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Digital Transformation in the Courier Service SMEs in Nigeria

A Study Utilizing the Industry 4.0 Technology Model

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Abstract

In contemporary times, industries are moving from manual business activities to digitalization, which helps ameliorate operational incapability and improve productivity. In the courier industry, digital transformation has led to the evolution of Industry 4.0, which refers to the integration of new technologies into supply chain and production operations. Industry 4.0 has been known to impact the courier service positively; its technologies (digital tools) make it possible for operations to be done in real time with little or no human assistance. However, in developing countries like Nigeria, it is not easy to ascertain the impact and success of this digital shift with the application of Industry 4.0 in the courier service SMEs as only a few cases have been adduced.

This study has examined how digital transformation with the application of Industry 4.0 and its technologies can impact courier services SMEs in Nigeria, as well as the challenges of implementing them.
For the most part, I have used the qualitative method in the form of a semi-structured interview guide to collect primary data. Ten employees from the case company, Tranex PLC, were interviewed. Secondary data that were used were derived from a variety of sources such as reports, books, Google Scholar, relevant internet publications, etc.

This research, based on empirical evidence, has revealed that there is a connection between Industry 4.0 and improved courier services, however, the degree of impact on SMEs is uncertain. This is because SMEs have not yet embraced the idea due to the challenges of financial and human constraints. There is an explicit gap in the availability of resources to small and large enterprises in Nigeria, which has made it impossible for courier service SMEs in Nigeria to ascertain the impact of Industry 4.0 technologies.

Language: English
Keywords: Digital Transformation, Industry 4.0, Courier service firm, SMEs, and Tranex PLC.

Table of contents

1. Introduction

Change is the only constant thing in life. Individuals, groups, companies, institutions, and nations that refuse to change with time and situation tend to face the survival challenge(s) or lose their competitive advantages in the contemporary world (Akkaya, 2020). Present-day reformers believe that the integration of the global economy has made digital transformation processes a key part of the functioning and characteristics of modern-day companies (Reis & Gao, 2021). Digital transformation in the business sector has become one key example or hallmark of business activities and operations. Innovation is strongly associated with the culture of change and anyone or business that fails to understand or function along the line of this doctrine could be unable to compete or completely be left behind.

Digital transformation is defined as the fusion of computer-based technologies into a company's commodities, plans, and procedures (Maheshwari, 2019). It has been known to add value to manufacturing and logistics, especially in SMEs in Nigeria by aiding the digital transition process. Mikalef and Parmiggiani (2022) stipulate that digital transformation is a process that assists industries in adopting the use of automated systems and information systems to enhance business activities and productivity. These emerging technologies are associated with the fourth industrial revolution which is also referred to as 4IR or Industry 4.0. According to Castelo-Branco, Amaro-Henriques, Cruz-Jesus and Oliveira (2023), Industry 4.0 is the integration of smart digital technologies into production and courier service operations. In contemporary times, in courier services, one of the digital transformations is the adoption and utilization of the Industry 4.0 technology model. According to Lahane S. et al. (2023), technologies like IoT, Blockchain, and cyber security of Industry 4.0 help to curb challenges like food traceability, transportation, and packaging in a sustainable food supply chain. Taking into consideration, the continuous growth of obtainable computational powers, utilization of robotic systems, and cloud-based platforms, logistics firms can determine supply chain and product lifecycle management accurately (Papakostas, Constantinescu & Mourtzis, 2020).

In delivery companies, Industry 4.0 has aided in the swift transformation of the courier industry from manual operations to digitalization and automation, which has brought about an immense increase in growth, performance, and market abilities.

1.1 Background

This research is for the case company Tranex PLC in Lagos, Nigeria, which is involved with courier service operations also known as logistics activities. Their main duties consist of transportation, conveying, or delivery of messages and packages from one party to the other.

The core focus of this research is to study the digital transformation of small and medium-sized enterprises in the courier service sector in Lagos, Nigeria through the utilization of the Industry 4.0 technology model. The departments of order processing warehouse, dispatch, and transportation that function with these technologies will be the center group from the case company, Tranex PLC.

One of the numerous advantages of digital transformation in the logistics sector both large, small, and medium enterprises (SMEs) is the vast opportunity to increase their competitiveness through the adoption of industry 4.0 technologies. Most large enterprises, all over the world, that have implemented these new technologies have seen the connections between the fourth industrial revolution (industry 4.0) and enhanced logistics operations in their establishment. However, the question being asked is whether courier service SMEs, especially in developing countries like Nigeria have been able to attain this digital transformation and apply such modern technologies swiftly. Digitalization is the application of digital technologies to reform or add value to a business model and create value-making opportunities and new revenue (Mikalef & Parmiggiani, 2022). Digitalization also helps manage business hitches, convolution, and accessibility-related issues through its fourth industrial revolution (Industry 4.0).

The desire to conduct business activities efficiently and effectively has been a critical goal and part of industrial revolutions. History has it that these industrial revolutions are of different stages; the first industrial revolution (1IR or Industry 1.0), the second industrial revolution (2IR or Industry 2.0), the third industrial revolution (3IR or Industry 3.0), and the fourth industrial revolution (4IR or Industry 4.0) (Carvalho & Cazarini, 2020).

The desire to achieve effectiveness and efficiency is also a vital part of the philosophy of scientific management by renowned management scholars such as Frederick Taylor. From the first industrial revolution to the current fourth industrial revolution, businesses and entrepreneurs have welcomed and adopted strategies that would help them realize

competitive advantage, outsmart competitors, and meet customers' expectations and satisfaction.

For courier service organizations, adopting the Industry 4.0 model is one of the biggest ways and strategies for embracing digital transformation. Industry 4.0 model involves digitalizing or adopting digital technologies in business activities and operations. According to Hahn (2020), the digitalization of the industrial field entails Industry 4.0. Industry 4.0 is a broader model for turning around logistics business operations and activities relating to the production, improvement, and distribution of products and services to realize set objectives (Hahn, 2020). Within this broader model, adopting innovative technologies such as the Internet of Things (IoT), cloud computing and analytics, machine learning, and AI is a key strategy in enhancing courier service operations (Lahane et al., 2023).

In the current fourth industrial revolution, the strategies adopted by courier service organizations to realize competitive advantage, outsmart competitors, and meet customers' expectations and satisfaction are unique largely from the previous strategies adopted by businesses and entrepreneurs in the first, second, and third industrial revolutions (Carvalho & Cazarini, 2020).

However, scientific facts have revealed that differences exist concerning the impacts, outcomes, or results (negative and positive) of adopting the Industry 4.0 model as an innovative strategy for turning around business operations and services from one organization to another, and one country to another. In most developing countries to be specific the impact or outcome of adopting this strategy by courier service SMEs has a unique outlook, because of different challenges such as poor digital infrastructure, limited funding, unfriendly governmental regulation, poor business environment, etc. Therefore, in this research, I focus on studying digital transformation in the Courier service SMEs in Nigeria through the utilization of the Industry 4.0 Technology model.

It is also good to mention that, throughout this thesis, I will be using the fourth industrial revolution, 4IR, and Industry 4.0 interchangeably because they all mean the same thing.

1.2 Research problem and significance

Some studies have proposed a digital transition of patterns, strategies, or readiness appraisal for practical utilization of Industry 4.0 (Grooss, Presser & Tambo, 2022; & Clausen,

2023) but the impact of Industry 4.0 technologies on the conception of courier service SMEs is still uncertain (Barreto, Amaral & Pereira, 2017).

Therefore, it is not easy to ascertain the digital shift impact of Industry 4.0 systems on courier services SMEs particularly in developing countries like Nigeria because just a few cases have been cited (Peter, Pradhan & Mbohwa, 2023). Moreover, it is difficult to elucidate the connection between improved courier services and the rise of Industry 4.0, taking into consideration the small number of empirical studies that have tried to derive the model's significant impact on courier services (Adeitan, Aigbavboa & Bamisaye, 2021). Additionally, it is important to ascertain the possible challenges and barriers to implementing these technologies (Adeitan, Aigbavboa & Bamisaye, 2021).

1.3 Purpose of the thesis and research questions

We dwell in a business world that is constantly changing and adopting emerging digital technologies for the growth and competitive advantage of the company (Berawi, Suwartha, Asvial & Harwahyu, 2020). For courier service SMEs seeking a competitive advantage over their competitors, this research aims to present an in-depth understanding of Industry 4.0 and its leverage on existing courier services since the research topic has been understudied in the context of developing countries, especially Nigeria.

The implementation of new technology requires a considerable manpower investment and physical and financial resources. This means start-ups would have to plan strategically and implement the necessary steps to lay hold of opportunities and conquer the obstacles that would arise while trying to comprehend the advancing needs and constraints. These limitations could be digitalization, international economic unification, structure, quality, and educational and professional expertise for the growth of the firm (Matt, Matt, Modrák & Zsifkovits, 2020).

Research Objectives

To find out the impact, problems, and challenges of applying Industry 4.0 in the courier service SMEs in Nigeria. These objectives are the reason for the next:

Research Question

What are the impact and challenges of applying Industry 4.0 in courier service SMEs in Nigeria?

1.4 Thesis project limitations

The digital transformation concept of Industry 4.0 technology is yet comparatively new in some countries, also, the availability of the quantity of country-specific academic research is however quite minimal. The method for obtaining maturity is still in the evolving phase and the anticipated networks with advantage will further strengthen findings. Consequently, the interviews that were done tended to not vividly display or show the perspectives of a substantial population. Therefore, there is a high possibility that one of the barriers to self-assessment is the current level of maturity or absence of capability and readiness concerning digital technology.

In this study, the focus is only on technologies used by the case company (Tranex PLC,) and does not include other courier services or IT firms. The core city where the case company is located is Lagos Nigeria. It will not address other Sub-Saharan countries and Asia. The main department to be interviewed is a team of experts from these departments; order processing warehouse, dispatch, and transportation or driving.

A delimitation and limitation of the research is concerned with the fact that it is limited to examining only one organization’s activities. It should be viable to hypothesize from a single example or a small number of instances in qualitative research. The financial and personal limitations of the author meant that she could only afford energy and time for only one company. In general, time constraints meant most elements of this project were put together in six months because of the late attainability of original data in connection to the thesis research schedule.

The implementation of other significant investments in data derivation or analysis and traveling to Nigeria (one week for a relative's wedding then seized the opportunity to do the interview onsite) for interviews for the thesis project was feasible and was solely financed by the researcher.

1.5 Structure of the thesis

This thesis is made up of seven chapters. Previously, I have presented the introduction, background, research problem, significance, purpose, the case company and its digital technology, and delimitations of the thesis study and these are what make up the first chapter.

The second chapter will consist of the introduction of the supporting literature for this master thesis to further broaden the knowledge of the subject.

In the third chapter, I will present the method that was used to collect data for this study.

The fourth chapter will be the presentation of the empirical findings and data analysis.

The fifth chapter consists of a discussion of the analysis made in the fourth chapter and its correlation with the theoretical framework to deduce an answer to the research question.

The sixth and last chapter involves the conclusion of the research and recommendations for future research.

1.6 The case organization (Tranex PLC)

A process whose objective is to alienate a business by prompting remarkable changes to its properties through the implementation of connectivity technologies, computing, communication, and information is known as digital transformation (Mikalef & Parmiggiani 2022). One of the ways courier service companies have embraced digital transformation is through connectivity technology, which is the utilization of Industry 4.0 or the fourth industrial revolution.

The case organization in my thesis research is Tranex PLC. Tranex PLC is a courier firm situated in Nigeria, West Africa, which began operation in the year 1984. They are engaged in all kinds of parcel delivery operations, both domestic and global. Tranex international deliveries are via the ARAMEX (UK) LTD networks in over 200 countries globally (Tranex, 2023). They started as a small courier service company with the vision of not just building their business but to building customer relations and going international. The company has about 68 employees and can be categorized as a medium enterprise and generally referred

to as SMEs. Tranex PLC sought and got recognized on the Nigeria Stock Exchange with a share capital of N250,000 and more than 3,500 shareholders in 1993 (Tranex, 2023).

For Tranex PLC, their integrated Track and Trace technology online platform helps to track all the shipping activities, which additionally, creates automatic evidence for delivery records on a daily, weekly, and monthly basis on the dependence on customers' demands. According to Tranex PLC's websites, the company uses many motorcycles, delivery vehicles, buses, and trucks for its day-to-day activities. Tranex PLC operations are committed to continually showing complete commitment to quality service, innovative ideas, and professional credibility.

I chose the firm as a case study because of its early utilization and adoption of logistical technologies for its smooth business operations, and because of how well and widely Nigerians use the company's logistic services. Lastly, it is categorized under small and medium-sized enterprises (SMEs).

