Adoption of Industry 4.0 and the Operations of the Nigerian Insurance Industry: A Study of AIICO Insurance Company

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ABSTRACT

This research study sets out to examine the Adoption of Industry 4.0 and the Operations of the Nigerian Insurance Industry. The study examined the impact of adoption of industry 4.0 on the improvement of penetration of insurance company in Nigeria. it also examined the impact of adoption of industry 4.0 on the improvement of profitability of insurance company in Nigeria. therefore the studied population of this project is 100staff of the study company. The study adopted purposive sampling technique. In analyzing the data, Descriptive statistics was used to present the data gathered, while chi-square were used to test the formulated hypothesis. The findings of the study revealed that adoption of industry 4.0 has significant impact on the improvement of Insurance penetration in Nigerian insurance companies ($p<0.05$). It also revealed that adoption of industry 4.0 have significant impact on the improvement of profitability of the insurance companies in Nigeria ($p<0.05$). The study recommends that the Insurance companies should create more awareness of this technology to potential clients through free workshops at place of work and other appropriate places.

Keywords: *Industry 4.0, Adoption. Penetration, Insurance, Profitability*

1. Introduction

The insurance sector has seen rapid grown in recent years. In 2015 Nigerian underwriters reported total gross written premiums (GWPs) of nearly N350bn ($1.1bn at the exchange of that time) according to data released by the Nigerian Insurers Association, an industry group (Nigeria Insurance Digest, 2015). This figure was up around 19% on the previous year. In light of the pace of expansion, and in addition to Nigeria's enormous population and low rate of insurance penetration, it is perhaps not surprising that the market has attracted a raft of major foreign insurance players in recent years. This includes global giants such as French firm AXA and the UK-based Prudential Life Company, each of which have made major acquisitions, with an eye towards the future. This notwithstanding, when compared to the population of the country, it is obvious that the country's insurance industry has not grown as would have expected.

The low insurance penetration has been attributed to factors like low earning capacity of the middle income earners, socio-cultural factors, un enforcement of the compulsory insurances among others (Anoka, & Uche, 2018). This low penetration has made the Nigerian insurance industry to be regarded as the poor cousin of the banks (Anoka & Uche, 2018). A situation whereby the total premium income of the insurance industry is not equal to the gross profit of any of the big five banks in the country, unlike what is obtainable in the advanced markets where insurance companies own banks.

Insurance, according to Adetunji, Nwude & Udeh (2018), is a scheme used to mitigate the effects of misfortune through provision of financial compensation from the pool of accumulated contributions or premium by all persons participating in the scheme. According to Adetunji, Nwude & Udeh (2018), in developed economies, insurance does contributes a lot to the well-being of the citizen and the economy at large. They further posited that here in Nigeria, an emerging economy in Africa, there is crisis of confidence towards the industry. Nigerians developed strong apathy towards insurance and this made the industry an non-trust worthy industry in Nigeria. The distrust was deeply bred so much that the performance of insurance stocks on the Nigerian Stock Exchange (NSE) has been negatively affected. Many of the stocks could not go beyond the minimum price per share of 50 kobo in the market and very few investors do trade on them. This scenario has refused to change with time. As a result it is generally believed that insurance inclusion is very low in Nigeria. Due to the negative attitude of people toward insurance, the ability of the Nigeria insurance industry to contribute significantly to the economic growth of the country has been in doubt. Many observers attribute claims fraud syndrome, religious antagonism and unfavourable macroeconomic environment as some of the major problems undermining insurance in Nigeria (Adetunji, *et al*, 2018). Careful study on the Nigeria's insurance industry reveals that it has been confronted with problems of products selling rather than

marketing, limited underwriting capacity, expertise, weak research capacity, institutional framework, lack of proper infrastructure, denial of genuine claims, lopsided office distribution, lack of proper education and awareness creation, fraudulent behaviour of insurance intermediaries, fraudulent claims syndrome, unfavourable macro-economic environment, religious antagonism, lack of reliable ICT, limited retention capacity among others which are likely to prevent insurance in Nigeria from meeting the expectation of the insuring public and consequently may not be contributing significantly to the Nigeria's economic growth.

In view of the aforementioned challenges facing the Nigeria's insurance industry, the question on the lips of many observers has been, "Does insurance developments make a positive and significant contribution to economic growth in this country Nigeria? Intuitively a diligent answer should be that' Insurance development does not have a positive and significant effect on economic growth in Nigeria but this remains a hypothesis (Adetunji, *et al*, 2018).

