

## **DIGITAL DISRUPTIONS AND OPERATIONAL EFFECTIVENESS OF TRANSPORTATION COMPANIES IN RIVERS STATE**

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**ABSTRACT:** *The study x-rayed the impact of digital disruptions on operational effectiveness of transportation companies in Rivers State. The study adopted the Adaptive Structuration Theory as the baseline theory. The study employed a qualitative approach which examined 30 transportation firms in Rivers State using secondary data such as internet sources. The gathered data was analysed using content analysis. The study from its finding concluded that artificial intelligence has influence on operational effectiveness of transportation companies in Rivers State. The study further says discovered that there is a positive relationship between internet of things and operational effectiveness of transportation companies in Rivers State. The study recommended amongst others that Businesses looking to adopt AI should take a collaborative approach, working closely with policymakers and other stakeholders to ensure that the benefits of AI are realized while addressing its potential challenges especially in transportation companies.*

**Keywords:** *Digital Disruptions, Artificial Intelligence, Internet of Things, Operational Effectiveness, Transportation Companies*

### **INTRODUCTION**

The increase in global competitiveness, together with advances in technology and on-going changes in the environment, requires organizations to continuously adapt and be willing to change their structures, strategies, methods and practices to remain competitive. Many organizations operate in unprecedented environment with a number of dynamics like advanced technology (Ihunwo & Poi, 2022). Technology has changed businesses and within-business connections. This has empowered reconfiguration of design, marketing, production, delivery and services through supply chains, independent structure, outsourced manufacturing, hospitality, transportation and contract warehousing and delivery. The advent of technology has prompted advanced digital transformation, which is not simply restricted to tech-savvy businesses, also high-tech major established organizations have embarked on digital transformation venture too (Idiegbeyan-Ose, Ilo & Isiakpona, 2015; Weill & Woerner, 2018; Agboola, Asokomeh, Akinbode, Peter & Deborah, 2017). Digital disruption is generally perceived from the perspective of firms that are heavily invested in old conditions and whose typical or planned course of development is interrupted (Skog, Wimelius & Sandberg, 2018). As the proliferation of certain digital processes or artefacts leads to change in established industry structures, established firms face severe pressure to respond. Such responses can prompt fundamental change to operations (Karimi & Walter 2015), the technologies that support legacy business models (Westerman & Bonnet 2015; Rauch, Wenzel & Wagner, 2016) and even the identities of the organizations and professionals within them (Utesheva, Simpson & Cecez-Kecmanovic, 2015). When firms face the threat of digital disruption there is often an acute need to react due to the rapidity and systemic nature of environmental change along with diminishing business results. However, it is generally difficult to change historically successful firm structures that have emerged from adaptation to previously prevalent environmental conditions (Lucas & Goh 2009; Karimi & Walter 2015; Wenzel, Wagner, Wagner & Koch,, 2015; Rauch et al. 2016; Skog, et al., 2018).

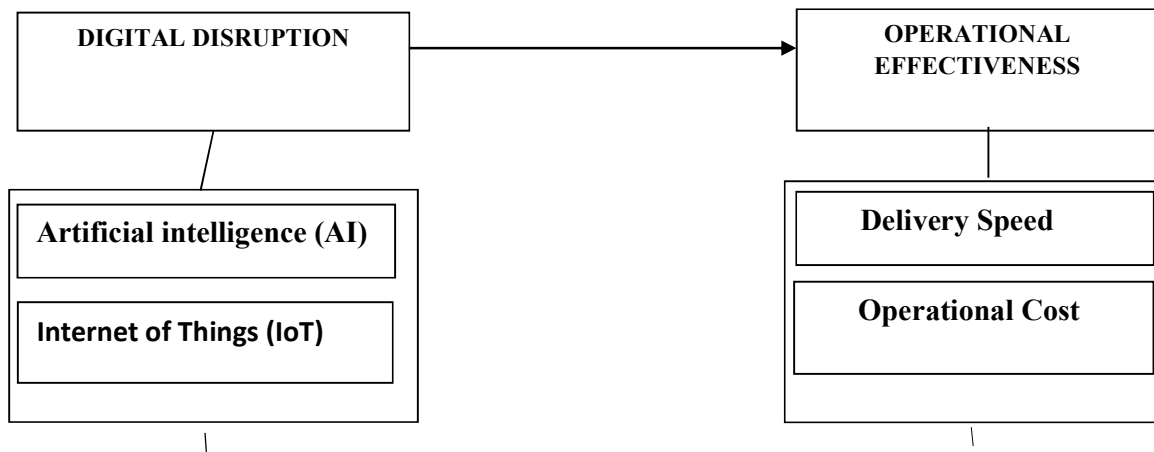
Digitalization of most transportation companies in Nigeria has brought about new models in businesses, that is new ideas with regards to development and improvement in various areas, from mobile banking to financial transactions and internet banking. This has continued to grow and supplant the conventional banking services to the customers through innovative technologies to