2. Supporting literature for the study

In this chapter, I will present the theoretical framework for this research. The purpose of this chapter is to give an insight into what digital transformation entails, present a broader view of SMEs, the idea behind the fourth industrial revolution (Industry 4.0), and the technologies that relate to it. This stage has become imperative for this research because it gives detailed information that can be utilized as a basis for a broader investigation of the challenges and impact Industry 4.0 will have on courier service SMEs in Nigeria, which is brought about by digital transformation. In this regard, I will be using an exploratory literature review. An exploratory review is a type of literature review used to outline the actual existence in the academic literature of this research project as regards the research methods, theory, and empirical evidence (Adams, Khan & Raeside, 2014).

The literature review has given an insight into what digital transformation is, and how it relates to industry 4.0. Erboz (2017) has defined Industry 4.0 as the integration of new digital technologies that help to enhance efficiency in the supply chain and courier service industries. In this regard, there are some identified key pillars of Industry 4.0: Big data and Analytics, Cloud Computing (CC), Internet of Things (IoT), Blockchain, and Artificial Intelligence (AI) (Erboz, 2017). The literature has stated that Industry 4.0 technologies greatly impact the efficiency of logistics companies and has also shown that courier service SMEs need these digital tools to enhance productivity (Matt, Modrák & Zsifkovits, 2020). However, it has been discovered that SMEs in Nigeria face some problems and challenges in implementing industry 4.0 technologies, as a result, the impact of these emerging technologies cannot be determined. It means, there is still a gap between Industry 4.0 technologies and enhanced operations in SMEs. According to Matt et al. (2020), SMEs lack the human and financial resources to systematically examine the impact and challenges of applying Industry 4.0. Adeitan, Aigbavboa, and Agbenyeku (2020) also gave a comprehensive reappraisal of these technologies and the challenges encountered by the courier service SMEs during the process of implementing them in Nigeria.
Literature is important for a better understanding of the subject and for answering research questions.

2.1 Digital transformation in courier service

Innovation is crucial in contemporary times, and the ways of deriving innovative ideas that can be transmogrified into new knowledge bring about the motivation of an organization, companies, and places (De Propris & Bailey, 2020). Digital transformation is the utilization of new and emerging technologies to drive remarkable development in every business section (Maheshwari, 2019). It is known as the process of incorporating computer-based technologies into a company's procedures, products, and policies. Digital transformation's main goal is to improve an organization by fostering remarkable changes through the integration of connectivity technologies (Mikalef & Parmiggiani, 2022). For manufacturing, energy, and logistics companies around the globe, digital transformation is achieved by attaining their Industry 4.0 goals (Nokia, 2023). In Industry 4.0, both the Internet of Things (IoT) and the Internet of Service (IoS) show the digital integration of production and services (European Parliament, 2016). The digital transformation to Industry 4.0 begins with receiving data and adding artificial intelligence to add meaning to the received data. The question is, what is Industry 4.0 and its technologies?

2.2 Industry 4.0

The introduction of modern ICT in production is known as the fourth industrial revolution (4IR) or Industry 4.0 (Matt et al., 2023). Industry 4.0 is reforming the methods firms produce, develop, and distribute their products. Industry 4.0 can be defined as the application of emerging technologies to manufacturing and courier service operations under the fourth industrial revolution model which has mainly been studied in production (Castelo-Branco et al., 2023). It consists of a set of innovative technologies that are utilized together for the transformation of the contemporary production paradigm and offering customers and companies products and services with ameliorated augmented value (Castelo-Branco et al., 2023). Industry 4.0 technologies have been combined to play important roles in improving and unifying the courier service and manufacturing organization's business goals and needs. According to Rauch and Woschank (2020), in the span of the fourth industrial revolution, new technologies developed such as automation systems (AS), cloud computing (CC), and artificial intelligence (AI), have been produced to combine digital and physical conditions. Industry 4.0 has the capability of using

communication technologies and internet networks together and combining them with business activities so that physical or manual operations can be carried out through automated systems and technologies. In this digital period, courier companies are proffering online services via applications and web servers where digital technologies are adequate to handle data management and ease of access-related issues (Aniedi, Caleb & Ojobah, 2023). The figure below shows the 9 technological pillars of Industry 4.0.

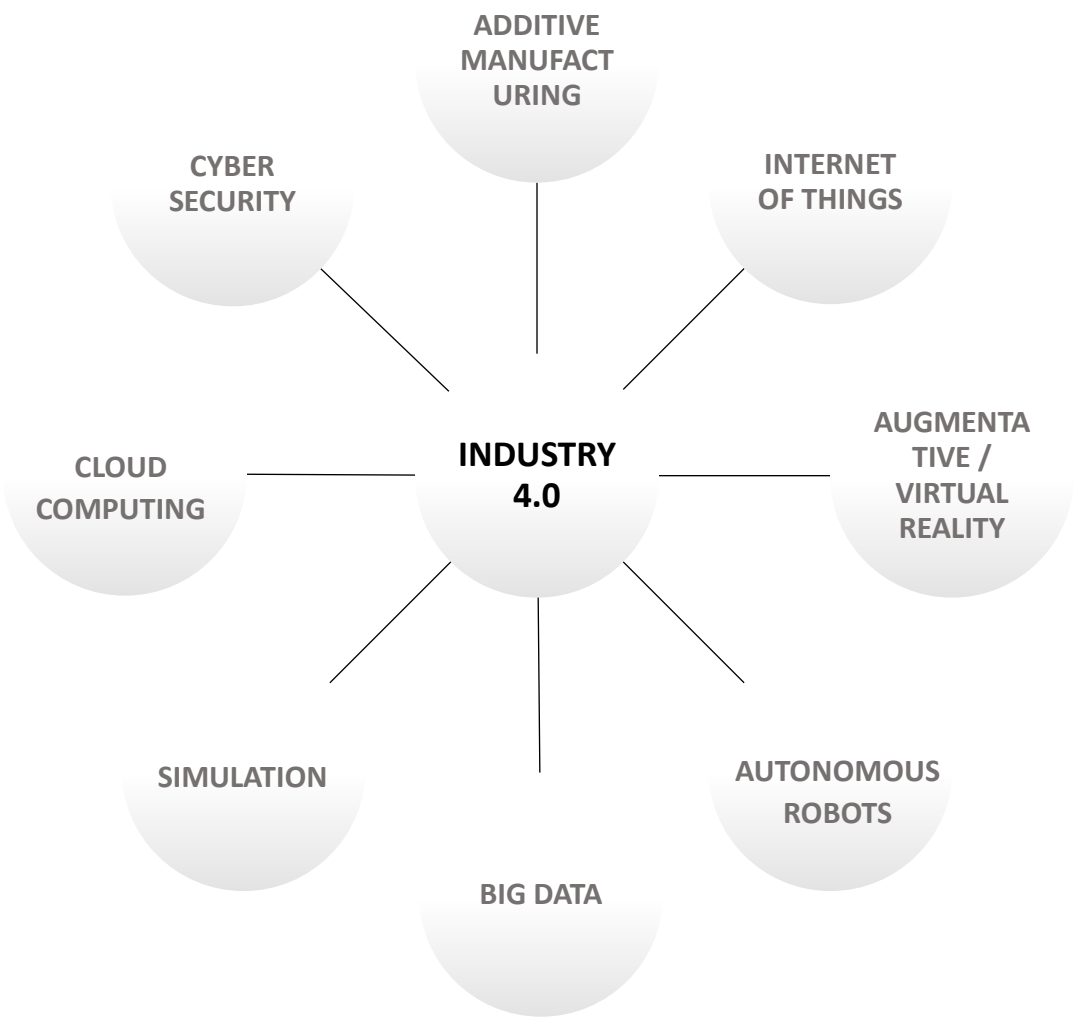

Figure 1: The nine pillars of Industry 4.0 (MITI, 2023)

History has it that the fourth industrial revolution evolved out of all three scientific and technological revolutions rather than the conventional one (Ferreira, 2023). During the first, second, and third industrial revolutions, individuals were able to develop mechanical, electrical, and information technologies to enhance industrial process performance

(Sharma, Bhandari, Pinca-Bretotean, Sharma, Dhakad, & Mathu, 2021). The fourth industrial revolution (Industry 4.0) originated in Germany in the year 2011 and it involves changes directly related to automation aspects integrated with information technology (Carvalho & Cazarini, 2020). Due to the advancement of the third industrial revolution's technology, i.e., the internet, the social system of life has passed through utter transformation, while the world economy has experienced immense growth. Below are the evolution stages of industrial development.

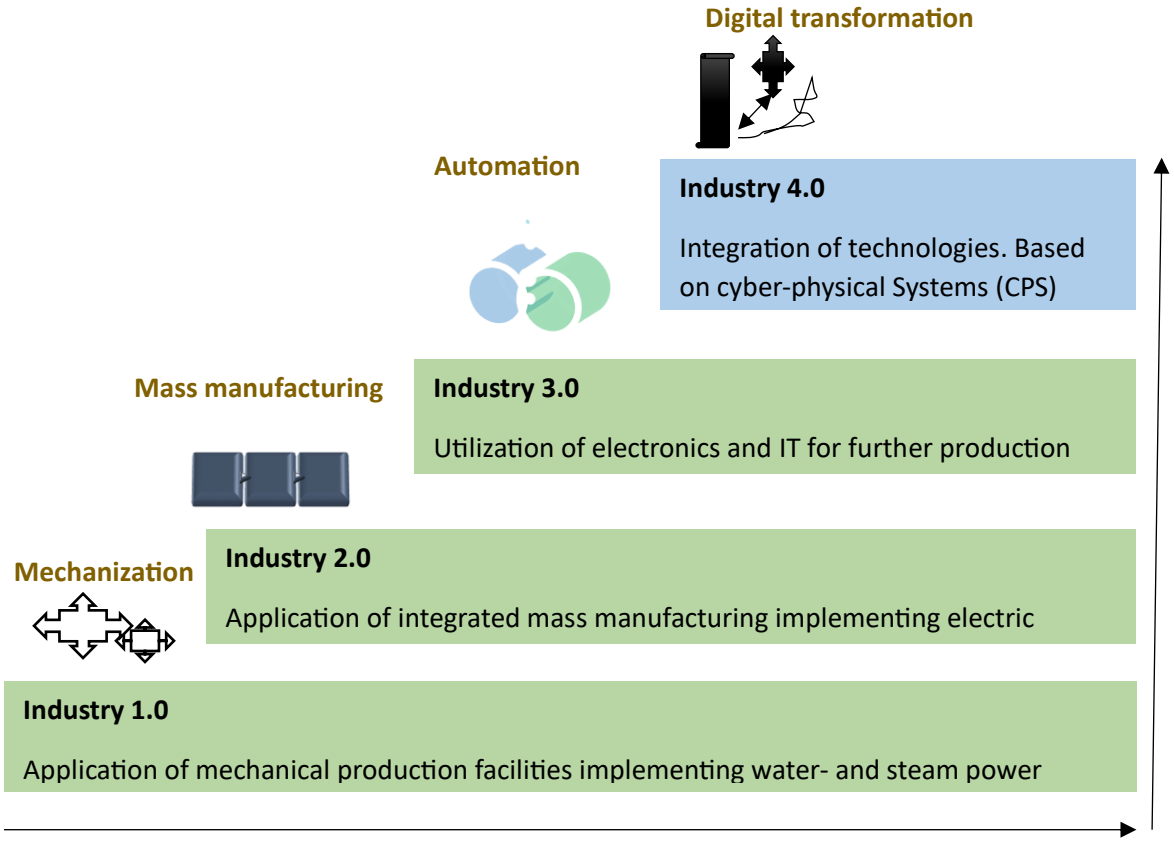

Figure 2: The stages of the four industrial evolution (Schmidtke et al., 2018).

Part of the fourth industrial revolution's core is the third industrial-galvanized nanomaterial-positioned sensing technology. This was brought about by progress in bio-electromagnetic circuits and AI, which can decode and examine great volumes of data at lightning-speed rates and inferred emissions like emotions and brain waves, which were previously known to be inaudible (Ferreira, 2023).

The fourth industrial revolution (Industry 4.0) can proffer productive systems and networks that can recognize and manage the issues connected with business activities. Industry 4.0 is different from the first, second, and third industrial revolutions because of its ability to integrate new technologies and connect them in remarkable ways (Rauch & Woschank, 2020). Its technologies are anchored on digitalization and firms need to update systems and operations as well as connect with automation and technologies to enable the smooth ratification of external and internal issues. According to the European Parliament (2016), Industry 4.0, the Internet of Things (IoT), and the Internet of Services are all terms that describe this new paradigm in industrial production.

The features of the Fourth Industrial Revolution according to the European Parliament (2016) are as follows.

