Indian insurance professionals and FinTech/InsurTech specialists holding executive level positions, this study, which is now restricted to academic literature, might be expanded.The Kenyan insurance industry can benefit from this study by better understanding its various issues and implementing the suggested solutions to improve insurance innovation, insurance penetration, and customer satisfaction, all of which are significantly lower than in developed nations and other developing nations. Countries that match the Indian cultural system and human development index can also benefit from this study.

The Kenyan government may create a national data analytics strategy that defines the advantages of big data analytics, points out the major difficulties and obstacles, and lays out a plan for implementing it in the insurance industry. The government might enact legislation to safeguard consumer data and ensure insurers manage data properly. This could cover regulations for data access, storage, sharing, and protection. To create a workforce that can effectively use big data analytics, the government may invest in initiatives that increase workers' abilities. Training courses, internships, and apprenticeships may all fall under this category. To promote the use of big data analytics, the government may provide financial incentives to insurers. This can involve giving infrastructure investments and analytical tools tax benefits, grants, and subsidies. Factors causing low insurance uptake include lack of knowledge and awareness about insurance products, negative perceptions, cultural and religious beliefs, inappropriate products, and limited distribution channels. Strategies to alleviate low insurance penetration include improving distribution channels, consumer education and awareness, reviewing products, and improving service standards.

Mobile insurance (M-insurance) has shown positive impacts on microfinance institutions' performance, outreach, and portfolio quality. Market penetration has been found to have a strong relationship with the performance of insurance companies in Kenya. A subsidized, mobile phone-based health insurance program has led to increased insurance uptake, improved healthcare utilization, and reduced out-of-pocket expenditures. Consumer education and outreach activities have mitigated information flow problems and increased trust in the insurance sector. By implementing these strategies and programs, insurance penetration in Kenya can be enhanced, leading to increased access to insurance products and improved financial protection for individuals and households. To promote knowledge exchange and innovation in the adoption of big data analytics, the government might support collaboration and partnerships between insurers, technological businesses, and academic institutions. Overall, these policy suggestions can assist in addressing the difficulties the Kenyan insurance industry is having using big data analytics and can help to foster a climate that encourages the creation and use of successful analytics strategies.

Abbreviations

Before Christ – **BC**
Structured Literature Review – **SLR**
Information Communication and Technology – **ICT**
Big Data – **BD**
International Telecommunication Union – **ITU**
Credit Reference Bureau - **CRB**
Electronic Data Interchange - **EDI**
Internet of Things - **IoT**
Technical University of Kenya - **TUK**
Strathmore University – **SU**

DECLARATIONS

Acknowledgement: We appreciate the generous support from all the supervisors and their different affiliations.
Funding: No funding body in the public, private, or nonprofit sectors provided a particular grant for his research.
Availability of data and material: In the approach, the data sources for the variables are stated.
Authors' contributions: Each author participated equally to the creation of this work.
Conflicts of Interests: The authors declare no conflict of interest.
Consent to Participate: Not Applicable
Consent for publication and Ethical approval: Because this study does not include human or animal data, ethical approval is not required for publication. All authors have given their consent.

REFERENCE

Akinnagbe, A., Peiris, K. D. A., & Akinloye, O. (2018). Prospects of big data analytics in Africa healthcare system. *Global Journal of Health Science*, *10*(6), 112–114.

Bishwati, N., Som, S. B., & Bala, K. (2019). Democratizing health insurance services, accelerating social inclusion through technology policy of health insurance firms. *Business Strategy and Development*, 1–11. https://doi. org/10.1002/bsd2.59

Brock, V. F., & Khan, H. U. (2017). Are enterprises ready for big data analytics? A survey-based approach. *International Journal of Business Information Systems*, *25*(2), 256–277. https://doi.org/10.1504/ijbis.2017.083688

Benedict, M.M., Lucy, W., & Joseph, T. (2023). Insurance Risks and Financial Performance of Insurance Companies in Kenya. *Journal of finance and accounting. 7*(2). 43-68.

Charles. O.O. (2016). An Analysis of Perception and Uptake of Insurance Products among Medium-low Income Earners in Kenya. *Advances in economics and business.*1-10.

Evans. (2020). Health Insurance in Kenya.