It is in line with this that this study wants to find out if technology could be of assistance in driving insurance penetration in the country, using Industry 4.0 as a tool. Thus, Schwab (2017) described how mankind is on the brink of "the fourth industrial revolution"(henceforth 4IR). While the incremental development of technology is by no means a new idea, Schwab is among those who believe technology breakthroughs have accumulated enough momentum to trigger a shift to an entirely new mode of production. The next industrial revolution, according to Schwab, is one that builds upon, but at the same time breaks away from the third industrial revolution with computers, software, and networks at its core. In Schwab own words, fourth industrial revolution "is characterized by a much more ubiquitous and mobile internet, by smaller and powerful sensors that have become cheaper, and by artificial intelligence and machine learning.

The issue now is could the adoption of Industrial Revolution 4.0 help in improving the landscape of the Nigerian insurance industry through an improvement of the insurance penetration of the country or not?

Moreover, Insurers operating in Nigeria face a range of challenges. The dramatic fall in the price of Brent crude – the international oil benchmark – that began in June 2014 has had a far-reaching impact on Nigeria's economy, which relies to a large degree on energy receipts. Additional issues that have put pressure on the nation's insurance sector include depreciation of the naira, rising claim payments in recent years and, more generally, falling consumption levels among a large swathe of the population.

According to industry statistics, Nigeria's insurance penetration rate (IPR) in 2013 was 0.39 percent, down from 0.48 percent in 2010. However, Nigeria's IPR worsened to 0.06 percent in 2016 – by comparison, South Africa's IPR reached 13.2 percent, the highest in Africa – while the insurance sector's contribution to Nigeria's real GDP was abysmally low at only 0.02 percent.

These statistics provide a good backdrop to the Nigerian insurance sector's huge potential for growth, particularly given the country's positive demographics, namely Nigeria's population of around 180 million people, and the potential upward mobility of substantial segments of the country's populace. As the nation fights the current recession, will a boost in the IPR increase the insurance industry's contribution to Nigeria's GDP?

The industry is far behind in the adoption of modern technology in its operation as situation that could have affected the improvement of insurance penetration in the county. The essence of this study is to find out the effect of Industry 4.0 on the operation of the insurance industry in the country. The study will make use of AIICO Insurance Company as a case study because it was ranked first among the 10 top competitors.

Objectives of the Study

This study intend to achieve the following objectives:

i. To examine the impact of adoption of industry 4.0 on the improvement of insurance companies penetration in Nigeria.
ii. To ascertain the impact of adoption of industry 4.0 on profitability of Nigerian insurance companies.

Research Hypotheses

Ho_1: Adoption of industry 4.0 do not have any significant impact on improvement of insurance penetration in Nigeria.

Ho_2: Adoption of industry 4.0 do not have any significant impact on improvement of insurance profitability in Nigeria.

2. Literature Review:

Concepts of industry 4.0

In Germany, the term "Industry 4.0" according to Vu and Anh (2017) is generally the equivalent of Forth Industrial Revolution (4IR). In 2012, the Working Group on Industry4.0 presented a set of Industry 4.0 implementation recommendations to the German federal government, in which it defines the emergence of the next production revolution as the convergence of the physical and thevirtual worlds—the Cyber-Physical systems (CPSs),which can monitor and control various stages withinthe production process by creating parallel virtual copies of the physical world and autonomously make prompt and effective decisions. What is entailed with a more prevalent application of CPSs is potentially a boost to productivity and more efficient resource allocation.

It is worth noting that this approach to Industry 4.0 is notthe only one, even within Germany. For example, Lasi posits that Industry 4.0 refers to a range of concepts, amongwhich CPSs are just one among others which cannot be possibly classified in individual cases (Lasi, Fettke, Kemper, Feld, & Hoffmann 2014). Meanwhile, discretenew technologies and their impacts on

industrial businessare individually discussed, such as 3D-printing as thecause for the next industrial revolution (Berman, 2012) or big data as anenabler to Industry 4.0.(Lee, Kao & Yang, 2014). In certain cases, there are doubtsover whether Industry 4.0 is just hype, or it can truly bringabout radical changes in production (Drath, & Horch, 2014).