- Interoperability: This is where people, machines, devices, and sensors are communicated and connected.
- Decentralization: The capacity of cyber-physical systems to implement easy decisions on their own and carry out their tasks autonomously is known as decentralization.
- Virtualization: This is when a virtual instance of something is made rather than a physical type.
- Real-Time Capability: It is the ability to receive and investigate or examine data and present the obtained knowledge immediately.
- Service Inclination
- Modularity: It lets any production chain operations transpose instantly.

As previously stated, the fourth industrial revolution (industry 4.0) consists of the integration of various new technologies for improved industry automation. Below are some of the emerging technologies and how they function.

2.2.1 Big Data and Analytics

Data analysis has always been a big challenge when it comes to logistic systems and activities (Erboz, 2017). This is because retrieved data from customers contains planned and

unplanned data where inspection cannot be carried out adequately. Nowadays, courier service organizations are embracing digital transformation in their companies for smooth operations. Digital transformation in courier service firms entails inculcating smart technologies and devices for the firm through the fourth industrial revolution (Maheshwari, 2019). Industry 4.0 lays out big data analytical systems that can inspect and assess the retrieved or collected data to resolve challenges associated with data management and handling problems (Erboz, 2017). Industry 4.0 big data analytical tools were provided to manage data handling issues by creating productive analytical problems and connecting them with the data collection procedures. It is an important pillar of Industry 4.0 due to its ability to track the favorable outcome of a business and compare it to its competitors. However, according to Greco, Maresca, and Caja (2019), the digital economy and factory are visualized as the main problems in the phase of big data Analytics. Through big data analytics, courier service industries can evaluate the received information and recognize the needs of customers and the demands of the courier services. A segment of big data analysis that can predict and evaluate the demands, as well as review the obtained statistics so that effective decisions can be made from the extracted crucial information is known as predictive analysis. According to Sedkaoui (2018), data analysis aids in the accurate prediction of demand and, additionally, helps the company to boost the productive use of the courier assets and convey suitable facilities to the customer. The addition of sensors in the courier activities and systems has the capability to record the situation of machines and systems used in the storehouses, also, providing genuine tracking and monitoring equipment.

Industry 4.0 technologies are important in the courier industries because, through them, logistic firms can take care of the productiveness of the supply chain and inventory monitor-associated challenges, as well as manage complaints in time and allow the customers easy access to the courier service facilities (Gilchrist, 2016).

2.2.2 The Industrial Internet of Things (IoT)

The idea of Industry 4.0 is to combine production, information technology IT, and the Internet of Things (Matt et al., 2023). When it has to do with courier activities, IoT technology assists in tracking products and providing remote access commands which can

help consumers get real-time updates and solve product and data tracking queries (Greengard, 2015). In contemporary times, e-commerce and online shopping platforms are being used by consumers to form larger and more complicated data which is quite difficult for organizations to review and examine the vast datasets. However, the utilization of Industry 4.0, IoT-based communication systems has made the ambiguous problems more subtle (Lee, Lv, Ng, Ho & Choy, 2018). IoT-based communication systems are functional and reliable, which assist courier services and other industries to create productive communication platforms and frameworks to achieve maintained connectivity. For business problems and data access-related issues to be resolved, IoT networks can be linked, monitored, and controlled with other smart devices. Del Giudice, (2016) stipulates that IoT-enabled devices and systems can solve and deal with communication issues and assist industries in transacting information within the working environment.

A good example of a company that engages in e-commerce is eBay (Duh, Sunder & Jamal, 2002). eBay as an e-commerce organization has adopted industry 4.0 technologies and IoT platforms to get real-time details about the supply chain, courier activities, and inventory controls so productive decisions can be implemented (Duh et al., 2002). In this way, eBay allows customers to obtain real-time upgrades concerning product delivery and accurate tracking programs. In courier services, the presence of IoT platforms and networks is effective by performing in a way to brings together different systems and departments through a sole platform/network that helps data to be exchanged at a fast pace (Cirani, Ferrari, Picone, & Veltri, 2019).

2.2.3 Blockchain Technology

This is another Industry 4.0 technology that assists courier firms to grow effective business partners and store operational data. Industry 4.0 technology that was invented to deal with financial and transactional issues that furnish decentralized networks to store the obtained information and control accessibility challenges is known as blockchain technology (Javaid, Haleem, Singh, Khan & Suman, 2021). One of the major attributes of blockchain technology is data transparency. Data transparency can boost the transparency of obtained information by enabling the courier firms to manage the needed additional resources and third parties, which in turn enhances clarity and openness (Banafa, 2020).

Regarding security, courier companies are faced with data breaching and hacking issues as the received products and information from customers can be easily accessed by cybercriminals (Alman & Hirsh, 2019). In managing these security issues, Industry 4.0 conveys blockchain-related security programs that can tackle external and internal threats. With the cryptography programs contained in the blockchain, the data is converted into codes utilizing private keys enabling courier industries to obtain transactional information from customers and third parties, as well as reserve it in databases with top-level security. Unlike conventional logistics, modern and advanced courier systems can deal with accessibility, information storage, and functionality-related worries (Laurence, 2017).

2.2.4 Cloud Computing

Papakostas et al. (2021) opined that Cloud Computing is the building block that is often used by courier service companies. Through cloud-based servers and programs, cloud computing helps to operate courier service activities which aid the easiness of accessing services and tackling or solving data storage and management-related issues (Papakostas et al., 2021). It is, therefore, imperative for logistic firms to apply Industry 4.0 technologies which can assist them in controlling and managing logistic challenges, as well as help the customers get real-time updates and track information in less time for the smooth improvement of operational activities. Cloud computing is another industry 4.0 technology that has the capacity to provide on-demand data storage programs and networks (André, 2019).

In contemporary times, organizations get data from customers that have broader datafiles, and it is challenging for management to save and review such complicated data. Cloud computing provides a network to store and record the received data from customers without difficulties so that data handling and management challenges can be minimized. Novais, Maqueira, and Ortiz-Bas (2019) opined that cloud technology provides a central network for the unification of programmable information technology sources and data storage information storage Through AI, organizations can form or create automated machines and systems for supply chain and courier service management.

Logistic industries can easily build service-oriented architecture and deliver software-tailored services to customers for easy accessibility of received data through the help of cloud technologies.

2.2.5 Artificial Intelligence

The fourth industrial revolution technology with the ability to form automated systems and programs effectively is known as artificial intelligence (AI). AI-enabled devices can perform courier service activities and tasks automatically and reduce human mistakes and challenges in a short time to foster the smooth improvement of logistic firms (André, 2019).

Compared to other industry 4.0 technologies, AI tends to be more efficient and suitable for courier firms that can advance learning, knowledge, reasoning, and operations through tutoring from data and algorithms (Davenport, 2019). Davenport (2019) noted that logistic industries can manage human mistakes, predict the needs of courier service facilities, and maintain market abilities through the help of AI robots and automated machines. This is achieved by understanding and controlling internal challenges associated with inventory management and supply chain. Communication is a key player in courier service companies because it interconnects with the computing networks and carries out business activities more swiftly. Ngo, Guegan, and Dinh-Tri Vo (2023) stipulate that Artificial intelligence can form automated communication networks through machine studying which aids in swift communication with customers and resolving their queries appropriately/accurately without needing human help.

The application of such automated systems and networks makes it easy for the courier service industries to maintain customer satisfaction and experience and assist in boosting operational performance and efficiency. Conveying a great customer experience is imperative to maintain productivity and control satisfaction levels (Davenport, 2019). With the utilization of Industry 4.0 technologies, courier service providers can provide authentic values alongside the supply chain to effectively minimize difficulties and challenges associated with customer satisfaction and product distribution. Solo and Arabnia (2019) suggest that industry 4.0 technologies promise business plans and systems by which courier service firms can make effectual schemes and strategies so that operational productivity

and goals can be attained. Through Industry 4.0, which is made up of digital networks, smart warehouses are being established by courier industries. According to Gupta and Mangla (2020), storing, distributing, and delivering products can be done in less time through AI robots and remote access controls.

Industry 4.0 technology assists warehouse managers in controlling products, smooth-running orders proceeding through AI and robots, also, boosting inventory exactness by tackling human errors and complications (Gordan, Ghaedi, & Saleh, 2023). In logistic activities, the utilization of wearable technologies helps to facilitate picking activities in the warehouse and control the efficacy of the courier models and programs. Additionally, when it comes to information-driven marketing and making decisions, industry 4.0 technology aids courier firms in reviewing information or data associated with customers and products, as well as establishing successful decisions to attain the company's objectives.

2.2.6 Transport Management Systems (TMS)

The technology or software that was solely designed to enable smart supply chain management is known as TMS (TMS, 2022). A TMS enables businesses to strategize, track, and enhance the delivery of products effectively by merging each step of the network in a central platform. According to the MENA Report on TMS (2022), the system brings the following benefits to courier service companies. Thus:

a. It provides insights into the firm's shipment performance, conformity, and main operations.
b. It provides the ease with which customers track their packages.
c. TMS Technology also assists organizations to meet the expectations of their customers more effectively both across complex and global supply chains.

2.2.7 Robotics

In the fourth industrial revolution, the technology that presents new and dynamic methods of integrating different technologies and humans is known as robotics. Robotics are particularly invented for multi-tasking and carrying out different jobs at once, making their importance in the courier service firm unlimited. For smooth acceleration of the industry,

robots carry out three main duties, which are performing duties as cobots with humans, acting autonomously, or acting as a product handling device (Vaisi, 2022).

According to Time magazine (2023), Amazon bought a monopoly of Kiva Robots in 2012. These robots take care of global orders made by Amazon customers every second. Kiva's robots take shelves of products out of the warehouse and bring them to employees, aiding Amazon to recover more goods for more consumers at the same time. These robots handle single–click orders in less than 15 minutes which a human can complete on an average of 60 – 75 minutes. This digital shift (Robots) made by Amazon reduced the organization's operating costs (Time magazine, 2023).

Because intelligent production involves the reduction of human involvement and the application of AI in manufacturing activities, robots are greatly utilized in production processes and may benefit industrial operations (Vaisi, 2022).

2.4 Impact of 4IR technology on the productivity of courier service firms

Digital transformation, through the adoption of the fourth industrial revolution (4IR or Industry 4.0) technologies has brought about the apt shift from traditional operations to automated systems in the activities of logistics companies (Soldatos, 2018). Industry 4.0 has influenced or impacted the courier service through two main sub-divided topics; IoT and integrated systems, and the future of employment.

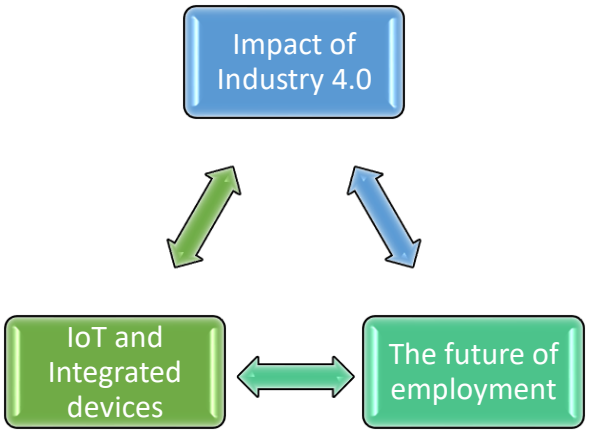

Figure 3: Two main sub-divided ways Industry 4.0 has impacted the courier service (Soldatos, 2018).

IoT and Integrated Devices

One of the most conspicuous impacts of Industry 4.0 is the Internet of Things (IoT) and integrated devices. Research by Juniper (2020) indicates there has been a vast growth rate and the number of integrated devices will get to 38.5 billion in 2020, up from its initial 13.4 billion in the year 2015, which made a huge difference of more than 285%. With the utilization and integration of industry 4.0 technologies, businesses, as well as consumers are now used to receiving their orders swiftly. The outcome of this paradigm shift is that producers and suppliers are excelling in reaching these expectations without often having the physical base (infrastructure) to link. Industry 4.0 technologies and processes can help meet the demand of logistic firms and their customers. By utilizing the advantage industry 4.0 machinery brings and the data it makes or creates, courier service firm operators and distributors can advance the organization's effectiveness and productivity easily. Additionally, the systems assist producers and distributors in dealing with company problems.