meet the developing complex necessities and challenges of globalization. The Nigerian banking and financial sector have experienced radical changes and improvement over the last few years and is in a consistent state of development (Mayowa, et al., 2019; Abbasi & Weigand, 2017). The development of AI based robots and machines in recent years has been found to be widely used in our daily lives, including marketing, robotics, healthcare, business, and many other areas (Kumar & Chadha, 2022). AI is found to be helpful to transportation companies in intelligent ticketing system, scheduling and timetabling, customer analytics, predictive maintenance, real-time operations management and multi modal journey planner (Kumar & Chadha, 2022). The IoT is a technological resource that has the combination of sensors, connectivity, and mobility as some of its basic characteristics, being important for the digitization of the industry. Currently, IoT applications are varied, permeating almost all activities, such as transportation, construction, agriculture, and healthcare (Patel & Patel, 2016). A study carried out by the Gartner Group (2017), the world's leader in technology research and consulting, found that, in 2017, 8.4 billion connected devices were used worldwide, representing an increase of 31% over the number of connected devices in 2016.

**Statement of Problem**

In turbulent times, the deployment of digital disruptive technologies is now one of the hot button academic subjects. Although, many scholars and practitioners argued that these technologies assists businesses in understanding the relationship between digital disruptions and operational efficiencies. However, the current knowledge of the relationship is insufficient. To our knowledge, academic work in the area of digital disruption and operational effectiveness has not yet been extensively explored in Rivers State, a context that shows high growth and digital transformation rates in relation to other developed countries, particularly in the transportation companies. In addition, previous research has called for investigating how digital transformation influences firm performance in different contexts and sectors (Zhai, Yang Chan, 2022; Martínez-Caro, Cegarra-Navarro Alfonso-Ruiz, 2020). Moreover, understanding which channels can explain how digital disruption influences operational effectiveness is worth understanding. Some proposed channels through which digital disruption can influence operational effectiveness are IT innovation and customer experience. Thus, this study aims to examine the effect of digital disruption on operational effectiveness in transportation companies in Rivers State. More specifically, we aim to examine the above relationship in a developing country like Nigeria and to be specific, Rivers State, where the transportation sector plays a crucial role in its economy

**Conceptual framework**



**Fig. 1.1** Conceptual Framework Showing the Relationship between Digital Disruption and Operational Effectiveness.

**Source:** Researcher's Adaptation (2023)

### **Objectives of the Study**

The aim of this study is to examine the relationship between disruptive technologies and operational effectiveness of transportation companies in Port Harcourt. However, the specific objectives were to:

1. Explore the relationship between artificial intelligence and operational effectiveness of transportation companies in Rivers State.
2. Examine the relationship between internet of things and operational effectiveness of transportation companies in Rivers State Harcourt.

### **Research Questions**

The following research questions guided the study:

1. What is the relationship between artificial intelligence and operational effectiveness of transportation companies in Rivers State?
2. What is the relationship between internet of things and operational effectiveness of transportation companies in Rivers State Harcourt?

## **REVIEW OF RELATED LITERATURE**

### **The Concepts of Digital Disruptions**

Disruption refers to a very specific process that explains how entrants can successfully compete with incumbents (Christensen et al. 2015). It is concerned with business-model innovation that enables entrants to enter markets with cheap, easy to use, but low-performing products (Christensen 2006; Christensen et al. 2015; Skog, et al., 2018). In a more lucid term, however, the verb disrupt has slightly different meanings: to prevent something, especially a system, process, or event, from continuing as usual or as expected (Cambridge online dictionary), to break apart, to throw into disorder, or to interrupt the normal course or unity of, for example, an industry with new technology (Merriam-Webster online dictionary).