Technology, Disruption and the Insurance Industry

Technology-led disruption, according to Crawford et al (2018) is set to continue for the insurance sector over short-term and long-term. They maintained that the pace of digital acceleration is set to continue in the insurance industry in the near future. As a result, the sector is set to continue a fundamental transformation. They also advise that autonomous vehicles, wearable, IoT are just a few of the major changes that insurers will need to navigate and adapt to in the next decade or so Crawford et al went on to reveal that inevitably not all will be successful and it is more than likely that at least one major insurer will fall victim to disruption as it has already happened in many other sector.

A key outcome of the combination of disruption and digital adoption, according to Crawford et al is that cross-sector convergence is becoming increasingly important and this is leading to a fundamental redesign of traditional value chains as well as the need to enter in new types of partnerships. For insurers, participating in digitally connected ecosystem "partnerships" is not natural and requires very different behaviors and commercial approaches versus the prevailing norm On the deployment of technology to insurance operations the Institute of International Finance observed that until recently, insurance has been a virtual island in a sea of technological change. It went on to say that while new players worked to disrupt banking and wealth management—after entirely transforming music, publishing, travel, taxis and booking—insurance seemed to be operating much as it had for decades. The Institute also noted that that era of relative stability has ended with the increasing deployment of advanced sensor technologies and related services. Insurance is now, like other major industries, grappling with the risks and opportunities of new technologies.

Thus, it is pertinent to agree with the Institute of International Finance (2016) that two major impressions emerge: technology is changing the nature of risk and is enabling new products, services and channels. One of the most exciting implications resulting from these developments is expanded insurability for low-income populations, which we will cover in our upcoming companion report, "Insurance Inclusion."

It is pertinent to note that he phenomenon of Industry 4.0 was first mentioned in 2011 in Germany as a proposal for the development of a new concept of German economic policy based on high-tech strategies (Mosconi, 2015). The concept has launched the fourth technological revolution, which is based on the concepts and technologies that include cyber-physical systems,

the Internet of things (IoT), and the Internet of services (Lasi, Fettke, Kemper, Feld, & Hoffmann 2014; Ning & Liu, 2015), based on perpetual communication via Internet that allows a continuous interaction and exchange of information not only between humans (C2C) and human and machine (C2M) but also between the machines themselves (Cooper & James, 2009). This communicational interaction influences the establishment of knowledge management 4.0 (Dominici, Roblek, Abbate, & Tani, 2016).

Information Technology and Nigerian Insurance Industry

Technology is the key to the insurance sector for its evolution and overall growth. It not only adds value to the industry but also to some extent directs its future with changing time and its requirements. Inventions and technology have its affects from influencing underwriting decisions to helping streamline business processes. The use of mobile devices, internet, GPS and other technical applications has played significant roles in various ways. It has helped the companies not only to market research, market penetration, and business promotion and market development but also to provide after sales service, understanding customer satisfaction and many more. Insurance companies' data collection and data analysis has become possible only using various software and hardware (Ostaga, 2018).

ICT are catalyst to economy growth and development (Kodakanchi *et al*., 2006). The role of ICT in national development cannot be over emphasised. The United Nations Development Programme (2001) describes ICT as a powerful enabler of development due to its role in the society and national development. Likewise, Datta and Agarwal (2004) show that economic benefits of ICT can be direct (through increases of employment and demand) and indirect (notably through social returns). Moreover, effective ICT network provides necessary information need of a nation economy - industry, commerce, agriculture, services sector - to foster necessary structural linkages for sustainable growth (Bhatnagar, 2005; Anie, 2011). Decision on ICT investments must take cognisance of other socioeconomic factors in order to facilitate growth in developing nations, such as Nigeria (Mbarika *et al*., 2003). ICT are fundamental to every sector of the Nigeria economy. In this regard, Kramer *et al*. (2007) highlight the role of ICT in modern economy growth and development. According to them, ICT reduces transaction cost thereby improve productivity; offers immediate connectivity by improving efficiency, transparency and accuracy; substitutes for other, more expensive means of communicating and transacting; increases choice in the marketplace in order to provide access to otherwise unavailable goods and services; widens the geographical scope of potential markets; and channels knowledge and information necessary for sustainable development (Kramer *et al*., 2007)

In Nigeria, ICT development and usage is enhanced by the nation's federal government through establishment of the National Information Technology