According to El Hamdi and Abouabdellah (2022), the impact of industry 4.0 technologies on the different logistics activities has brought about efficiency in the way that it has helped in the optimization of resource planning and warehouse management systems, as well as in the intelligent transport systems where the security of data and information tends to be highly crucial. Through the IoT and integrated devices, the courier firm can create digital systems and technologies that can easily tackle business challenges and issues (Lee et al., 2018). Industry 4.0 has the tendency to offer automated programs that help courier service organizations automate logistics activities, also, enabling the management to tackle business issues. Comparing the traditional way of logistic operations to that of these contemporary times, the latter has been able to minimize the efforts, problems, and intricacy of the courier service activities by providing data management, processing, and analytical systems through its technologies and automated systems (Lee et al., 2018). Nowadays, it is easy for the courier service industry to control business challenges and take care of logistics and supply chain activities automatically through the utilization of information technologies and communication systems (Antony, Sony, Garza-Reyes, McDermott, Tortorella, Jayaraman, Sucharitha, Salentijin & Maalouf, 2023).

The Future of Employment

The impact the fourth industrial revolution will have on the workforce is the most significant. The report by the International Labor Organization (ILO) (2018) deduced that since 2010, in about five countries, industrial robots have experienced a yearly acceleration rate of 17%. Because of this digital (technical) transformation, many professionals view automation as a risk to employees and employment.

However, the ILO (2018) report also found that half of the executives surveyed feel automation is an advantage and can give rise to job creation. Adding to the beliefs that these executives have concerning the positive impact of Industry 4.0 automation on the workforce, research by Boston Consulting Group (BCG) (2023) reveals the number of jobs will grow by 6% in Germany by 2025.

2.5 Technology in Nigerian courier service company

Though still in need of development in more important areas, Nigeria is one of the fastest-rising African countries in the logistics and supply chain (ITA, 2023). A study on African markets revealed that African countries especially the sub-Sahara (Nigeria included) are strategically emerging as the main business hub specifically for parts of Europe and Asia, due to their great resources, increasing riches, and substantial working-class with an increase in buying power (Kuteyi & Winkler 2022). In 2018, the Nigerian courier service sector value was forecasted to be $584 million which was equivalent to 250 billion naira (Nigerian currency), an increase of $117 million (50 billion naira) from the year 2017.

In addition, Nigeria was recognized globally as the 131 out of 190 countries to be doing business with ease, also, 110 positions in the logistics performance index (ITA, 2023). In contemporary times, the growth in Nigeria's courier services is because of advancement in connection with other countries, development in the infrastructure of railways and airways areas, production and export sector development, and the increase in e-business and logistics technologies. Nigerian enterprises that engage in courier service operations have been advised about the importance of adopting industry 4.0 technologies in their organizations to help with growth and development (Adeitan et al., 2021).

However, there are some challenges to the Nigerian logistics sector, these are; government laws that erode the ease of business operations, high infrastructure shortcomings, lack of stable power supply, inadequate road network, various taxation, and ingrained corruption (Adeitan et al., 2021). Ineffectual and pricey courier services are obstructing development, increasing import prices, growing segregation of landlocked countries, and decreasing export competitiveness in West Africa (Kuti & Winkler 2022).

Adding to the above challenges, the exorbitant cost of IT facilities maintenance or having their substandard technology replaced signifies that most courier service firms in Nigeria are still using the basic practices of operations for collecting data (ITA, 2023).

In all these shortcomings, Nigerian logistics are still able to maintain a smooth courier service operation through e-business. According to Adepetun (2022), despite the slow growth of the Nigerian logistics business which is caused by infrastructure difficulties, the company's value is forecasted to be $60 billion, having the e-business as the important factor. The Nigerian e-business made $4.8 billion as revenue in 2019 and is expected to grow at a CAGR of 20.5% between 2019 and 2023 (Adepetun, 2022).

National Bureau of Statistics noted that the growth of delivery and storage units of Nigerian logistics by 29.72% in Q4 2021 shows a 35.67%-point increase over the same time the previous year as well as a 9.12%-point rise in a prior quarter (Adepetun, 2022).
Below are some of the Industry 4.0 technologies known to have the possibility of enhancing courier services efficiency in Nigeria.

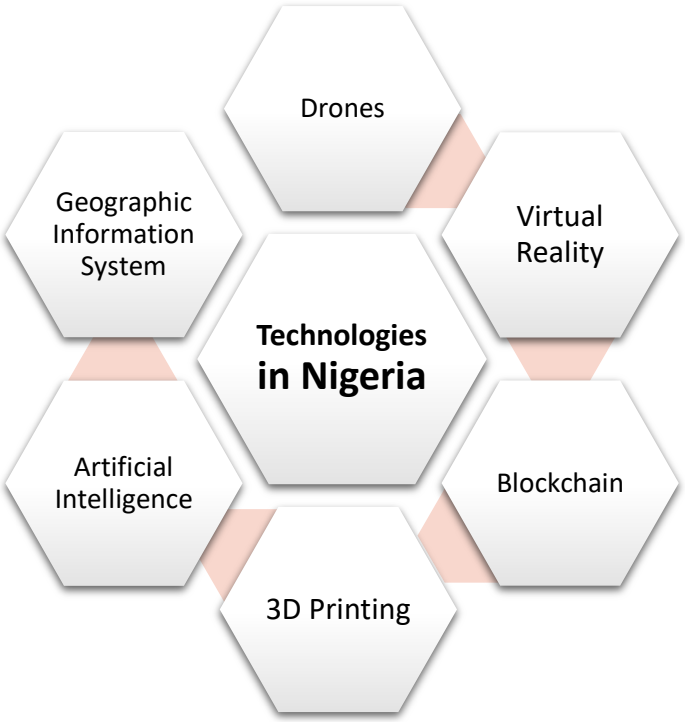

Figure 4: Some of the technologies that have been known to enhance performance in Nigeria (The Guardian, 2022).

2.5.1 Small and medium-sized enterprises (SMEs)

Small and medium-sized enterprises (SMEs) are merchandise that sustains assets, revenues, or an aggregate number of employees below a particular threshold (European Commission, 2023). SMEs are the key players in a country's economy through employing a high number of employees and assisting to empower innovation, because of this, the government always provides incentives like reduced tax and good access to loans, to make sure SMEs are in operation (European Commission, 2023). It is an enterprise whose employees can be between 1 – 249 people. When the number of staff of an organization is 250 and above, it is no longer categorized as an SME but a large enterprise. According to (European Commission, 2023), SMEs are subcategorized into three phases: micro enterprises (made up of about 1 to 10 employees), small enterprises (between 10 – 49 workers), and medium enterprises (which consist of 50 to 249 people).

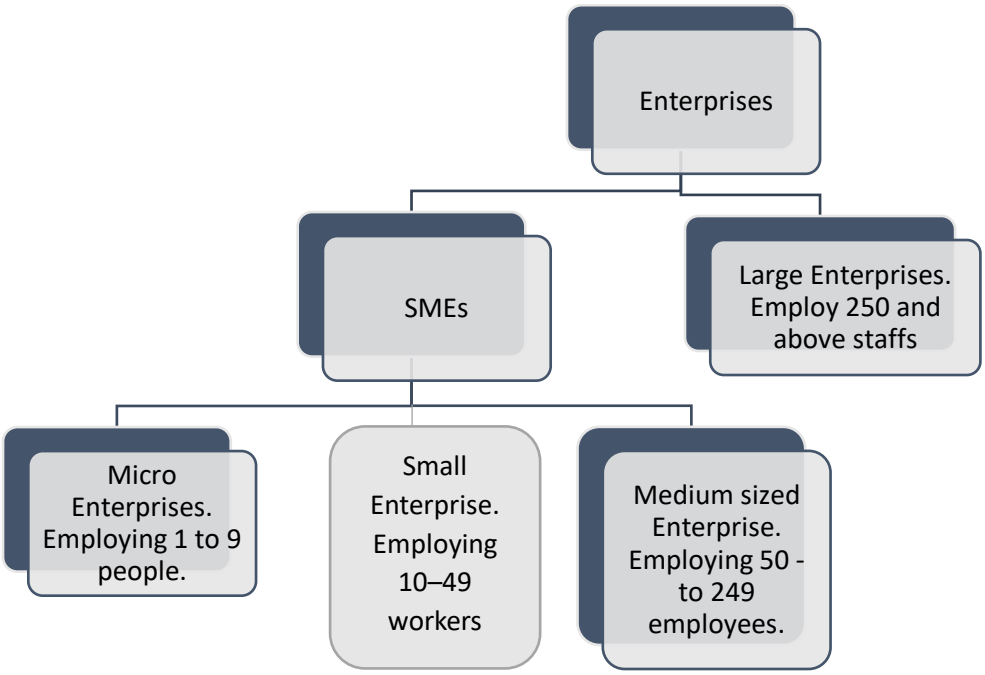

Figure 5: Different specifications of enterprises (European Commission, 2023).

However, it is imperative to mention that the number of employees varies when it comes to the whole continent. Each country has its meaning and outlines of what small and medium-sized enterprises constitute. For this context, I will only talk about SMEs in Europe and Africa continent.

SMEs in the European Union (EU)

According to the European Union (2023), when a company is made up of 1 – 9 employees and its yearly turnover is below £3 million, it is seen as a micro-enterprise, and, a firm is addressed as a small-sized enterprise when it employs less than 50 people and has a yearly turnover of about £10 million, also, a medium-sized enterprise, when it is made of employees between 50- 250, and has an annual turnover of £10 - £50. In Europe, SMEs are the key players in Europe's economy, and they amount to 99% of entire businesses in the European Union (European Commission, 2023).

SMEs in Nigeria

Nigeria is a country in West Africa or sub-Sahara with a population of over 200 million people (World Bank, 2023). Its capital city is Abuja, and it is in the northern part of the

country. In Nigeria, Small and medium-sized enterprises (SMEs) are also known to be micro, small, and medium enterprises (MSMEs), which are mostly referred to as enterprises employing up to 250 employees at the maximum (Ufua, Olujobi, Ogbari, Dada & Edafe, 2020). SMEs in Nigeria are defined as follows: Microenterprises consist of companies employing 1 to 9 people, small enterprise consists of 10 to 49 employees, and medium enterprises is made up of 50 to 250 people (Sanni & Ammattikorkeakoulu, 2009).
According to Vanguard (2023), the World Bank (WB) defines small enterprises as companies with not more than 49 employees on a yearly average, with aggregate financial assets of not more than N1.28 billion ($1.29 million) and an average yearly turnover of N1.29 billion ($3.0 million). For medium enterprises, the WB defines as companies with aggregate assets of more than $3.0 million but not above 14 million (N6.40 billion), having an average yearly turnover of more than $2.9 million and below $15 million (N6.45 billion), and employing staffs between 50 to 249. SMEs are ideal for the Nigerian economy because N10,000.00 is the minimum constitutional share capital and the loan can be gotten easily from banks or other financial bodies (Ufua, Olujobi, Ogbari, Dada & Edafe, 2020).

In the courier service, computers, telecommunication, and internet devices have been known to be very crucial, important, and necessary delivery systems as well as effective techniques of digital information and data (Agwu, 2018). It benefits logistics by bringing about a swift delivery of services to the customers, as well as the capacity of clients to be attended to from any part of the country free from any form of impediment (Agwu, 2018). In Nigeria through industry 4.0 technologies, Adepetun and his team were able to create Haul247, and cloud-based online logistics platform for its courier service large enterprise (LE) (Adepetun, 2022). Haul247 is a courier service platform formed for solving challenges and making the logistic processes simple, and the cloud-based online courier service platform which is accessible through mobile apps and a website provides a modern and easy way of trucking, warehousing, and shipping or transportation (Adepetun, 2022). Information and communication technology (ICT) has been identified as one of the industry 4.0 technologies needed for growth and boosting competitive advantages in Nigerian courier service SMEs (Adeitan, Aigbavboa & Agbenyeku, 2020). However, the courier service SMEs in Nigeria, due to some challenges, have not been able to fully exploit the possible benefits of these new technologies brought about by digital transformation (Agwu, 2018).

2.7 Challenges of adopting Industry 4.0 in SMEs in Nigeria

There have been some challenges and difficulties identified with the digital transformation of courier service companies of the Industry 4.0 paradigm. These challenges that occur while implementing or seeing the success of the fourth industrial revolution happen globally, are from one geographical region to the other. According to Nokia (2023), it was gathered that manufacturing, energy, and transportation executives around the globe were faced with digital transformation challenges. This was due to 5 barriers encountered by the companies during the process of trying to attain their Industry 4.0 goals. They included working with vendors, people and processes, cybersecurity and cyber threats, data architectures and infrastructure, networking capabilities, and the operating environment. Gyorffi (2017) mentioned cybersecurity risk as one of the challenges encountered while implementing a program for digitizing European industry (Industry 4.0). In Nigeria, large enterprises that have adopted Industry 4.0 are faced with some difficulties associated with this new technology. For example, GPS tracking and control tower has yet to gain traction, which poses an opportunity for US companies to close the gap in the market (ITA, 2023). Since the fourth industrial revolution is all about adopting technologies, SMEs are not left behind. They also are plagued with various barriers in the process of implementation (Nikmah, Sudarmiatin, Hermawan, Wardoyo & Hasan, 2021).