Digital disruption is the transformation that occurs when new digital technologies and business models impact the value proposition of existing products and services. Disruption happens when it's necessary for companies to change the way they operate to stay relevant and competitive (Indeed Editorial Team, 2023). Increased customer satisfaction, access into new markets, creation of entirely new business models, increase in efficiency and productivity by automating tasks and processes, facilitation of innovation, creation of new jobs, communication improvement, and cost reduction has been added as key benefits of digital disruptions (Indeed Editorial Team, 2023).

Many researchers have developed dimensions of digital disruptors to include (data analytical, cloud and mobile, robotics and 3D printing (Bayo & Red-Well, 2020). The McKinsey Global Institute (MGI) has identified 12 forms of disruptive technologies which exhibit the greatest economic impact and potential to cause disruption by 2025: mobile Internet, automation of knowledge work (artificial intelligence, AI), the Internet of Things, cloud technology, advanced robotics, autonomous and near autonomous vehicles, next generation genomics, energy storage, 3-D printing, advanced materials, advanced oil and gas explorations, and renewable energy (Manyika, 2013). Therefore, this present study adopted artificial intelligence and internet of things as its major dimensions.

### **Dimensions of Digital Disruptions**

#### **Internet of Things**

The concept of IoT was promulgated by **Ashton (2009)** at the Massachusetts Institute of Technology (MIT), who predicted the connection of physical objects to the internet by means of sensors, such as Radiofrequency identification (RFID) which allows the gathering of information without human interference. The IoT rests on the idea of managing processes through connectivity, mobility, and analysis of data generated by sensors, bringing the real world closer to the virtual

(Abersfelder, Bogner, Heyder, & Franke, 2016). The Internet of Things (IoT) is a concept where objects are capable of categorising, sensing, networking and handling potentials to allocate them to interact with each other via the Internet to realise a purpose (Whitmore, Agarwal & Xu, 2015). Dobbs (2015) described IOT as embedded sensors and actuators in machines and other physical objects that are being adopted for data collection, remote monitoring, decision making and process optimization in everything from manufacturing to infrastructure to health care. European Commission (2015) mentioned IOT to connote devices of all sorts, equipped with sensors and actuators, connected to the Internet, allowing them to monitor their status or the environment, to receive orders or even to take autonomous action based on available information.

### **Artificial Intelligence (AI)**

AI is defined as a network of computers that can simulate human intellect while making decisions on how to approach a business problem (Huang & Rust, 2018). AI helps with business system design thinking and learns from data to gain insights without human input (Mohsen, 2023). With the help of AI, organizations can pinpoint the weak points in their supply chain management and allocate resources accordingly (FossoWamba & Akter, 2019). By rapidly extracting client expectations, sensing the market, utilizing failure modes, optimizing internal and external supply chains, and encouraging a more creative workforce through the automation of routine tasks, AI has the potential to help businesses build the best possible goods (Jabbour et al., 2020; Mohsen, 2023).

Expert systems", also known as "knowledge-based systems", are a subfield of artificial intelligence that focuses on the development of software that gives computers the ability to perform tasks that have historically been carried out by humans with the assistance of specialized instruction and knowledge in supply chain management (Pournader et al., 2021). The components of an expert system that are outlined by Kusiak (2019) are as follows: Knowledge reorientation, which is where knowledge is framed, the interface engine, which describes the control strategy, and knowledge acquisition, which enables the system to collect data and knowledge for the purpose of problem-solving in supply chain management (Mohsen, 2023).

### **Operational Effectiveness**

The rise in number of factors prompt organizations to operate more efficiently and to enable them carry out effective operational processes (Hill, 2000; Slack, Chambers, & Johnston, 2004) cited in (Ihunwo & Opara, 2021). Operational effectiveness emphasizes the need of an organization to deliver value adding products or services of unique quality, on time, at a competitive price (Ihunwo & Poi, 2022). Thus, organizations attempting to meet these objectives need to pay attention to their operational effectiveness as this is a primary driver of business performance in order to remain competitive (Wheelwright & Bowen, 1996; Ben-Rajeb, Morel-Guimaraes, Boly & Assielou, 2008; Slack, Chambers & Johnston, 2010).