Gitau, B. N. (2013). *Strategies adopted by Kenyan Insurance companies to Alleviate low Insurance penetration*. University of Nairobi, School of Business. http://erepository.uonbi.ac.ke:8080/xmlui/handle/123456789/60847

John, T.K. & Assumpta, K. (2018). Strategic role of big data analytics on innovation in the telecommunications sector in Kenya: A Case of Safaricom plc. *5* (4). Retrieved from http://erepo.usiu.ac.ke/11732/3640

Jackson, K. M., & Miriam, K. (2018). Big data analytics on decision making by smart firms in Kenya. *Research Acies International Journal of Computing and Knowledge Management, I*(1), -

Joubert, A., Murawski, M. & Bick, M. (2023). Measuring the Big Data Readiness of Developing Countries – Index Development and its Application to Africa. *Inf Syst Front, 25*, 327–350.

Kagermann, H., Helbig, J., Hellinger, A., & Wahlster, W. (2013). *Recommendations for implementing the strategic initiative INDUSTRIE 4.0: Securing the future of German manufacturing industry; final report of the Industrie 4.0 Working Group*. Forschungsunion.

Kajwang, B. (2022). Implications for big data and analytics on underwriting practices in insurance sector. *American Journal of Data, Information and Knowledge Management*, *3*(1), 1-11.

Luna, D. R., Mayan, J. C., García, M. J., Almerares, A. A., & Househ, M. (2014). Challenges and potential solutions for big data implementations in developing countries. *Yearbook of Medical Informatics*, *23*(01), 36–41.

Luvembe, A. M., & Mutai, H. (2019). Big Data Framework for Kenya's County Governments. *Journal of Computer and Communications*, *7*(1), 1–9. https://doi.org/10.4236/jcc.2019.71001

Maina, G. K., & Erima, J. (2018). *Transforming Service Delivery in Uasin-Gishu County, Kenya through Enhanced E-Records Management Solutions*. http://41.89.160.13:8080/xmlui/bitstream/handle/123456789/5880/ICA%20MAINA%20YAOUNDE%20PRESENTATION.pdf?sequence=1&isAllowed=y

Micheni, E. M. (2015). Diffusion of Big Data and analytics in developing countries. *The International Journal of Engineering & Science*, *4*(8), 44–50.

Moturi, Christopher A. (2019). Use Of Data Mining To Detect Fraud Health Insurance Claims. http://erepository.uonbi.ac.ke/handle/11295/107178. UoN

Munyole, Alex & Mutai, Hillary. (2019). Big Data Framework for Kenya's County Governments. Journal of Computer and Communications. 07. 1-9. 10.4236/jcc.2019.71001.

Melanie, R.N. (2021). Use of big data in insurance. The Palgrave Handbook of Technological Finance, 669-700.

Nicoleta Tantalaki, Stavros Souravlas & Manos Roumeliotis (2019) Data-Driven Decision Making in Precision Agriculture: The Rise of Big Data in Agricultural Systems, Journal of Agricultural & Food Information, 20:4, 344-380, DOI: 10.1080/10496505.2019.1638264

Nelson, M. L., Shaw, M. J., & Qualls, W. (2005). Interorganizational system standards development in vertical industries. *Electronic Markets*, *15*(4), 378–392.

Nelson. (2021). An Analysis of Perception and Uptake of Insurance Products among Medium-low Income Earners in Kenya. *Advances in economics and business.* 1-10.

Revathi, P. (2020). Technology and Innovation in Insurance–Present and Future Technology in Indian Insurance Industry. *International Journal of Engineering and Management Research*, *10*.

Rojas-Torres, D., & Kshetri, N. (2019). Big data solutions for micro-, small-, and medium-sized enterprises in developing countries. *IT Professional*, *21*(5), 67–70. https://doi.org/10.1109/mitp.2019.2932236

Sahay, S. (2016). Big data and public health: Challenges and opportunities for low and middle income countries. *Communications of the Association for Information Systems*, *39*(1), 20. https://doi.org/10.17705/1CAIS.03920

Schwab, K. (2017). *The fourth industrial revolution*. Currency.

Trenerry, C. F. (2009). *The origin and early history of insurance: Including the contract of bottomry*. The Lawbook Exchange, Ltd.

Urvashi, S. (2022). The InsurTech Revolution in Insurance Industry: Emerging Trends, Challenges and Opportunities. *International journal of management and development studies. 11*(8).12-19.