However, for courier service SMEs in Nigeria, the outcome of a study carried out by Adeitan et al. (2020) shows that financial constraint is the main challenge of adopting ICT by courier service SMEs in Nigeria. The lack of financial resources to fund the adoption of these new technologies is a huge challenge or barrier to implementing industry 4.0 technologies for logistics small and medium-sized enterprises in Nigeria. Since the pool of resources for SMEs is quite small, and the cost of these technologies is quite high, the possibility of SMEs adopting them without financial aid is very low.

Poor infrastructural development was found to be another problem and barrier stopping the transformation of implementing Industry 4.0 and its technology in Nigeria and the Sub–Saharan nations (Berawi, Suwartha, Asvial & Harwahyu, 2020). This barrier is preventing the transformation of these countries from becoming smart societies.

Additionally, lack of technical know-how, unfavorable government regulations, and inaccessibility of loans from financial institutions were included in the limitations

encountered by SMEs in the adoption of Industry 4.0 into their courier service operations (Matt, Modrák & Zsifkovits, 2020). According to Saari (2020), due to the small stream of resources of SMEs and inadequate finance to keep the business going, SMEs opt for loans from financial institutions, which happens to be difficult to get and inaccessible.

3. Research methodology

The purpose of this chapter is to present in detail and to explain the research methodology and methods used in this project. I will introduce the choice of methods that I will use in this research.

The last part of this chapter will entail a discussion about the quality of the research.

In this project, I will use only a qualitative method to get data. The reason for using this method will be explained while writing.

3.1 Research design

This research aims to find out how digital transformation with the application of Industry 4.0 and its technologies has influenced courier services SMEs in Nigeria, and the challenges of implementing them.

Research design in a research task or study is a framework of a scientific study. This framework can include research methodologies, tools, and styles to conduct the research and it can further assist in identifying and addressing challenges that may come up via the process of research and analysis (Saunders, Lewis, & Thornhill, 2019).

In this study, I will conduct qualitative research to get my primary data. The qualitative research will be in the form of a semi-structured interview guide in an open-ended question format, and about 10 employees will be interviewed.

3.2 Research method

A method in a research process can have or possess different characteristics, patterns, or steps. An example could be a method for meeting social needs via the articulation, formulation, and implementation of public policies. A method in a research process or exercise is the defined step for achieving or approaching something (e.g., phenomenon, variable, problem, challenge, or case), especially a systematic or traditionally defined one (Adams, Khan, & Raeside, 2014).

It is important to mention that the method in a research process or exercise is different from the methodology in the same process. Methodology is a system of methods used in a particular area of research or study endeavor. An example could be a methodology for investigating and identifying concepts and variables relating to “willingness” in the

implementation of policy actions on environmental phenomena such as climate change (Adams et al., 2014). On the other hand, research methods entail the approach, procedures, or plans used in collecting data or information for evaluation, for the sole purpose of deriving a better insight into a topic (Fellows & Liu, 2021).

For this research, I will be using an exploratory research methodology since it is for gaining understanding and obtaining data (Fellows & Liu, 2021), as well as a qualitative method of research.

When it comes to research, both qualitative and quantitative methods could be used. The difference between qualitative and quantitative research is, that, whilst qualitative studies depend on personal details, written or spoken words, or documents illustrating how individuals think or act in an environment, quantitative studies depend on measurable or numerical data (Fellows & Liu, 2021).

With the help of diagrams, statistics, and graphs, qualitative data can easily be evaluated. In contrast, quantitative data would have to be formed by the researcher in a manner that allows for easy application to the research through the making use of phrases and definitions that correlate with the purpose of the study (Fellows & Liu, 2021). Additionally, qualitative research is usually used in circumstances where the study pattern has been clearly shown/displayed and the research hypothesis has been derived from the thesis, while, in quantitative research, the method and conception are often used to produce anticipation about what is to take place (Fellows & Liu, 2021).

Since this study examines the challenges and impact that Industry 4.0 technologies will have on courier service SMEs, a qualitative method is more suitable than a quantitative type. This is because it is difficult to analyze attitudes, ideas, views, and perceptions using a quantitative approach. To get an in-depth understanding of the notion and opinions concerning the implications of Industry 4.0 on courier services, it is feasible to engage qualitative methods, so that, broader research on a company, its internal behaviors, as well as the external components that impact it could be conducted smoothly.

3.3 Data collection

To fulfill the quest for obtaining data, different techniques are accessible for the investigators, however, the use of surveys, questionnaires, and interview guides are the most common ways in which data is collected (Myers, Well, Lorch, Woolley, Kimmins, Harrison & Harrison, 2010).

For this research, data was collected through a face-to-face semi-structured interview guide of a qualitative method in an open-ended format. I had traveled to Nigeria for one week, for a relative's wedding, then seized the opportunity to do the interviews onsite.

The questions asked were derived from the research question above. To gain deeper knowledge, I ensured none of the questions were closed-ended and instead opted for an open-ended question. Myers et al. (2010) stated that a well-made research question would be compensated by decisive empirical outcomes in the real world.

The primary data for this research was collected through a semi-structured interview guide. It involves interviewing the personnel of a courier service company (Tranex PLC), using open-ended questions, and carrying out in-depth interviews to collect the most precise data available. Through face-to-face interviews, the author was able to get primary data on the general affairs of the country. Different employees of Tranex PLC were interviewed to make sure the research was as accurate as possible. As regards the digital transformation of courier delivery SMEs in Nigeria, the interpretivism approach is important and needed for having a deeper knowledge of the country's culture and way of life through direct experience. Interpretivism is defined as a situation whereby a researcher studies an item in its original and organic nature, so, a clasp of the theory could be obtained (Fellows & Liu, 2021). In this case, the clasp of the theory is the impact and challenges of adopting Industry 4.0 technology on courier service SMEs in Nigeria.

To properly tackle the issue of this research, various databases were reviewed by the author. It became, however, imperative to source data through the utilization of organizationally validated databases. For this study, eBook Central, ProQuest, Research Gate, Science Direct, University of Applied Sciences search engines, external journals, publications, google, newspapers, magazines, and DOAB were used to search relevant literature. To accurately

find the materials that are pertinent to the core study, various search phrases like, 'Industry 4.0', 'digital transformation', 'logistics', 'courier services', 'SMEs', and 'Nigeria' were utilized. Concluding this thesis, some of the work performed on the issue of the impact that digital transformation would have on courier service SMEs by utilizing Industry 4.0 will be discussed.

3.4 Qualitative research

The qualitative method of research is a study where the meanings and interpretation of words are the processes of making connections (Seale, Gobo, Gubrium & Silverman, 2004). It consists of the collection and evaluation of non-numerical data, such as video, text, or audio, to get insights into ideas, thoughts, or experiences (Seale et al., 2004). It can also be used to produce new ideas for research or convene a deep understanding of a problem. There are three different ways of conducting a qualitative interview, these are structured, semi-structured, and unstructured interview methods.

Structured interview styles. This is a qualitative research method that is done in a much more rigid way than the two other types. According to Zainab (2016), it is a prearranged style interview whose content is arranged before it is conducted. The structured interview method stands out from other types because it can be conducted by various interviewers and will make sure the answers generated are all put together and affirmed in the same manner. The main goal of using this kind of interview method is to get the highest number of systematized answers which are usually expressed through closed questions.

Semi-structured interview styles. Elhami and Khoshnevisan (2022) argued that when it comes to this method of interview, the interviewer asks open-ended questions instead of adopting rigid and formalized question lists. Questions that are predetermined with the intentions of the interviewer to further survey particular responses. These questions are governed by an interview guide that acts as a framework for the interview. The semi-structured and unstructured interview aims to get the ideas, attitudes, and behavior of consumers, and, to get an in-depth insight into their habits. The types of questions here are always open-ended.

Unstructured interview style. In this case, there is no interview guide, nor structured questions. To interview an unstructured method, also known as free interviews, the interviewer does not need to prepare the documents before the deal day (Elhami & Khoshnevisan, 2022). Due to the lack of structure, this kind of interview is difficult to carry out. Additionally, there are no directions to the questions asked.

However, for this research study, I used a semi-structured interview guide. This was because I wanted to promote respondents' open thoughts and determine their behaviors on possible reasons preventing their business from growing which otherwise couldn't have come up in a questionnaire style.

The research interview was done through face-to-face meetings, and the exercise took about 60 minutes. I had the opportunity to travel to Nigeria for my relative's wedding for one week, then seized the opportunity to do the interview onsite.

The questions at the end of the interview are presented in the relevant order and are also connected to the research question: 'What are the impact and challenges of applying Industry 4.0 in courier service SMEs in Nigeria'?

3.5 The respondents

The sample, which is the overall population, has been based on an unremunerative approach for this research. This method therefore means that the picking of the sample has not been carried out using a technique that consists of random selection. Purposeful sampling was utilized in choosing respondents for this research (Tranex PLC). A type of unremunerative or non-profitability sampling in which investigators depend on their findings during the process of individual selection from the population to partake in their survey is known as purposeful, selective, judgmental, or subjective sampling (Palinkas, Horwitz, Green, Wisdom, Duan & Hoagwood, 2015). Ten employees were selected to participate in the interview. The selection was based on their roles and positions held in the company, as well as their vast knowledge of industry 4.0 technologies and logistics operations.

3.6 The interviews

From the selected company, it is necessary to get as much information as possible to have a better understanding or insights about the effects and challenges of utilizing Industry 4,0 by logistic SMEs in Nigeria.

The primary data for this study was gathered through qualitative interviews. As stated earlier, there is a vast difference between qualitative and quantitative interviews. Though both are kinds of research methods, qualitative focuses on delivering answers for 'why' behind a behavior, a circumstance, etc., while quantitative data are investigated numerically to derive a statistical visualization of a movement (Fellows & Liu, 2021).
See Appendix 1 for the qualitative interview questions.

3.7 Data analysis

The data analysis was a process. The transcripts exercise data collection must be put together to examine how Tranex PLC workers feel about the impact Industry 4.0 technologies have on courier services. The transcript investigation is tailored to be proactive and positive because it allows for investigating the importance, discrepancies, challenges, and continuity (Walsh, McClean, Doyle, Ryan, Scarborough-Lang, Rishton, & Dagnall, 2019) of embracing digital transformation through the application of Industry 4.0 technologies in the long run.

The collected raw data was refined to extract important information which has been of immense help in aiding the furnishing of better insights and understanding of the thesis topic. Because this is qualitative research, the information obtained pertains to a qualitative analysis which therefore means the findings are provided in a text format grounded on what respondents in the study have voiced out. By narrative analysis, the data obtained was investigated. A type of qualitative data analysis that focuses on the interpretation of the main narratives from the respondents, as well as feedback provided by them to ascertain whether the participants were able to give relevant facts that can be trusted for developing a better insight into the thesis topic being presented, is what is known as narrative analysis (Koppa, 2023).

Sample description

The overall response rate was 89%. The actual participant's behavior in answering the questions was a bit tricky. I noticed that some of the respondents avoided answering some of the questions. For example, in question 1, all ten respondents answered the question, but in question 7, only one participant gave his answers, and so on. I think it was because the answer required lots of thinking and there was a shortage of time for the interview. The time permitted for the interview questions was 60 minutes.

3.8 Reliability and validity of the data

Reliability and validity are crucial when it comes to research. This is because while researching, reliability and validity help to reduce the tendency of an incorrect answer. Qualitative research depends only on reliability and validity because they help in determining the research's objective (Litwin, 1995). The extent of authenticity and trustworthiness of research may be measured by seeking its reliability and validity. According to Andrade (2018), reliability is pertinent to how harmonized and steady research results are as well as the extent they can be reproduced by other investigators, while validity pertains to how well research matches what it plans to measure and the degree of accuracy it has in reflecting the facts of the circumstances being studied. Gordon, Colin and Elliott (2001) show the two different conceptions of reliability as external and internal. External reliability refers to a situation whereby a research result has the same similarity to those of the original. That is the capacity of a text to give rise to similar results from each person who partakes in it over time. Since the phenomena and setting tend to differ from the previous study to the second one, it may be difficult to get high external dependability. On the other hand, internal reliability is the method of determining if all the questions in an interview measure a similar construct (Gordon, Colin & Elliott, 2001). The challenge here is that even if the study is reliable but the tool does not measure the correct thing, it will give rise to an incorrect answer (Kim & Hodgins, 2017). However, Wagemaker and Wagemaker (2020) have suggested a technique that involves the utilization of a position like the original researcher to replicate the initial study.