Operational effectiveness refers to the ability of setting processes, based on core capabilities within the organisations, which work well (Santa, Ferrer & Hyland, 2018). Operational effectiveness involves improving process performance by leading and controlling the processes within the firm as well as measuring and improving the processes. A better use of resources through these core processes enables the organisation to eliminate waste, adapt more appropriate technology and therefore perform better than competitors ((Santa et al., 2018). It refers to the ability to establish processes, based on core capabilities within the organizations that encourage them to exceed customer's expectations (Porter, 1996; Evans & Lindsay, 2011). Operational effectiveness involves improving process performance by leading and controlling the processes within the firm as well as measuring and improving the processes. A better use of resources through these core processes enables the organization to eliminate waste, adapt more appropriate technology and therefore perform better than competitors (Porter, 1996; (Ihunwo & Poi, 2022).

### **AI and Operational Effectiveness of Transportation Companies**

As organisations seek to embrace AI, it is necessary for public transport organisations to understand there are inherent challenges with AI and key building blocks for the public transport sector (Action Point, 2020).. Currently, the most common applications of AI have been in the areas of real-time operations management and customer analytics (Action Point, 2020). In the near future, one in three public transport organisations expressed they would be considering the integration of AI-driven applications in customer analytics, predictive maintenance, and network planning and route design. The use of AI applications in public transport could be one of the critical solutions that effectively unlocks the value of data to improve the quality and efficiency of the public transport sector (Action Point, 2020). There are numerous contemporary uses for transportation technology that have emerged recently and will continue to do so in the years to come. The software developer's area of expertise is method-oriented machine approach with an embedded offer as a means to ascertain the consequences of the solutions related to the transportation sector (Kumar & Chadha, 2022). Numerous studies on AI in the transportation sector have been conducted in a number of nations, with various findings. Here are a few of them: In the area of transportation, Transport Management Systems (TMS) is a potent software program (Kumar & Chadha, 2022). TMS are well-known in the market these days, especially for shippers that may be moving high volumes, as they assist businesses in preparing them for optimization, route planning, and much more (Muyneck, Duran & Johns, 2021). They help them manage their data and automate various business processes, allowing them to use fewer workers and be more efficient in transportation. A data system for better management that might educate us on taking photos, transmitting them, and managing the statistics created is tied to the transportation methods used in a city.

### **Internet of Things and Operational Effectiveness**

Giudice (2016) stated that the IoT enabled OE because it provides refined real-world information, streamlining the business management process. **Macaulay et al. (2015)** stated that the logistics and the IoT are a perfect match since technology connected several assets corresponding to the logistical flow and enables the analysis of data generated from these connections in order to capture new ideas to achieve higher levels of OE. Porter and Heppelmann (2015) stated that the IoT consists of information processing to act and react in order to maximize performance. In an expansion of the production scale, which requires rapid growth in demand and storage management, the IoT strengthens inventory control, reduces logistics and distribution costs, and optimizes the purchasing process (Yu & Bai, 2013). Porter and Heppelmann (2015) contributed significantly by demonstrating the relationship along a supply chain prior to the application of the IoT - companies had to obtain the information by verifying orders issued, submitting satisfaction and intention questionnaires to customers, and by visiting suppliers. **Brous et al. (2019)** said that IoT allows for the reduction of operating costs, generates insights into new forms of revenue, and increases efficiency in communicating with the customer. Considering these facts, the following hypothesis was developed.

### **Operational Effectiveness**

#### **Delivery Speed**

It is important for businesses in the current competitive environment to understand the value of their customers, as they are important to the business future growth. This should motivate organizations to find ways to capture, attract and maintain their customer's loyalty. Organizations should understand the wants and needs of their target market and make sure that the delivery of these wants and needs is in an efficient and effective manner so as to satisfy the customer in the target market (Ihunwo & Poi, 2022; Maxhand & Plowman, 2012). Improving on speed boosts an organization to be able to shorten the time between the service request and delivery of the service, with the frequency and at the times requested by customers (Ihunwo & Poi, 2022; Hill, 2005).