Development Agency (NITDA) in 2001. NITDA is an agency responsible for fostering the development and growth of IT in Nigeria. The agency regulates, monitors, evaluates, and verifies progress of IT development in Nigeria, under the supervision and coordination of the Federal Ministry of Science and Technology (NITDA, 2013). NITDA power has further been enhanced by National Information Technology Development Agency Act (NITDA Act) of 2007 to ensure effective operation and implementation of National IT policy in Nigeria. Consequently, Nigeria is one of the world's fastest growing telecoms market and largest telecoms sector in Africa. Nigeria is ranked as one of the largest internet usage in Africa; with online population of 45, 039,711 users, representing 26.5% of the nations' population (ITU, 2013; IWS, 2013). Likewise, the nation's internet penetration in 2012 was 28.4%, representing 28.9% of African total internet usage (ITU, 2013; IWS, 2013). The nation's ICT development and usage is far above the International Telephone Union's (ITU) benchmark of 1% (Ndukwe, 2005). This suggests that the ICT culture in Nigeria economy has improved significantly.

Modern society and businesses are threatened by higher risks than ever. It is therefore necessary that insurance firms' should develop and maintain a high level of ICT usage in order to meet the nation's insurance needs, to enhance their profitability and to contribute positively to the economy. This implies that there is a positive relationship between ICT and organisational activities (Wali, 2010). Recapitalisation has resulted in installing substantially better developed IT facilities in insurance companies in Nigeria (Ayeleso, 2010). Development and usage of ICT in the insurance industry is relevant as its foster flexible, time conscious and customer focused service delivery. ICT infrastructure can reduce transaction costs, and improve outputs of firms in various sectors of the economy, including insurance (Röller and Waverman, 2001). Thus, ICT enables insurance companies to explore the benefits of technological advancements to take timely decision to improve the Nigeria insurance industry competitive advantage (Pankajakshi and Shailaja, 2012). Likewise, ICT adoption can significantly impact the insurance industry by improving the mode of operation and development of range of services to customers; by creating multi-channel communication between the company and customers; and by actualising effective organisation and efficient management of customers' information (Caviello, 2008). Consequently, ICT, if adequately engaged by insurance firms, can ensure creation and maintenance of a flexible business network of inter-organisational arrangements within the Nigerian insurance industry (Jaiswal, 2009). More interestingly, almost all insurance companies in Nigeria have internet, website and on-line real time e-insurance facilities which have improved the scope of insurance practice in Nigeria. Considering the fact that the insurance sector is a major player and contributor to the nation's economic development, coupled with the apparent benefits of ICT in enhancing competitive advantage of the Nigeria insurance

industry.

The use of ICT in the insurance industry, according to Fadun (2013) is relevant and beneficial considering the significant role of insurance in the economy. Amongst other, insurance promotes business activity by providing financial intermediary services necessary to induce economy growth (Ward and Zurbruegg, 2000; Liedtke, 2007). The insurance industry consolidation, particularly the recapitalisation, seeks to ensure that the industry contribute positively to the economy (Obaremi, 2007). ICT usage has considerately improved operations and performance of businesses in Nigeria (Adegbemi et al, 2012; Adewoye and Akanbi 2011). It is, therefore, expected that the impact of the consolidation will enhance the use of ICT by stimulating some form of competitive advantage, accuracy and efficient transactions to improve the quality of service delivery in the Nigerian insurance industry.

Theoretical Reviews:

Theory of Regulation

This study adopted the theory of regulation. Regulation plays a very important part in the maintenance of order in a society or group. It is as a result of this that the government once in a while comes up with regulations to help it maintain order and achieve control in certain aspects of the lives of its citizenry. It is through regulations that the government can effectively achieve efficiency in the allocation of resources (Arrow, 1979; Schlessinger & Doherty, 1985). The public interest theory provides that the government through regulations attempts to overcome the disadvantages of imperfect competition, unbalanced market operations, missing markets and undesirable market results. In this way, regulations can be used to address identified problems in the system.

It is line with the above there will be need for proper regulation of the industry so that some of the companies do not abuse the use of technologies in their operations. This may further create more problem of distrust of the industry.

Empirical Review

In a study that offers a pioneering perspective on how new technologies may affect the core business functions in industries, while presenting an example through the lens of the relationship between the insurance sector and underwriting, Akkor and Ozyykel (2020) note that there are gaps between the extant competencies of workers as compared to evolving required qualifications are widening very fast, which indicates an urgent need for an increased level of education for the workforce. In addition, the particular competencies of an insurance underwriter that should be prioritized for development are revealed. Based on our investigation of the insurance industry; preparedness for both disruptive and transformative challenges, better talent training programs, and increased up skilling training activities in order to maintain competition and

furthermore, focus on building differentiating capabilities are recommended (Akkor and Ozyuksel, 2020).