The purpose of this master thesis was to examine how digital transformation with the application of Industry 4.0 and its technologies has influenced courier service SMEs in

Nigeria and the challenges of implementing them. Digital transformation is defined as the process of utilizing and integrating digital technologies to make new values or reform pre-existing business cultures, processes, and consumer experiences to attain transforming business and market needs (Leignel, Ungaro & Staar, 2016). The case company in this master thesis is Tranex PLC located in the city of Lagos Nigeria, and they started their change journey a few years back. They have developed new products, increased the number of employees, and inculcated digitalization in their daily business operations, etc. Since the company is planning to transform its business operations from manual to digital through the adoption of Industry 4.0 technologies, I classified this as digital transformation. The data was collected through a qualitative research interview guide in an open-ended format. 10 employees were interviewed, and about 89% of the questions were answered. Both males and females were in the group, and there was no age specification. To ensure the validity of this thesis, this chapter discusses in-depth the techniques used in obtaining data and conducting interviews. Appendix 1 consists of all the research questions asked during the interview. The result is based on answers from employees with distinct opinions, ideas, and experiences. In this regard, reliability was increased due to the diversity among the participants.

3.9 Ethical considerations and time plan

In this research, there are indisputably ethical considerations that must be noted to produce viable inferences and develop research that is inclusive since the study consists of data that was collected through primary techniques. Therefore, to protect the participants, it was agreed their identities should be kept anonymous. The respondents did not participate in the interview under duress but rather on their own will. Before conducting the research, the participant's notified consent was carried out so they could have knowledge of the research questions and prepare beforehand for the study. The data received from the research will only be used for study purposes, therefore, be kept confidential. Prior to the release of the results to the public, they will first be communicated to the participants.

The time duration of this research was about six (6) months. Included in the activities were, the preparation of research, the literature review phase which consisted of the assembling

of relevant literature used for the study, traveling to Nigeria, data collection, analyzing the data collected, and presenting the research for final examination.

4. Empirical findings

In Chapter 5, the answers to the questions in the semi-structured interview guide will be discussed extensively. It is the duty of the team to take care of day-to-day work activities and find out the degree to which technology may impact courier service activities, total productivity, and favorable outcomes throughout their operations as well as the perceived challenges of implementing these technologies. The operational teams that contributed to the industry's overall performance were all recognized. The key individuals responsible for the order processing warehouse, dispatch activities, and the drivers were all interviewed as part of this research to derive the challenges and the extent to which Industry 4.0 will help enhance operations in the case company. I will present the empirical findings of my research for better understanding and to determine the length to which technology may impact courier service operations.

Research Question

The research question explicated in the study was: 'What are the impact and challenges of applying Industry 4.0 in courier service SMEs in Nigeria?'

The analysis produced seven themes. Thus,

Table 1. The seven themes

Based on the Impact of 4IR on logistics	Based on the Challenges of applying 4IR
1. Impact of Industry 4.0 on workplace digital transformation	7. Utilization of Industry 4.0 technologies
2. Impact of Industry 4.0 on minimization of errors	
3. Impact of Industry 4.0 on improved operations	
4. Impact of Industry 4.0 on speed and productivity	
5. Impact of Industry 4.0 technology on CRM	

6. The effect of Industry 4.0 on procurement

4.1 Workplace digital transformation

Courier service operations are improved and ameliorated with the development and integration of Industry 4.0 technology. The participants in the dispatch team emphasized that if the company adopts Industry 4.0 technology such as Artificial intelligence, it will simplify or ease the parcel delivery process. When Industry 4.0 technology is enacted in the day-to-day operations, it can automate processes such as preparing orders and clearing trucks that exit the warehouse. Almost all the participants reported that the digital transformation of the courier service firm through the implementation of industry 4.0 technologies will create a positive impact on the workplace. For example, the team chair believes that digitalization is enhancing paperless bills of lading, creating a possibility in which paperwork can be minimized, the procedures of preparing orders improved, and the flexibility of operations increased.

According to the interviewed team's chairperson:

'Industry 4.0 technology will enhance paperless bills of lading by presenting an opportunity for all the legal documents and paperwork to be done electronically as well as minimize lengthy constitutional or legal processes which often obstruct loading, unloading and dispatch time'.

Then, the director of global warehousing who was interviewed said the below statement:

'The combination of Artificial intelligence (AI) and Machine language (ML) will assist our industry to automate transportation process. It will boost fast solutions to the courier service demands of customers.

The warehouse technician thinks digitalization is having a great impact.

"*For me as a technician within the warehouse service department, I would say the adoption of Industry 4.0 technology in SMEs in developing nations such as Nigeria is a commendable development and doing the talk of innovation strategies*.

This is explicit that the utilization of Industry 4.0 technology will present an opportunity through which procedures in the work environment can be ameliorated and improved. An opportunity through which courier service organizations can move operations from manual to digitalization has been provided by industry 4.0 technology by creating effective automation processes. It is regarded as an act that has presented a way through which a firm can improve its activities by elevating the speed at which orders are organized and dispatched.

4.2 Minimization of errors

Blunders in courier services activities are usually experienced by firms that indulge in human manual operations. Automation in courier activities has given rise to the growth and utilization of programs like robots and self-driving vehicles which use Artificial intelligence technology to perform activities speedily, compared to operations performed by humans. Most of the interviewees agreed that through the adoption of the fourth industrial revolution technologies, errors can be reduced.

For instance, the logistics manager at the firm said:

'*Instituting robots and automation at the workplace will increase time efficiency, speedy accessibility of various information and data through the single digital network and will notably minimize error ratio'*.

Mistakes or blunders that come up due to manual operations usually influence the industry's returns and revenue maximizations.

When the participants were asked if they think the adoption of Industry 4.0 technology would have a negative or positive impact on the logistics firms in Nigeria (question 4.), most of the interviewees said it would have a positive effect on logistics.

The transport personnel made the following statement:

'*If Tranex PLC should implement these new technologies like autonomous vehicles, it would impact the firm positively. Tranex PLC has yet to introduce driverless cars which will aid in fast order processing times. These cars will present a possibility through which the industry can minimize blunders that relate to manual order processing, a situation that brings about*

delays in dispatching of orders, as well as an increase in potential errors which will result in reduced organization revenue.'

In endorsing the importance of using self-driving cars, they minimize human errors and inventory management. Workers interviewed in the same work unit agreed. The employees emphasized that the use of automatic robots will give a possibility through which the firm can lower errors connected with order received processing and container handling at the terminals. By presenting an opportunity through which machine systems utilized can identify containers and activate them on dispatch function speedily as compared to humans performing the same duty manually, logistics operations will be eased by technologies provided by Industry 4.0.

4.3 Improved operations

To ascertain to what degree a firm can improve and enhance service delivery, logistic organizations are confronted with enormous activities that need actual time operations.

In contemporary times, the industry is going through acute operations worldwide which requires real-time access to tracking and data processing to guarantee the reduction of delays and ensure operations are performed with high precision. Difficult courier activities can be taken care of with the application of technology, thus showing technology is necessary for growth and improved operations. Respondents highlighted how these emerging technologies would enhance the company's logistics operations.

The interviewed route optimization manager mentioned that:

'Because the firm has not adopted Real-Time tracking digital solutions at work, experiencing smooth operations has not been feasible for us, thus encountering real-time tracking and data processing problems. Furthermore, automation of processing forklifts and cranes will get rid of manual labor and improve and create effective operations.

However, one of the employees interviewed has mixed feelings about the situation. He mentioned the negative situation he experiences daily due to the absence of the 4IR technologies and stated the threat of adopting these digital tools by the firm. Thus:

'Most of the work has not been automated and that makes us still operate at lower levels and invest more time in delivery processes. However, if these technologies are introduced and applied, the future of our employment will be under great threat.

4.4 Speed and productivity

Speed is known as the measure through which a processing component can enhance the delivery of courier service, also, it has the possibility of boosting its demands among consumers due to the smooth handling and solving of customers' queries. The technologies associated with Industry 4.0 are equipped with a package of improved speed which allows users to process data in real-time compared to the conventional method. In the respondents' accounts, many of them stated how the company can derive speed and efficiency through the utilization of these digital tools.

The warehouse administrator interviewed believes that:

'The application of industry 4.0 technologies will enhance service delivery at the warehouse as well as present a possibility through which inside and outside technical issues that always cause operations to be slow, will be resolved'.

Because the industry deals with an aggregate of consumers, the organization must ensure they can process information and convey to consumers the specific timespan.

Another senior staff buttressed on the matter by saying:

'Industry 4.0 technologies will bring ease to the operation of business. Service delivery has become faster, smoother, less stressful, and more efficient. In addition, customers' complaints are now easily identified, and reforms needed for service improvements are now easy to carry out.

4.5 Technology on CRM

It has become imperative for any industry or organization to have smooth customer relationship management (CRM) no matter the type of company. Though the customers of a firm might not see how industry 4.0 technology benefits a company, the technology helps firms redesign their sales procedures, establish long-term customer relationships, and

secure more merchandise with a great level of CRM. By utilizing a CRM tool, companies can store important data that can be utilized for the optimization of customer experiences and enable increased conversions.

One of the employees further elaborated on the matter by saying:

'I am informed that a digital manufacturing enterprise (DME) utilizes industry 4.0 technology in the creation of value through the supply chain. I am also aware that the benefits of integrating these technologies into manufacturing processes are greater relationships with external suppliers and better customer satisfaction. And organizations may utilize the information derived to forecast the demands of their prospective customers before even determining what they are.

Unanimously, the participants drew the conclusion that when it comes to customer relationship management, getting things done rightly will be the goal.

4.6 The effect of Industry 4.0 on procurement

As earlier stated, new technologies like Big Data and IoT help information or data flow smoothly across a business. This is feasible by linking every department and single supply chain together. The IoT systems assist companies in tracking their shipped consignment in real time to ensure efficiency. Likewise, Augmentative reality device enhances the real world with computer-generated content.

The business operations manager of the firm stipulated that:

'*The integration of industry 4.0 technologies into procurement transforms the procurement function of collecting, analyzing, and processing sourcing data to assist a firm's supply chain. Through cloud technology, the sharing of data may be between producers and suppliers, enabling enhanced processing of supply. Also, cloud technology makes It possible to restrict the data retrieved so the providers don't know the company's confidential information. Additionally, with augmentative reality enterprise gets a measure for a long meeting with suppliers, finding solutions for raw materials issues, and expectations of long-distance supply. Due to the easy accessibility of data and non-physical presence required for the*

verification of products' timely arrival, this technique helps achieve better and faster sourcing'.

Based on the study, it has been deduced that industry 4.0 technologies will have a great effect on procurement for several years to come. Thea result of these arising phenomena, the firm's procurement departments have the tendency to become more associated with the manufacturing department or probably joined together.

4.7 Utilization of Industry 4.0 technologies

When asked if their company has adopted these new technologies, some of them replied no, while some said the company was in the process of integrating them. According to them, the delays were due to some challenges. According to the manager of the warehouse.

'*I think the reason why the company hasn't adopted some of the industry 4.0 technology is due to the high cost of implementing them, unfavorable government policies on SMEs, inadequate power supply (we use fuel every time we want to work), etc*.

However, when asked about their support and how prepared the organization was for the adoption of these new technologies (interview question 10), the other workers stated the above challenges as the obstacle, but about three employees were of a different opinion about the limitations of adopting Industry 4.0. They think that before incorporating these new technologies in the company, the management should be willing to invest in training, by providing experts that will tutor them in-depth about the various uses and functions of these technologies thus:

'*As an employee of Tranex PLC Nigeria, I would not quickly support the utilization of Industry 4.0 technology until more rooms are created for training and career development'*.

The above issues discussed during the interview show that Industry 4.0 can impact logistics positively, however, there are some challenges and barriers to the successful implementation of these technologies in courier service SMEs in Nigeria. The below table shows the current application of Industry 4.0 technology by Tranex PLC, Nigeria.

Table 2. Technology implementation in Courier service SMEs in Nigeria by Tranex PLC (2023).

Industry 4.0 technology	*Current application in courier service SME*	*Statements*
Autonomous vehicles	0%	The organization feels the cost of implementing it is high. Only large enterprises can afford it
Blockchain	0%	Blockchain technology is not in the company's schedule for now
Augmentative reality (AR)	0%	Apart from the inaccessibility of loans, the company lacks expertise
Internet of Things	6%	The industry has been able to install a few
Cloud computing	2%	The firm shares very little data with a nearby large enterprise. They can't afford to finance theirs

5. Discussion

In this chapter, I will be discussing and analyzing the findings from my investigation, and finding an answer to the research question: what are the impact and challenges of applying Industry 4.0 in courier service SMEs in Nigeria? I will answer the questions by analyzing my findings in-depth by integrating the theory. The differences and similarities of opinions according to the interview respondents, for example in this research were influenced by different issues such as orientations, backgrounds, work experiences, age, training, status, and many others etc.