### **Operational Cost**

Creating competitive advantage niche is not instantaneously; hence an organization becomes advantageous in the market by outshining on some of the objectives and being competitive (Ihunwo & Poi, 2022; Wheelwright & Bowen, 1996). Organizations need to identify the inadequacies and waste in practices such as procurement, product or service design, and the performance of staff to enhancing cost performance (Russell & Taylor, 2008). An appropriate disaggregation of the cost components impacting on the total cost performance of an organization gives the opportunity to identify the areas for improvement (Ihunwo & Poi, 2022; Slack et al., 2004).

### **Theoretical Review**

#### **The Adaptive Structuration Theory (AST)**

The AST was developed by M. Scott Poole in (1991). Adaptive structuration theory (AST) attempts to evaluate the structural changes that technology causes in organizations (DeSanctis & Poole, 1991). Structuration theory offers a good basis for understanding the behavior of people and groups in organizations (Walsham 1993). It is discussed in a more detailed form by, for example, Poole and DeSanctis (1989), and has mainly been applied in the research of group decision support systems. But the foundations of the theory are not tightly connected to any specific technology; we may therefore apply it to other forms of technology as well. AST tends to construct models of the effects of technology and tasks on group decision making. Structuration theory suggests that the interaction between elements of the model is quite complicated. It is difficult to identify strict cause-effect relationships; the elements rather bind together in a process of mutual interaction. It is natural that the relationships between elements change over time. Social networks are not stable, but rather change as people's values and intentions change (McGrath, 1991). This dynamic process of change is depicted in figure 2. Social networks are open systems that gather information and influences from their environment and react to changes.

The implication of the theory to the study is that management of transportation companies may cause significant changes in the structure and action of networks by setting objectives and performance measures in their adoption of disruptive technologies.

### **METHODOLOGY**

The study adopted a qualitative approach. A total of 30 transportation firms were sampled taking into account business effectiveness using artificial intelligence (AI) and internet of things (IoT). However, 20 transportation firms were used in the study. These 30 transportation firms were directly related to the study purpose. Data was obtained using secondary data such as internet sources. This was done through Google search by using the main research. The gathered data was analysed using content analysis. The data was coded to ascertain patterns. A pre-set code was used to categorise data.

### **Summary of Findings**

The following findings were established

1. There is significant relationship between artificial intelligence and operational effectiveness
2. There is significant relationship between internet of things and operational effectiveness.

### **RESULTS AND DISCUSSIONS**

The findings of the study discovered that artificial intelligence affect operational effectiveness of transportation companies in Rivers State. The adoption of artificial intelligence is on the increase at an amazing speed. This offers a huge opportunity for industries looking to function extra efficiently and effectively. This is the reason why this study seeks to use Artificial Intelligence to improve operational effectiveness of most transportation companies in Rivers State. The results of findings is in line with the findings of (Jain, 2019) who said that AI can help businesses make more informed

decisions by analyzing large amounts of data and identifying patterns and trends. The results of the study indicate that AI has the potential to drive significant improvements in business operations. The study also discovered that there is a significant relationship between internet of this and operational effectiveness of transportation companies in Rivers State. It was indicated from the findings of Abubakari (2019) that IoT facilitates collaboration at the workplace as it helps workforce through networks to carry out their duties wherever they are. The findings also established that collaboration can be enhanced using portable devices and cloud systems to improve speed and cost. Abubakari (2019) went on to assert that IoT enhances human resources in the general business and biotechnology industry using human resource applications and wearable devices. It improves protection to check worker attentiveness; develop operational competence; support employee wellness; and organise employees based on their tasks and breaks to they observe.

### **CONCLUSIONS**

The study has attempted to establish a relationship between digital disruptions and operational effectiveness of transportation companies in Rivers State. The study finds that artificial intelligence has influence on operational effectiveness of transportation companies in Rivers State. The study further says that there is a positive relationship between internet of things and operational effectiveness of transportation companies in Rivers State. Hence, the variables taken under our study need to be properly explored by transportation companies to boost the morale of the shareholders.

### **RECOMMENDATIONS**

1. Businesses looking to adopt AI should take a collaborative approach, working closely with policymakers and other stakeholders to ensure that the benefits of AI are realized while addressing its potential challenges especially in transportation companies.
2. Transportation companies should reflect on ways the Internet of Things can promote their business activities in addition to their industries.

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