Roblek, Mesko and Krapez (2016) in their article on Complex View of Industry 4.0 focused on the importance of industry 4.0 and consequently the internet-connected technologies for the creation of value added for organizations and society. The study noted that the fourth industrial revolution is happening now; and that it requires from each company and each individual a rethinking of what is expected or desired from the smart project and smart internet-connected devices.

Similarly in a study by Iskandar, Hafizah & Hermansuyur (2020) titiled The Impact of the Industrial Revolution 4.0 on the Insurance Industry and whether if the assets and investments play a role in investment yield, the researchers found that there are an influence of Assets and Investment on Investment Yield on insurance companies in the Industrial Revolution 4.0 era. They added that in the era of the industrial revolution, 4.0 potential insurance improve economic growth through several aspects, namely promote financial stability; facilitate trade and commercial activities: mobilize domestic savings, offering a variety of risk management on capital, increase more efficient allocation of capital and reduce the risk of loss and can increase Investment Yield for shareholders and stakeholders.

Yildrum (2019) in a study titled Industrial 4.0 and its effect on Insurance sector found that one of the most important preconditions for the realization of the Industry 4.0 revolution is that companies have completed their digital transformations. New technologies and digitalization.

3. Methodology

The survey design was adopted as a means for assessing the impact of industry 4.0 on the operations of insurance companies in Nigeria. The population of the study comprise 559 of employees of AIICO Insurance Company .AIICO Insurance Company was chosen for this study because it was ranked first among its top 10 competitors. The study made use of purposive sampling technique to select 100 employees who are at the management level and have the required experience to respond to the study. The study made use of primary data collected from the respondents through the use of structured questionnaire. The data collected were presented using frequency tables while chi-square ( ) test was used to analyze the formulated hypotheses. This will be done through the use of SPSS package.

4. Results and Discussion

Hypothesis 1

Ho_1: Adoption of industry 4.0 do not have any significant impact on improvement of insurance penetration in Nigeria.

Table 1: *Test Statistics of Impact of adoption of industry 4.0 on improvement of insurance penetration in Nigeria.*

	Impact of adoption of industry 4.0 on improvement of insurance penetration in Nigeria.
Chi-Square	76.380[a]
Df	4
Asymp. Sig.	.000
a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 15.8.	

Source: Author's Fieldwork, 2021

Decision: From the figures above, calculated chi square (x^2) is 76.380[a] which is greater than tabulated chi square (x^2) of 9.49 at 0.05 % level of significance, therefore the Null hypothesis (Ho), Adoption of industry 4.0 do not have any significant impact on improvement of insurance penetration in Nigeria is rejected. The conclusion is that Adoption of industry 4.0 have significant impact on improvement of insurance penetration in Nigeria.

Hypothesis Two

Ho_2: Adoption of industry 4.0 do not have any significant impact on improvement of insurance profitability in Nigeria.

Table 2: *Test Statistics of Impact of adoption of industry 4.0 on improvement of insurance profitability in Nigeria.*

	Impact of adoption of industry 4.0 on improvement of insurance profitability in Nigeria.
Chi-Square	69.418[a]
Df	4
Asymp. Sig.	.000
a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 15.8.	

Source: Author's Fieldwork, 2021

Decision: From the figures above, calculated chi square (x^2) is 69.418[a] which is greater than tabulated chi square (x^2) of 9.49 at 0.05 % level of significance, therefore the Null hypothesis (Ho),which stated that adoption of industry 4.0

do not have any significant impact on improvement of insurance profitability in Nigeria. is rejected. The conclusion is that Adoption of industry 4.0 have significant impact on improvement of insurance profitability in Nigeria.

5. Conclusion and Recommendations

This study was carried out in order to examine the impact of the adoption of industry 4.0 on the operations of the Nigerian insurance industry. From the findings of the analyses, this paper concludes that even though the industry 4.0 has a good impact on the operations of insurance companies, it is not without some challenges. Unless insurance companies look for a way to surmount this challenges the full benefit of the industry 4.0 will not be enjoyed.

Also the study shows improvement in insurance penetration as a result of the adoption of industry 4.0 by Nigerian insurance companies. With the adoption of Industry 4.0 more clients can be reached and services can be delivered promptly.