5.1 Utilization of new technologies in SMEs

Tranex PLC has yet to embrace Industry 4.0 hence, it is still using the analogue processes. There is still a huge gap between Tranex and the fourth industrial revolution technologies. According to the participants, this is because the costs of implementing Industry 4.0 technologies in SMEs are expensive and high. This corresponds with the previous findings of the research by Matt, Modrák and Zsifkovits (2020) which stipulates that SMEs lack the financial resources and human experts to implement new technologies. The outcome of a study carried out by Adeitan et al., (2020) shows financial constraints are the main challenge of adopting ICT by courier service SMEs in Nigeria. ICT which is an acronym for information and communication technology is an infrastructure that can help SMEs achieve a high standard of service, employee relations, and quick transmission of services, in addition, helps in making the integration of a company's service, both at internal and global platforms, have better opportunities (Mohammed & Trzcielinski, 2021).

Secondly, inadequate power supply was seen to discourage most Nigerian SMEs from embracing digital transformation and adopting Information Communication Technology (ICT). Alawiye (2011) argues that a constant power supply is very important and is a key determinant of the successful transformation process of a nation. It is no news that Nigeria is known to be the largest oil-producing country in Africa and possesses about one-third of verified gas reserves (Nnodim, 2023), the country has not stopped battling with inadequate power supply (Alawiye, 2011) which has an adverse effect on ICT success. Nigeria is afflicted by acute inadequate energy even though it has vast energy resources like gas, water, and minerals (Alawiye, 2011). Also, many rural areas cannot boast of having access to energy,

and even the urban region that has access to energy is confined to a limited electricity supply. Even though the cost associated with the provision of electricity in Nigeria is considerable, it is not unusual to be without an uninterrupted power supply in a single day. Thirdly, another problem associated with the adoption of Industry 4.0 by courier service SMEs in Nigeria is, that if these enterprises recognize the process of implementing the new technologies to be very challenging, they will not likely accept or embrace the utilization of ICT in their activities (Matt, Modrák & Zsifkovits, 2020). For the company to start implementing emerging technologies in its business operations, employees of the company should be well-equipped with the knowledge and skills to operate them. According to Adeitan et al. (2020), a major barrier for SMEs when it involves the application of ICT is the inadequacy of suitable managerial and technical employees with vast knowledge of the cores of ICT. Furthermore, change in the business paradigm through participating in Industry 4.0 supply chains could lead SMEs to have challenges like; reduced flexibility, risks, reduced strategic independence, and costs (European Parliament, 2016). Private owners of SMEs are unlikely to adopt these new technologies if they lack adequate skills, abilities, and expertise.

The packing and unpacking of goods from vehicles (trucks) are examples of the manual activities carried out by Tranex PLC. Even when the circulation of movement in the firm's warehouse is enormous and frequent, the probability of helping the engaged workers apply these technologies is quite low. A crucial step in the courier service is the receiving of goods. However, Tranex PLC battles with this acknowledgment daily. The products that arrive at the organization's warehouse don't go through the stipulated standard of practice, which involves a thorough verification at the checkpoint to ascertain whether the products meet the specified norms for storage.

Tranex PLC and other firms that carry out processes manually are often susceptible to errors in courier service activities. Because of these manual processes, the industry's returns and revenue are adversely influenced. One of the dispatch riders interviewed says the firm has not yet adopted self-driving cars that help to tackle demand on the agenda. This part adds to the late delivery of orders and the propensity to make mistakes, which results in lower revenue for the company. But, when these autonomous vehicles are adopted, it will assist the organization in minimizing blunders associated with the manual processing of orders.

The evolution of Industry 4.0 has conferred Nigeria with a compelling barrier in the global market. In contemporary times, the obtainability of vast and cheap labor sources is no longer a yardstick that may create a competitive advantage and inspire global investors to invest in Nigeria. Soon, the machines associated with this fourth industrial revolution will take over most tasks done by humans in the manufacturing sector. According to one of the participants interviewed, their future employment would be threatened should Tranex PLC adopt industry 4.0 technologies, etc.

However, Industry 4.0 technologies promise great benefits to logistics industries if they adopt and implement them in their daily activities. According to Koman, Kubina, Bubelíny, and Gabryšová (2019), the creation of a competitive advantage for business can be actualized through the implementation of Industry 4.0. The benefits are shown below:

Higher resilience and swiftness: Koman et al. (2019) opined that logistics firms can promptly and efficiently embrace and adjust to changes by furnishing a supply chain with digital technologies and making use of data to improve and understand it. If there is an unexpected increase in demand, changes in wholesale, or an impromptu shift in the business paradigm, the logistics firm can adapt to the changes quickly and easily with digital technologies. With a smart supply chain management network, courier service businesses can adjust and continue running uninterruptedly through any problems. In a nutshell, these industry 4.0 digital technologies help to make a courier service operator more resilient and agile.

Advanced warehouse management: Koman et al. (2019) opined that due to the increase in the demand of customers, the warehouse pattern is obliged to adjust to continue running the affairs of the business. All activities in the smart warehouse can improve for the highest efficiency and speed because their devices are fully equipped and connected. Courier service operators can help consumers with their demands in an effective and security-conscious way by furnishing their warehouses with independent, flexible inventory management and artificially smart picking systems and robotics. Additionally, the received data can be used by the operators to continuously advance operations as well as have a higher competitive advantage. These activities included; specialist storage (storing a wider span of products brings about quality control and compliance challenges which will be in need for specialist storage), returns handling (involving direct communication with customers on behalf of suppliers, controlling the collection, storage, and in some cases

repair, rewrapping, and resale of goods), reverse logistics (the collection of end-of-life products from industries, somethings during the process of delivering new products, and organizing their discarding process in line with environmental regulations), and omnichannel ordering (warehouses now should manage and control orders from a range of sources, in most cases, on behalf of suppliers).

Better demand Scheduling: Due to the enormous amount of data, there are more opportunities to evaluate and strategize ahead. With the application of Industry 4.0 technologies, logistic companies can point out and resolve challenges in the supply chain before they turn into great problems (Koman et al., 2019). As a result of the increased data sharing, producers can accurately speculate on the demands of customers. This means manufacturers can plan production procedures more precisely and notify business decision-making when mapping out a method or indulging in investments. With this information, producers can future-orient their businesses, also, consumers receive better and more effective service.

Navigating complex supply chain: El Hamdi and Abouabdellah (2022) stated that introducing industry 4.0 technologies equipped with well-grounded, data sharing and communicating with different businesses in the supply chain will become much easier. Producers and vendors can smoothly exchange data and information. Additionally, the high visibility of the system compels smart supply chain management and improvement feasible.

Consequently, instead of enjoying the benefit of an inexpensive labor force, the country will gradually turn into a country that is surrounded by unemployment and experiences a high rate of social variability. Therefore, the long-term goal of Nigeria becoming the world hub of production and processing by the year 2029 through attaining a high rate of employment would not be feasible anymore because of the outcome of the effect of Industry 4.0 technology.

5.2 Effect of Industry 4.0 on courier service SMEs in Nigeria

The application of automated systems in courier service operations that can become mechanized turned into an important option for various types of commerce. Locating, moving, retrieving, and storing materials on their own without the aid of human or manual

procedures are what automated handling devices can achieve. By applying the automated system, industries try to minimize the number of blunders or mistakes caused by humans during manual procedures of the materials. Similarly, firms with an increased level of movement in the warehouse apply this technology to achieve fast, secure, and stable motion of products.

Proliferating operational performance is paramount in the courier service operation because it does not only bring about productive activities that are economical, waste reduction, and maintaining quality and service, but it also helps to ensure precise data is obtainable and the amenity can take care of information in real-time thereby, effecting the organization's performance. A logistic firm's overall performance can be impacted negatively when the operations are carried out manually, thereby, constituting a danger to the information being handled which has to do with providing incorrect information as well as delay in dispatch. This fourth industrial revolution has been regarded as one of the ways courier service productivity could be enhanced through its technologies.

Advocating the importance of adopting self-driving cars, Sell, Rassõlkin, Wang, and Otto (2019), opined that self-driving vehicles minimize human mistakes and aid product control. The interviewed participants from the Tranex PLC warehousing department shared the same thoughts. They think that the application of this technology would create a possibility by which the firm can minimize blunders connected with order processing and controlling the containers at the checkpoints. It is quite glaring to know how imperative the application of these automated material handling systems is in the courier service operation due to the reduced error it makes feasible. According to Sell et al. (2019), some of the ways autonomous vehicles benefit a firm's delivery processes are by helping with increased efficiency, reduced cost, low risk or human error, increased safety, always being available, etc.

In summary, improving a firm's operation can lead to a higher level of the organization's collective performance and a competitive advantage over its competitors. Acceleration and precision are key factors that create a possibility through which the facility can take care of large orders and convey them within a scheduled period. A high level of supply chain reduces order cycle time, lowers lead time, and smoothens supply chain processes, additionally, boosting customer satisfaction and loyalty for the organization (Castelo-Branco

et al., 2023). Through this technology, the firm's capabilities can be improved because of the smooth processing of real-time data.

5.3 The effect of industry 4.0 on customer service

Controlling customer connections is dicey for every enterprise no matter the area. Although industry 4.0 technology does not directly interact with customers, it provides capacity for firms that assist companies in improving their engagement with customers (Castelo-Branco et al., 2023). A digital manufacturing enterprise (DME) is seen as a business that utilizes the fourth industrial revolution technology to create value all over the supply chain (Global Conference & Lu, 2011). The unification of technologies into the manufacturing process to help plant activities become strong, resilient, and adaptable amidst varying market demands is known as Digital manufacturing. The main difference between a traditional business and a digital manufacturing one is that DMEs are more dynamic in their interactions with customers than the conventional types (Castelo-Branco et al., 2023). Due to the benefit DME has, companies may utilize information to predict the needs of their clients before even having knowledge of what their demands are. An added advantage is the continuous interactions or exchange of data with customers that is made possible by the reconcilable data flow (Castelo-Branco et al., 2023). If for instance, a product gets a bad reception from any client group, it is immediately rectified before advancing to an uncontrollable challenge. One of the great advantages of Industry 4.0 technology is data management (Williams & Tang, 2020). Data management is the method of receiving, storing, and utilizing data safely, adeptly, and cost-effectively (Lucas-Estañ, Sepulcre, Raptis, Passarella, & Conti, 2018). This means that customer relations are much easier to control because of the vast volume of information that can be organized at once through the fourth industrial revolution technology (Williams & Tang, 2020). Bringing together information from different scheduled periods and investigating the number of sales of any company creates easier ways to control and manage a client's inclinations and needs. Utilizing this information, forthcoming leadership planning may be originated, making it possible for customers' expectations to be met more quickly and easily. Consumer's allegiance would increase if their requirements from the company were met. As an outcome, Big Data and AI technology help firms to have a perception of various customer groups without assigning

an opinion research poll to different clients if they intend to raise their consumer base (Lahane et al., 2023).

In addition, Trauth, Bergs, and Prinz (2023) stipulated that through the development of different cyber tools, companies are now able to monetize those software tools by laying out augmenting services that are traded in line with the purchase of those digital tools. The method of monetizing goods or services may be significantly different, relying on both the company that supplied the commodity or service, and on the good or service alone. As an outcome, the client will get additional data about the commodity that was purchased or simply gain access to further services that would align with the goods. This makes it possible for the goods to exceed their substantial constraints and acquire worth in their digital format. When these digital tools are used judiciously, they have the possibility of generating more money for the company, which would consequently assist the firm in having a competitive advantage (Trauth et al., 2023). Not all digital tools impact customer relationship management directly, however, some of the technologies have profitable effects on customer relationship management.

To proceed further, AR (augmented reality) provides customers with the possibility to digitally visualize a commodity in its entire form before proceeding to buy it (Efthymiou & Ponis, 2021). Due to this reason, it has become unnecessary for the client to embark on a journey to a particular store to buy a product, instead, they can visualize how it looks and functions digitally.

Additionally, AI (artificial intelligence) can assess the purchasing method of a client and present guidance for goods and services that align with the customer's demands because of the discovery. Several online retailers have been utilizing this digital tool, which helps clients have special experiences with their purchases.

Furthermore, the application of GPS (global positioning system) makes it easier for both firms and customers to control the location of the products as they go from one place to another. The enterprise has the possibility of detecting whether the conveying processes have been delayed or not so that the clients can be notified earlier. Also, the customer is advantageous by using GPS in the sense that it gives them an insight into where their expected products are and when they will arrive (Adeitan, Aigbavboa & Agbenyeku, 2019). Being proactive is the key factor when it comes to leadership of customer relationships.

Advanced technologies like AI have now made it possible for firms to predict the demands of clients and give answers to those needs beforehand, which helps secure a more loyal customer base. With the fourth industrial revolution, a commodity may now be presented to new markets and customer groups with more articulation, irrespective of the size of the company.

5.4 The effect of Industry 4.0 on delivery

A supply chain is solely as powerful as the goods and provisions it makes. Nowadays supply chains, which might cover many countries and continents, highly gain from swift product conveyance. There has been a substantial effect of Industry 4.0 technology on the supply firms (Asdecker & Felch, 2018). A self-supporting computerized web is produced to interconnect machines within and outside the supply chain (Cruz-Mejía, Márquez & Monsreal-Barrera, 2019). The state of the final customer is usually being re-directed by smart distribution. A real-time delivery system is utilized to anticipate/predict the dispatch period of a product. The distribution of goods may be made more productive by making use of big data analysis to examine and suggest better routes. As firms increase the volume of their delivery capacities, the supply chain has become more complex and sophisticated. In applying an analytic method, lead time and delivery dates could be anticipated.

The optimization of the distribution time is the goal of Industry 4.0 technology and not the delivery time itself (Cruz-Mejía et al., 2019). Notwithstanding the advantages of engaging in nowadays shipment, consignments might still be slow in delivery because of unanticipated occurrences/happenings. One single dawdle in unprocessed materials may harm the manufacturing line and the firm's capability to function. Though it might be difficult to predict every possible barrier to delivery, it is feasible to make sure that the supply chain isn't distorted in the circumstances of a blockade. Using GPS comes with so many advantages and rewards like the ability to control the products being shipped, and help transporters arrive at their destinations faster. For more accuracy about the exact location and efficient determination of route due to current road and traffic circumstances, and determining roads under construction, the trucker GPS is the sure plug. At the arrival of the delivery truck, drivers examine the route to check whether there is any challenge

that requires fixing. If it happens there are issues, the dispatchers get an alternative route quickly.

For a better result, route management could be automated with the application of Industry 4.0 technology. There are different areas in which Data technology can help in the storing of route data to enable AI to examine it for the creation of a higher standard route, it also can have total control of the movement of trucks in real-time by upgrading the real-time routes with accuracy and swiftness that isn't feasible for manpower to achieve. The option of having a simulation to investigate the duration for resolving any challenges that may be present during shipment is also possible. It is recommended that the government policies governing the impact of goods conveyance on the environment must be obeyed by businesses of today. Consequently, when scheduling routes, it is important to take into consideration both efficient and less dangerous routes, as well as stay out of closely contaminated areas, if possible, to reduce noise pollution.

However, it is advised that the supply chain be more explicit in its operations so that, when there is a challenge, both the organization and the supplier of the products will be acquainted with it through the utilization of a two-way data exchange system in trucks. In this way, the supply chain may be less disorganized and develop incident contingencies when faced with disruption. In addition, distributors may apply cloud systems to furnish the exchange of a large volume of information or make solutions that might be helpful should there be issues with conveying the products.

In time to come, the traditional method of transportation in the product conveyance process may be entirely replaced by autonomous vehicles and drones. Though not yet completed, many organizations including eBay have made investments already in these technologies. The companies would want to either engage in virtual reality (VR) or augmented reality (AR) technology to handle them remotely or utilize an automation device and AI to select a high-standard route and attune the environment in real time (Scurati, Gattullo, Fiorentino, Ferrise, Bordegoni & Uva, 2018). The transportation approach has the tendency to become more adaptable with a shared structure like this. With these digital tools, both the distributor and the company will have the ability to know and visualize the condition or situation of any supplies in real-time. Also, every delivery will be jointly attached to one supply chain (i.e., another supplier may have the leverage of automatically accepting components of the supplies from another depending on the congestion of the

supplier). In cases where the cars/trucks carrying goods are held in traffic, another vehicle from the same distributor may come to take up the products and supply them if required. Distributors, courier service providers and producers teaming together to enhance supply chain adaptability and resilience would be advantageous to all of them (Schroeder, Bigdeli, Zarcos & Baines, 2019).

The application of industry 4.0 technologies like IoT and cloud systems helps information to be exchanged and put together whilst on the whole supply process. AI may then control and modify the route in real-time, making transporters ask for help from both the devices and human operators. In this regard, the most necessary feature of Industry 4.0 technology is its collaborative work. The whole essence of these new technologies can only be accomplished by making information exchange and collaborating with all parties involved. Industry 4.0 makes it necessary for businesses to collaborate with distributors and courier service providers to get used to the new technology. The utilization of improved rationale to harmonize funds in Industry 4.0 has created more organized and blended work surroundings.

6. Conclusion

In the last chapter of this thesis, I will focus on the conclusion of the study, the research limitations, and recommendations for future study.

This research has tried to examine the impact and challenges of digital transformation on the courier service SMEs in Nigeria through the framework of the utilization of the Industry 4.0 technology model. This topic focus of my thesis is significant in many ways, but most importantly is that Nigeria is a developing country where impact assessments are few and standard empirical research works are difficult to come across. Better still to put this in a simplified language or clearer explanation, this research primarily aims to find out the impact, problems, and challenges of applying Industry 4.0 in the courier service SMEs in Nigeria as well as provide guidelines to courier service small and medium-sized organizations (SMEs) in Nigeria.

In contemporary times, it is meaningful to argue that we live and co-exist in a business world, that is continuously evolving or changing and adopting emerging digital technologies for the growth and competitive advantage of the company. For small and medium-sized enterprises seeking a competitive advantage over their competitors, this research focused on the need to have an in-depth understanding of Industry 4.0 technologies, the challenges of adopting them, and their leverage or influence on existing courier service small and medium-sized enterprises. The implementation of new technology requires a considerable manpower investment and physical and financial resources (Matt et al., 2020). This means SMEs would have to plan strategically and implement the necessary steps to lay hold of opportunities and conquer the obstacles that would arise while trying to comprehend the advancing needs and constraints. These limitations could be digitalization, international economic unification, structure, quality, government policies, infrastructural development, and educational and professional expertise for the growth of the firm (Adeitan et al., 2020).

The argumentation in the above paragraph aggregates the statement of research in this study. The statement of research is the main influence and reason for the research questions below:

What are the impact and challenges of applying Industry 4.0 in courier service SMEs in Nigeria?

The question was carefully answered via the responses from the respondents who were selected to answer the relevant interview questions in this study. The findings confirm past research, which has validated the challenges in adopting industry 4.0 technologies and endorsed a positive connection between digital transformation, technological elements, and innovational success, resulting in greater productivity and courier service business growth. However, the impact on courier service SMEs in Nigeria is still unknown because SMEs have yet to adopt these new technologies, which also is in line with the findings made by Adeitan et al. (2021). According to their investigation, it is difficult to explain the synergy between enhanced courier service operations and the evolution of Industry 4.0. It is therefore not easy to ascertain the digital shift impact of Industry 4.0 systems (Adeita et al., 2021). Also, the investigation of this study has confirmed the research carried out by Barreto, Amaral and Pereira (2017) which stipulates that the impact of Industry 4.0 technologies on SMEs in the courier service sector is still uncertain.

In various studies done by Adeitan et al. (2020); Mikalef and Parmiggiani (2022); Maheshwari (2019); Hahn (2020); Matt et al. (2023), digital adoption was seen to have a positive impact on business productivity and growth. The results retrieved in this research are like the findings of previous studies, where the adoption of digital tools is positively connected to business efficiency. Since technologies are making it feasible for companies to carry out operations more effectively and have a competitive advantage over their competitors (Mikalef & Parmiggiani, 2022), it is shown that Industry 4.0 is taking a positive toll on courier service. While some organizations have not yet had great success stories with the adoption and utilization of industry 4.0 technologies, others have. However, the impact of Industry 4.0 technologies on the conception of courier service SMEs is still uncertain (Barreto et al., 2017). It is difficult to ascertain how improved courier services and the rise of Industry 4.0 are connected, taking into consideration the small number of empirical studies that have tried to derive the model's significant impact on courier services (Adeitan et al., 2021).

In a general summary or conclusion, this research has been able to reveal that there is an ongoing paradigm shift in the courier service companies and it is a long process that has just begun. Though these emerging technologies are being implemented at a very moderate rate, soon, the courier service industries may experience an absolute change.

The traditional methods of carrying out courier service operations are being taken over by automation and the utilization of data. Digital producers will depend on techniques and tools that are enterprising and perform data-based decisions through automation and big data analytics. This new paradigm shift will show customized and personalized manufacturing at a great level, with the maximization of behavior style and more diligent clients.

The information that has been generated by the consumer through the phase of creating a commodity is nowadays more treasured than before, and its value will keep expanding because it will always be used by the different parts of the courier service operations to improve their productivity. There is a great possibility that courier service companies will soon be experiencing smooth and enhanced operations due to the rise of these emerging technologies. These technologies make it possible for every element to be integrated, making the supply chain connect and deliver a final consignment to the client without the possibility of human error which is found in the conventional method.

Since these technologies are newly developed and the acceptance rate has not been substantial, the cost of implementation is extensively higher than the ordinary basic technologies found all over the place. This, therefore, makes the probability of industries embracing them quickly very low. Other challenges associated with the adoption of Industry 4.0 technologies are the inadequate number of skilled personnel who know these technologies, Infrastructural development, unfavorable government policies, poor road networks, inaccessibility of loans from financial institutions (banks), and few data scientists and IT specialists. Adding to the above challenges, these emerging technologies can somewhat be more effective only in a digital environment that can handle the vast quantity of information with the ability to receive it via sensors connected to an Internet of Things (IoT) system. This is where courier service SMEs in Nigeria are disadvantaged due to their small stream of resources compared to large-scale enterprises. As a result, SMEs must always rely on their rigorous scheduling and inspection of their supply chain strengths and weaknesses.

This research will improve the business efficiency and technological literature for developing countries, especially Nigeria. Courier service SMEs in Nigeria should practice more digital transformation strategies to enhance their business development.

6.1 Future prospect

The problematization, operationalization, measurement, interpretation, and empirical findings in a research task help in building up the final reflection concerning a particular research task. It is this final reflection that guides and justify the recommendation or recommendations to build and improve on outcomes or results, limitations, challenges, problem, solutions, methodology, methods, strategies, etc., in a future research task that shares the same topic, objective, discipline, orientation, and others.

The findings help in examining the impact and challenges of utilizing Industry 4.0 in courier service SMEs in Nigeria. Thus, managers should have an understanding that putting forth applicable measures, strategies, policies, processes, and structures in place will aid in improving digital transformation which, eventually will help in having a successful business performance.

6.2 Limitation and further research

In the case or premised on the general experience (scientific and personal) I got from conducting this research exercise, I am acquainted with the fact that, notwithstanding how well most of the research is conducted, they experience certain limitations. However, these constraints are taken to be appropriate because they are seen as providing guidelines for future study. One of the constraints of this research is that this study selected experts from the department of warehouse, dispatch, and transportation from courier service SMEs as the focal point of prominence in conducting the research. Other investigators desiring to research the same topic may choose owners and the workforce from other sectors to conduct their study.

Additionally, researchers are also supported to examine a demographic outlook. Since digital manufacturing will rely on agile, iterative methods to keep up, and companies who learn, embrace, and use industry 4.0 tools will have success in the digital future, a demographic outlook is recommended. The demographic outlook is important to study the gender (male and female) attitude (acceptance or rejection) to the adoption of the Industry 4.0 model in business in developing countries or emerging economies. This would further help in understanding and finding solutions to social questions (e.g., inequality and representation of women in tech in these countries) within the tech boundary.

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8. Appendices

Appendix 1: The Interview Questions

1. How would you describe the adoption of Industry 4.0 technology in growing companies?
2. How would you describe the willingness and commitment of small and medium-sized enterprises (SMEs) in Nigeria to utilize the Industry 4.0 technology in their business and services?
3. Would you say the current business environment and governmental policies support the adoption of Industry 4.0 technology in the courier service organization in Nigeria?
4. Would you say that the adoption of Industry 4.0 technology in the courier service organization in Nigeria has had positive or negative impacts?
5. As an employee of Tranex PLC. Nigeria, would you greatly support the utilization of Industry 4.0 technology in your organization?
6. As an employee of Tranex PLC in Nigeria, would you greatly recommend the utilization of Industry 4.0 technology to other organizations?
7. As an employee of Tranex PLC in Nigeria, what are the key strengths relating to using Industry 4.0 technology in your organization?
8. As an employee of Tranex PLC in Nigeria, what are the key weaknesses or limitations relating to using Industry 4.0 technology in your organization?
9. As an employee of Tranex PLC in Nigeria, how would you describe your organization's preparedness to improve the adoption of Industry 4.0 technology?
10. As an employee of Tranex PLC in Nigeria, what do you think are the current strategies of your organization to make improvements about adopting Industry 4.0 technology?