The adoption of industry 4.0 makes service delivery and work generally easier for Nigerian insurance companies which in turn leads to improvement in profitability. One of the downside to the adoption of industry 4.0 is that less workers are required. An insurance company that has embraced this technology ends up downsizing since automated services are now available for client

Based on the findings generated from this study the following recommendations were made:

i. NAICOM should partner with insurance companies so they have easily access the needed infrastructure to make the adoption of industry 4.0 easy because some insurance company lack the needed funds.
ii. Insurance companies should create more awareness of this technology to potential clients through free workshops at place of work and other appropriate places
iii. As insurance companies embraces industry 4.0, they can also help the laid off staff get another job.
iv. Banks should make loan available for insurance companies so they can fund the transition to the adoption of industry 4.0

References

Adetunji, A. L. Nwude, L. C. & Udeh, S. N. (2018). Interface of Insurance and Economic Growth: Nigerian Experience. International Journal of Economic and Financial Issues, 8(4), 16-26

Akkor, D. G. and Ozyuksel, S. (2020). The effects of New Technologies on the insurance sector: A proposition for underwriting qualifications for the future. Eurasian Journal of Business and Management, 8(1), 85-99

Anoka, A. F. & Uche, W. J. (2018) Impact of Inflation on Insurance Claims in Nigeria. *Journal of Economics and Finance,* 9(6). DOI: 10.9790/5933-0906014353 www.iosrjournals.org

Arrow, K. J . (1979). Insurance, Risk and Resource Allocation, Aspects of the Theory of Risks. London: Pitmans Publishing.

Ayeleso, O. (2010). *Nigeria @50: Insurance in retrospect.* Retrieved from http://www.tribune.com.ng/index.php/insurance/11686-nigeria--50insurancein- retrospect on 20;02;2019.

Berman, S. J. (2012) "Digital Transformation: Opportunities to Create New Business Models," *Strategy & Leadership* 40 (2) 16–24, https://doi.org/10.1108/10878571211209314.
Coviello, A. (2008). *The impact of ICT in the insurance industry. The role of customer relationship management*. Retrieved from http://www.cersi.it /itais2012/ pdf/002.pdf on 20:02:2019.
Cooper, J., & James, A. (2009). Challenges for database management in the Internet of things. *IETE Technical Review*, *26*, 320-329. doi:10.4103/0256-4602.55275
Dominici, G., Roblek, V., Abbate, T., & Tani, M. (2016). "Click and drive": Consumer attitude to product development. Towards future transformations of driving experience. *Business Process Management Journal*, *22*, 420-434. doi:10.1108/BPMJ-05-2015-0076
Drath, R. and Horch, A. (2014) "Industrie 4.0: Hit or Hype?," *IEEE Industrial Electronics Magazine* 8 (2) 56–58, https://doi.org/10.1109/MIE.2014.2312079.
Iskandar, M., Hafizah, B. A., & Hermansuyur, E (2020). The impact of the Industrial Revolution 4.0 on the Insurance Industry and whether if the assets and investments play a role in investment yield. Humanities and Social Sciences Reviews, 8(2), 345-351
Lasi, H. (2014) et al., "Industry 4.0," *Business and Information Systems Engineering* 6 (4) 239–42, https://doi.org/10.1007/s12599-014-0334-4.
Lee, J., Kao, H. A. and Yang, S. (2014) "Service Innovation and Smart Analytics for Industry 4.0 and Big Data Environment," in *Procedia CIRP*, vol. 16, 2014, 3–8, https://doi.org/10.1016/j.procir.2014.02.001.
Mosconi, F. (2015). *The new European industrial policy: Global competitiveness and the manufacturing renaissance*. London, England: Routledge.
Obaremi, N. (2007). Nigeria insurance special report: Big is beautiful. *African Business*, *4*, 51-62.
Ostaga, A. M. (2018). Impact of Technology and Innovation in Insurance Sector. International Journal of Management, IT & Engineering, 8(12), 253-258
Pankajakshi, R. and Shailaja, M. L., (2012). The role of information and communication technologies (ICTs) in service sector. *World Journal of Science and Technology*, 2(5), 66-70.
Roller, L. H., & Waverman, L. (2001). Telecommunications infrastructure and economic development: A simultaneous approach. *American Economic Review, 91*(4), 909-923.
Schwab, K. (2017). *The Fourth Industrial Revolution*. New York: Crown Business.
Yildrum, I. (2019). Industrial 4.0 and its effect on Insurance sector. Research Gate, 253-261